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Environmental, social and governance in Canada
Mining reclamation
Mines for Limitless Minds

PreshowGuide 2023



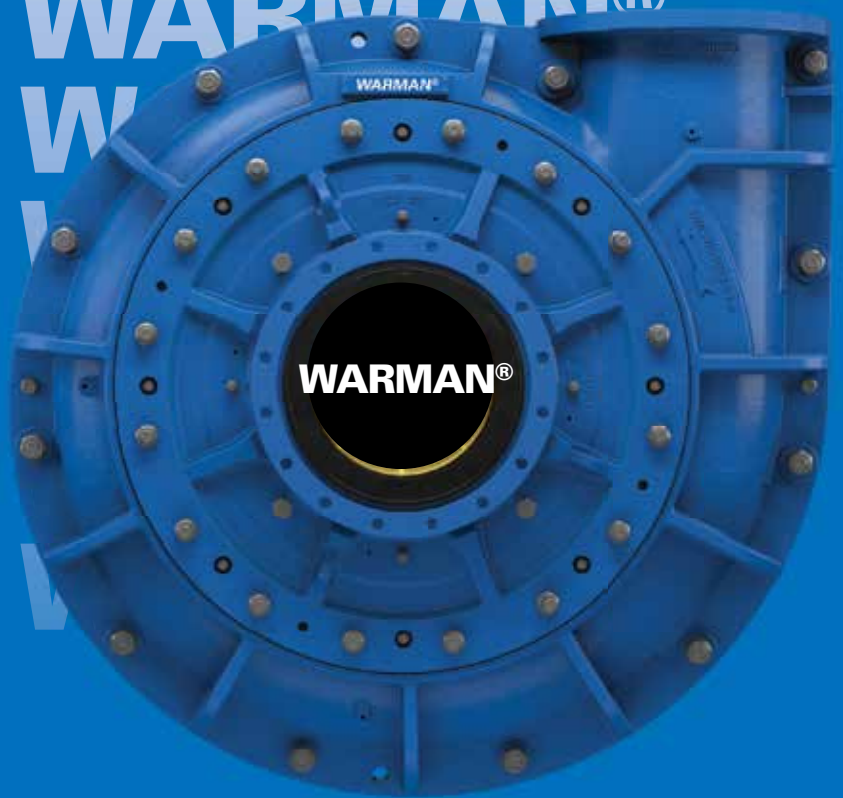
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Cover

Environmental, social and governance (ESG) issues have become one of the primary driving forces in the mining industry. ESG has evolved over time leading to the question of what is the best way for the industry to conduct itself to earn and maintain a social license to operate. On page 16, Sidney Schafrik provides insight into ESG efforts taking place in Canada. Cover photo: Historic Canmore Engine Bridge over the Bow River in the Canadian Rockies of Alberta. Photo credit, Shutterstock. Design by Ted Robertson.



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The SME Foundation supports your industry; The future of mining will need the next generation



Ronald Parratt
2022 SME President

The Society for Mining, Metallurgy & Exploration Foundation, Inc. (SMEF) was established in 1991 and was created to attract and leverage resources for a sustainable mining industry through education and outreach. Through its many years of operation, it has been supported by numerous SME members, friends of the industry and, importantly, many mining and mining-related corporations. SMEF is well known to SME members, and their support over the years has been critical to the overall success of the Foundation. I certainly encourage SME members to support the Foundation and its

activities that are so important to our industry. In that regard, I thought it would be helpful to review the various programs that SMEF currently supports, and to provide members with a better idea of what their donations are accomplishing.

SMEF currently supports five specific programs: the Ph.D. Fellowship and Academic Career Development Grant Program, ABET, the Professional Engineers (PE) Licensure Committee, Minerals Education Coalition (MEC), and SME Foundation scholarships. Specifics of each of the programs are as follows.

Ph.D. Fellowship and Academic Career Development Program

This program supports the advancement of Ph.D. students to attain Ph.D. degrees in mining and metallurgical engineering and provides support for existing Ph.D.s to attain tenure in the teaching of these important disciplines, given the declining number of such faculty. There are 21 current and former participants in the Fellowship program with six having earned their Ph.D.s and one additional Ph.D. recipient accepting an assistant professorship position. There are 14 current and former participants in the Career program, and nine individuals have achieved tenure, one has accepted a faculty position and one received a promotion.

This program is fulfilling its goal of replacing retiring faculty and assuring the continued education of mining and metallurgical engineers for the remaining 13 U.S. mining schools.

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ABET is a nongovernmental organization that accredits more than 4,360 applied science, computing, engineering and engineering

Safety Share: Large mining electric vehicles (EVs) are coming, and there is no question that mines of the future will have battery storage and change-out facilities along with battery charging stations. Until we are assured that no mobile battery will catch on fire, the safe way to operate these facilities is to keep them away from other buildings, particularly those that have large numbers of employees in them. On the surface, this means separate structures sufficiently separated so that a fire can be extinguished without jeopardizing the rest of the surface plant. Obviously, they should have built-in fire suppression systems. Underground, this means that all battery areas should be on separate ventilation splits so that fire emissions can be discharged without recirculation into the rest of the mine. Individual platforms for large batteries should be far enough apart that a fire on one will not spread to others.

Lee Saperstein,
NORA Mining Sector co-chair

technology programs at more than 850 institutions in 41 nations. Eighteen program evaluators were nominated from SME for geological, mining and mineral engineering and geology program visits for the 2022-2023 review cycle. Of these, 10 visits are in the United States and will be conducted in person, while six visits to foreign institutions will be completed virtually. The group rigorously evaluates these programs to ensure they meet the standards necessary to grant the degrees noted. Each college or university that grants these degrees must be re-evaluated every five years to ensure the programs continue to meet the requirements. Funds provided by SMEF are for travel and related expenses and the materials needed to visit the colleges or universities being evaluated.

SME Professional Engineers Licensure Committee

Each year SME administers the PE Exam in October. To prepare individuals to take the exam, SME conducts a PE Review course that is held in September of each year. The 2021 PE Exam was the first computerized exam for the mining and mineral processing discipline. The PE Committee has supervised the writing of the *Mining Reference Handbook, Edition II*, which

(continued on page 14)

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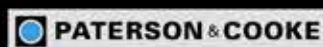
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Department of Defense awards critical minerals contract

PERPETUA RESOURCES has been awarded the first critical minerals award from the Defense Production Act (DPA) Investments Program and the Air Force Executive Agent. The award, issued using Ukraine Supplemental Appropriations, aims to secure an American source of critical minerals for missiles and munitions.

The U.S. Department of Defense (DoD), reported that the DPA Investments Program will provide \$24.8 million to Perpetua to complete environmental and engineering studies necessary to obtain a Final Environmental Impact Statement, a Final Record of Decision, and other ancillary permits. Perpetua will perform this study work related to its Stibnite-Gold Project in central Idaho through 2024.

This investment is essential to ensure the timely development of a

domestic source of antimony trisulfide for the manufacture of small arms and medium caliber cartridges, as well as many other missile and munition items.

Perpetua wrote in a press release that antimony trisulfide is essential to national defense as a key component for munitions yet there is no U.S. mined supply. Perpetua plans to re-establish a domestic supply of the critical mineral antimony as a by-product of one of the highest-grade openpit gold resources in the United States. The DPA funding allows the company to advance the construction readiness of the Stibnite Gold Project while the company continues through the ongoing permitting process, led by the United States Forest Service.

Under the funding agreement, Perpetua may request reimbursement for certain costs incurred over 24 months related to environmental

baseline data monitoring, environmental and technical studies and other activities related to advancing construction readiness and permitting process for the Stibnite Gold Project. The DPA funding does not interrupt the ongoing National Environmental Policy Act (NEPA) review process.

“As Perpetua continues advancing our project through the permitting process, we are honored to enter this agreement to help advance our construction readiness for future development,” said Laurel Sayer, President and CEO of Perpetua Resources. “Our vision remains unchanged, which is to redevelop a world class gold deposit, provide the country with a critical mineral, and restore an abandoned brownfield site. Today, we continue to build momentum toward turning our vision into a reality.” ■

EPA proceeds with proposal to block Pebble Mine

THE U.S. Environmental Protection Agency (EPA) has proposed a ban on waste disposal in Alaska’s Bristol Bay that if finalized, could essentially put an end to Northern Dynasty Minerals’ hopes to mine the massive Pebble deposit.

Alaska Public Media reported that Casey Sixkiller, the Region 10 administrator for the EPA announced that he sent a recommendation to EPA headquarters to protect the area by vetoing the proposed mine.

The ban was first proposed in May after Region 10 concluded that operating the mine — specifically, the dumping or dredge or fill material in waterways — could result in “unacceptable adverse effects” on fish spawning and breeding areas.

More than 600,000 people commented on the proposal.

Sixkiller’s move now puts the matter in the hands of Radhika Fox, the assistant EPA administrator for water. Fox could impose the veto, make changes or reject it entirely. She has 60 days to consider it.

“If affirmed by EPA’s Office of Water during the fourth and final step,

this action would help protect salmon fishery areas that support world-class commercial and recreational fisheries, and that have sustained Alaska Native communities for thousands of years, supporting a subsistence-based way of life for one of the last intact wild salmon-based cultures in the world,” Sixkiller said in a written statement announcing the action.

Pebble Partnership chief executive John Shively said the proposed ban amounts to a massive federal overreach and goes beyond what the Clean Water Act allows.

“Perhaps the most egregious aspect of this entire process is the EPA’s blatant dismissal of, and complete lack of consideration for, the significant economic benefits this project could have for the region and for the state,” Shively said in an emailed statement to *Alaska Public Media*.

Shively said if the EPA finalizes the veto, it would preclude “any development” on more than 300 square miles.

The project has always faced strong opposition because the deposit sits upstream from Bristol

Bay, home to lucrative salmon fisheries. Economists have estimated the fisheries are worth more than \$2.2 billion, including the value to subsistence users.

The Pebble deposit is on state-owned land, but to develop the mine, the Pebble Partnership would need federal permits under the Clean Water Act.

Under the Obama administration, the EPA regional office also set out to ban the mine. That proposed action was called a “pre-emptive veto,” because it was proposed before Pebble filed for permits.

The “pre-emptive veto” proposal was withdrawn during the Trump administration and the company finally submitted a permit application in late 2017. The U.S. Army Corps of Engineers denied the permits in 2020. Pebble is appealing.

The process EPA has to follow to issue a veto is long, with steps that seem to repeat themselves. A regional administrator has to propose a ban, seek public comment, then recommend a ban, and then submit it to headquarters for final approval. ■



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Canada moves to reduce reliance on China; New alliance and examination of permitting announced

THE UNITED STATES, Canada and other Western nations announced the Sustainable Critical Minerals Alliance during the COP15 talks on biodiversity in Montreal, Canada. The alliance aims to produce and acquire critical minerals with strong environmental and labor standards.

The alliance will target elements such as lithium, cobalt and nickel and could help Western nations reduce their dependence on China for critical minerals.

“Unless China and Russia are willing to put in place ... measures required to be able to legitimately say that they are supporting these kinds of standards, then it would essentially mean ... we will be buying alternatives as we can,” Canada’s Natural Resources Minister Jonathan Wilkinson told *Reuters*.

China continues to dominate much of the critical-minerals supply chain and Western nations will not be able to replace that supply any time soon, but the alliance is another step toward mineral independence.

China said it has taken steps to curb pollution in its mining sector, but has faced criticism.

Mining, along with other sectors are under scrutiny at the Montreal talks due to their impact on nature.

“China is actually free to up its game with respect to environmental standards and with respect to labor standards and eventually join the alliance,” Wilkinson said. “But it would have to make those kinds of changes.”

Separately, Wilkinson announced efforts in Canada to get critical-mineral projects into production quicker by streamlining the permitting process. His stated goal is to build the projects in less than a decade.

“We need to get to the point where we can get these mines from concept to production certainly within a decade, and ideally less than that,” Wilkinson said.

Bloomberg reported that Wilkinson’s ministry published a critical-minerals strategy that pledged to review Canada’s approval process for developing mines.

Government estimates show it can take up to 25 years for a mining project to become operational. Wilkinson said he expects policy recommendations on streamlining processes within the next 12 months.

The time it takes to build a mine has been a source of concern for mining companies worldwide, given that lengthy approval processes pose investment risks and heightened costs, and is top of mind for many mining chief executive officers. The head of Vancouver-based Teck Resources Ltd, for instance, said that the Canadian government could help the industry with an approval process that ensures projects get done in a timely fashion.

“If we are going to bring supply online at the pace that the world needs to electrify, we need to shorten those timelines,” chief executive officer Jonathan Price said in a interview with *Bloomberg*. “Getting the approvals pathway right is very important, but we have to look for opportunities to accelerate so we can bring new production to market more quickly.” ■

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Have all the high-grade mineral discoveries been made?

Australia to establish environment agency that will oversee permitting

AUSTRALIA WILL establish an independent environment protection agency that will have powers to decide on the approvals of resource development projects. The new Environment Protection Agency (EPA) will be responsible for all project assessments and decisions, but the federal environment minister will retain the power to review EPA approvals, *Reuters* reported.

The announcement of the new agency was made by Environment Minister Tanya Plibersek on Dec. 8.

“What exists now isn’t working. Our environmental laws are broken. They don’t work for business, they don’t protect the environment. What

we are seeking is a win-win — a win for the environment and a win for business,” Plibersek told reporters.

Plibersek said businesses were waiting “too long” for decisions and that the proposed changes will also cut red tape, streamlining the project assessment process.

The opposition Liberal-National coalition said it supported steps to protect the environment but the government’s plans have “unworkable regulations which will strangle businesses across the country.” Environment groups welcomed the government’s decision, though WWF-Australia flagged concerns about a lack of urgency. ■

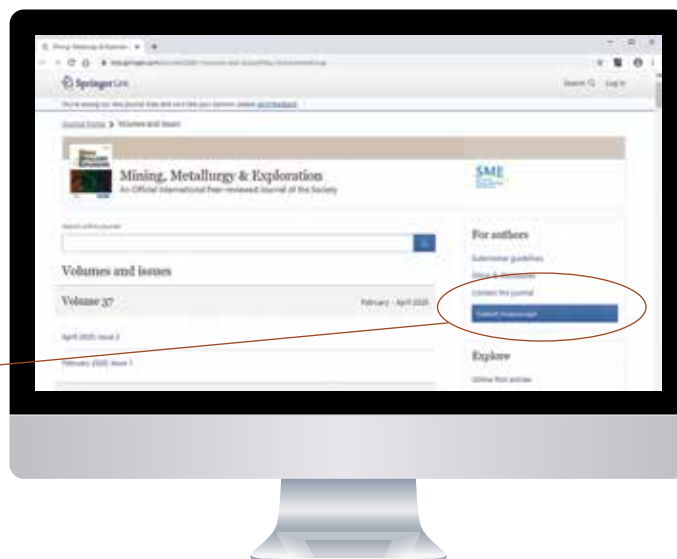
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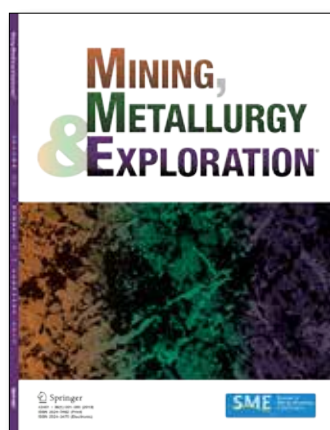
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Collection in Honor of Dr. Patrick Taylor: All About Metallurgy



This special collection is to pay tribute to Dr. Patrick R. Taylor, who recently retired from Colorado School of Mines as Ansell Distinguished Professor of Chemical Engineering. Dr. Taylor is a registered professional engineer with over 45 years of experience in mineral processing and extractive metallurgy engineering, research, teaching and consulting. He is experienced and trained in pyrometallurgy, hydrometallurgy, and mineral processing.

He has directed research for more than 100 graduate students and post-docs, and has taught extractive metallurgy and mineral processing university courses for the past 45 years.

This collection will honor the breadth of Dr. Taylor's career with papers in the areas of **extractive and process metallurgy, mineral processing, recycling, waste treatment and minimization, and thermal plasma processing** in a wide range of metals and materials, including base metals (copper, zinc, lead, etc.), critical metals (REEs, lithium, cobalt, nickel, indium, etc.), precious metals (gold, silver, platinum, etc.), and ceramic powders.

Editor: Fangyu Liu, Ph.D., Hatch Ltd.

DEADLINE: Submit by February 28, 2023

Email Chee Theng at theng@smenet.org if you have questions or need help.

Collection on Underground Ventilation

Technological advances in automation and control, underground equipment, computer modeling power, development of deeper and hotter mines, and strict mine health and safety regulations have brought significant improvements to mine ventilation engineering and mine atmospheric monitoring.

Editor: Purushotham Tukkaraja, Ph.D., QP, Associate Professor of Mining Engineering, South Dakota Mines
Submit by February 28, 2023

Collection on Ground Control in Mining

Mine ground control engineering has been constantly improving over the years to tackle the continual challenges of the mining industry. Stricter mine health and safety regulations, depletion of "easy-to-mine" resources resulting in more challenging mining conditions, and technological and computational advancements have been catalysts to mine ground control research over the years.

Editor: Deniz Tuncay, Ph.D., Assistant Professor of Mining Engineering, West Virginia University
Submit by February 28, 2023



Mining industry must recruit new talent; BHP chief technology officer calls for diverse workforce

THE GLOBAL mining industry is challenged with attracting a new generation of workers to the field that has become increasingly reliant on technology. In the December issue of *Mining Engineering*, some of these challenges are discussed at length. They were also discussed by BHP Group chief technology officer Laura Tyler during a mining event in Melbourne, Australia.

Reuters reported that Tyler told the Melbourne Mining Club that the industry must step up its efforts to attract workers with digital skills or it will “lose out to the ‘cool kids’ of Google and Amazon.”

The global mining industry relies on technology to manage tasks such as automated truck fleets, and using artificial intelligence to delve into reams of data and discover the next big deposit, said Tyler.

“We need more technologists, more data scientists and more mathematicians,” she told the Melbourne Mining Club business luncheon, according to a prepared speech. “We compete for such talent not just with each other, but with the cool kids such as Google and Amazon ... the defense and pharmaceuticals industries, government and NGOs,” she said. “Increasingly, we need more digital skills in every aspect of what we do.”

A PwC analysis last year suggested that by 2040, the industry will need 21 percent more mining engineers and geotech engineers, and 29 percent more metallurgists than it had in 2020, she said.

“We need to train them now ... and we need to make sure they see the mining industry as stable, attractive, and dare I say it, exciting,” she said.

Reuters reported that Australia’s mining giants BHP, Rio Tinto Ltd and Fortescue have redoubled efforts to attract new workers to an industry confronting a dire skills shortage, and concerns over job security, sexual harassment and social license.

BHP’s First Year Intern program was oversubscribed seven times and resulted in 60 graduates deciding to switch to resources-facing subjects for their next year of university, she said.

A program at Adelaide University is developing a pipeline of exploration geologists, specializing in finding ore deposits deep beneath the surface.

BHP has also established a reentry program to welcome back those who left the industry, while Rio Tinto’s efforts to advance jobs in automation and industry efforts to train metallurgists are all bearing fruit — but are still not enough, Tyler said. ■

Caterpillar demonstrates battery-electric haul truck; Invests to transform Arizona proving grounds

CATERPILLAR Inc. has announced a successful demonstration of its first battery-electric 793 large mining truck and a significant investment to transform its Arizona-based proving grounds into a sustainable testing and validation hub of the future.

Caterpillar completed development of its first battery-electric 793 prototype with support from key mining customers participating in Caterpillar’s Early Learner program. Participants of the program with definitive electrification agreements include BHP, Freeport-McMoRan, Newmont Corp., Rio Tinto and Teck Resources Ltd.

“Our global team came together to develop this battery truck at an accelerated pace to help our customers meet their sustainability commitments,” said Resource Industries Group President Denise Johnson. “This demonstration is a significant milestone, and we are excited for these trucks to get to work

at customers’ sites around the world in the near future.” The Early Learner program launched in 2021 and focuses on accelerating the development and validation of Caterpillar’s battery-electric trucks at participating customers’ sites. It supports the individual commitments each Early Learner participant has made to reduce and eliminate greenhouse-gas emissions from their operations. A primary objective of the program is for Caterpillar to collaborate more closely with its customers as the industry undergoes transformational change through the energy transition.

Early Learner customers came together to witness a live demonstration of Caterpillar’s prototype battery truck on a 7-km (4.3-mile) course. During the event, Caterpillar monitored more than 1,100 data channels, gathering 110,000 data points per second, to validate simulation and engineering modeling capabilities. Fully loaded to its rated capacity, the truck achieved a top

speed of 60 km/h (37.3 mph). The loaded truck traveled 1 km (0.62 mile) up a 10 percent grade at 12 km/h (7.5 mph). The truck also performed a 1-km (0.62-mile) run on a 10 percent downhill grade, capturing the energy that would normally be lost to heat and regenerating that energy to the battery. Upon completing the entire run, the truck maintained enough battery energy to perform additional complete cycles.

The prototype truck was built at Caterpillar’s Tucson Proving Grounds, located in Green Valley, AZ. In support of the energy transition, Caterpillar is investing to transform the proving ground into a working, sustainable “mine site of the future” by installing and utilizing a variety of renewable energy sources. The objective is to implement the same sustainable solutions mining companies will use at their own operations to learn firsthand what it takes to run an electrified mine site and effectively support customers



72nd Annual Colorado MPD Meeting

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Rio Tinto finalizes acquisition of Turquoise Hill; \$3.1 billion deal gives Rio Tinto 66 percent of Oyu Tolgoi project

RIO TINTO HAS completed its acquisition of Turquoise Hill Resources Ltd. for a consideration of approximately \$3.1 billion, simplifying its ownership of the Oyu Tolgoi Mine in Mongolia, significantly strengthening Rio Tinto's copper portfolio, and demonstrating its long-term commitment to the project and Mongolia.

Rio Tinto now holds a 66 percent direct interest in the Oyu Tolgoi project with the remaining 34 percent owned by the government of Mongolia through Erdenes Oyu Tolgoi. The transaction closed following approval from the Yukon court in Canada and the majority of TRQ minority shareholders supporting the deal.

"Oyu Tolgoi is an outstanding asset with incredible people that will deliver significant long-term value for Rio Tinto and Mongolia," said Rio Tinto chief executive Jakob Stausholm

in a statement. "I would like to acknowledge the Turquoise Hill board and management, under the leadership of Peter Gillin and Steve Thibeault, for their considerable effort and support over the years, working in partnership with Rio Tinto and the government of Mongolia in developing Oyu Tolgoi into a world-class mine. I would like to offer my best wishes to each of them for the future."

Rio Tinto Copper chief executive Bold Baatar said, "This acquisition further strengthens our copper portfolio, as part of our strategy to grow in materials the world needs for achieving net zero and delivering long-term value for our shareholders. We now have a simpler and more efficient ownership and governance structure, with our partner the government of Mongolia, as we proceed together toward sustainable production from the underground mine."

Turquoise Hill has become a wholly owned subsidiary of Rio Tinto and Turquoise Hill shares will cease trading.

First production from Oyu Tolgoi was initially expected in late 2020 but was rescheduled for October 2022 and later to the first half of 2023.

Once completed, the underground section will lift production from 125 kt–150 kt (138,000–165,000 st) in 2019 to 560 kt (617,000 st) at peak output, which is now expected by 2025 at the earliest.

According to the miner, this would make it the biggest new copper mine to come on stream in several years and, by 2030, the operation would be the world's fourth largest copper mine.

Oyu Tolgoi is expected to produce 110 kt–150 kt (121,000–165,000 st) of copper and 4.5 t–4.8 t (150,000–170,000 oz) of gold in concentrates in 2022 from processing ore from the openpit, underground and stockpiles. ■



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Global coal consumption set to hit record high; IEA reports coal consumption increased 1.2 percent in 2022

THE INTERNATIONAL Energy Agency (IEA) released its Coal 2022 report in which it found that global coal consumption is likely to hit an all-time mark of 8 Gt (8.8 billion st) consumed in a single year.

The IEA report, which forecasts the world's coal consumption, said coal use is set to rise by 1.2 percent and pass the previous record that was set in 2013. It forecast that consumption levels will remain relatively flat through 2025 as declines in mature markets are offset by continued robust demand in emerging Asian economies. This means coal will continue to be the global energy system's largest single source of carbon dioxide emissions by far.

The global coal market has experienced a volatile year in which high natural-gas prices have led to increased demand for coal but this was offset by slowing economic growth that reduced electricity demand in industrial output all while power generation from renewables has risen to a new record. In China, the world's largest coal consumer, a heat wave and drought pushed up coal power generation during the summer, even

as strict Covid-19 restrictions slowed down demand.

"The world is close to a peak in fossil fuel use, with coal set to be the first to decline, but we are not there yet," said Keisuke Sadamori, the IEA's director of Energy Markets and Security. "Coal demand is stubborn and will likely reach an all-time high this year, pushing up global emissions. At the same time, there are many signs that today's crisis is accelerating the deployment of renewables, energy efficiency and heat pumps – and this will moderate coal demand in the coming years. Government policies will be key to ensuring a secure and sustainable path forward."

IEA reported that the international coal market remained tight in 2022, with coal demand for power generation set to hit a new record. Coal prices rose to unprecedented levels in March and then again in June, pushed higher by the strains caused by the global energy crisis, especially the spikes in natural-gas prices, as well as adverse weather conditions in Australia, a key international supplier. Europe, which has been heavily impacted by

Russia's sharp reductions of natural-gas flows, is on course to increase its coal consumption for the second year in a row. However, by 2025, European coal demand is expected to decline below 2020 levels.

The world's three largest coal producers – China, India and Indonesia – will all hit production records in 2022. However, the report notes that despite high prices and comfortable margins for coal producers, there is no sign of surging investment in export-driven coal projects. This reflects caution among investors and mining companies about the medium- and longer-term prospects for coal.

Coal demand is forecast to fall in advanced economies in the coming years as renewables increasingly displace it for electricity generation. However, emerging and developing economies in Asia are set to increase coal use to help power their economic growth, even as they add more renewables. Developments in China, the world's largest coal consumer, will have the biggest impact on global coal demand in the coming years, but India will also be significant. ■

Komatsu to acquire GHH Group; Acquisition provides opportunity to expand to underground mining

KOMATSU ANNOUNCED that it has entered into an agreement to acquire GHH Group GmbH (GHH), a manufacturer of underground mining, tunneling and special civil engineering equipment headquartered in Gelsenkirchen, Germany.

Founded in the 1960s and currently part of the German-owned Schmidt Kranz Group, GHH offers a wide range of equipment focused on loaders (LHDs) and articulated dump trucks in the mid-seam mass mining, narrow vein and low-profile market segments. The company also supports customers with aftermarket parts and service support through the entire life of each machine. With this acquisition, Komatsu will add GHH's factories and rebuild facilities in key markets, in addition to its robust product offerings and talented staff.

"We are very excited about this acquisition as it represents a great opportunity for Komatsu to expand its offerings for underground mining equipment and accelerate new product development through synergies with Komatsu's existing team and product offerings," said Peter Salditt, president and chief executive officer, Komatsu Mining Corp. "By adding GHH's factories and rebuild facilities in key markets in Europe, South Africa, India and Chile. We also aim to strengthen production and service capabilities for our customers."

Komatsu intends to continue the service GHH provides and plans to support business as usual post-acquisition. The combined team will then work together to expand Komatsu's offering for underground

mining equipment and increase customer access to products in new territories.

"GHH is excited to be able to start a new journey with a strong player in the mining world. This opens huge doors for our people and our products to develop further and grow beyond what we could have hoped for," said GHH Group CEO Jan Petzold. "This is the next logical step in becoming a true global player and we look forward to becoming part of the Komatsu family."

The official close of the acquisition is projected for the first half of 2023.

Komatsu is working to expand offerings for underground hard rock mining, creating new value for customers with the development of new equipment, processes and technologies. ■

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Perpetua Resources awarded up to \$24.8 million; U.S. Defense Production Act funds will be used to source critical minerals

PERPETUA RESOURCES has been awarded the first critical minerals award from the Defense Production Act (DPA) Investments Program and the Air Force's executive agent. The award was issued using Ukraine Supplemental Appropriations to secure an American source of critical minerals for missiles and munitions.

The U.S. Department of Defense (DOD), reported that the DPA Investments Program will provide \$24.8 million to Perpetua to complete environmental and engineering studies necessary to obtain a final environmental impact statement, a final record of decision, and other ancillary permits. Perpetua will perform this study work related to its Stibnite-Gold Project in central Idaho through 2024.

This investment is essential to ensure the timely development of a

domestic source of antimony trisulfide for the manufacture of small arms and medium caliber cartridges, as well as many other missile and munition items.

Perpetua wrote in a press release that antimony trisulfide is essential to national defense as a key component for munitions, yet there is no U.S. mined supply. Perpetua plans to re-establish a domestic supply of the critical mineral antimony as a by-product of its Stibnite gold project.

Under the funding agreement, Perpetua may request reimbursement for certain costs incurred over 24 months related to environmental baseline data monitoring, environmental and technical studies, and other activities related to advancing Perpetua's construction readiness and permitting process for the Stibnite gold project. The DPA funding does

not interrupt the ongoing National Environmental Policy Act (NEPA) review process.

"As Perpetua continues advancing our project through the permitting process, we are honored to enter this agreement to help advance our construction readiness for future development," said Laurel Sayer, president and CEO of Perpetua Resources.

"The Department's DPA Investments Program is delivering on its core mission to restore domestic industrial capabilities essential to the national defense by enabling the warfighter," said Halimah Najieb-Locke, deputy assistant secretary of defense for Industrial Base Resilience. "This action reinforces the administration's goals to increase the resilience of our critical mineral supply chains." ■

President's Page: Please support SMEF

(continued from page 4)

is the single reference allowed in the PE Exam. The SMEF provides funds for the committee's activities.

Minerals Education Coalition

The MEC provides resources for K-12 classrooms, consisting of fact-based curriculum on minerals and mining. MEC also ensures that lesson plans are current and continually design new programs according to educational and STEM standards. The MEC also provides outreach to communities regarding the importance of mining. All of these efforts inform students and educate the public about the importance of mining in their everyday lives. Funds for the MEC cover the costs of preparing and disseminating education lessons, and the materials used in these efforts.

Additionally, the MEC supports Scouting outreach and awards the Mining in Society Merit Badge. Scouts learn about mine safety, reclamation, exploration and careers in mining. The MEC also provides materials for the

American Geosciences Institute's Earth Science Week and for the National Science Teaching Association (NSTA) Conference. It supports the Miners Give Back program to support initiatives focused on humanitarian efforts and community service that tangibly improves the lives of individuals and inspires a commitment to give back to the local community. Miners Give Back has an award program for the recognition of SME Section community service, and humanitarian outreach initiated by SME Sections within their communities, and facilitates networking among Sections.

Foundation scholarships

In 2022, SMEF awarded 17 scholarships totaling \$68,500 to students pursuing several mining-related disciplines. Six of these scholarships are "named" scholarships provided by individuals and mining-related companies, with one scholarship given jointly by the Mining and Metallurgical Society of America (MMSA) and SMEF.

Summary

I hope that you can see that the value of the SMEF is significant and of great support to SME, our members and our future members. Maintaining our Society and the benefits that it provides to our industry is critical to the well being of our nation. The Foundation is investing in our future by ensuring we have the educators needed and the students we need who will become the geologists, engineers and metallurgists of the future. But importantly, too, we need to continually provide society with the message of mining — what we do, and why it's important. We need to deliver that message to our K-12 educators and to the communities we touch. These efforts take all of us in SME and mining to accomplish the task and the Foundation is a huge part of that effort. Please consider providing support for the efforts of SME and especially the SMEF. The SMEF is a major part of our Society and needs support from SME members and the companies that employ us, allowing its important work to continue. You can help in that effort to be successful. ■

Have all the high-grade mineral discoveries been made?

I recently attended a conference where someone asked me whether all the high-grade discoveries have been made. My tongue-in-cheek answer was “Ask me in 100 years.” But this question brought to light an issue that I have heard many times over the past 40 years — “All the easy ones have been found.”

The figure below was part of my 2021 PDAC keynote presentation. It compares discovery curves from 1986 to those from 2000 and 2017. Notice that in all three graphs, the trends were always down, yet as time progresses, the numbers increase. Why is this?

The definition of what constitutes a discovery is, in itself, vague. The consensus view is that a discovery is defined by a drill hole that penetrates an economic grade over a minable width. For example, drilling 50 m (164 ft) grading 1 g/t Au in an openpit configuration would be considered a discovery, but if this same intercept was at 500 m (1,640 ft) depth, it would not.

The reason these graphs exhibit similar behaviors is that it takes time for companies to complete their follow-up work. Smaller companies tend to promote the hot drill hole because they need

this success to raise more money to drill out the deposit. Larger companies have the financial resources and tend to hold off publishing their results until they have some preliminary economics. Eventually, the news is shared and the curve changes.

The question about high-grade discoveries is an interesting one. It is common knowledge that average grades have been dropping over time. But simultaneously, metal prices have been increasing, which allows lower grades to be profitable. This suggests that the lower grade trend may be more related to metal prices than natural endowment. At lower metal prices, higher grades are required to build the mine. It would be interesting to see if the higher grades in the past had smaller tonnages, because some of today’s mega deposits may have high-grade cores that are masked by the massive tonnages of lower grades.

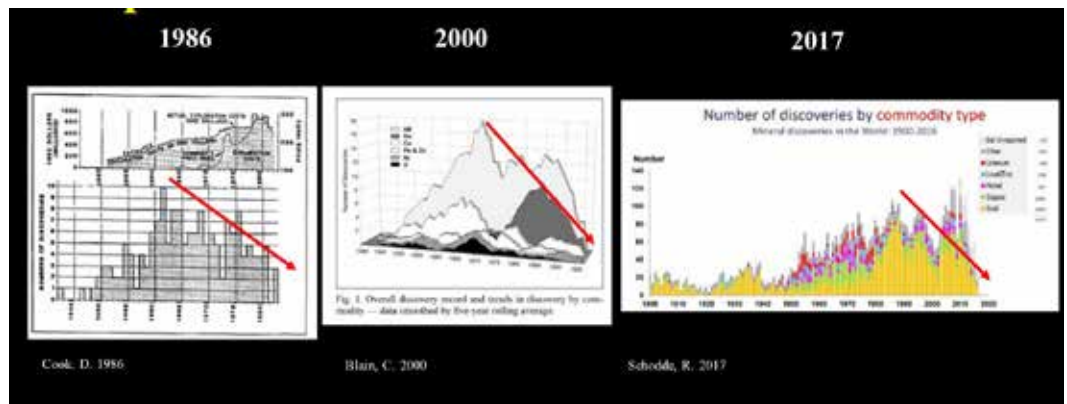
It is also important to point out



by Douglas Silver

that high-grade intercepts are reported everyday in the press. So, “Yes,” high-grade discoveries are still being made. But do they have the associated tonnage to make them Tier 1 assets? This is the one question asked by every investor when they buy shares, and the hopes and dreams of every small company.

The answer is, we will have to wait and see. ■



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Environmental and social governance for the extractive industry in Canada

by Sidney Schafrik



The historic Canmore Engine Bridge is a truss bridge over the Bow River in the Canadian Rockies of Alberta. The bridge was built by the Canadian Pacific Railway in 1891 to serve a coal mine.

The concept of environmental and social governance (ESG) has become much more complex and less defined since its original implementation from the 2006 United Nations' (UN) Principles for Responsible Investment (PRI) report. This report first contained the "Who Cares Wins" concept initiated by the UN Secretary-General and UN Global Compact. The second component was the Freshfields Bruckhaus Deringer Report, requested by the UN Environmental Programme Finance Initiative's (UNEP FI) Asset Management Working Group (AMWG), which examines the legal framework for integrating issues of ESG into institutional investment. Both are excellent reads to begin a baseline for this topic.

As can be seen on the standard communication mediums currently available, we are overloaded with contradictions of how ESG currently could, should and can function. The difficulty from a technical perspective is that there are many conflicting concepts. One example is that many ESG guidance principles view the extraction of minerals as contradictory to ESG principles and therefore the companies that conduct mineral extraction should not be encouraged by receiving investment. However, renewable-energy projects rely on the minerals for their

construction. Many believe that this is the wrong model, and companies focused on mining and oil and gas extraction can be classified as having "responsible" or "nonresponsible" values. By using this classification, it allows the more advanced extractive companies access to cash flow to manage and mitigate the issues that are being considered and that need to be discussed with them.

The question for us in the extractive industry is how we should conduct ourselves in reasonable ways where overlying principles of business apply, while still receiving social license to do business. There are many elements to the question. Engineers are trained on how to have a "third-party neutrality" mentality, and we should use this on some of the parameters that need to be covered in our process of roaming the ESG world.

The easiest way to present an ESG methodology being practiced in Canada is through risk-assessment-based parameters used in the consultation responsibilities for due diligence. These are required of a project proponent to get a project fully permitted through environmental assessment (EA).

In Canada, ESG issues involve a project proponent as well as external stakeholders, permitting bodies, various levels of government, and the public. The ESG components can be defined as:

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Figure 1**Mining risk universe for enterprise risk management.**

- Communication protocols.
- Community enhancement methods.
- Economic issues.
- Employment issues.
- Environmental issues.
- Operational considerations.
- Social and governance issues (Aboriginal treaty rights).

Rules-based tasks have special influence from additional indigenous peoples, generally called First Nations, and are a legal requirement in both federal and provincial EAs.

A key component to keep in mind is the concept of the “mining risk universe,” created by Ernst and Young in 2007, to obtain a perspective on how the values or sustainability of a company applies. By looking at the parameters of ESG in a similar way, it can relate to our understanding of the topics that extractive companies must understand. The influences of the diverse people required and the influence of individuals go from the board-of-directors or chief-executive-officer levels down to everyday engineers.

As most major issues of ESG in Canada deal with First Nations groups and actual governance, a description of First Nations is needed.

Overall spatial scope perspective of governance

Canada. Canada is a Westminster-style parliamentary democracy under the current head of state King Charles III. The Prime Minister is Justin Trudeau. A House of Commons gives confidence to the party with the most elected seats to form a government. The functioning government, referred to as the Crown, is the highest power associated with conversations involving First Nations groups. The negotiation of First Nations Treaties first began in 1701 before the formation of Canada, with the Royal Proclamation of 1763 solidifying the formal process. As time progressed, First Nations Treaty rights have been formally placed within the Constitution of Canada (transferred from British control in 1982), which was created in 1867. A common term used for these rights is a result of Section 35 of the Constitution, where they are formally located. A key document that the government of Canada produced is the Aboriginal Consultation and Accommodation Guidelines for Federal Officials to Fulfill the Duty to Consult — this document is of

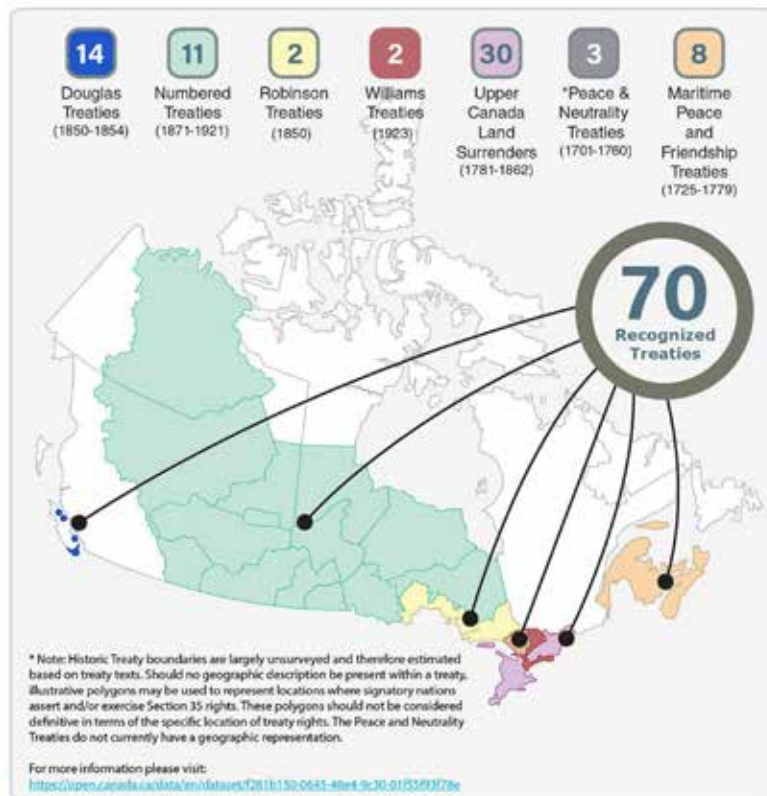


enormous value to any extractive company dealing with First Nations groups to begin understanding the process.

Provinces and territories. Within Canada, there are 10 provinces and three territorial governments. These governments have many responsibilities deferred to them, such as healthcare implementation, education and provincial taxes. The distribution to First Nations groups of any royalties from the provincial level is a constant risk item, depending on the status of the First Nations group.

Figure 2**A map of Canada.**

Figure 3
Canadian treaties.



Provincial and territorial governments have powers to make decisions relating to areas of law that affect their province or territory directly, but there are sometimes gray areas when it comes to Section 35 impacts on provincially approved projects (permitting bodies) for the extractive industry. This confusion traditionally can lead to disputes and risk associated with these projects, but it must be remembered that ultimately the duty to consult is a federally mandated activity (<https://digitalcommons.schulichlaw.dal.ca/dlj/vol22/iss1/5/>).

Types of First Nations groups created by treaties. Since the signing of treaties in 1701, there have been many types of classifications and levels of powers given to First Nations groups. There are officially 617 First Nations groups in Canada, including 364 Treaty Nations. The powers vary from document to document, and the remaining First Nations groups without treaties can still assert or have their Section 35 rights. We will quickly go over a three-tier classification of Canadian First Nations groups, and this will serve as the baseline for the Aboriginal treaty rights components of ESG and EA risk.

Treaty Nations. Treaty Nations are generally the most commonly known and referred-to type of First Nations classification. The treaty defines the boundaries, but there is a gray area

when it comes to the term “traditional territory.” These boundaries tend to not be official, but characteristics of traditional land use and knowledge are key to determining what these lines are. This loose definition can lead to many issues over who has jurisdiction over these lands as well as how much input and authority the local First Nations groups have on an EA process.

Treaty rights are a function of how a potential project may directly interfere with First Nations lands. For example, there are many disputes over the possible downstream impacts on water quality to First Nations groups or to the wildlife they were promised they would be able to harvest forever. The Alberta oil sands projects are a prime example of this, due to their known downstream impacts on the First Nations groups in Treaties 6 and 8 (https://www.greenparty.ca/sites/default/files/a_comprehensive_guide_to_the_alberta_oil_sands_-_may_2011_-_last_revised_march_2012.pdf).

Unceded First Nations. These First Nations groups are on territories that either were never signed or are being disputed on the topic of full rights and privileges to the land. There are many individual First Nations groups with this status, but the Maritimes, nearly all of British Columbia and a large swath of eastern Ontario and Quebec fall into this group. The risks involved vary widely as there are no defined terms for reference beyond Section 35. Conflicts between these First Nations groups and the federal, provincial and other First Nations governments are common. Depending on whom the exact conflict is with, values associated with ESG are often tested in these cases.

Modern and self-governing First Nations. As the difficulties of having unceded First Nations groups are a substantial source of uncertainty, the treaty process is still active and the newest classification of treaties began to be signed in 1977 with the James Bay area Cree First Nations group. The remaining self-governing First Nations groups are in British Columbia, Manitoba, Northwest Territories, all of Nunavut and most of the Yukon. The powers and abilities of these treaties cannot be overstated, as contained within most of them are clauses stating for EA processes that the First Nations groups themselves are permitting bodies (similar to the principles of the UN Declaration on the Rights of Indigenous Peoples). The modern-treaty First Nations powers can include the creation of laws (on heritage, taxation, land use and planning, permits for extraction of minerals/oil and gas) that apply to all individuals within a First Nations group’s

Figure 4
Modern treaties and self-government agreements.

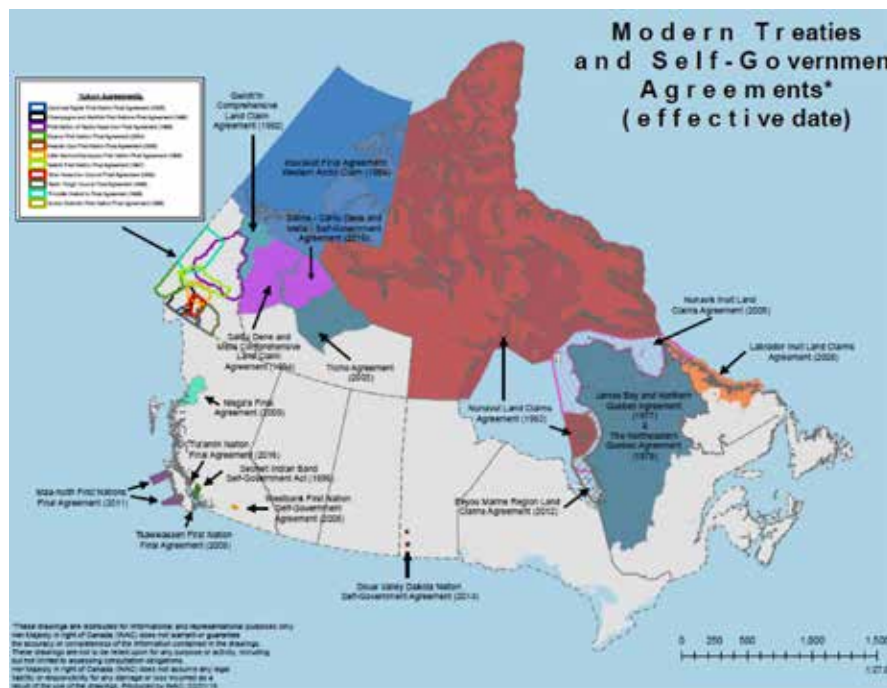
well-defined traditional territory and are completely entrenched within the Canadian Constitution. These laws also take precedence over asserted or unproven uncaded rights. The ideas of cogovernance of their areas are also included along with input on wildlife controls, timber harvesting and other key parameters. Generally, these are by far the most powerful First Nations groups on their traditional territory, and conditions of the treaties ensure that Canada (the federal government) must defend these rights by maintaining the law in the event of transboundary conditions such as international borders.

First Nations issues in risk assessment/ESG evaluation

Now that the basic spatial scope has been described, we can review the more direct First Nations issues that are covered in a risk assessment or ESG evaluation. They are the technical side of issues in which First Nations generally have an interest when making a direct agreement with a project proponent, known as an impact benefit agreement (IBA), which are the premise of real ESG.

Communication protocols. Communication protocols relate to different levels and methods of communication between a company or government and a First Nations group. Communication procedures and sets of guidelines make up the fundamentals of how negotiations, as well as the due diligence necessary for stated consultation procedures from the government, are conducted. For example, the basic principles of announcing acknowledgment of where a meeting is taking place comes into play. It should be noted that both provincial and federal governments now always mention at the beginning of a meeting where they are. This has become formal policy and should be acknowledged by extractive companies as well (<https://www.cspcs-efpc.gc.ca/tools/blogs/insights/indigenous-territory-eng.aspx>). There are major variances between First Nations communities on this topic. Some First Nations protocols are highly developed and comprehensive, while others are not developed and should be established and agreed between the extractive company and the First Nations groups.

Community enhancement methods. Part of the core fundamental principles of ESG



aims to set out what a community requires the extractive company to provide as a condition of social consent for development and operations. This may include improving local services and infrastructure such as roads, and the development of trade and technical abilities in the community to meet both company and community needs. The specific compositions of these elements vary from site to site, depending on the status and economic condition of the community.

Economic issues. Economic variables relate to how the First Nations group will be compensated for the potential extractive activity. These can be critical components of any ESG program or IBA and may be some of the most fiercely debated issues. These may be critical to securing local community support of the project. ESG does not cover this well and is a function of how much the company is willing to sacrifice for a solid agreement. This is where the value of the social license is taken into account.

Employment issues. Employment is invariably a major issue for every community. Many native communities are located in economically deprived areas with no local industry or major sources of employment. Techniques and methods of recruitment are dependent on the evaluation of the First Nations group. While many First Nations groups have high rates of unemployment, in other key areas where resources are plentiful there can be almost no available First Nations

employees due to the other activities.

Technical environmental issues. Local First Nations communities may be able to substantially assist companies in terms of project development. Environmental regulations for mine permits can be some of the most difficult tasks to complete, with information needed from prefeasibility through to closure. Environmental Assessment Act guidelines state that communities and stakeholders must be consulted as well, and projects can be judged on this consultation. In addition, complete closure plans along with financial guarantees must be provided as part of the permitting process. This serves as a prime point for good-faith relations between a community and extractive companies, and it needs to be an important part of ESG programs or policies.

Operational considerations. Operational topics are based on some of the infrastructure parameters of a potential project. These can include operational, procedural and technical issues, such as location of infrastructure and drill-rig locations for exploration. Other topics are due to particular legal issues, including that due to reserves (Treaty First Nations lands) being federal lands. The use of provincial guidelines as operational rules instead of federal rules has been written into several agreements due to the former being more stringent. Major infrastructure can become a big topic of dispute, depending on its location, and must be identified early in consultation with First Nations.

Social and governance issues. Social issues include factors that affect the community as a whole, which are not company generated, and may become problematic. The risk is that these issues also bring government treaty obligations to bear. These can be critical threats to a potential project and are fundamentally knowledge based on what the type of First Nations group described entails.

Why does ESG actually matter?

Now that we have the ability to assess the risks of a project and what the ESG parameters are generally, let us put our techniques to the test with a heavy emphasis on the Aboriginal governance theme. The example case is an oil and gas exploration company and a modern-treaty First Nations group (Vuntut Gwitchin) located in the Yukon Territory. The company did not have a proper relationship with the First Nations group, and the project proponent also potentially assumed that the financial benefits

of having a project near the community, and the resulting jobs, would be good enough to get through the social side of the EA process. While the technical components were somewhat understood, the location of the project was specifically in areas where migrating caribou herd calving grounds are documented and traditional and cultural activities are confirmed to take place.

The local EA office maintained there would be a need for more information during the EA process and upgraded it to a higher level of assessment, specifically in respect to the Porcupine caribou herd (referral report: <https://yesabregistry.ca/projects/ea33a0ac-8a2a-4bd0-b96d-4e7483cba7ac/documents>). The company then put in a request for judicial review of the grounds for an upgraded assessment (<https://www.whitehorsestar.com/News/northern-cross-seeks-judicial-review-of-yesab-action>).

As a further complication, the modern-treaty First Nations group and other First Nations groups within the Yukon passed a resolution banning fracking in their respective traditional territories through the Council of Yukon First Nations (<https://www.yukon-news.com/news/cyfn-bans-fracking/>). This, in part, forced the Yukon Government (Yukon Party, or conservatives) to create a moratorium on fracking in the area in 2015 after many months of hearings and understanding of what the First Nations treaty rights actually are. This case forced thought independently of political opinion and exhibits the power of ESG guidelines and their implementation. The issues and subsequent lawsuits continue to this day.

This can be seen as a simple case study as it is on traditional territory within Canada. What if we move on to the next phase, where those same caribou cross international borders in their migration route into the U.S. Arctic National Wildlife Refuge? Canada has treaty obligations to the First Nations groups, and as seen earlier, the local First Nations group has grave concerns about the status of this herd. The direct relationship between the United States and Canada now becomes the theme for how any decisions on changing environmental standards making it easier for companies to lease and permit exploration/future production activities. While the proponents of the activity in the United States may be good partners, the governance side of ESG may be too powerful to stop opposition.

The question is how do the rules of Canadian ESG (specifically with First Nations rights) apply to American values, or is there truly separation between them? ■

Modern methods of geomonitoring in post-mining processes

by M. Pawlik, X. Yin, T. Rudolph, P. Goerke-Mallet, J. F. Brune and J. Benndorf

The long and often undefined period in the post-mining phase challenges geomonitoring with its various responsibilities, like the detection of environmental changes, ground movements and water management. Modern methods of geo- and environmental monitoring observe numerous aspects of these using active and passive sensors with multispectral, hyperspectral and microwave sensors. These offer diverse spatial dimensions and spatiotemporal resolutions from satellites, unmanned aerial vehicles (UAVs) and in situ sensors. Data integration, together with on-site knowledge and experience, provides the basis for comprehensive modeling, which improves the understanding of the environmental changes and their related causes, and is an essential step toward public acceptance. In this article, we aim to give a brief overview of various geo- and environmental monitoring methods.

Geomonitoring in post mining

Mining is subject to a specific life cycle. It begins with the granting of rights and concessions, followed by the exploration and exploitation stage, and ends with mine closure and post-mining processes (Goerke-Mallet et al., 2016).

Mining processes have a strong impact on the surrounding environment. Therefore, continuous monitoring is important to detect changes and deterioration. Monitoring and protection of the environment in mining areas is a complex issue that touches many environmental factors. First, there is water management: mine drainage affects water quality in the area. Soil removal or deposit may lead to ground instabilities, subsidence or uplift, gas emissions, or changes in vegetation (Goerke-Mallet et al., 2016).

Geomonitoring in post-mining areas requires an integrated spatial monitoring concept, which is based on project data and common research techniques, which should be collected, evaluated and implemented (Rudolph, 2020; Rudolph et al., 2020). The data used for geomonitoring in post-mining processes come from a variety of sources; starting from data collected during mining exploitation, for example, mining or geological maps, data coming from space missions, both including multispectral and hyperspectral sensors, photo documentation coming from UAV or plane flights, and data coming from in situ sensors. Techniques such as geophysics,

monitoring wells and geodetic networks above and below the ground are also valuable sources of data. Each of these provide the basis for understanding post-mining processes.

This article is intended to provide an overview of modern geomonitoring possibilities, which provide observations of important post-mining objects from space, air, and down to the surface and subsurface. Relating to observations from multisensors and multiscales, we review the data integration in a comprehensive framework.

Satellite remote sensing

Remote sensing is a method of obtaining data on processes, phenomena and objects from a long distance (remotely) by means of high-tech sensors (Wiggenhagen and Steensen, 2021). These sensors are mounted on terrestrial stations (terrestrial hyperspectral cameras), drones, aircraft and satellites. In space, satellites of various space missions orbit the Earth and regularly scan the Earth's surface with the help of sensors. Developments in space technology have led to better resolution of data from space missions, and data are increasingly being made available through web portals such as those of the U.S. National Aeronautics and Space Administration (NASA) and the European Space Agency (ESA). The ESA's Copernicus program relies on a fleet of Sentinel satellites, each with its own mission. For the observation of post-mining processes, two missions are worth mentioning: Sentinel 1, which monitors Earth's movements, and Sentinel 2, which monitors changes in the use of Earth, and allows observation of vegetation.

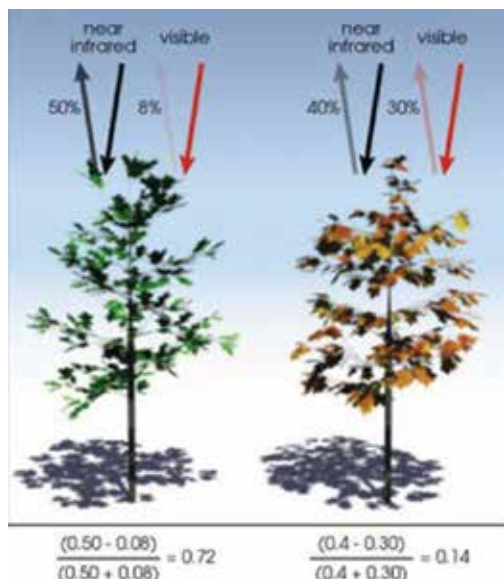
Optical remote sensing

Optical remote sensing covers the characteristics of electromagnetic waves such as visible range, near infrared and thermal infrared. This method relies on the reflection of radiation emitted by the Sun from objects. In this method, sensors on the satellite record the radiation returned by objects on the Earth's surface (such as vegetation, buildings or water surfaces). Due to cloud cover, not all images

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Figure 1

An NDVI calculated from the visible and near-infrared light reflected by vegetation. Healthy vegetation (left) and unhealthy vegetation (right). The numbers represent NDVI values. (Source: Simmon, 2000)



taken are used. An important advantage in the use of satellite data is the large observation area. The obtained data is converted into information that is used to analyze and interpret phenomena on the Earth's surface.

Monitoring of post-mining activities is possible using remote sensing methods. This allows the initiation of preventive measures in the future (Kretschmann and Nguyen, 2020). One of the aspects of geomonitoring of post-mining processes

is the observation of vegetation changes through the calculation of vegetation indices. One of them is the normalized difference vegetation index (NDVI) (Rouse et al., 1973), which obtains information on the health of vegetation by applying calculations using surface reflections

in the red and near-infrared channels. This index takes advantage of the property that the spectrum of vegetation vitality reflections differs significantly in the red and near-infrared wavelength ranges.

There is a property that healthy vegetation absorbs almost completely the red part of sunlight (it is needed for photosynthesis) and reflects a very large part of incident solar energy in the near infrared. In contrast, nonliving vegetation shows a different reflective behavior (Fig. 1).

This characteristic of healthy vegetation has been mathematically formulated using the NDVI index (Simmon, 2000):

$$NDVI = \frac{\rho_{NIR} - \rho_{RED}}{\rho_{NIR} + \rho_{RED}}$$

where ρ_{NIR} means near-infrared wavelength (from about 800 nm to 900 nm) and ρ_{RED} means red wavelength (from about 600 nm to 700 nm). The individual wavelengths depend on the satellite in question and the sensor used. NDVI takes values from -1 to 1. The waters show values close to -1, the value of 0 means that there is no vegetation. The healthier the vegetation, the higher the value of NDVI becomes.

There are examples in the world literature of the use of these vegetation indices to monitor vegetation changes in post-mining areas in:

China (Ma et al., 2017), the Czech Republic (Halounová et al., 2005; Matejicek and Kopackova, 2010), Germany (Padmanaban et al., 2017), Poland (Buczynska and Blachowski, 2021), Turkey (Erனர், 2011; Koruyan et al., 2012) and the United States (Raval et al., 2014). The above case studies using individual vegetation indices in the calculations indicate the validity of using vegetation indices in the geomonitoring of post-mining processes.

An important aspect is the spatiotemporal analysis of satellite images (Fig. 2) and selected vegetation indicators, thanks to which it is possible to observe changes in a given area. Collecting data from a given time interval and then presenting satellite date as well as calculated vegetation indicates allows for the detection of areas where a change in vegetation has been made, as well as the detection of wetlands in mining areas. An

Figure 2

Satellite images from 1991 through 2021 of the closed coal mine Prosper-Haniel. (Data from project Digital Twin, THGA)

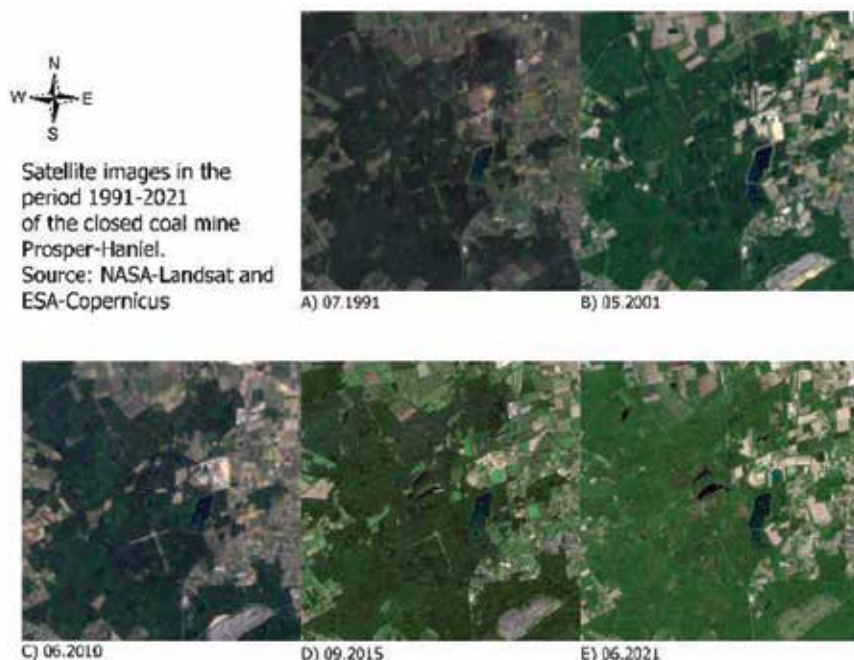
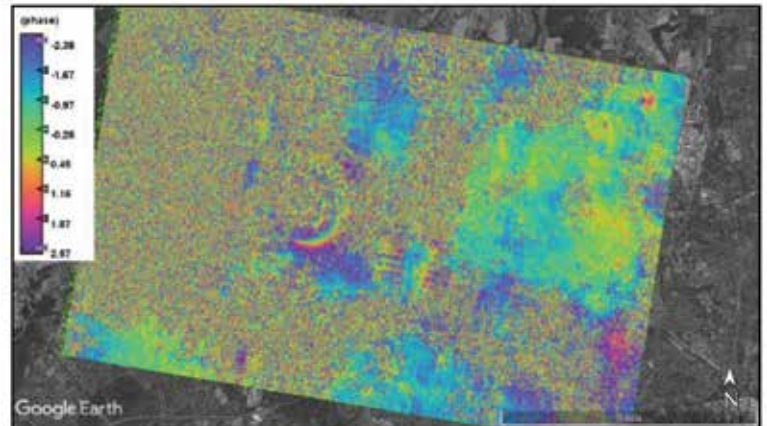


Figure 3

Differential interferogram for a mining-induced subsidence from Sentinel-1 data (2015-09.04-2015.11.15).



The phase information enables analysis about the length of the propagation paths of the radar signals, which is used for the detection of ground movements or extraction of the digital elevation model. These can be done by using SAR interferometry (InSAR), which calculates phase differences, the so-called interferograms, from two SAR images. The phase differences result from the recording geometry and the slightly different orbit positions of the satellite at the recording times, and on the other from the object heights of the terrain and object surface and their deformation. Furthermore, atmospheric effects trigger additional signal delays. The remaining part, the measurement noise, is described by term noise. Methods like differential SAR-interferometry are used to calculate the deformation, which uses at least two SAR data sets acquired at different times over the same area, and the deformation-related phase component is calculated from the interferogram. Figure 3 shows an example

example of a spatiotemporal analysis in the Ruhr area is an article by Padmanaban et al. (2017) who, using NDVI, identified two areas where adverse vegetation changes and wetland formation occurred in the Kirchheller Heide area.

Observation of vegetation condition using remote sensing methods is one of the aspects of post-mining geomonitoring. Remote sensing methods allow for compiling data for large areas, which is an undoubted advantage of this method. Before starting the study, it was necessary to get acquainted with the characteristics of the output data, in particular: spatial and spectral resolution. Satellite data from NASA's Landsat 7, Landsat 8 and ESA's Sentinel 2 space missions have the best characteristics in terms of spatial resolution and spectral ranges, which are used to calculate vegetation indices.

Radar remote sensing

Radar is the abbreviation for "radio detection and ranging" and uses the principle of echolocation, in which the echoes of a transmitted signal are measured. The signal carrier is electromagnetic waves in the 300-1 GHz microwave range, the frequency range of which is divided into different radar bands. An active, imaging radar system is mounted on an aircraft or satellite, which moves along a straight flight path at a height above a reference surface.

Optical satellite remote sensing collects Earth observation data typically from reflected sunlight, in the relatively short wavelength range from visible light to the thermal infrared. Therefore, traditional optical remote sensing is severely dependent on atmospheric effects such as cloud cover, which limits the ability to acquire information from the Earth's surface.

Radar systems, in comparison with optical remote sensing systems, are independent of the time of day because they have their own radiation source. Radar remote sensing uses the microwave range, which makes it possible to penetrate the atmosphere. This enables radar recordings to be made even when the sky is cloudy.

The radar remote sensing method is a synthetic aperture radar (SAR) system. Such radar systems mainly provide two pieces of information: the backscatter intensity and the phase position. The intensity of the backscattered radar radiation depends on the physical features of the object surfaces, such as roughness and geometry, and the material properties, such as water content and dielectric properties. This is used to detect water reservoirs (Hahmann et al., 2008) and retrieve soil moisture data (Esch et al., 2018).

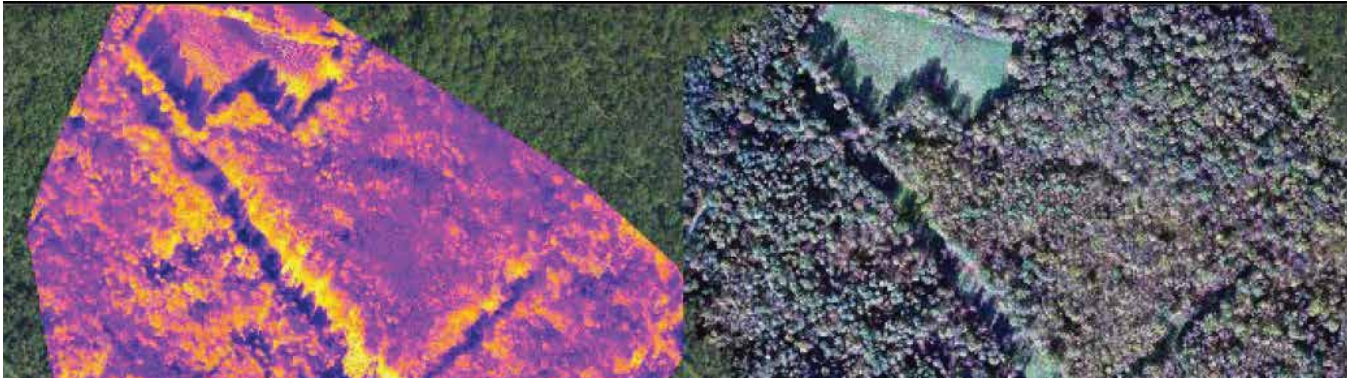
Figure 4

Water mask extracted from Sentinel-1 data.



Figure 5

A thermal photo (left) and photo in natural colors (right) in the Kircheller Heide. (Data from project Digital Twin; made by Benjamin Haske and Bodo Bernsdorf, both of THGA)



of a (wrapped) differential interferogram of a mining-induced subsidence. The map of interferogram (phase shift), which is depicted with a repeating color scale, shows displacement in line of sight between the two used acquisitions.

Toward the better solution of the decorrelations (noisy area in Fig. 3) time series-based methods, such as persistent scatter interferometry (PSI) and small baseline subset (SBAS) are increasingly used for monitoring ground movement. While PSI determines displacement time series only from the “high-quality” backscatters with long-term stable and strong signals, which are usually only available in urban areas due to the double-bounce effect of buildings, SBAS uses the network of highly coherent interferograms to overcome the influences of decorrelation, also in rural areas. In such areas, just like most of the mining and post-mining areas, the dominate so-called distributed scatters, are used in the new developments combined with PSI in order to determine high-quality results for ground movement in large areas. An abstract explanation of the measuring principle of these methods can be found in Crosetto et al. (2016).

A comprehensive investigation on opportunities and limits of radar interferometry for ground movements due to mine water rise in an abandoned coal mining areas is provided in John (2021).

Radar polarization refers to the polarization state of the waves emitted by the radar and the echoes received. In radar remote sensing, the polarization state of the wave changes because the waves interact with the medium and target during the propagation process. These changes therefore indicate the information of the medium and the target. Polarization interferometric SAR (PolSAR) uses the characteristics of coherence and interferometric phase observations that vary with polarization, enabling interferometric SAR observations to achieve target elevation acquisition. It also has the ability to distinguish between different

scattering mechanisms by polarimetric SAR to identify targets such as forest, rocks, water bodies (Fig.4) and bare land (Wang et al., 2019).

Such methods are also used for wide-area monitoring in agriculture and land use, which are also monitoring objects in post-mining regions. All in all, radar remote sensing plays a major role during the post-mining phase with its capabilities in environmental monitoring and ground movement detection.

Unmanned aerial vehicles

UAVs have become an increasingly popular type of data acquisition. First, they are characterized by high accuracy of the obtained results. Second, data collection time is shorter compared to satellite imagery, where acquisition time takes several days.

UAVs are increasingly used in monitoring and surveying mining areas. Data collection by UAV is a fast but equally safe method.

However, it is worth remembering that apart from its advantages, this method of monitoring also has its drawbacks. First of all, it depends on the prevailing weather conditions (precipitation, temperature or wind). In addition, national and European Union regulations limit the areas in which UAVs can be used.

Similar with aircraft and satellites, it is possible to mount sensors on UAVs. Passive sensors based on electromagnetic radiation are digital cameras. Active sensors, which emit electromagnetic waves toward a ground target and then collect information from the reflected target are, for example, LiDAR (light detection and ranging).

Various types of sensors are used to monitor post-mining processes. These include digital cameras, multispectral cameras, hyperspectral cameras, thermal imaging cameras, gas decoders and LiDAR sensors (Ren et al., 2019). Depending on the sensor equipment, they enable the preparation of images (an orthophoto map) and thermal analyses (Fig. 5) (Bernsdorf et al., 2020; Bernsdorf, Formaniuk et al., 2021;

Figure 6**TELID sensors for soil moisture measurements in Project C2M2, THGA.**

Bernsdorf, Rudolph et al., 2021).

UAVs show better accuracy than satellite images. Multispectral cameras placed on UAVs also make it possible to calculate vegetation indices. Thanks to the use of UAV flights, it is possible to visualize data in a two-dimensional as well as three-dimensional space, which allows the presentation of the cinematography area in the form of a digital terrain model and the integration into computer-aided design (CAD) and building information model (BIM) environments.

Software for airstrip preparation is under continuous development. On the market, the most commonly used commercial programs are Agisoft Metashape, Pix4d and Drone2Map. Therefore, UAVs are used to verify and better understand phenomena in a limited area.

In situ measurements

During monitoring, in situ measurements are integral to describe ongoing natural processes, since they are conducted at discrete locations at a given time. Depending on the type and purpose of the in situ sensor used and, for example, its spacing, various observations can be taken into account to evaluate phenomena in the environment. By contrast, data are gathered remotely, typically in nondiscrete ways based on indirect observations. For optical satellite remote sensing and UAVs, images are recorded during the day from reflected sunlight. From the collected information in various frequencies, the data of interest are calculated as derived quantity. Instead of measuring area-wide information, the in situ measurements mostly provide point-related measurement results, which are very important for geomonitoring of environmental changes, including during post-mining.

In order to derive information on the vegetation vitality and stress, through indices like NDVI, local sampling is a vital part in the validation process. Furthermore, it needs to be taken into consideration that only the top layer of vegetation can be detected remotely. Sublayers down to the ground level are hidden to the Nadir imaging and require additional local input from site inspection to complement the dataset.

Terrestrial measurements from surveying results of geodesy and mine surveying are of particular importance for radar interferometric determination of ground movements. The InSAR methods only determine the movement in the line of sight of the satellite, which is not important for most applications that require a detection of gravity-oriented, three-dimensional

ground movement components. The radar interferometric results can be improved by validation with terrestrial height changes, for example, from leveling and the three-dimensional movements measured by GNSS.

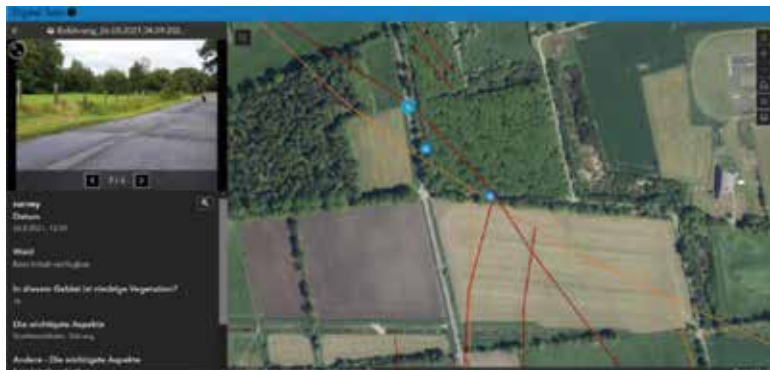
Measurements with soil moisture sensors are required for many approaches to calculating soil moisture from radar remote sensing. With this kind of soil sensors, the continuous recording of soil moisture on the sensor point at different depths is possible, for example, in project C2M2 of THGA (Fig. 6), this was also used to derive the seasonal change of the soil moisture. Due to the numerous influences on the propagation path of the radar waves, the complete separation of the signal caused by soil moisture from other factors is only possible to a limited extent. The connection between the SAR acquisitions and the suitable model for deriving the soil moisture is only possible by considering them together with the measurements for the same period. During the implementation of the model, validation is an ongoing process.

In addition to the use in the verification as the ground truth of the results of the image processing and adaption of the calculation model of the various indicators, the observation of objects that are located in the ground or that are not visible for pictorial recordings can only be carried out through in situ measurements. These include, for example, the groundwater measuring points and the soil analysis and mapping through sampling. Since the observation of the contamination through pollutants is one of the most important aspects in post-mining, the establishment of a network of regular in situ measurements is necessary.

Closely related to the theme of in situ measurements is the concept of mobile GIS, which allows users to enter, display, update and above all analyze the data and geospatial information using applications on smartphones and tablets in the field. During the field work,

Figure 7

The design of the mobile GIS application including an example of road damage. The red lines indicate tectonic faults and the orange lines indicate lineaments that have been vectorized using data from mining and geological maps. (Data from project Digital Twin, THGA)



it is possible to verify the places that are not visible on the map or satellite image, thus increasing the accuracy of the study. Data can be collected in a form as descriptive data of a place. It is also possible to add photos taken in the field as attachments (Fig. 7). This method is strictly dependent on the GNSS signal, which is a disadvantage, especially for forest and mountain areas. The data collected using mobile GIS can then be made available in the form of web applications.

Integration of monitoring in multiscale

By use of methods based on in situ measurements with UAVs and satellites it is possible to provide monitoring results with different temporal and spatial resolution. Geomonitoring of post-mining processes is the analysis and integration of data from

many independent sources, which enables an understanding of post-mining phenomena as a complex system.

For mapping and quantifying in geomonitoring, satellite remote sensing provides the information in a wide area with mostly low spatial resolution of a few meters. Cloud coverage can lead to a total loss of information by optical satellite remote sensing, while the use of UAVs can greatly improve the local spatial resolution (in centimeters). The low flight elevation also provides compatibility in cloudy weather conditions. For this purpose, the recording of the UAVs in comparable spectral range and bands to a similar period for local observations. It is also possible to record with UAVs during the necessary period in which the recording from satellites cannot be used, for example, due to high cloud coverage.

In the time domain, the fusion of different monitoring data with different temporal resolutions is also a great advantage. The repetition cycle for the optical satellites is a few days, while UAVs can be operated on demand. Continuous measurements are possible selectively using in situ sensors. Validations and additions through an in situ measurement system allow the derived indicators for monitoring objects to be confirmed with high-quality, object-related information. The positional accuracy of different data and the comparability of data with different resolutions and quality is one of the greatest challenges. It might be necessary to develop local solutions to ensure the correct data fusion from the various scale.

Table 1

Characteristics of multiscale geomonitoring methods.

Method	Advantages	Disadvantages
Optical remote sensing	+ Large observation area + Free data access possible	- Low spatial resolution (m) - Highly dependent on atmospheric conditions - Low temporal resolution
Radar remote sensing	+ Large observation area + Free data access possible + Low dependency on atmospheric conditions	- Low spatial resolution (m) - Low temporal resolution
UAV	+ Very high spatial resolution (cm) + High temporal resolution (operated on-demand)	- Small observation area - Usually no open access - Dependent on atmospheric conditions
In situ sensors	+ High temporal resolution, continuous measurement possible + On-site knowledge due to self-collecting data	- Local observation, usually only on points - Usually no open access - Accessibility to objects required
Mobile GIS	+ High temporal resolution possible (operated on-demand) + On-site knowledge due to self-collecting data	- Local observation, usually only on points - Dependent on atmospheric conditions - Accessibility to objects required

Numerous topics are or may be of interest for geomonitoring in the context of post-mining landscapes. An additional complexity is given by the interconnected nature of compartments in geomonitoring; one cannot be fully understood without identifying originating from the entire system. Geomonitoring in the post-mining landscape can only be successfully managed when the system is recognized in its entirety. This includes not only the collected data, but also the knowledge and experience of local experts.

Conclusions

The combination and integration of different geomonitoring and observation methods is key to a successful management of post-mining areas. In a complex system, the fusion of available resources with different types of data from satellites, UAVs and in situ sensors is necessary to provide data and information for disclosure and public discourse. As each method provides specific data, their combination makes it possible to analyze and correlate a comprehensive set of data, and to develop conclusive models that provide useful information about the post-mining area. This analysis yields an interpreted, modern understanding and provides transparency for the public. Therefore, geo- and environmental monitoring methods are important for the public acceptance of mining operations. ■

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Disruption, data capture and analysis: IFS Unleashed includes themes of automation and AI

by Nancy Profera



Technologies and vendors were showcased in the exhibit hall.

Hot, humid and art-deco-style South Beach, Miami, FL and the Miami Beach Convention Center was the site where approximately 2,000 data, cloud-storage and digital-transformation professionals met Oct. 10-14 for IFS Unleashed 2022. The conference is organized by enterprise software company IFS for its employees, partners and customers to discuss the latest in data capture and cloud computing and the digital frontier, and to share success stories, challenges and tales of business disruptions that are dominating the automation landscape. This was the first time in three years that the group had gathered, due to the COVID-19 pandemic, and attendees came from Australia, Canada, France, India, Italy, Norway, Sri Lanka, Sweden, the United Kingdom and United States.

IFS develops and delivers cloud enterprise software for companies around the world — including mining companies — that manufacture and distribute goods, build and maintain assets, and manage service-focused operations.

Center stage

At the opening of the conference, IFS chief executive officer Darren Roos invited customers and partners to join him on stage for quick, individual mini talks, lasting five minutes or less, in which they explained the ways their partnership with IFS had transformed their businesses. “Our industry expertise has been a huge differentiator. We are bringing the best

functionality on a single platform in a way that it can be integrated with other technologies. We exist to help you create those amazing moments of service for your customers, which are critical, because they help you to build loyalty with your customers and secure repeat business,” said Roos.

The sectors IFS serves include service, energy, utilities and resources, telecommunications, aerospace and defense, manufacturing and construction and engineering. For example, the company manages the information technology backbone (also known as enterprise resource management) of the Norwegian Maritime Authority, Norway’s ships and vessel authority, where IFS computer applications run in navigation, vehicle carrying and search information. For Southwest Airlines, the largest domestic airline carrier in the United States with 60,000 employees supporting 4,000 flights per day, IFS implemented the largest master data management (MRO) project in the world, said Roos. MRO is a discipline driven by ensuring accuracy and consistency of shared master data to optimize supply and minimize risk, and is typically used in businesses that have a variety of functions such as sourcing, purchasing, maintenance, inventory and analytics. In 2022, Southwest went live with the IFS MRO solution, which now supports the maintenance of the airline’s entire Boeing 737 fleet, and introduced automation for processes and real-time compliance, allowing the carrier to be more efficient and effective.

Mining data

Mining Engineering conducted a one-on-one interview with Antony Bourne, senior vice president at IFS. Bourne graduated college with a computer science degree and was hired on to the IFS computer help desk in 1997 as employee number 15. Since then, he has worked at IFS for 25 years and has seen tremendous growth for the company, which now has 5,000 employees worldwide.

IFS is established as a cloud provider for some mines and operates as their data backbone, merging different systems as needed, and managing and parsing the massive amounts of information mines need to manage and decipher. LKAB, a government-owned Swedish mining

company and Europe's biggest iron mine, is one such company where IFS has been involved in managing data, including that on health and safety, Bourne said. IFS has also worked with Hecla Mining Co. on some of their mining efforts out of the United Kingdom, and other mines in Australia, South Africa, Scandinavia and the United States.

According to Bourne, having intelligent assets is the most important factor to consider when it comes to data today. "Everyone is focused on efficiency in how to operate. The intelligence comes in by being able to look at the data and gather meaningful information from it," said Bourne. "How can I look at my assets more efficiently and make them more reliable," these are the questions to ask of one's organizational information and how it is managed, he said.

Bourne has witnessed a complete transformation of information technology, digitalization, and data capture and analysis during the course of his career. In the next generation of change, he expects computer professionals will learn to better manage "soft data," which is unstructured data, and will discover how to make that information helpful to decision makers. He also anticipates more work around digital twins, and mapping and simulation work, and that these efforts will all be a part of companies' planning and strategies in the future.

"We don't expect our customers to hire data scientists. They want a system that's built in," he said. This is where IFS comes in and today includes employing techniques of artificial intelligence (AI). Understanding when certain events should happen, "explainable" AI, is all a part of what IFS offers its customers.

ESG

Another theme of the primarily technology-related conference that is shared with the mining industry is that of environmental, social and governance (ESG) topics and goals. ESG was a topic repeatedly discussed throughout the conference — how to work and act with sustainability in mind, and how to use and harness green technologies in business pursuits, and their importance to shareholders and customers.

Many European countries already have requirements for companies to report on their ESG efforts, including how much fuel they are consuming, as well as government policies on reporting companies' direct and indirect emissions and their carbon footprints.

IFS manages data for many of its customers on their environmental performance. It has conducted surveys with its customers and partners, and ESG efforts are second only in



Carol Johnston, vice president of Energy, Utility and Resources at IFS, speaking to the crowd during an industry break-out session at the IFS Unleashed 2022 conference.

importance to safety when it comes to customer expectations today. ESG is "coming like a freight train," said Christian Pedersen, chief product officer at IFS. According to Pedersen, "People often forget about the S and the G in ESG; to not just look at it from an emissions point of view," he said. IFS has established a variety of ways to capture ESG data for companies that can be collected from many different sources and streamline their ESG reporting.

"IFS has come a long way in a short time in its ability to understand and track customers' ESG performance and support them on their journey to sustainability. We have concentrated on the element that represents the biggest challenge: data. Understanding data and being able to collect and interpret it is ultimately fundamental to any strategy. We are focused on making this easier and simpler for every organization to achieve," said Pedersen.

Motivational talks

The three-day conference featured guest speakers including keynote speaker R. "Ray" Wang, founder, chairman and principal analyst at Constellation Research Inc. based in the Silicon Valley, CA. Wang gave a talk on disruptive technologies, the rules of digitalization, and how to take business growth to the next level during times of massive change. "The question asked around the world is, how do you grow when 61 percent of Fortune 500 companies have been borrowed, merged, acquired and disrupted since 2000," said Wang.

Wang explained that every business is a technology business today. "It doesn't matter what you're selling. It is the enablement of automation and technology that gives companies the edge. Competing for digital supremacy starts with analytics, and the goal is to automate precision decisions," he said.

Michael Phelps, world Olympic Games champion and 23-time swimming gold medalist was also a featured speaker. Along with discussing his road to success with earning the medals, Phelps talked about balancing work and mental health. ■

Mines for Limitless Minds:

Showcasing education and career pathways in mining

by Ami Jones, University of Arizona

At the University of Arizona (UArizona), the new School of Mining and Mineral Resources presented a first-of-its-kind event for students to get a glimpse into the diverse world of mining. Companies from across the United States came to the event to present their job and internship opportunities, personal experiences, and information about mining and the fascinating new technology used in the industry. Numerous UArizona departments,



A student examining a mineral sample under a microscope at the Geosciences Department booth.

centers and institutes demonstrated how the university prepares talent and innovation for this exciting field.

The event was open to all students of all majors, experiences and backgrounds, as well as industry and community members.

One Arizona Department of Environmental Quality exhibitor told students to “put yourself out there.” The agency recruits from a diversity of areas, from environmental scientists and archaeologists to accountants. She said the more internships students do and the more

connections students make the better, as it can really help when making career decisions and knowing what field they want to go into post-graduation.

The mining industry is facing a shortage of talent across many disciplines, such as accounting, supply-chain management, industrial hygiene,

environmental sciences and data science in addition to traditional fields such as mining and metallurgical engineering.

“[ASARCO] has been around for more than 100 years,” said an ASARCO Grupo Mexico recruiter, and the company is one of the top producers of copper in the United States, a key resource for renewable-energy development. “You never know what kind of careers we’re looking for in the mining world,” the recruiter said. All degrees are needed, even those in business or government.

Many students were intrigued to find their education was needed in mining. For example, a nursing student learned from the Lundin Group the value of knowledge of medicine within the mining industry.

Event features

The School of Mining and Mineral Resources hopes to bring students, educators and industry together to innovate within the mining industry and think critically about modern problems to provide for a rapidly growing world.

The event was organized into categories, including sustainability, student life, exploration and entrepreneurship, and technology, featuring dozens of exhibits and displays. The idea was to illustrate that mining has something for everyone. In the technology section, students were able to test-drive a simulator haul truck and dozer, and see what it is like to train to be on a mine site driving heavy equipment. “It’s limitless what you can do [in this industry],” said Freeport-McMoRan technical instructor Hector Guerra.

Also on exhibit was a new app being developed by Nathalie Rizzo, assistant professor of mining and geological engineering, which uses artificial intelligence (AI) to detect whether individuals are wearing proper safety gear. Other exhibits included interactive software from Hexagon Mining, hardware from Canary Systems, and a virtual-reality (VR) headset to experience being in a mine. GroundProbe and the university’s Geotechnical Center of Excellence demonstrated modern radar systems and their role in monitoring slope stability, among other applications.

In the sustainability area, students

Ami Jones graduated in the fall of 2022 with majors in English and political science and a minor in American Indian studies from the University of Arizona. She is a writer for the School of Mining and Mineral Resources. Email: amijones@arizona.edu.

learned what companies are doing to help the environment and use new technology to protect biodiversity, implement Native American traditional ecological knowledge, and track water quality. Brian Lindenlaub, vice president and senior environmental consultant shared how WestLand Resources works directly with tribal members to implement their perspectives in consulting for a mine. “It really opens so many eyes to what is of interest and what the community cares about in all of these mine sites. We’re really proud of that ... we’ve hired a number of folks from the various tribes around the state,” he said.

Cactus Mine explained to students what “net zero” means in mining and how the company plans to get there. Florence Copper demonstrated in situ copper mining — something most students have never heard of.

The industry is brimming with new technologies and innovations. For example, the university’s Center for Sustainable Mining showcased plants that mine. These plants were being used as an experiment to see what minerals they absorbed as an element in order to understand biodiversity and land resilience. The researchers hope to find out if in the future plants can be used to help clean mine sites, or perhaps extract materials in a more sustainable way, from the plants themselves.

In the exploration and entrepreneurship area, companies like BHP and Hudbay demonstrated what it is like to search the globe for minerals, while the Lundin Group talked to students about raising funds to develop a mine. The university’s Lowell Program in Economic Geology featured highlights from field-mapping courses. Finding Opportunities and Resources to Grow Entrepreneurs (FORGE) introduced students to entrepreneurial education, and the Eller College of Management showcased how marketing is important for mining.

The student-life section was filled with student clubs and organizations from multiple disciplines, including Women in Mining, SME, Society of Economic Geologists, and Students for Sustainability, which featured an e-waste drop-off station educating students about recycling critical metals. “E-waste is electronic waste ... that doesn’t work anymore ... that you’d think to throw in the trash but you shouldn’t because it’s toxic, and the minerals inside are really valuable and can be recycled multiple times,” said Nicole Collins, waste reduction chair at Students for Sustainability and recipient of the new School of Mining and Mineral Resources scholarship award.

The student organizations displayed what



students can do with an education in and outside of mining, and opportunities they’ve been able to participate in, including the university’s San Xavier Mining Laboratory, which allows students to put their classroom knowledge to work in a real mine setting.

Freeport-McMoRan hosted a table staffed by previous interns who are looking forward to new jobs with the copper giant and excited to share their internship experience with other students. “I learned so much [from my internship],” said Danielle Schroeder, environmental engineering major at UArizona and a Freeport-McMoRan intern. She explained that while most people do not connect environmental protection with mining, internships can teach students about how mining can be made more sustainable. “I learned how environmentally focused they are,” she said.

To bring visiting students one step closer to a job in the industry, recruiters and volunteers from Freeport-McMoRan offered resume reviews and conducted mock interviews.

To complete the student-life showcase, Caelen Burand, a student in geology and mining and geological engineering, conducted two live podcast episodes with Adam Hawkins, chief

Top: A student test-driving the shovel simulator.

Bottom: Hervé Rezeau, assistant professor in the Geosciences Department, and students presented a variety of rocks and minerals.



University mascot Wilbur Wildcat visited Stephen Williams at the Lundin Group booth.

executive officer of global external relations, and Stephen Williams, vice president of corporate development and investor relations at Bluestone Resources. "Mining is unique because it creates value. It does not simply shift its location; it produces value for communities," Hawkins said.

Burand created the podcast "Our Resources" for new answers for the future. "The industry is siloed, and the conversations seem to be constant echoes. That said, there are brilliant people across the globe with exciting ideas for our future. I love investigating their ideas and understanding how we will use our resources ... to create a better future," he said.

Welcoming the school's newest recruits

During the event, UArizona deans Carmala Garzione (College of Science) and David Hahn (College of Engineering) presented scholarships to four students from various disciplines, courtesy of Freeport-McMoRan, as they continue with a new minor in sustainable mineral resources. The minor is a new cross-disciplinary minor, and the school's flagship academic offering.

"The Mines for Limitless Minds event was so amazing. It was great to see so many different companies and student groups in one space sharing different aspects of mining and mineral resources," said Nicole Collins, scholarship recipient and environmental studies major.

Students had a great opportunity to get a glimpse into the world of minerals and were fascinated by the companies' various processes and environmental considerations. "As a scholarship recipient, it was invigorating to see firsthand the excitement that Dean Garzione, Dean Hahn, Betsy Johnson from Freeport-McMoRan, and Jodi Banta [program manager at the School of Mining and Mineral Resources] have for the future of mining. I felt firsthand the impact of their investment in future mining professionals, through scholarships, time and connections," said Isabel Baron, scholarship

recipient and a double major in operations and supply-chain management and environmental studies.

"It was such a pleasure to be picked as a scholarship recipient as a transfer student in my first semester, getting used to the pace and environment of the university. I really feel like the community around mining engineering has supported me all the way through my professors, events and advisors. Also, hearing from the dean that I was the first person to declare this minor gave me a sense of pride as a trailblazer for this amazing opportunity," said Seth Kreinbrook, scholarship recipient and a mining and geological engineering major.

Impact on industry and students

"So many conferences are more social events where the exhibitors talk to each other, but here we really met a lot of students," said Mark Baker, founding principal of Modular Mining and commercialization partner to the university's Tech Launch Arizona.

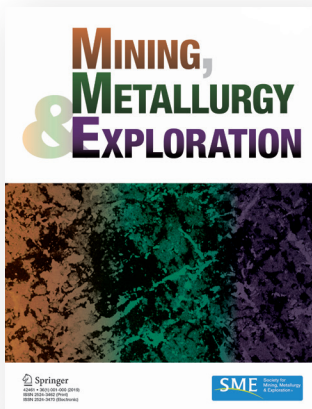
The industry members were excited to meet the students and talk about their own experiences in mining, and the value of diversity within the industry. "I'm from Globe-Miami," said one Arizona Sonoran Copper Company exhibitor. "Never thought I would go into mining." But after seeing the impact of economic development in her hometown, and the necessity of minerals in order for the world to "go green," she wanted to be a part of the change.

To make sure students did not miss the connection between mineral resources and a green economy, two electric vehicles, including a Ford F-150 Lightning truck, were on display along with a giant illustration of the minerals that make them. It was among the many educational features appreciated by the students and community members.

"This event really captures the spirit of the new school," Dean Garzione said. "The School of Mining and Mineral Resources is dedicated to highlighting the intersections between education, community and industry, and wants to prepare students for future careers in mineral resources."

Mineral resources matter. Students who visited with exhibitors learned the importance of minerals around them, and they got a firsthand look at the things minerals can do and the opportunities mining presents. Equally important, they were able to experience the great sense of community that is unique to mining. For information on becoming an exhibitor in next year's event, contact Jodi Banta at jhbanta@arizona.edu. ■

Extended abstracts from the SME journal Mining, Metallurgy & Exploration



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Collection on Ground Control in Mining

Exploration of limestone pillar stability in multiple-level mining conditions using numerical models

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Full-text paper:

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Keywords: Ground control, Limestone, Multiple level, Pillar stability, Interburden stability

Many underground stone mines in the United States operate on multiple mining levels. The effects of interburden thickness, pillar offset between mining levels at various depths of cover, and in situ stress conditions are poorly understood. Pillar offset is the degree to which pillars are not columnized or stacked. In this study, calibrated numerical models are used to examine limestone pillar stability in these conditions. Also, the critical interburden thickness required to minimize the interaction between mining levels is explored. The model results show that there is interaction between numerous factors that control the stability of stone pillars in multiple-level conditions. The highest degree of local pillar instability occurs when pillar overlap ranges between 10 and 70 percent. The highest degree of stability occurs when pillars are stacked.

Introduction

Recent research by the National Institute for Occupational Safety and Health (NIOSH) has led to pillar design guidelines for shallow, flat-lying deposits of single-level operations [1,2], and NIOSH is expanding that research by investigating the stability of multiple-level stone mines. The body of research for multiple-level underground limestone research is limited, while there is an abundance of research into room-and-pillar, multiple-level mining in coal mining [3,4]. Limestone mines tend to have larger roof spans, larger pillar heights, smaller and stronger pillars and less geologic stratification; pillars are usually benched in these mines and retreat mining is not used, making the interactions between levels distinctly different from what has been studied previ-

ously in coal mines. Numerical models have been used to gain some insight into how stone pillars can be affected by undermining, and some considerations for ensuring stable pillar design.

In this study, the actual jointed rock mass was replaced with a homogenous isotropic continuum model of equivalent properties. The underlying assumption of the continuum rock mass model used in this study is that rock mass behavior is not dominantly controlled by a single joint set. A stable interburden and a stable roof span were assumed.

Table 1 summarizes the parameters used in the FLAC3D models, and the values for each parameter. Numerous combinations of the study parameters were generated to determine when the interaction between the mining levels occurs and how significant the impact of these parameters could be on pillar stability.

Pillar overlap is the area of the top-level pillar that is directly overlying a bottom-level pillar. To capture a complete picture of the effect of pillar overlap on pillar stability, the bottom-level pillars were offset either in the x direction only

or in both the x and y directions. When pillars are offset in x and y directions, the offset distance is the same for both directions.

Results and discussion

Calibrated FLAC3D models were used to investigate the impact of pillar offset at various interburden thicknesses, depths, and in situ stress conditions. Figure 1 shows the effect of pillar offset in the x direction only on vertical stress distributions for 8-m interburden thickness and k -ratio = 0.3. Pillar offset generates asymmetric stress distribution such that stress concentration is higher on one side of the study pillar compared to the other side. These stress concentrations could be extremely high depending on the magnitude of the pillar offset and interburden thickness, which might lead to local instabilities and failures. The highest stress concentration occurs when the pillar overlap percent ranges from 67 to 33 percent.

The effect of percent pillar overlap and interburden thicknesses on percent yield when the depth of cover is 300 m (984 ft) is illustrated in Fig. 2. The pillar offset has a substantial effect on percent yield when the interburden thickness is thin. As the interburden thickness increases, the impact of pillar offset on pillar stability decreases. The lowest degree of percent yield in the study pillar (highest pillar stability) occurs when the pillars are stacked, while the highest degree of percent yield (highest local instability) occurs between 10 and 70 percent pillar overlap. The degree of interaction between the mining levels is minimal when the interburden thickness is greater than 16 m (26.2 ft), which is about 1.33 of the roof span.

Figure 3 shows the variation of percent yield at various degrees of pillar overlap and interburden thicknesses, when the depth of cover is 300 m (984 ft) for pillar offset in the x direction only. The pillar offset has a substantial effect on percent yield when the interburden thickness is thin. As the interburden thickness increases, the impact of pillar offset on pillar stability decreases. When the interburden thickness is 16 or 32 m (52.4 or 104.9 ft), the pillar offset has less sub-

Table 1 – Summary of the study parameters used in the FLAC3D models.

Parameter	Parameter values evaluated
Depth, m (ft)	100 (328), 200 (656), 300 (984), 400 (1,312)
Interburden thickness, m (ft)	4 (13.1), 8 (26.2), 16 (52.4), 32 (104.9)
Pillar overlap in x direction, %	100, 83, 67, 50, 33, 8, 0
Pillar overlap in x and y directions, %	100, 69, 44, 25, 11, 0
k -ratio	0.3, 3.0
Pillar width-to-height ratio	1.5
Roof span, m (ft)	12 (~40)
Material model	Linear, nonlinear

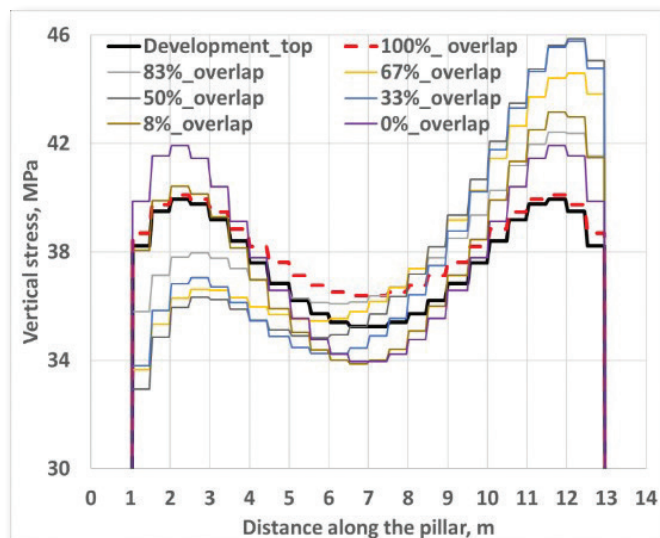


Fig. 1 Variation of vertical stress distributions with pillar overlap percent for 8-m interburden thickness, k -ratio = 0.3 and depth of cover = 400 m.

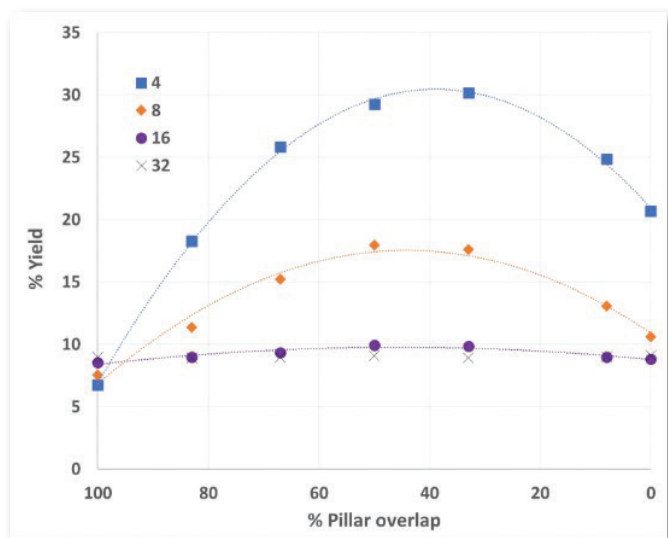


Fig. 2 Influence of interburden thickness on percent yield at various pillar offsets for pillar offset in the x direction only and depth of cover = 300 m.

stantial effect on pillar percent yield. It is obvious that the lowest degree of percent yield in the study pillar (highest pillar stability) occurs when the pillars are stacked, while the highest degree of percent yield (highest local instability) occurs between 10 and 70 percent pillar overlap.

Conclusion

Many mines are operating in multiple-level environments, and an understanding of the interactions between levels is critical to ensuring pillar stability. Modeling results show that pillar overlap can have a significant impact on pillar stability, becoming less stable in a range of 10 to 70 percent overlap, at decreasing interburden thicknesses and at increasing depth. The model scenarios here are idealized, but the mechanisms underlying these findings may be generalizable to a variety of geometries and stress states, improving our understanding of how pillars and interburden interact.

Disclaimer

The findings and conclusions in this paper are those of the authors and do not necessarily represent the official position of the National Institute for Occupational Safety and Health (NIOSH), Centers for Disease Control and Prevention (CDC). Mention of any company name or product does not constitute endorsement by NIOSH. ■

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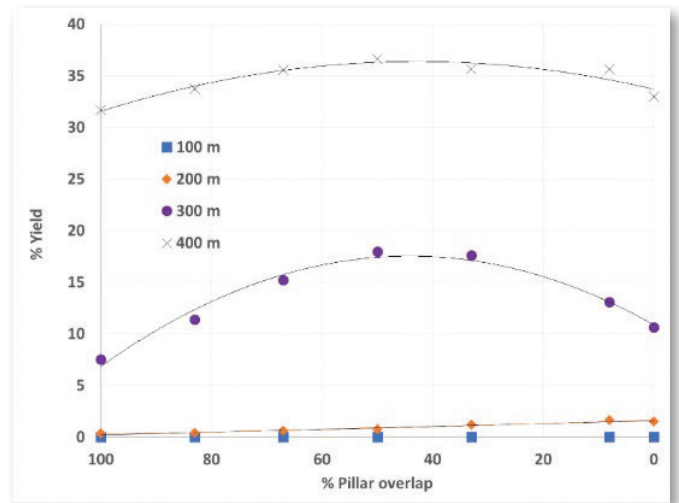


Fig. 3 Influence of depth on percent yield at various pillar offsets for pillar offset in the x direction only.

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Purification of molybdenite concentrates by a continuous sulfation-leaching process

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Full-text paper:

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Keywords: Molybdenite, Purification, Sulfation, Reactor design

The current processes that aim to purify molybdenite concentrates are not able to dissolve some copper compounds, hence limiting the processes. Typically, the copper content results are from 2 up to 4 weight percent in the last concentrate. Such values are still too high for the molybdenite concentrate to be further processed to molybdenum trioxide by roasting. In order to achieve lower levels of copper — but also avoid excessive molybdenite losses — a continuous sulfation-leaching process is investigated and applied successfully on a pilot scale. Additionally, a reactor prototype and its process parameters are proposed for a commercial plant.

Background

Molybdenite concentrates are usually produced as a by-product of porphyry copper concentrates, leading to over-

all molybdenite recoveries generally below 70 percent. To reduce the copper content, molybdenite concentrates are generally leached using a ferric chloride solution or cyanide — although ferric chloride does not dissolve some species, such as enargite (Cu_3AsS_4), and cyanidation does not dissolve chalcopyrite (CuFeS_2), as well.

In the 1970s, U.S.-based Kennecott Copper Co. applied sulfation with sulfuric acid to purify low-grade molybdenite concentrates with high copper contents [1,2], but severe corrosion of the equipment used hampered further development of the technology.

Methods and technology development

The purification of molybdenite concentrate from copper concentrates was performed by sulfation. The sulfation

was carried out with pure sulfuric acid (purity greater than 96 percent) at 160 to 190 °C. The influences of reaction temperature and reaction time on the residual copper in the molybdenite concentrates were studied.

At nearly 100 °C, pure sulfuric acid rapidly reacts with all copper sulfides, forming anhydrous copper sulfate. Similar reactions also occur to other less common copper sulfides.

Design of the reactor prototype. To achieve 0.1 weight percent copper in the purified molybdenite concentrate, the sulfation reactor must operate close to plug flow to avoid backmixing — but also because molybdenite concentrates can have up to 8 weight percent copper, representing a sulfation efficiency close to 99 percent. A horizontal reactor was designed along with a coaxial agitator with low revolution-per-minute agitation rate and a variable number of internal compartments, resembling a plug flow reactor. As corrosion by hot sulfuric acid is extreme, few materials can withstand these conditions; they include some ceramics, glass and Teflon.

Determination of the residence time distribution in the prototype. A series of tracer tests were performed using the isotope 99 of molybdenum to determine the effect of both the design and operational parameters. Assuming that the

reactor performs as a plug flow reactor with axial dispersion, the Levenspiel number, Le , was evaluated according to the concentration tracer at the discharge of the reactor. A value of Le lower than 0.15 indicates a low dispersion in the reactor, while Le above 1 approaches backmixing conditions.

The influences of the number of compartments, agitation rate, weight ratio of molybdenite concentrate to acid, and pulp flow rate were analyzed as a function of the reactor dispersion number of the reactor. The results are shown in Fig. 1.

Based on the tracer tests, the operational and design parameters chosen for the sulfation reactor were: (1) dimensions of 0.9 m in length, 0.20 m in height, 0.15 m in diameter (U-shaped open channel), (2) six compartments in series, (3) weight ratio of molybdenite concentrate to acid of 1/1, (4) agitation rate of 10 rpm and (5) pulp flowrate of 9 kg/h.

Results

Tests were carried out in the continuous reactor with continuous feeding of the molybdenite/acid pulp under the conditions shown in Table 1. Sulfated slurry was leached with hot water at 50 to 60 °C to dissolve the sulfates, followed by filtration and washing of the purified concentrate with hot water. The results are shown in Fig. 2.

Escalation to pilot and commercial plants. Based on these promising results, a large 250-kg/d pilot plant was built and operated at the Chuquicamata Copper Concentrator in Chile. The reactor consisted of six 5-L subreactors in series, provided with rotary stirrers and lined with borosilicate glass with a glass stirrer. The plant operated successfully, generating more than 10 t of high-grade molybdenite with less than 0.1 weight percent copper.

Furthermore, a commercial plant was evaluated to process 80 t/d of molybdenite concentrates with 4 weight

Table 1 — Variables studied in the sulfation.

Copper content (weight percent)	Copper species	Reaction temperature (°C)	Reaction time (h)
1.0–7.1	cs, cv, cpy, en	130–200	2–10
(Molybdenite concentrate to acid = 1; acid 96 percent moisture = 10–12 percent) (cs = chalcocite, cv = covellite, cpy = chalcopyrite, en = enargite)			

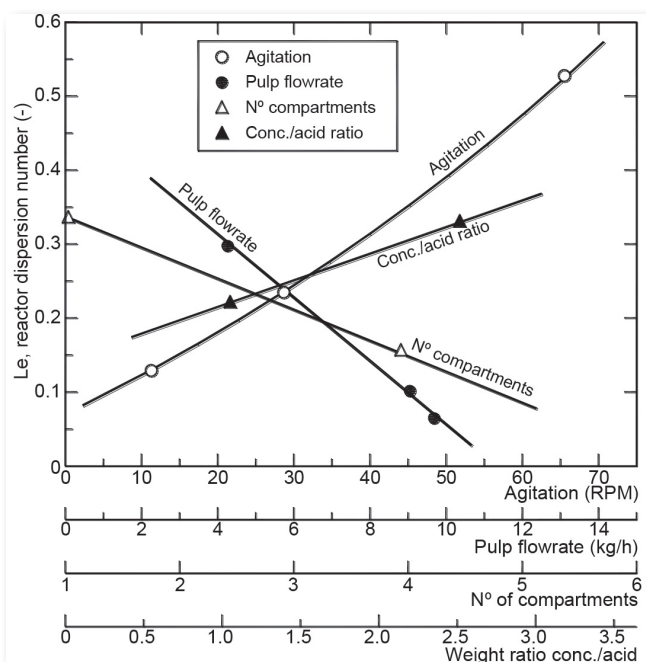


Fig. 1 Influences of the operational and design parameters of the sulfation reactor on the reactor dispersion number, Le .

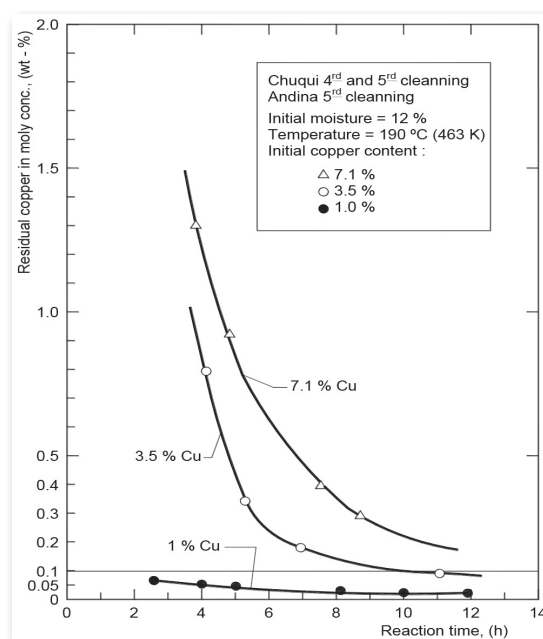


Fig. 2 Influences of the initial copper content of the molybdenite concentrate and the reaction time on the residual copper in the purified concentrate.

percent copper. To model the process, it was assumed that the transformation follows the unreacted core model with chemical control. The expected efficiency of copper removal was 98.6 percent.

Conclusions

The sulfation of molybdenite concentrates at 160 to 190 °C with pure acid (purity greater than 96 percent) is an adequate alternative to remove copper and most other contained impurities, leaving a purified concentrate with less than 0.1 weight percent copper and low levels of other metals, dissolving less than 0.5 weight percent of the molybdenite. For up to 7 weight percent copper, conditions required are temperature of 190 °C, reaction time of 14 h and molyb-

denite concentrate to acid weight ratio of 1/1.

The reactor's required design and construction materials are crucial to obtain the targeted level of copper in the product and to reach an effective corrosion protection of the reactor. The basic design for an 80-t/d molybdenite concentrate plant with 4 weight percent copper requires five 8-m³ backmixed reactors in series, operating at 190 °C and with reaction time of 10 h. The reactor must be protected with either Teflon, glass or ceramic against severe corrosion. ■

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Analysis of SLAM-based lidar data quality metrics for geotechnical underground monitoring

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Full-text paper:

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Keywords: Mobile laser scanning, Simultaneous localization and mapping (SLAM), Geotechnical monitoring, Change detection, Rockfall and convergence

Adverse ground behavior events, such as convergence and ground falls, pose critical risks to underground mine safety and productivity. Today, monitoring of such failures is primarily conducted using legacy techniques with low spatial and temporal resolution while exposing workers to hazardous environments. This study assesses the potential of novel simultaneous localization and mapping (SLAM)-based light detection and ranging (lidar) data quality for rapid, digital and, eventually, autonomous minewide underground geotechnical monitoring. We derive a comprehensive suite of quality metrics based on tests in two underground mines for two state-of-the-art mobile laser scanning (MLS) systems. Our results provide evidence that SLAM-based MLS systems provide data of the quality required to detect geotechnically relevant changes while being significantly more efficient for large mine layouts when compared to traditional static systems. Additionally, we show that SLAM-specific processing can achieve an order of magnitude better relative accuracy relevant for change detection than quality metrics derived from traditionally deployed tests would suggest, while reducing SLAM-drift error by up to 90 percent. In collaboration with an operating block-caving mine, we confirm these capabilities in field tests on a minewide scale and, for the first time, demonstrate methods of rockfall detection using MLS data. While more work is required to investigate optimal collection, processing and utilization of MLS data, we demonstrate its potential to become an effective and widely applicable data source for rapid, accurate and comprehensive geotechnical inspections.

Table 1 — Overview of target- and site-scale tests and metrics used in study.

Results section	Tested variable	Key metric
Data quality investigation	Normality	QQ-plot, skewness, kurtosis
	Density	Minimum spacing
	Coverage	Percent occlusion
	Absolute accuracy	Trueness (μ/m)
		Precision (σ/MAD)
	Relative accuracy	Trueness (μ/m)
		Precision (σ/MAD)
Intrinsic and extrinsic SLAM precision (σ/MAD)		
MLS operational tests	Data collection efficiency	Points per second
	Loop-closure quality	Delta sensor accuracy and delta x, y, z static
	SLAM-registration quality	m/MAD
	Rockfall and convergence detection	Visual comparison/practical detection limit

μ = mean error of the distribution, m = median, σ = standard deviation, MAD = median absolute deviation.

Background

SLAM-based MLS systems show promise for large-scale, multipoint and frequent underground mine monitoring applications [1,2]. Because mobile units such as standalone MLS systems and sensor payloads on autonomous mining equipment do not need to be set up at a specific scan station, they can significantly increase lidar data collection speed. The high temporal and spatial resolution of MLS data makes it ideal for rock-mass deformation and failure monitoring applications [3]. Although research on mobile lidar systems in underground environments has been ongoing for more than 20 years [4], geotechnical monitoring of the failures described above has not been investigated in much detail.

Methods

Our study aims to provide a current and detailed analysis of MLS lidar data quality by deploying two state-of-the-art SLAM-based systems (Kartaa Stencil 2 and Emesent Hovermap) and two static lidar scanners (Faro Focus S70 and 3D X 330). We collected data in two underground mines: an operational block-caving mine (Mine-A) and the Colorado School of Mines Edgar Experimental Mine (Edgar). We

derived target- and site-scale quality metrics on MLS data collection efficiency, density and coverage as well as absolute and relative accuracy metrics. Furthermore, we tested the effect of loop closure and SLAM-based registration on data accuracy. We also conducted specific geotechnical monitoring tests for rockfall and convergence detection. Table 1 summarizes the complete set of tested variables and metrics used in our study.

Results and discussion

Efficiency. Table 2 highlights the efficiency of MLS compared to static lidar scanning. The total number of points in each of the two MLS data sets is about 80 percent lower than the number of points in the static data set. As MLS data collection is 30 times faster, the effective sampling rate measured in points per second is approximately five times higher than the rate for the static system. This is likely a lower-bound estimate, as time requirements for static scanning can increase if scans are interrupted, larger scanners and more elaborate leveling procedures are used, and the time for moving between scans is considered.

Loop closure. To evaluate the effect of SLAM-based loop closure on absolute accuracy, we registered MLS data to static data for the first 240 m of drift at Edgar by using a section, 30 m in length, at the beginning of each scan. We can observe a difference of up to 1.0 m in horizontal drift and 0.5 m in vertical drift in the nonloop-closed data. The loop-closed data shows a maximum of 0.25 m of horizontal difference and less than 5.0 cm of vertical difference from the survey data. This represents a 75 percent decrease in drift horizontal drift error and a decrease of 90 percent in vertical drift error.

Rockfall detection. Figure 1 shows two tests using Hovermap data collected at Edgar to evaluate the detectability of rock fragments in a size range typical for minor geotechnical failures that could be a potential precursor of a more significant event. In the structured scene in Figs. 1a and 1b, we can make out all six rocks with the smallest (No. 6) measuring about 2.5×5 cm. Four rocks from the structured scene were placed in the unstructured scene in Figs. 1c and 1d. The larger three (Nos. 1, 2, 5) can be easily detected using cloud-to-cloud (C2C), cloud-to-mesh (C2M) and multiscale model-to-model cloud (M3C2) comparisons. The smallest (No. 6) could not be identified in a C2C comparison, while the C2M and M3C2 analyses resulted in small but noticeable change signatures.

Table 2 — Point collection efficiency of static lidar and two MLS.

	Faro Focus S70	Stencil 2	Hovermap
Trajectory length (m)	45 (single pass)	2 × 45 (in and out)	2 × 45 (in and out)
Trajectory time (s)	900	30	33
Average speed (km/h)	0.18	10.8	9.7
Total points (M)	26.1	4	5.2
Points per second (pts/s)	29,000	133,333	156,000

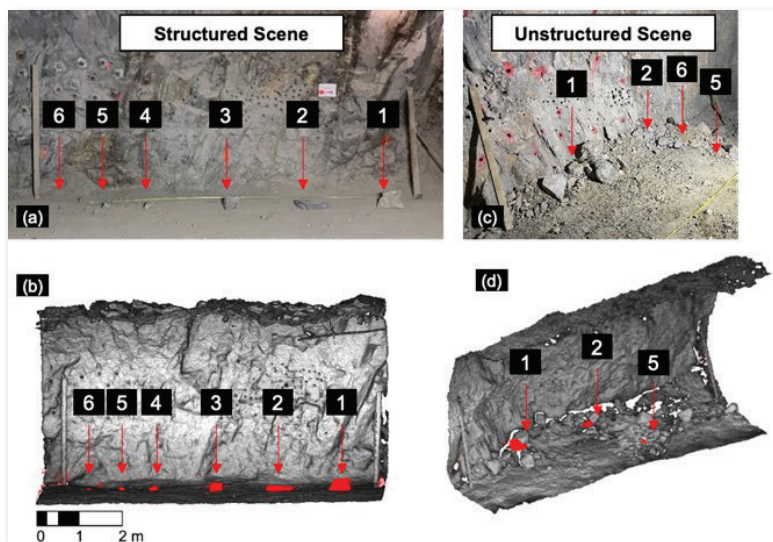


Fig. 1 Test of detectability of progressively smaller rocks, Nos. 1 (25×20 cm) to 6 (2.5×5 cm) on a flat surface in: (a),(b) structured and (c),(d) unstructured scenes with threshold filtered cloud-to-cloud distances.

Convergence detection. Figure 2 shows an example of our mine-scale convergence monitoring tests at Mine-A. Over three months, we can detect significant changes in (A), (B) and (C) based on M3C2-distance computations and an assumed 3-cm limit of detection. Geotechnical engineers at Mine-A confirmed that changes in (A) correlate with the construction of concrete road surfaces and shotcrete work in the mine roof. The changes in (B) represent mining-induced convergence of

up to 10 cm (1.0 mm/d) in the mine roof and ribs. Visual and range-finder monitoring confirmed both the magnitude and location of the convergence.

Conclusion

Our study shows that MLS lidar data conform to or exceed the required quality to detect geotechnically relevant changes, and MLS monitoring can outperform static lidar scanning in target- and site-level coverage, uniformity of spatial sample distribution, and efficiency. In combination with advanced SLAM features like loop closure and scan registration, MLS data have the potential to become an effective and ubiquitous data source for rapid, accurate and comprehensive geotechnical inspections. More work will be required to test the sensitivity of change detection accuracy to SLAM-based alignment and the possible improvements of site-level accuracy by tightly integrating ground-control-point constraints for the SLAM algorithm. ■

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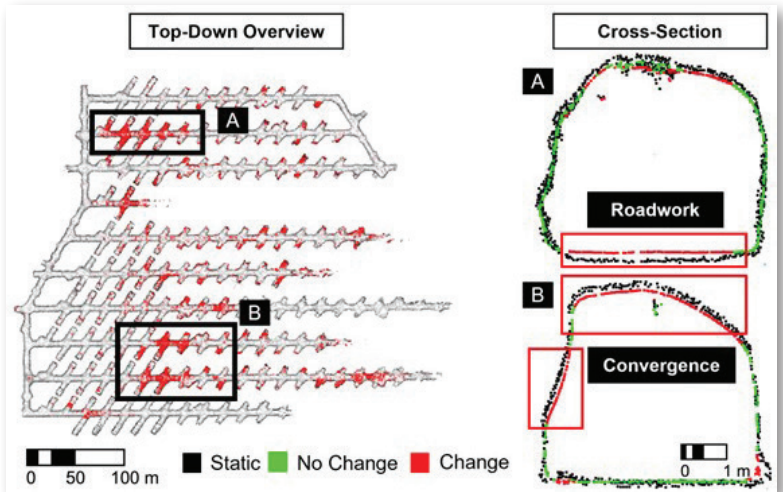


Fig. 2 Results of SLAM MLS survey at Mine-A with Stencil 2, with significant changes detected based on multiscale model-to-model cloud comparison distance calculation.

Collection on Ground Control in Mining

Roof stability and support strategies associated with longwall-induced horizontal stress changes in belt entries

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Full-text paper:

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Keywords: Roof stability, Belt entries, Horizontal stress

Roof stability in the belt entry is critical for safe and continuous production of coal during longwall mining. Previous studies of roof falls that occurred in belt entries have shown that the roof falls were largely associated with high in situ and longwall-induced horizontal stresses [1,2,3,4]. To properly support the roof in a belt entry, it is important to understand how longwall-induced horizontal stress changes can affect roof stability in the belt entry. Monitoring of horizontal stress changes was conducted in the belt entries of two Pittsburgh seam longwall panels oriented unfavorably to the major horizontal stress. Numerical models were also set up to investigate how horizontal stress concentrates and relieves in the belt-entry roof near the face as panel orientation changes. Both measurements and modeling results show that high hor-

izontal stress concentrates in the belt entry roof within about 15 m outby the face. The study demonstrates that longwall-induced differential horizontal stress can be used to evaluate the horizontal stress concentration factors. The horizontal stress concentration factors change with panel orientation, resulting in high stress concentrations at orientations between 20 and 110° and low stress concentrations between 130 and 180°. Roof support strategies are given for the belt entries under the influence of high horizontal stress. For unfavorably oriented panels in weak roof conditions, supplementary support should be installed during development, and cable bolts should be anchored into a stable roof horizon. The bolting pattern should be designed to cover both entry corners and the entry center to prevent potential roof cutters and sagging.

Introduction

The stability of the belt entry in longwall mines is crucial for longwall safety and continuous production of coal from the longwall face. Any roof fall in the longwall belt entry would not only result in substantial interruption of coal production but potentially cause injuries or fatalities. Even though the roof in the belt entry is carefully supported to accommodate both abutment pressure and horizontal stress, roof falls still occasionally occur in belt entries in U.S. longwall mines, and they are mostly associated with high horizontal stress. This paper addresses how longwall-induced horizontal stress affects belt-entry roof stability by horizontal stress monitoring and numerical modeling.

Method, results and discussion

Horizontal stress monitoring and numerical modeling.

The stress changes in the immediate roof in the belt entries were monitored for two longwall panels in the Pittsburgh seam. Hollow inclusion cells (HICells) were installed in the roof at an intersection in each of the belt entries, and stress changes were monitored as the longwall face was approaching and passing the intersection. Figure 1 shows the panel layout and HICell locations at the monitoring sites. The panels were oriented at 37° to the major horizontal stress. The overburden depths were 259 m at both sites, and mining height was

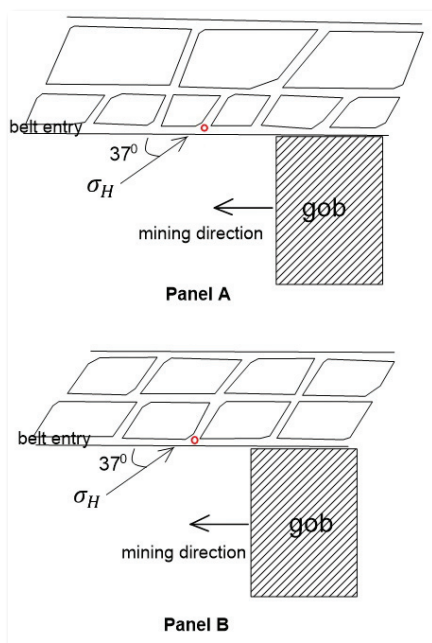


Fig. 1 Panel layout and HICell locations at the monitoring sites.

2.3 m. The horizontal stress monitoring showed that the longwall-induced horizontal stress changes occurred within about 12 m outby the face in the limestone roof 6 m above the roofline at the intersections in the belt entries.

FLAC3D models were set up to calculate longwall-induced stresses in the belt-entry roof. The predicted horizontal stress changes were generally in good agreement with the measurements. The model predicted that horizontal stress across the entry and horizontal shear stress along the entry concentrate within about 15 m outby the face, but horizontal stress along the entry relieves within about 15 m outby the face. Among the three stress components on the horizontal plane, the greatest stress change induced by longwall retreat is the shear stress, which would significantly change and rotate the principal stresses on the horizontal plane.

Effect of panel orientation on belt-entry roof stability.

Longwall mining induces principal horizontal stress changes in the belt-entry roof outby the face. The difference between the two horizontal principal stresses, referred to as differential horizontal principal stress, can be used as an indicator for the degree of horizontal stress concentration. The differential horizontal stress is defined by:

$$\sigma_{\text{diff}} = \frac{1}{2} (\sigma_1 - \sigma_2) \quad (1)$$

where σ_1 and σ_2 are the major and minor horizontal principal stresses in the belt-entry roof.

To understand how panel orientation affects roof stability, the model is used to calculate the differential horizontal stress at different panel orientations. The differential horizontal stress concentration factors are calculated at the T-junction corner on the panel side 2.4 m above the roofline and 3.0 m outby the face. Figure 2 shows differential horizontal stress concentration factors at different panel orientations. The horizontal stress concentration factors change with panel orientation, with high horizontal stress concentration at 20 to 110° and low horizontal stress concentration at 130 to 180°. The figure is also plotted with reported cases of roof falls and good roof conditions in the Pittsburgh seam belt entries. The results from this study indicate that roof falls occur at high differential horizontal stress concentration factors of 1.9 to 2.4, and that good roof conditions are experienced at low stress concentration factors of 1.0 to 1.4.

Conclusions

The following conclusions are made based on horizontal stress monitoring in the belt entry in a longwall mine in the Pittsburgh seam, numerical modeling of stress changes in the longwall belt entry, and the experience of roof control in Pittsburgh seam longwall mines:

- Under the influence of high horizontal stress, the roof in the belt entry could fail in the form of cutters and sagging. Horizontal stress monitoring and numerical modeling show that the influence zone of longwall-induced horizontal stress is within about 15 m outby the face.

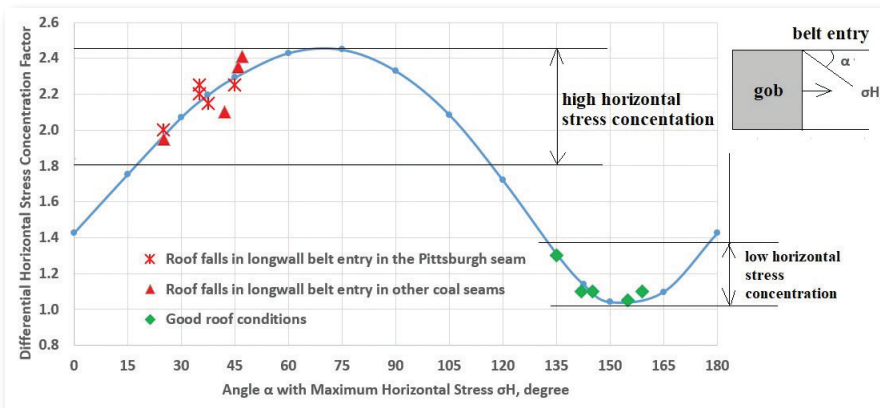


Fig. 2 Differential horizontal stress concentration factors at different panel orientations.

- The horizontal stress concentration factors change with panel orientation, with high stress concentration at 20 to 110° and low stress concentration at 130 to 180°.
- Optimizing panel orientation is the first step to prevent roof falls in belt entries. For unfavorably oriented panels in weak roof conditions, supplementary support should be installed during development, and cable bolts should be anchored into a stable roof horizon. The bolting pattern should be designed to cover both entry corners and the entry center to prevent potential roof cutters and sagging. ■

Disclaimer

The findings and conclusions in this report are those of

the authors and do not necessarily represent the official position of the National Institute for Occupational Safety and Health, Centers for Disease Control and Prevention (CDC). Mention of any company or product does not constitute endorsement by NIOSH.

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Creep damage model for rockburst at Mufulira Mine in Zambia

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Full-text paper:

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Keywords: Rockburst, Copperbelt, Stress analysis, Brittle creep

This paper describes a creep damage model that was proposed to clarify the rockburst mechanism for the Mufulira underground copper mine in Zambia. Cumulative rock damage was evaluated for the edge elements of each sidewall of the mining drives based on normal stresses by the 3-D displacement discontinuity method (DDM) (Crouch and Fairhurst, 1973). The rockburst occurrences were well hindcasted.

Background

In January 2018, the Mufulira Mine recorded a rockburst at 1,440 mL underground with a magnitude of 2.8 (Fig. 1a). We conducted a study on the M2.8 (#12) rockburst based on field investigation, rock testing and numerical elastic stress analysis [1], and calculated the normal stress to the orebody at the M2.8 rockburst and its variation with face advance using 3-D DDM. However, the elastically predicted stress at the rockburst site was not high and barely increased with the face advance. The present study applies DDM with a larger model to investigate other rockburst events from 2016 to 2018 and re-examine the M2.8 rockburst. Again, it is shown that the normal stress value or its increase with face advance cannot explain the rockburst occurrences. Therefore, the creep damage model is proposed under an assumption that the rockbursts could be brittle creep failure of the relatively intact rock mass.

Method

Minewide stress analysis. Three-dimensional elastic stress analyses by DDM were carried out, assuming the hydrostatic stress state is equal to the overburden pressure. A similar approach to that in Sinkala et al. [1] was followed,

using the input parameters listed in Table 1, considering a larger minewide model. Fujii et al. [2] explained the conceptual equations applied in this method. The lithostatic state of stress was assumed for simplicity:

$$\sigma_v = \sigma_H = \sigma_h = \gamma h \quad (1)$$

where σ_v is the vertical component of stress, σ_H is the maximum horizontal stress, σ_h is the minimum horizontal stress, γ is the unit weight of the rock mass, and h is the overburden depth.

Creep damage model. The basic concept of the creep damage model on the rate of creep damage D is shown in:

$$\frac{dD}{dt} = S_{sc}^n \quad (2)$$

where S_{sc} is the stress severity for compressive failure, and n is a constant which represents the degree of time-depen-

Table 1 – Input parameters for numerical analysis.

Rock	Unit weight (N/m ³)	Tangent modulus (GPa)	Poisson's ratio
Hanging wall and footwall	27,000	12.33	0.222
Orebody	27,000	10.23	0.241

Table 2 – Input parameters for brittle creep model.

UCS (MPa)	n	t (d)
80	25	1

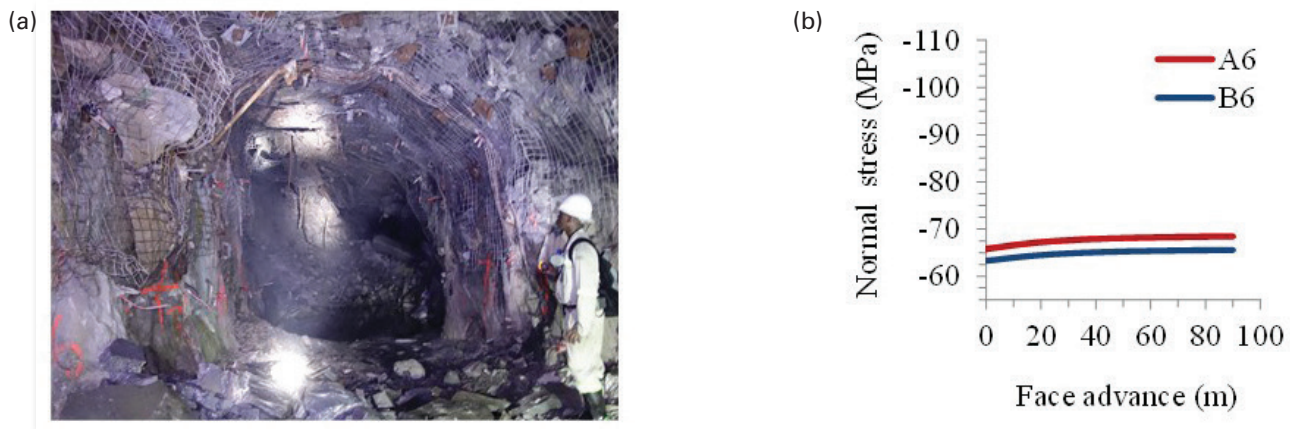


Fig. 1 (a) Rockburst site for M2.8 (photograph taken March 15, 2018) and (b) change in normal stress due to face advance.

dependency of strength. Assuming that rock mass failure occurs when D reaches 1, the time of failure under a constant stress severity is obtained as:

$$t_F = S_{SC}^{-n} \quad (3)$$

or

$$\log(S_{SC}) = -\frac{1}{n} \log t_F \quad (4)$$

This equation represents the typical relationship between creep stress and time to failure, and t_F becomes 1 when $S_{SC} = 1$. Rock damage was evaluated based on the normal stress obtained by the 3-D DDM. The calculation was carried out using the input parameters listed in Table 2.

Results and discussion

The normal stress distribution on the orebody is shown in Fig. 1b. As mine extraction advances, the normal stresses increase around the excavation. However, there was almost negligible stress increase for site #12 (Fig. 1b). It would be difficult to explain that rockburst from the normal stress increase.

Therefore, a creep damage model is proposed as another model for rockburst mechanism. The cumulative damage for the rockburst site #12 (A6, B6) exceeded one (yellow) at the rockburst occurrence (Fig. 2b). This may suggest that the relatively wide area of rock mass left around the M2.8 (#12) behind the starting entry of the stope experiences moderate stress concentration, which may not reach instantaneous strength but exceed the long-term strength for creep failure over a long time. The stress may have been kept for a long time, and brittle creep failure may have finally occurred and

been recognized as the severe rockburst.

The damage at the chain pillars indicates far beyond one. Rockbursts there cannot be detected because most of them are in the mined-out area. The rock mass at the face experiences high stress concentration. However, rock-mass failure is not likely because the rock mass was sequentially already fractured by blasting for extraction.

Conclusion

Minewide elastic stress analyses of rockburst sites using 3-D DDM indicate low stress concentration at the rockburst sites in the initial mining stage, but stress levels gradually increased with progress in mining (Fig. 1b). However, rockbursts cannot be explained as an instantaneous rock-mass failure due to stress increase by mining. Therefore, a creep damage model is proposed. Cumulative rock damage was evaluated for the edge elements of each sidewall of the mining drives, based on the normal stresses, using 3-D DDM. Rockburst occurrences were well hindcasted.

Future studies will focus on whether changing the mining sequence and pillar geometry can affect potential rock-bursting areas using the creep-damage analysis. ■

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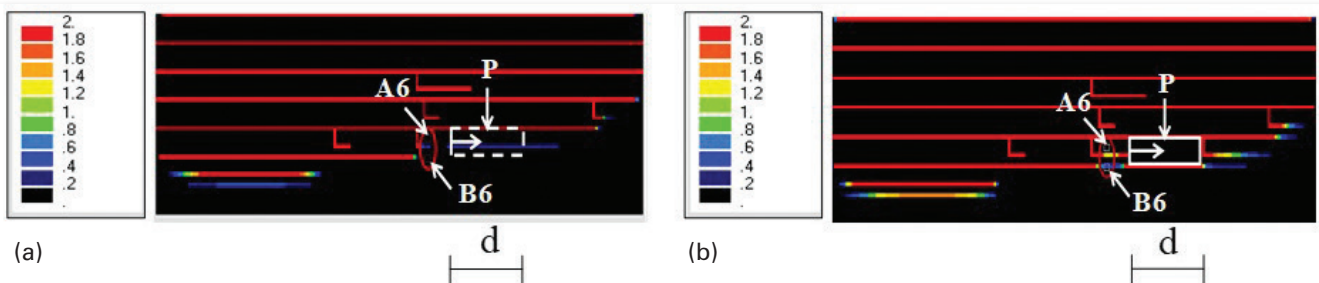


Fig. 2 Results of creep damage evaluation for rockburst #12 (a) before the mining and (b) at the rockburst occurrences.

Ground control and safety management coffee break, an industry perspective

by Juan Monslave, Virginia Tech

Ground instability issues have been historically one of the main causes of accidents and fatalities in the mining industry worldwide. In the United States, 30 percent (122 out of 391 cases) of the fatalities in underground mining between 2000 and 2020 were caused by ground instability-related issues [1]. In addition, 15 percent (7,117 out of 48,685 cases) of all nonfatal lost-time injuries in the same time frame were associated with fall of ground (as referred to by the Mine Safety and Health Administration (MSHA) [2]) as well.

Data- and science-driven engineering solutions to ground instability — that is, ground control engineering — are relatively recent, and often based on experience and rules of thumb. With the advances in ground monitoring technologies, effective implementation is not just collecting data but communicating value to the stakeholders, especially miners, which usually takes the form of a ground control management plan (GCMP). The main goal of a GCMP is to facilitate the timely recognition of ground control hazards with a systematical and methodical approach. GCMP documents must be dynamic to accommodate new ground conditions and new mining technologies over the life of the mine.

On Aug. 10, 2022 the SME Young Leaders Committee organized a coffee-break session on best practices in ground control and safety management, where a variety of stakeholders discussed how their ground control processes interact with their safety management systems in their operations.

These coffee-break sessions are virtual hangout venues for people to share their stories and experiences. The Aug. 10 event saw more than 50 people register, including mining operators, contractors, consultants and students from around the world. They were asked three questions regarding the communication of geomechanical hazards,

the implementation and performance evaluation of designs, and the integration of geomechanical processes with the company's management systems.

In the first question, attendees were asked about best practices they were aware of that companies are currently implementing to communicate geomechanical hazards to mine workers. Geology was highlighted as one of

the most important factors that condition geomechanical hazards. Therefore, it was suggested by one of the attendees that communication among the geologists, engineers and operators is key to keeping miners informed about potential hazards in the work area. It was also suggested that trusting the experience of operators and maintaining strong communication channels with them is essential to report and highlight areas that may be presenting problems. Finally, the attendees stressed the importance of training inexperienced operators on what they should be looking for during the identification of ground instability-related hazards.

In the second question, participants were asked about strategies to ensure geomechanical designs are effectively implemented as planned, and how their performance is monitored. As an introduction to this question, it was brought up that in the past five years there have been multiple pillar collapses occurring in the underground stone mine industry.

One of the factors the MSHA encountered in some of these events was that the actual pillar dimensions did not follow the original design [3]. It was mentioned that building trust between the engineer and the operator is paramount to ensure operators follow the designs and understand their importance. Some attendees pointed out that external factors sometimes make it difficult to fulfill some of the designs and plans. For instance, they mentioned that supply-chain shortages in the past year had been affecting their plans, therefore the designs had to be adapted to meet these external challenges while ensuring the overall safety of the mine operation.

Quality assurance/quality control programs and continuous monitoring were highlighted as important tools to keep track of in the due implementation of designs. In addition, it was mentioned that the implementation of triggered action response plans and their communication was very important to ensure all stakeholders are aware of the importance of following engineering designs.

The last question was on how mining companies are integrating their geomechanical processes with their safety management systems. Some participants highlighted that some components of management systems, such as documentation of processes, definition of policies and procedures, and definition of roles and responsibilities, are important and already implemented in the geomechanical engineering departments of some operations. They noted that one of the most important procedures in place to prevent ground instability-related accidents is the daily work area inspection, which should also be supported with a supervisor inspection. They underlined the importance of making sure everyone in the operation is aware of the importance of this procedure so it does not become a

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SME recognizes new Legion of Honor and 25-year members

SME members from the class of 1973 have achieved Legion of Honor (50-year) status. Of those who joined SME in 1973, 70 have maintained their memberships for the past 50 years. Each 50-year member receives a certificate and a gold lapel pin. Upon membership renewal for 2023, the following persons will have been members of SME for 50 years.

Thomas H. Bagan, PE, Sparks, NV
 Thomas J. Baker, Santa Fe, NM
 David R. Baughman, Golden, CO
 Michael C. Baumann, Elko, NV
 John A. Begeman, Rapid City, SD
 John A W Bowsher, Tucson, AZ
 Phil Breaden, Rozelle, NSW, Australia
 Corale L. Brierley, Highlands Ranch, CO
 Scott G. Britton, PE, Monument, CO
 David M. Brown, Tucson, AZ
 Darrel G. Cameron, Bountiful, UT
 Steven B. Carpenter, PG, Valencia, CA
 Odin D. Christensen, Flagstaff, AZ
 Mark F. Coolbaugh, Reno, NV
 Charles S. Eady, Safford, AZ
 David W. Farnsworth, PE, McCall, ID
 William P. Felts, Wilmington, NC
 Leigh W. Freeman, Indian Hills, CO
 Richard M. Frentress, Ctr Sandwich, NH
 Akinori Fujimoto, Tokyo, Japan
 Robert J. Green, Farmington, NM
 Richard J. Hall, Silverthorne, CO
 Larry L. Harkins, Canon City, CO
 Ronald F. Hartung, Lakeland, FL

Laren S. Haskins, Fairbanks, AK
 Daniel T. Hurst, South Jordan, UT
 Uldis Jansons, Lakewood, CO
 Don L. Jenkins, Prescott, AZ
 Lane F. Johnston, Jasper, TN
 Donald G. Keene, PE, Lone Tree, CO
 Bruce Kettunen, Mountain Iron, MN
 Charles A. Kliche, Rapid City, SD
 Fleetwood R. Koutz, Reno, NV
 Henry J. Lamb, Lakeland, FL
 Donald J. Leslie, Duluth, MN
 Alan S. Levy, Sherman Oaks, CA
 John C. Lucking, Phoenix, AZ
 Joseph T. Mattson, Littleton, CO
 Steven W. McClelland, Morgantown, WV
 Steven A. McGhee, Oracle, AZ
 Donald E. Moe, Spring, TX
 Brij M. Moudgil, Gainesville, FL
 Ted W. Moulin, Tucson, AZ
 Charles K. Mulhall, PE, Centennial, CO
 Kirk A. Nobis, South Jordan, UT
 Jerry J. Oliver, Houston, TX
 Terry L. Owen, Spokane, WA
 Arthur Palm, Coeur D Alene, ID

Louis Pierre Gignac, Brossard, QC, Canada
 Fredric L. Pirkle, Jacksonville, FL
 John M. Purcell, Carlsbad, NM
 William W. Reid, Denver, CO
 Jean-Michel M. Rendu, Santa Fe, NM
 Robert J. Reviere, Ripley, TN
 Richard B. Rickard, Boise, ID
 Jim V. Rouse, Golden, CO
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 Henry A. Scholz, Missoula, MT
 Robert S. Shank, MSCIS, Ventura, CA
 Alastair H. Summers, Coeur D Alene, ID
 Dan Tolgyesi, Quebec, QC, Canada
 Peter J. Versteegh, Sittard, Netherlands
 David E. Wahl, Jr., Mesa, AZ
 Randall E. Walleit, Gardners, PA
 William A. Warfield, Roseville, CA
 Larry A. Watters, Venetia, PA
 Christopher D. West, Salt Lake City, UT
 Richard M. Whiting, Saint Louis, MO
 Richard H. Young, Parsippany, NJ

The SME members listed below joined SME in 1998 and have maintained their memberships for 25 years. Upon membership renewal for 2023, the 113 members listed below will receive their 25-year certificates.

Jeff S. Allaman, Franklin, PA
 John P. Ansted, Littleton, CO
 Katherine A. Arnold, PE, Tucson, AZ
 Ryan T. Baker, Lone Tree, CO
 Andrew H. Barksdale, Raleigh, NC
 Joseph Basar, Bexley, OH
 Eric R. Bauer, Canonsburg, PA
 Nathan A. Bennett, Elko, NV
 Ian Billingsley, Draper, UT
 Richard Edwin Bishop, Blacksburg, VA
 Randy Black, Sandersville, GA
 Eric J. Blanford, Slaughters, KY
 Bernard G. Bonifas, Casper, WY
 Terry H. Braun, Denver, CO
 Nance Card, Sparks, NV
 Andrew J. Carter, Salisbury, United Kingdom
 Daniel C. Cassidy, Highvale, Qld, Australia
 Gary E. Coates, Mississauga, ON, Canada
 Peter C. Cooper, Oroville, WA
 Michael G. Crowe, Cluden, Qld, Australia
 Michelle D. Cunningham, Folsom, CA
 Ronald V. Davis, Naperville, IL
 Tara K. Davis, Englewood, CO
 Yvonne R. Dean, Citrus Heights, CA
 Patrick G. De Saint Simon, Lyon, France
 Heather N. Dougherty, Finleyville, PA
 Fiona M. Doyle, Berkeley, CA

Michael L. Droszcz, Shaker Heights, OH
 Herb Duerr, Reno, NV
 W Scott Dunbar, Vancouver, BC, Canada
 Jorge Durant Broden, Puno, Peru
 Jami G. Dwyer, Elko, NV
 Drummond Earley, South Ogden, UT
 Paul Eger, Saint Paul, MN
 John W. Eloranta, Tower, MN
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 Troy J. Fierro, Mesa, AZ
 Stephen W. Ford, Casper, WY
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 Taehong Kim, Montvale, NJ
 Fritz J. Klingler, Madison Heights, MI
 Karoly K. Kocsis, Salt Lake City, UT
 Jerzy Krol, Edmonton, AB, Canada
 Alberto Leiva Torres, Lima, Peru
 Dariusz Lelinski, Midvale, UT

Jens K. Lichter, Olympia, WA
 Mandy Lilla, Tyrone, NM
 Michelle N. Lovland, PE, Plano, TX
 Donald K. Lumm, Lexington, KY
 Mark G. Luxbacher, Tucson, AZ
 Paul A. Manning, Moseley, VA
 Samuel A. Marich, Spring Creek, NV
 Julie Marinucci, Virginia, MN
 James M. Marquardt, Washington, DC
 Jeff R. Mattern, Elko, NV
 Craig R. McClung, South Jordan, UT
 Gevan L. McCoy, New Braunfels, TX
 Clay A. McNail, Farmington, MO
 Nicholas Michael, Littleton, CO
 Catherine A. Michaud, Leeming, WAS, Australia
 John D. Millerchip, Montrose, CO
 Karl H. Mitterndorfer, Hagerstown, MD
 Manoj Mohanty, Reno, NV
 Carlos E. Ignacio Moraga Ensignia, Santiago, Chile
 John J. Morrison, Littleton, CO
 Ryan M. Murray, Saint Clairsville, OH
 Chris C. Myers, Spokane, WA
 Craig J. Nelsen, Centennial, CO
 Hernan I. Parra, Lima, Peru
 Alexander Partsch, Edmonton, AB, Canada

(continued on page 55)

Thank you to our MPD sponsors; they make our community better

by Aaron Noble, Secretary-Treasurer, MPD Executive Committee

Thankful (adjective): *Conscious of benefit received.* (Merriam-Webster online, 2022)

In my 15 years as an SME member, I have had the privilege of listening to many of my colleagues describe their experiences within SME. The extent and breadth of their stories are enormous, but one theme that comes up nearly every time is thankfulness. Members are thankful for the technical content, thankful for the professional development opportunities, thankful for the scholarship support, thankful for the opportunities to serve, and thankful for the friendships and community they have found. I find it fitting that I am drafting this article on Thanksgiving — my favorite holiday, particularly given the focus on gratitude and appreciation that the day entails.

While preparing this article, I stumbled upon the definition for “thankful” given above. As is the case for most literal definitions, I found it to be provoking, despite its simplicity. Of note is the leading word “conscious.” The word “conscious” here implies that thankfulness is an active emotion or an active process. As we know, one can experience many emotions passively. One can be passively content with their SAG (semiautogenous grinding) mill performance or passively disappointed by their intern’s inability to run a consistent float test. However, one cannot be passively thankful.

Interestingly, the same logic applies to groups and institutions. We in the MPD Executive Committee cannot be truly “thankful” unless we take action to indicate as such. Thus, we would like to take this opportunity to consciously acknowledge the benefit we have received from our numerous sponsors and supporters over the past year. Support from you provides the resources we need to fulfill the MPD’s mission, which includes providing a platform for cooperation and communication, professional development opportunities, world-class technical content, and scholarships and awards. Specifically, we would like to

thank sponsors of the 2023 MPD Scotch Nightcap, MPD Luncheon and Student Poster Contest, the MPD Calendar, which is in its 14th year of printing, and the Metallic Student Design Competition.

MPD Scotch Nightcap

- Title sponsors: Boart Longyear, FLSmidth, Molycop, Unified Purchasing Group (UPG).
- Supporting sponsors: Bechtel, Paterson & Cooke, P&C Recruiting, Polydeck.

MPD Luncheon

- Title sponsors: Flottweg Separation Technology Inc., FLSmidth, M3 Engineering & Technology, Millcreek Engineering, Newmont Malozemoff Technical Facility.
- Supporting sponsors: MolyCop, Unified Purchasing Group.

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- Weir Minerals (month and front cover).
- Derrick Corp. (month and back cover).
- Diemme Filtration.
- FLSmidth.
- Forte Dynamics.
- Hatch.
- Hazen Research.
- Kappes, Cassiday & Associates.
- M3 Engineering & Technology.
- Molycop.
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- Woodgrove Technologies.

Metallic Student Design Competition

- Main sponsor: Rio Tinto.
- Supporting sponsors: Hexagon, METSIM International, Costmine.

We hope that in the course of your work you will choose to do business with these vendors, thanking them and acknowledging their support of the SME/MPD. Your acknowledgements provide incentive for these valued sponsors to continue financial support of the MPD and its activities.

If your company has interest in sponsoring MPD scholarships or other activities, please contact any member of the MPD Executive Committee or Emma Salditt, SME Partnership Development Strategist. ■



2022-2023 MPD Calendar.

Fine Grind serves as a forum for the presentation and discussion of facts, ideas and opinions pertaining to the interests and technology of the Mineral & Metallurgical Processing Division. Accordingly, all material published herein is signed and reflects the individual views of the authors. It is not an official position of SME or the division. Comments by readers will be referred to the division for response. The division chair in 2022 is Ronel Kappes.

Call for silent-auction items; Mineral specimens among diverse items for bidding

by Julie Neilson, Associate Research Professor, University of Arizona

The SME Environmental Division is excited to announce our silent auction to be held at the MINEXCHANGE 2023 SME Annual Conference & Expo in Denver, CO Feb. 26–March 1, 2023. We have a diversity of great items including mineral specimens. Look for us on the resource floor at MINEXCHANGE 2023 to bid on these items and to learn more about the Environmental Division. Funds raised from this silent auction are used to fund Environmental Division student scholarships.

We are also seeking donations of additional items for the silent auction. If you are interested in donating an item to the auction, please contact the Environmental Division

Chair Lisa Gonzales at Lisa.Gonzales@arcadis.com or Jackie Dorr at dorr@smenet.org for more information. ■

The **Environmental Division** page serves as a forum for the presentation and discussion of facts, ideas and opinions pertaining to the interests and technology of the Environmental Division. Accordingly, all material published herein is signed and reflects the individual views of the authors. It is not an official position of SME or the division. Comments by readers will be referred to the division for response. The division chair in 2022 is Lisa Gonzales.



Young Leaders Committee

(continued from page 46)

routine task where they simply pencil whip a paper form. With regard to the definition of roles and responsibilities, one participant brought up that some companies are using a responsible–accountable–consult–inform (RACI) matrix to help in this process. This tool has been effective and helps to define an effective chain of communication among stakeholders.

The coffee break concluded with the need for clear communication and upskilling personnel in the mine area of practical ground control.

The session gave different perspectives and explanations on how the challenges on ground control should be and are being assessed when safety management is in the spotlight. Some students in the event who have rock-mechanics literacy felt they needed more of this practical knowledge as they found this coffee break's discussions hard to understand. With the changing workforce in an industry built on experience, the transfer of this practical knowledge is essential to

upcoming generations — not just rules of thumbs but most importantly learning from mistakes of the past.

Be sure to join us for the upcoming discussion panel on International Practices on Ground Control and Safety Management, scheduled for Jan. 25, 2023 at 8 am (MT). This international discussion panel is organized by the SME Young Leaders Committee in collaboration with the SME Health & Safety Division and the American Rock Mechanics Association Future Leaders. It will feature international experts from South Africa, Canada and the United States. ■

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2. NIOSH, "NIOSH Mining," [Online]. Available: <https://wwwn.cdc.gov/NIOSH-Mining/MMWC/Injuries/Count?StartYear=2000&EndYear=2021&SelectedMineType=1>. [Accessed 28 November 2022].
3. G. Rumbaugh, C. Mark and T. Kostecki, "Massive pillar collapses in US underground limestone mines: 2015-2021," in International Conference on Ground Control in Mining, Canonsburg, 2022.

St. Louis Section presents scholarships; Six Missouri S&T University students earn scholarships

Each year, the St. Louis Section (STL) of SME strives to recognize students studying mining and extractive fields at the Missouri University of Science and Technology with our section scholarships.

With the help of our annual golf tournament and generous section members, we are able to sustain our scholarship fund.

SME President Ron Parratt was present at our November section meeting to assist in presenting the awards to this year's recipients in addition to delivering an update on the Society's activities and initiatives to local section members.

A big thank you to Ron Parratt for traveling to St. Louis, to Joe Hatfield for organizing another successful fundraiser, to Bob Johnston for planning our banquet, to Guang Xu for coordinating the scholarship distribution, and to Jayson Ripke for taking great photos. ■



From left to right: SME President Ron Parratt, Melodie Wilcox, Alec Gray, Ashley Marie Davis, Dustin Peterson, Mirza Muhammad Zaid, Samuel Nowak and Guang Xu, associate professor at Missouri S&T.

SME members included in “100 Global Inspirational Women in Mining” 2022 publication

Women in Mining UK (WIM UK) has published its “100 Global Inspirational Women in Mining” (WIM 100), a biennial publication that highlights the wealth of female talent within the global mining industry, celebrates women's “above and beyond” contributions to the industry, and identifies role models for future generations. It is the fifth edition of the publication.

In 2022, WIM UK received 915 nominations for 491 women from 61 countries. Among the 100 chosen to be honored this year are SME members Juliet Akamboe, Michele Asby, Emily Haas, Kathleen Tew, Barb Filas and Rebecca Siwale.

Tew, Haas and Siwale attended the in-person celebration in London. Tew and Haas were nominated by SME member Ali Lashgari.

“All the representation of cultures, industry experience, and industry roles stuck out to me,” said Tew, who is project engineer at Cementation. “For some (women), they can't see themselves in this industry due to a lack of visual representation — but let me tell you, the WIM 100 event represented women from all around the world. There is power in seeing representation, and there is power in diversity.”



From left to right: Emily Haas, Rebecca Siwale and Kathleen Tew are among the SME members named to WIM 100.

(continued on page 52)

2022 SME Foundation Benefit Golf tournament raises \$64,000

by Megan Martin, SME Foundation Manager

The third annual SME Foundation Benefit Golf Tournament was held Nov. 18, 2022 at the Gold Canyon Golf Resort outside of Phoenix, AZ. Thanks to the generous sponsors and numerous golf teams, the SME Foundation raised more than \$64,000 for the Ph.D. Fellowship and Career Development Grant Program. The big winners of the day out of the 239 golfers who competed on the Dinosaur Mountain and Sidewinder courses were:

Dinosaur Mountain

1st Place: The Elko Wire Rope team of Andrew Arbizo, Francisco Arbizo, Josh Hammond and Nick Roberts.

2nd Place: The Cementation team of Deuce Brown, Nick Dyken, Robert Gripper and Matthew Swanson.

Most Average Golfers: The Freeport-McMoRan Miami team of Deaver Acosta, Curtis Huddleston, Martin Navarette and Jeff Rice.

- Closest to the pin–Men: Kaden Larkey.
- Closest to the pin–Women: Jessamyn Messick.
- Longest drive–Men: Kaden Larkey.

- Longest drive–Women: Jessamyn Messick.
- Putting contest: Sione MOUNGALOA.

Sidewinder

1st Place and Operator's Challenge Winner: The Pioneer Equipment team of Kevin Adolick, Gary Denkler, Bill Watson and Eric Williams.

2nd Place: The Open Loop Energy team of Joey Scott, Gary Scott, Dow Waite and Tom Waite.

Most Average Golfers: The SMS Construction team of Don Kunzler, Chris Pena, Kyle Silvester and Shawn Silvester.

- Closest to the pin–Men: John Rathbun.
- Closest to the pin–Women: Maria Gehring.
- Longest drive–Women: Bianca Goerke.
- Longest drive–Men: David Guy.
- Putting contest: Ray Budisavljevic.

Thank you to the Golf Planning Committee members Mark Baker, Steve Holmes, Fred Sanders, Dow Waite and Robert Washnock. This event would not have been possible without their commitment and dedication. ■

Thank you to our 2022 golf sponsors



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 National Mining Hall of Fame • One Digital • Open Loop Energy
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 Southwest Energy • Sumitomo Drive Technologies • Weir ESCO

Health & Safety Division to award inaugural division scholarships during MINEXCHANGE 2023

The SME Health & Safety Division announced it has created the Health & Safety Division Scholarship program, and the first scholarship recipients will be recognized at the Division's Annual Awards Breakfast on Feb. 28, 2023 during MINEXCHANGE 2023 SME Annual Conference & Expo in Denver, CO.

The awards breakfast will feature a keynote presentation by John Dony, vice president of workplace strategy at the National Safety Council as well as a short presentation by Sadie Costello, occupational and environmental epidemiologist at the University of California, Berkeley School of Public Health, who will speak on Improving Miner Health through Communication Best Practices. The Division invites all SME members to this event.

Seventh Annual 5K Fun Run/Walk Sponsored by Rio Tinto

The annual 5K fun run and walk, sponsored by Rio Tinto, will take place in Denver's City Park this year. It is the Mile High City's premier regional park and home to the Denver Zoo, Denver Museum of Nature and Science as well as two lakes, historical monuments and statuary. Pack some cold-weather running gear and join the Division for this brisk run to kick off the MINEXCHANGE 2023 week on Feb. 27.

This is the Division's primary fundraiser and all proceeds will go toward the Health & Safety Division Scholarship fund. Bus transportation from the Colorado Convention Center will be provided.

Technical programming

The Health & Safety Division will host eight technical sessions and two joint sessions during MINEXCHANGE 2023. Sessions include: H&S Case Studies in Direct Reading Instrumentation and Sensor Technology; Exploring the Return on Value of Health & Safety Management

Systems (CORESafety) and Credential Programs (CMSP); Reducing Occupational Exposures from a Hierarchy of Controls Perspective; Hazard Recognition Using Artificial Intelligence and Machine Learning; Innovations in Emergency Preparedness and Response; Human Factors Issues in the Workplace: Problems and Solutions; Advancements in H&S Training and Other Hazard Identification Strategies and National Occupational Research Agenda (NORA); Future Health and Safety Challenges with All-Electric Mobile Equipment.

Joint sessions are: Health and Safety in Industrial Minerals (joint session with the Industrial Minerals & Aggregates Division) and Health and Safety in Mining and Exploration (joint session with the Mining & Exploration Division).

Certified Mine Safety Professional (CMSP) Review course

A review course for the Certified Mine Safety Professional (CMSP) certification will take place Feb. 24–Feb. 26, 2023. The CMSP examination will be administered on Feb. 27, 2023.

Health & Safety Division Executive Committee Meeting

The Health & Safety Division's Executive Committee will meet on Feb. 26, 2023 at 9 am. This meeting is open to anyone interested in working with the Division. Find out about volunteer opportunities and Division activities in this meeting.

Mine Rescue Skills First Aid

Working with the SME Young Leaders Committee, the Health & Safety Division will host a four-hour first-aid training course on Feb. 28, 2023, 1–5 pm. ■

Women in Mining

(continued from page 50)

Haas, research health scientist at the National Institute for Occupational Safety and Health said, "What an incredible experience to be honored in the "100 Global Inspirational Women in Mining" 2022 cohort in London. I was in awe to be sitting among so many trailblazers who have not only been resilient but also a strong voice and example for others to follow. Hearing and reading about the journeys of these women was empowering."

"This year's cohort is a reminder that, despite the global tensions caused by the likes of geopolitical conflict and the growing realization that the world is not equipped to meet net-zero targets by 2050, the future workforce and its abilities to demonstrate diverse perspectives and skillsets are paramount to future-proofing the industry and global decarbonization efforts," WIM chair Carole Cable and Dr. Stacy Hope, WIM managing director wrote

in the publication's foreword. "There is little debate that diversity improves organizational performance, creativity, innovation and profit ... Only by removing systemic barriers, introducing new systems to allow diversity, equity and inclusion, and championing the amazing women in the sector, will we be able to attract and retain a diverse workforce."

SME members in the WIM 100 include:

- Juliet, Akamboe, Colorado School of Mines, graduate student and research assistant.
- Michele Ashby, chief executive officer, ACE LLC.
- Barb Filas, independent consultant.
- Rebecca Siwale, vice president, head of digital services, FLSmidth Inc.
- Debra Struhsacker, principal, Struhsacker Consulting. ■

Support the Mining & Exploration Division scholarship fund with your donations to the annual silent auction

by Robert Washnock, Vice Chair for Program Planning

Dear Fellow Mining & Exploration Division Members:

The SME Mining & Exploration Division's Richard E. Gertsch Memorial Silent Auction is pleased to announce that the event will be held in conjunction with the MINEXCHANGE 2023 SME Annual Conference & Expo Feb. 26 to March 1, 2023 in Denver, CO.

The in-person auction will take place at the M&E Division Luncheon on Wednesday, March 1, 2023, starting at noon at the Colorado Convention Center.

The Mining & Exploration Division has given three to five scholarships annually for many years, and these scholarships are needed to attract and retain the most promising students to the mining and geology fields. Due to the enormous debt these students are forced to incur, our scholarship amounts must increase to provide significant financial support.

All proceeds (yes, 100 percent) from the items donated will be deposited into the division Scholarship Fund.

We request your help in making our auction event a huge success by generously donating. This is an excellent way for you to give back to our industry, help a student financially, advertise on behalf of your company, and donate to the Mining & Exploration Division.

Popular items to consider donating include:

- Scale models of mining equipment.
- Historical mining memorabilia.
- Mineral and fossil specimens.
- Jewelry and gems.
- Private VIP tours of mines.
- Adventure outings.
- Sports tickets/sports memorabilia.
- Electronics and technology items.
- Professional services.
- Gift baskets.
- Artwork.

Your item(s) must be received by Feb. 3, 2023 to allow for shipping and handling by SME staff.

If you would like to make a tax-deductible donation please send to:



Attendees examine auction items at the the M&E Division silent auction during the MINEXCHANGE 2022 SME Annual Conference & Expo in Salt Lake City, UT.

SME – M&E Division
Attn: Robert Washnock
12999 E. Adam Aircraft Circle
Englewood, CO 80112-4167

Thank you for your time and consideration.
Sincerely,

Robert V. Washnock
M&E Fundraising Chair

Upcoming SME Events

George A. Fox Conference
Jan. 31, 2023
New York, NY

MINEXCHANGE 2023 SME Annual Conference & Expo
Feb. 26-Mar. 1, 2023
Denver, CO

2023 SME Minnesota Conference
April 17-19, 2023
Virginia, MN

For additional information, contact: Meetings Dept., SME
Phone 800-763-3132 • 303-948-4200 • Fax 303-979-3461 • email sme@smenet.org • www.smenet.org

SME introduces surface-mining and underground-mining handbooks edited by Peter Darling

SME has introduced two new handbooks, edited by Peter Darling: the *SME Surface Mining Handbook* and the *SME Underground Mining Handbook*.

SME Surface Mining Handbook

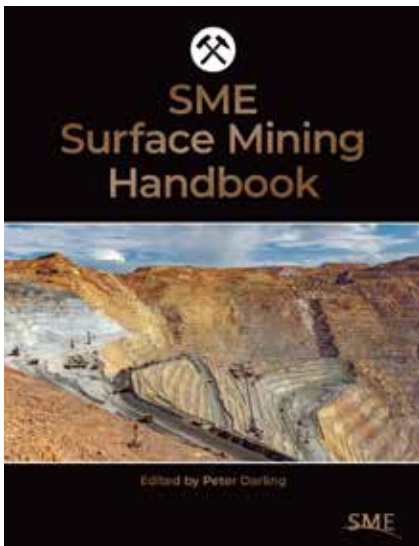
This landmark publication distills the collective knowledge of the surface mining industry's most astute and discerning professionals. There are an extraordinary number of sectors that must be harnessed and understood before any surface operation can become a viable and profitable enterprise.

Most of the world's natural resources are mined from open-sky, surface operations. If the mining world is to continue to provide the building blocks

that global development demands, surface mining must be conducted in a smarter and more sustainable way, with fewer people and under greater scrutiny than in the past to match the expectations of a skeptical public, environmental custodians and host communities, as well as the legislative and financial entities that allow mining to continue.

The *SME Surface Mining Handbook* captures the essence of efficient, safe and effective surface mining, thus inspiring and informing current and future generations of mining professionals.

The *SME Surface Mining Handbook* describes the major methodologies involved in the surface extraction of ores, highlights the direction of change, and examines and communicates the developments within the sector. It explores the varied work being undertaken by individuals, academia, companies, equipment manufacturers and specialist organizations in overcoming the myriad challenges that face today's surface mining industry.



2023, 672 pages
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SME Surface Mining Handbook
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SME Underground Mining Handbook

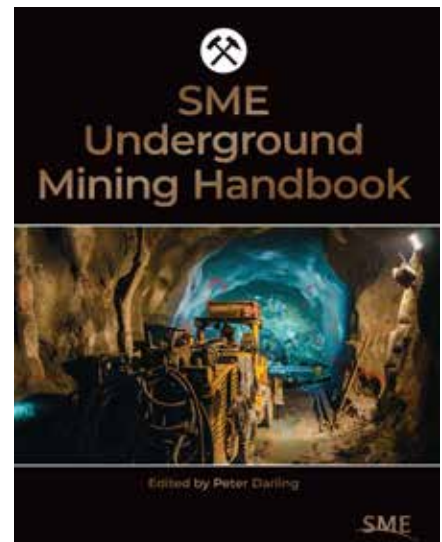
The *SME Underground Mining Handbook* distills the body of knowledge from many of the world's most distinguished mining professionals, bringing clarity to this multifaceted engineering discipline. By presenting the leading edge of the industry's expertise, this landmark publication will inspire and inform both current and future generations of mining professionals.

The need to mine deeper for ever-decreasing ore grades in more austere and remote parts of the world under greater scrutiny by both a discerning public and the communities where mining takes place, as well as those who finance such operations, is the backdrop for this book.

As these — and other conditions — become more demanding, the mining industry must learn to operate more efficiently and effectively, and with fewer operators and engineers.

The *SME Underground Mining Handbook* describes the major methodologies employed within this

global industry, highlights the thrust and direction of change, and examines the white heat of revolutionary developments within numerous sectors. It also explores the myriad research projects and work being undertaken by individuals, academia, companies, equipment manufacturers and specialist organizations in overcoming the plethora of challenges that face today's underground mining industry. ■



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MEC Student Chapter Education Outreach Award

The Minerals Education Coalition's Student Chapter Education Outreach Award recognizes an SME student chapter for reaching out to local K-12 students and teachers and the general public to let people know how important mining and minerals are to their lives. This is a way to make a difference in public perception and help ensure that there are workers for the industry's future.

The SME Norwood Student Chapter — University of Kentucky won the 2021 award. Their exciting outreach work included new digital content due to COVID-19 impacts:

- A new outreach, website <https://www.ukycuriosityrocks.com/>, divided by age groups to deliver information about mining and mining engineering to K-12 students and teachers, as well as information related to the BSA Mining in Society merit badge.
- A YouTube channel, Curiosity Rocks, with videos linked to their outreach website and targeted at K-12.

- A new electronics-waste recycling program with which they plan to engage the community and draw links between mining engineering and sustainability.

This year's (2022) winner has already been selected and will receive the award at the MINEXCHANGE 2023 SME Annual Conference & Expo. The winning student chapter receives a framed certificate, a \$250 check, two tickets to the SME Awards Dinner and up to \$500 travel reimbursement to attend MINEXCHANGE 2023.

The online application window for next year will be open April 1–June 1, 2023 at smenet.org. To apply, submit a short form answering four questions about your student chapter's educational outreach to K-12 students and teachers and to the general public, as well as support of the outreach efforts of other SME chapters or sections or of the Minerals Education Coalition's programs.

Please continue all of the great outreach you are doing, and please be sure to submit your chapter for the MEC award come April 1, 2023. ■

Leonard G. Austin, 1929-2022

Leonard G. Austin, 93, born Oct. 5, 1929, in London, England peacefully passed away on Nov. 21, 2022. He was born to Albert Austin and Charlotte Freeth. He graduated with a B.S. in physics, chemistry and pure maths from London University in 1950, and a Ph.D. in fuel technology in 1961 from the Pennsylvania State University (PSU).

Austin is survived by his wife Sofia, his ex-wife Ann, and his three children: Mark, Timothy and Stuart. He also leaves his grandchildren: Thomas, Charlotte and Joseph. Many a young heart, including those of his grandchildren and nieces, will remember him as an amazing story reader, and he was often found telling stories through song. He married Sofia in 1984, and they lived together in Centre Hall, PA. Sofia will always remember Leonard as the sweetest husband, full of life and vitality; witty and with a great sense of humor. He was preceded in death by his father, mother and brother.

Among his many accomplishments in life, Austin was Emeritus Professor in Fuel and Mineral Engineering at PSU until he retired in 1996 and was passionate about bringing about the most positive change in people. After

retirement from PSU, he became a visiting professor in the United Kingdom, Holland, Chile, Canada, South Africa and Australia. He was honored with several awards, including the Antoine M. Gaudin Award of the Society of Mining Engineers in 1983, and the Percy W. Nicholls Award of the AIME-ASME in 1987.

Austin loved animals, especially his dogs, enjoyed traveling, was an avid reader and enjoyed listening to music. His neighbors and others will remember him walking the dogs around the area, regardless of weather. It was a social event for both him and his beloved dogs. But it was family and friends that meant the most to Austin. He remembered his family, students, colleagues and friends around the world with such love. His students from all around the globe will remember him with much fondness. Austin lived and loved well, and he showed us all an example of how to do so in the ledger of his daily life.

Austin's family will hold a celebration of life at a later date. An online guest book can be signed or condolences to the family available at www.daughenbaughfuneralhome.com. ■

25-year members

(continued from page 47)

Christopher F. Pascoe, Chicago, IL
Amit Patwardhan, Austin, TX
Denver A. Phares, Lakeland, FL
Robert Pronovost, North Bay, ON, Canada
Edward H. Purvis, Abbotsford, BC, Canada
Robert L. Rippley, Littleton, CO
Gerald R. Roose, Gilbert, AZ
David J. Rose, Negaunee, MI
Steven R. Rowland, Palmer, AK

Stacy M. Saari, Hibbing, MN
Christian M. Sagedahl, Oslo, Norway
Ronald I. Schindler, Justin, TX
Warren D. Scott, Kingwood, TX
Steven W. Sheppard, Sandersville, GA
Scott Shuey, Highlands Ranch, CO
Shane P. Spor, Temperance, MI
Shawn E. Stickler, PE, Loudon, TN
David M. Stone, Oro Valley, AZ
Genevieve M. Sutton, Bunker, MO
Ernest E. Thacker, Nicholasville, KY
Richard D. Trynoski, Bethlehem, PA
James R. Turner, Jr., St Clairsville, OH

Roland C. Walker, Warners Bay, Nsw, Australia
Jeffrey M. Wallace, Sacramento, CA
Keith S. Watson, Courtenay, BC, Canada
Mark D. Wayment, Holladay, UT
Erik C. Westman, Blacksburg, VA
Ronald White, Pima, AZ
Sugeng Widodo, Phoenix, AZ
David Williams, Butte, MT
Patrick T. Williamson, Boulder, CO
Matthew Young, Englewood, CO
Michael E. Young, Macedonia, OH
John D. Zeise, Shepherd, MT

SME, SME Foundation and AIME will present awards in 2023

SME, the SME Foundation and AIME will present the following awards during the MINEXCHANGE 2023 SME Annual Conference & Expo on Wednesday, March 1. The 2022 Class of SME Fellows, AIME Honorary Members and SME division award winners are recognized here.

SME Presidential Citations

TIMOTHY D. ARNOLD

SME recognizes Timothy Arnold for “his leadership, dedication, enthusiasm, and continuous contributions to the Society over the course of four decades. Tim’s roles within SME, including President in 2016, have been numerous



TIMOTHY ARNOLD

and exceptional, providing an enduring benefit to the Society. You can always count on Tim to accept a new role and show strong leadership to make SME better.”

Arnold has more than 40 years of experience in hard-rock mining. He has held positions in mining companies ranging from laborer to contract miner, and from shift boss through general manager and chief operating officer (COO). He has spent most of his career either operating or developing

mines. He is currently the COO for Integra Resources, advancing the DeLamar project in Southwest Idaho toward production.

Arnold graduated in 1982 from the University of Idaho with a degree in mining engineering and completed an Executive MBA certificate program from Northwestern’s Kellogg Graduate School of Management in 2000. In 2016 he served the SME as its President, and has received numerous awards from SME, AIME and the University of Idaho.

GEORGE W. LUXBACHER

SME recognizes George Luxbacher for “his many years of dedication and exceptional leadership to SME. George has shown significant commitment to the Society and our industry by serving as the 2008 SME President and as President of AIME for two terms. George’s dedication to SME is exemplary, beneficial, and impactful to the Society.”

Luxbacher is deputy associate director for mining at the National Institute for Occupational Safety and Health (NIOSH), where he is responsible for extramural research funded under the MINER Act program, as well as assisting in the management of the overall Mining Program. Luxbacher received his Ph.D. from Penn State, where he conducted research in the areas of mine ventilation and electrical systems. He started his mining career as a

union miner underground with Pittsburgh Coal Co., a then-subsubsidiary of Consolidation Coal Corp., later working for Island Creek Coal Co. in research, engineering and mergers-and-acquisitions roles through 1993 (when Island Creek was sold to Consol), then various subsidiaries of Occidental Petroleum dealing with legacy mining issues in coal, copper and oil shale mining, as well as chemical and oil and gas production, before taking early retirement from Occidental in 2014. Luxbacher then did several years of consulting before joining NIOSH in 2016 to manage the extramural research portfolio within its mining program, accepting the role of deputy associate director for mining in 2018.

Luxbacher was President of SME in 2008 and has served as President of AIME twice, in 2012 and 2020. Luxbacher has served as an ABET program evaluator in mining engineering for many years and is on the Industry Professional Advisory Committee for the Penn State mining engineering program.

He is a Fellow (formerly Distinguished Member) of SME, an Honorary Member of AIME, a Distinguished Fellow of the SME Pittsburgh Section, and a Penn State College of Earth & Mineral Sciences Centennial Fellow. Luxbacher has received the SME Ivan B. Rahn Education Award, the Penn State Robert Stefanko Distinguished Achievement Award, and the SME Health & Safety Individual Excellence Award, among other honors. He is a registered professional engineer.



GEORGE LUXBACHER

DENNIS RUGG

SME recognizes Dennis Rugg for “his leadership and the enthusiasm needed to push the online tailings portal project forward and to completion. This is an important accomplishment for the industry in a critical area of our business and at a critical time. Dennis successfully performed a key role in this project and demonstrated his dedication to our industry and SME.”

Rugg is a chief geotechnical engineer with Freeport-McMoRan and works as part of the corporate tailings, crushed leach and water (TCLW) group. Rugg began

working on the Tailings Portal in March 2020, while he was still working for Golder Associates, Inc. as an associate and senior geotechnical engineer. When he joined the Tailings Portal subcommittee, the previous chairperson and the existing Tailings Portal subcommittee had already made substantial strides in developing the database of tailings sources and references — the precursor to the current published website.

Shortly after joining Freeport in November 2020, Rugg assumed the role of Tailings Portal subcommittee chair in March 2021. Throughout 2021 and 2022, the Tailings Portal subcommittee worked collaboratively with SME staff to bring the Tailings Portal website to fruition. The Tailings Portal offers a singular location to access tailings management case studies, research, technical papers and industry best practices from around the world.



DENNIS RUGG

for programming in economic and exploration geology at SME's MINEXCHANGE annual meetings and at the AIPG annual meetings. Garcia's enthusiasm and leadership were critical in bringing this partnership to fruition."

Garcia is a hydrogeologist and a licensed professional geologist with more than 35 years of experience. She has worked in characterization, remediation and reclamation projects, and public disclosure reporting. She has visited hundreds of mineral development projects and mining operations.

She has a long history of service to the profession of geology and the mining industry. She has been an invited speaker at workshops, has been a presenter of technical papers at numerous technical conferences, and has taught a short course on mine closure at the University of Guanajuato.

She has served as the geologist member of the Arizona Board of Technical Registration by appointment of the governor. She received an award from AIPG in 2021 for distinguished service to the profession of geology. She currently serves as 2023 president of AIPG. She served on the SME Arizona Conference executive board for over a decade.



DAWN H. GARCIA

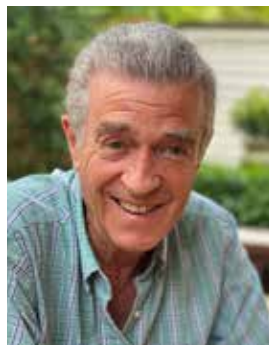
DAWN H. GARCIA

SME recognizes Dawn Garcia for "her persistence and enthusiasm that were instrumental in establishing a memorandum of understanding between SME and the American Institute of Professional Geologists (AIPG). This agreement establishes a collaborative relationship

SME Awards

ROBERT M. DREYER AWARD TO RICHARD SILLITOE

The Robert M. Dreyer Award is presented to Richard Sillitoe, "recognizing a peerless career in application of economic geology principles, publication of landmark works describing mineral deposits in porphyry intrusive environments, and providing guidance in discovery of innumerable mineral deposits."



RICHARD SILLITOE

Sillitoe graduated from London University in England where he went on to earn a Ph.D. degree in 1968. After three years with the Geological Survey of Chile and a Shell postdoctoral research fellowship at the Royal School of Mines in London, he has operated for five decades as an independent consultant to mining companies, international agencies and foreign governments. He has

worked on a variety of mineral deposits and prospects in 100 countries worldwide, but focuses on the epithermal gold and porphyry copper environments. Published research has earned him awards in Europe, Australia, and North and South America, including the SGA-Newmont Gold Medal and the Penrose Gold Medal of the Society of Economic Geologists, of which he was president in 1999-2000.

IVAN B. RAHN EDUCATION AWARD TO NICK GOW

The Ivan B. Rahn Award is presented to Nick Gow, "for his relentless commitment to creating a bright future for the mining industry by educating, mentoring, and motivating students and young professionals in the metallurgy and mineral processing industries."

Gow is the director of technical services at Forte Analytical, a mineral-processing laboratory based in Fort Collins, CO. Gow has a decade of experience in hands-on metallurgical testing, with a focus on mineral-processing feasibility. His experience includes design and



NICK GOW

due diligence of metallurgical testing campaigns for processes including comminution, gravity, flotation and leaching of base and precious metals.

He has been involved with SME since his academic career started, almost 20 years ago. After several years of planning, in conjunction with Mona Vandervoort of SME and with support from several other key individuals, Gow debuted the new SME Metallic Student Design Competition in 2020.

Gow serves as an associate editor on the editorial board of the *SME Mining, Metallurgy & Exploration* journal and has also served on the Professional Engineers Exam Committee and more recently, the ABET Accreditation Committee.

He has since joined the MPD Executive Committee and will co-chair the upcoming Hydrometallurgy 2023 and World Gold 2025 conferences.

ROBERT E. MURRAY INNOVATION AWARD TO HECLA MINING CO. — LUCKY FRIDAY MINE

The Robert E. Murray Innovation Award is presented to Hecla Mining Co.'s Lucky Friday Mine: "The Lucky Friday Mine is one of the deepest mines in the western hemisphere thanks to Hecla, a leader in the mining

industry with a 130-year history of responsible, sustainable and innovative operation."

Hecla Mining Co., a 130-year-old company, is the United States' largest silver producer, mining more than 40

percent of that country's silver. Philips S. Baker has been its chief executive officer for almost 20 years, starting with the company when the price of silver was at its lowest in the last 30 years.

As a company with a long history, Hecla had significant legacy environmental liabilities, which Baker made sure Hecla resolved with hundreds of millions of dollars of expenditures long before environmental, social and governance (ESG) became a thing. He sold Hecla's mines in Venezuela, where the company was the country's largest gold producer, using the proceeds to increase Hecla's ownership to 100 percent of one of the world's best silver mines, Greens Creek. He has encouraged the



development of a new mining method at the long-lived Lucky Friday Mine, which makes the next 20 years of the mine safer and more productive. He is a leading voice for the importance of silver as a metal necessary for renewable energy. He has seen the highs and lows of our industry.

OUTSTANDING STUDENT CHAPTER AWARD TO SOHAG UNIVERSITY

Believing that "Today's student is tomorrow's professional," Sohag University

is working on connecting mining engineering and geology students in Egypt with the mining industry's professionals around the world to gain experience and get involved with all of the technologies and updates of the mining industry. "We build students' personality that fits market needs."



CINDY MOORE COURAGEOUS IMPACT AWARD TO RONEL KAPPES

The Cindy Moore Courageous Impact Award is presented to Ronel Kappes "for her significant contributions and dedication to the mining industry and for enthusiastically blazing a trail for mining professionals with collaboration, mentorship and support."

Kappes is director of processing for Newmont's Processing and Metallurgy Technical Services team located in Englewood, CO. She earned a baccalaureate degree in chemical engineering from Potchefstroom University, South Africa and a Ph.D. in metallurgical engineering from the University of Utah. She is a qualified professional member of the Mining and Metallurgical Society of America and a member (and current chair) of the board of directors of AMIRA.

Kappes is presently the executive editor of the editorial board of the SME journal, *Mining, Metallurgy & Exploration* and is the Chair of the SME Mineral & Metallurgical Processing Division Executive Committee.

Kappes has extensive flotation development experience in a variety of commodities including copper, gold, platinum group metals, molybdenum, lead and zinc. In her current role, she supports Newmont's global flotation portfolio and provides metallurgical support for due-diligence efforts and evaluations as required.



RONEL KAPPES

SME Foundation Awards

C. DALE AND KATHLEEN B. ELIFRITS MEC LEADERSHIP AWARD TO JAMES H. BENDA

The C. Dale and Kathleen B. Elifrits Minerals Education Coalition (MEC) Leadership Award is presented to James H. Benda, “in recognition for your continued efforts to educate the public on the importance of mining and inspire the next generation of industry leaders.”

James “Moe” Benda is a three-time finalist in the MEC’s MoveMining competition and has been active in the Northern Minnesota subsection of SME since 2010. With SME, he has helped create professional development as well as provide networking opportunities for SME members. In the community, he has also volunteered to “teach the teachers,” sharing minerals and mining activities with the Minnesota Minerals Education Workshop and the Minnesota Science Teachers Association along with teacher in-service trainings. He grew up in the suburbs of Detroit, MI and has raised his six kids in the mining communities of northeastern Minnesota.



JAMES H. BENDA

Benda is director of the University of Minnesota-Duluth’s Iron Range Graduate Engineering Program and has developed and teaches mining policy, digging into historical and current laws, regulations and agencies affecting our nation and our world.

He is also an active member of his community as a volunteer firefighter, emergency medical technician and ice-hockey official.

MEC PARTNERSHIP APPRECIATION AWARD TO THE MINNESOTA MINERALS EDUCATION WORKSHOP

The MEC Partnership Appreciation Award is presented to the the Minnesota Minerals Education Workshop (MMEW), “in recognition of the efforts to promote awareness of the positive contribution that mineral resources make in Minnesota through the support of teacher education.”

Each year, as many as 100 teachers from across Minnesota attended MMEWs that were held at sites throughout Minnesota from 1997 to 2008. The 2009 workshop was rescheduled to 2010 as part of the transition to operation under the Minnesota Center for Mineral Resource Education (MCMRE). The workshop held in the Twin Cities in August 2010 was a great success, as were the June 2011 workshop held on the Iron Range, the 2012 workshop held at Winona State University, and the 2013 workshop held at Hibbing

Community College. For 2014, MMEW held a very successful 17th Annual MMEW at Southwest Minnesota State University in Marshall.

The 2015 workshop was held June 16–18 in Duluth, while the 2016 workshop was held June 21–23 in St. Peter, MN. The 2017 workshop, which was the 20th annual MMEW, was held June 20–22 in northern Minnesota at Vermilion Community College in Ely. The 2018 workshop was held June 19–21 in the St. Cloud area at College of Saint Benedict, and the 2019 workshop was held June 18–20 in Grand Rapids. The 2020 and 2021 workshops planned for Winona were delayed due to the COVID-19 pandemic. MMEW 2022 will be held at Interstate State Park in Taylors Falls on June 22, 2022. MMEW 2023 will be held in Winona during the month of June. MMEW is designed to address Minnesota Science Standards, and when possible, university credits are arranged.



MINNESOTA MINERALS EDUCATION WORKSHOP

MEC STUDENT CHAPTER AWARD TO COLORADO STATE UNIVERSITY

The MEC Student Chapter Award is presented to Colorado State University.

SME students at Colorado State University are committed to advancing public understanding of mining and minerals, with emphasis on educating K-12 and undergraduate students about careers in tailings and mine waste. The chapter has developed several middle and high school tailings-focused outreach programs that highlight the importance of mining and the concepts employed to manage mining residuals. The chapter also hosts presentations and panel sessions at Colorado State University with topics that include future mineral demand, tailings engineering and careers in mining. Over the next year, the chapter intends to continue creating tailings education content and grow outreach efforts at local middle schools, high schools and at Colorado State University. The chapter wishes to thank the MEC, the SME Colorado Section, tailings practitioners and the SME Foundation for the generous outreach support they have provided.

SYD S. AND FELICIA F. PENG AWARD TO GABRIEL S. ESTERHUIZEN

The Syd S. and Felicia F. Peng Ground Control in Mining Award is presented to Gabriel

S. Esterhuizen, “for recognition of outstanding accomplishments in ground control through pioneering and practical research in the advancement of numerical modeling and ground control design.”



GABRIEL S. ESTERHUIZEN

Gabriel (Essie) Esterhuizen has dedicated his entire career to the safety and stability of mining excavations in rock. He has practiced as a rock mechanics engineer at operating mines, as a consultant to mining operations on five continents, as a research engineer and as an educator. During his career he addressed stability issues ranging from seismicity in ultra-deep gold mines in South Africa, to caving and fragmentation in massive block-caving operations.

He has had a lasting impact on ground stability in mining through design software that has found application in both openpit and underground mines around the world. Most recently, he was a principal research engineer in the ground control branch of the National Institute for Occupational Safety and Health (NIOSH) in Pittsburgh, PA where he was involved in coal and limestone mine stability research. He earned a Ph.D. in mining engineering from the University of Pretoria, South Africa.

MINERS GIVE BACK AWARD TO SME UPPER PENINSULA AND WISCONSIN SECTIONS

The SME Foundation Miners Give Back Award is presented to the SME Upper Peninsula and Wisconsin Sections: “The nominated sections have gone above and beyond in their commitment to promote the industries and careers represented by SME in an equitable manner to youth in an effort to bolster the future workforce required to provide society with the resources that it will need.”

This year, the Upper Peninsula Section collaborated with the Wisconsin Section and 4H in Wisconsin to present an eight-module workshop to 30 middle school youth across the state of Wisconsin that introduced several layers of geoscience and engineering themes. Focusing primarily on the minerals that are relevant to the state, these youth made connections to the role of minerals in their lives, and also to the diverse career paths that are rooted in the mineral economy around them. The Sections were fortunate to leverage a significant collection of educational resources developed by the MEC for content in the workshops, along with the time of dedicated Section membership, to organize a well-received effort.

Looking to the future, the Sections are looking for new partnerships with youth organizations across the United States with which to deploy the workshops, and also working to improve the content of the workshop so that it is more accessible.

SME Fellows

The SME Fellow (previously Distinguished Member) class of membership was established by SME to honor those members who achieve distinction deemed worthy of special recognition. It acknowledges members who have attained eminence in industry or the academic world or who have made significant and sustained contributions to SME.

ABANI SAMAL



ABANI SAMAL

Abani R. Samal earned a Ph.D. from SIU Carbondale, a DIC and an M.S. from Imperial College, London and a mineral exploration degree from IIT (ISM) Dhanbad, India. He has been in the mining industry since 1996. Currently he is the principal and owner of GeoGlobal, LLC. Samal provides consulting services to exploration and mining companies, government agencies, and major financial

institutions worldwide. Mineral deposit evaluation, applied geostatistics and mine-mill reconciliation are his technical specializations. He provides strategic advice to governmental agencies for the development of mineral resources. He offers professional development programs to industry professionals and academic researchers worldwide. Major professional societies including SME, AIG, CIM and the Mining Engineers Association of India (MEAI) have hosted his professional development programs.

Samal is a Registered Member of SME and a leading member of many other international professional societies. He is an active contributing member of the SME Resources and Reserves Committee, immediate past chair of the Government Relations and Public

Affairs Committee (GPAC) and current member of the Association Growth Strategic Committee. Samal is also member of other SME committees, including the ESG Toolkit Committee. He is active in the Minerals Education Coalition as a member at large.

Samal also served on the Committee of Committees (nominating committee) of the Society of Economic Geologists (SEG) for 2020-21. Currently, he is serving on the nominating committee of the Geological Society of America (GSA). He is also serving as a council member of the MEAI for the second term.

He serves on the editorial boards of two international journals: *Mining, Metallurgy & Exploration* (MME) and *Natural Resources Research Journal* (NARR).

ANNE L. WILLIAMSON

Anne Williamson is an industry leader in the development and implementation of sustainability and environmental programs in the global engineering business and mining.

Williamson's career has spanned from greenfield exploration to compliance and mine permitting, to executive leadership. She has created environment, sustainability, and enterprise risk management and facilitated a culture of responsible stewardship within multiple organizations. She has created relationships of trust and respect with communities, indigenous groups, labor organizations and regulatory agencies. She was a member of the Mining, Minerals and Sustainable Development Project (MMSD), the precursor organization to ICMM, and contributed to regulatory development in multiple jurisdictions.

Williamson currently has the honor of serving as an SME Director-at-Large. She has served on the board of directors and as vice president of the Mining Minnesota trade association, and as board advisor to Jobs for Minnesotans, a coalition of industry, labor and municipalities.



ANNE WILLIAMSON

RYAN MURRAY

Ryan Murray is the owner and founder of Murray Mining, LLC. Most recently, Murray served as the vice president of operations for Murray Energy Corp. and its successor, American Consolidated Natural Resources, Inc. Murray Energy Corp. was the largest independent underground producer of coal in the world. Since 2007, Murray had oversight of all operations of Murray Energy Corp., including all mining operations, processing facilities, trans-loading, repair shops and other company operations. Murray has worked at surface and underground coal mines

for the duration of his career. His duties have spanned from laborer, foreman and engineer to vice president.

Murray earned his master's degree in business administration from The Ohio State University and a bachelor of science in mining engineering from West Virginia University. He is a recipient of the J.W. Woomer Award, the John T. Boyd Memorial Award, the SME Foundation (SMEF) Excellence in Prospecting Award and the very first recipient of the SMEF \$4K by 40 Challenge Award. He has served on numerous awards committees, is a past SMEF Trustee and has served on the SMEF Executive Committee. He has been a member of the Coal & Energy Division for more than 20 years and is the immediate Past Chair of the Coal & Energy Division Executive Committee.



RYAN MURRAY

JOHN O. VOIGT

John O. Voigt retired after 47 years of working in salt, specializing in underground salt mining geology, water leak control/grouting, subsidence, and mine safety. He has worked for seven of the 13 operating underground rock salt mines in the United States, either on staff or as a consultant. His superb mentor was world-class salt dome geologist, the late Dr. Donald H. Kupfer of Louisiana State University. Voigt is a certified U.S. Mine Safety and Health Administration (MSHA) instructor with 10 years of rewarding miner rescue team experience at two different salt mines (Retsof, NY, and Avery Island, LA).

For more than 30 years, Voigt also learned 'salt' by involvement in the Solution Mining Research Institute, Inc., (SMRI), proudly completing 15 years as executive director in 2019.

Within SME, Voigt is a Registered Honorary Member, Legion of Honor member, Pennsylvania Anthracite Section four-time past chair, counselor for the BSA Mining in Society merit badge and has authored several salt reviews for *Mining Engineering's* annual industrial minerals issues.

Voigt earned a B.S. in earth sciences from Pennsylvania State University and an MBA from the University of Scranton.



JOHN O. VOIGT

AIME Honorary Members

C. DALE ELIFRITS

The AIME Honorary Member award is given to C. Dale Elifrits, “in recognition of his service to SME, SMEF, and as an SME representative to ABET and his distinguished career as a professor at the Missouri School of Mines and Metallurgy, as a role model and a staunch advocate for mining education.”

Elifrits is professor emeritus of geological engineering and associate director emeritus of the freshman



C. DALE ELIFRITS

engineering program at the Missouri University of Science and Technology, having retired after 26 years on the faculty. He was also the director of pre-engineering and outreach at Northern Kentucky University in the Center for Integrative Natural Science and Mathematics. Elifrits earned a B.S. degree with majors in mathematics and chemistry plus in secondary education. He earned M.S. degrees in earth science and geological

engineering, and a Ph.D. in geological engineering. Before entering his career in university education and research, he taught earth science and chemistry in Missouri public schools. Elifrits is a Registered Geologist in Missouri and a Registered Member of SME. Prior to moving to Northern Kentucky, he was vice president of the small Genius Consulting Group, LLC. He is a member of the Association of Engineering and Environmental Geologists, the American Society of Civil Engineers, and the American Society for Engineering Education. He is active in community organizations such as Rotary International, his church, the Council of the Boy Scouts of America and CSR Academy, a charter school in Cincinnati. He has more than 80 publications.

JOHN MANSANTI

The AIME Honorary Member award is given to John Mansanti, “in recognition of exemplary service to SME and

AIME, and his distinguished professional career in the mining industry.”

Mansanti has more than four decades of mining experience, primarily in operations, technical support and capital projects. He was general manager for two flagship operations in Nevada (Cortez and Goldstrike), and process manager for another flagship (Carlin). He led the team for the start-up of Intrepid’s HB solution mine and was an integral member of the start-up teams at Chimney Creek and Cortez Hills, two of the lowest-cost gold mines for their areas. He led the resurrections of the Bald Mountain and Getchell/Turquoise Ridge mines. His latter assignments were as chief executive officer for development-stage projects, and as board member for precious-metals companies.

He is a Distinguished Member of the SME, was division chair for the Mineral & Metallurgical Processing division (MPD) and the 2017 SME President. While President he introduced initiatives to recognize and reward increased innovation as evidenced by the Robert E. Murray Innovation Award and Scholarship and other programs. In 2006, he was the president of the Nevada Mining Association. He was recognized multiple times for his technical and leadership contributions. In 2012, he was awarded the Bureau of Land Management (BLM) Director’s Excellence Through Leadership Award for collaborative work between the New Mexico potash and oil and gas industries.

Mansanti graduated from Montana College of Mineral Science and Technology with a B.S. in chemistry, an M.S. in mineral processing engineering, and an Honorary Ph.D. Today he serves on several college advisory committees. Always a champion for education and training, he and his team developed the Turquoise Ridge Underground Miner Training Academy, which was recognized and received unprecedented, special funding from the state of Nevada. Outside mining, he served eight years as a local school board trustee.



JOHN MANSANTI



AIME Awards

WILLIAM L. SAUNDERS GOLD MEDAL AWARD TO RICHARD J. LAMBERT

The William L. Saunders Gold Medal Award is presented to Richard J. Lambert, “in recognition of his extensive experience and contributions to metal mining in all major commodities in a variety of projects worldwide.”

Lambert is technical director, U.S. Mining Advisory for SLR Consulting and is responsible for the operations of the company’s U.S. mining consulting practice. He was chief operating officer and a principal of Roscoe Postle Associates and helped to build the name and reputation of the firm prior to its sale to SLR. He is a senior mining executive with more than 40 years of experience in all aspects of mine development, from permitting to closure. His experience includes the development and operation of openpit mines, start-ups, preparation and



RICHARD J. LAMBERT

implementation of feasibility studies, due diligence, mergers and acquisitions and management consulting.

Lambert was employed by Fortune 500 mining companies for the first 17 years of his career, including Phelps Dodge, Kennecott, NERCO and Exxon Minerals. Since then, he has been providing consulting services. He has led teams of mining experts in reserve audits for major mining companies and been involved as the independent engineer on many large mining project financings worth more than \$1 billion.

CHARLES F. RAND MEMORIAL GOLD MEDAL TO GREGORY ERWIN HINSHAW

The Charles F. Rand Memorial Gold Medal is presented to Gregory Erwin Hinshaw, “in recognition of displaying great leadership, innovation, and implementation of engineering and technological solutions that have reduced the risk of accidents, injuries, and illnesses in underground coal mines.”

Hinshaw began working for J.H. Fletcher & Co. after graduating from Duke University in 1980 with a degree in mechanical engineering and materials science. He earned his



GREGORY ERWIN HINSHAW

Professional Engineer certification in 1985 and became the head of Fletcher’s first research and development department in 1988. Hinshaw became engineering manager, earned his MBA from Marshall University and became chief operating officer for J.H. Fletcher & Co. in 2004. He has been chief executive officer since 2012.

Hinshaw serves on the National Mining Association (NMA) board, as an SMEF Trustee and on the advisory committee for ICGCM. He has authored several papers and is an inventor on more than 15 patents, most of which are focused on rock drilling, ground support mechanization and mining automation.

Hinshaw is blessed to be married to his loving wife Susan. They are the proud parents of three children who have all excelled in their education and are accomplished young adults. Greg and Susan are active members of Lewis Memorial Baptist Church.

DANIEL C. JACKLING AWARD TO ADAM WHITE

The Daniel C. Jackling Award is presented to Adam White “for significant contributions to the mining industry by advancing software that continually enhances the quality, accuracy, and efficiency of mining professionals.”

A mining engineer turned software enthusiast, White has more than 25 years’ experience working in the mining industry from operations to mine planning consulting. His passion lies within the software space, however, and it was this curiosity that led him to develop multiple mine planning systems throughout his career, including Mine24D and Deswik Suite. White’s current role as Deswik’s chief technology officer is a marriage between his industry experience and an eye for technology, where he oversees the development of a range of software to solve real-world mining issues.



ADAM WHITE

ENVIRONMENTAL DIVISION STEWARDSHIP DISTINGUISHED SERVICE AWARD TO SCOTT I. BENOWITZ

The Environmental Division Stewardship Distinguished Service Award is presented to Scott I. Benowitz “for his valuable contribution to the progress of mine-water treatment technology.”

Benowitz has worked on the assessment, planning

**SCOTT I. BENOWITZ**

and design of industrial and municipal water projects since 1985. Benowitz formed Water Engineering Technologies Inc. in 1995, where he specializes in the water management of openpit and underground hard-rock and industrial mineral mines. His mining experience includes evaluation and technology design to manage process solutions; storm water; adit drainage; waste rock seeps; and pit water.

Clients have utilized this experience in North America,

Mexico, Central and South America, Australia and New Zealand for water balance optimization; new facility design; closure plans; abandoned mine reclamation; third-party environmental reviews; stream channel reclamation; acid rock drainage mitigation; tailings pond management; water treatment process selection and operational and closure audits.

ERSKINE RAMSAY MEDAL TO THOMAS A. GRAY

The Erskine Ramsay Medal is presented to Thomas A. Gray, “in recognition of his distinguished achievements in mine subsidence mitigation, abandoned mine fire abatement, and identification of high levels of rare earth elements in coal seams in the Appalachian Regions.”

**THOMAS A. GRAY**

Gray received a mining engineering degree from Penn State in 1973 and an MBA from the University of Pittsburgh in 1977. Gray started his distinguished career at U.S. Steel’s Frick Coal District in Pennsylvania; coincidentally, the same company where Erskine Ramsay began his career.

He then transitioned to Dravo Engineers and

Constructors, where he spent seven years developing new coal mines in Appalachia. Gray would then spend 21 years working for GAI Consultants, successfully managing numerous mining projects.

He went on to serve as a senior manager for Tetra Tech in Pittsburgh from 2007 until 2021, when he transitioned to an advisor/consultant role.

Gray is a Professional Engineer in five states and specializes in active and abandoned mine reclamation and in REE/critical mineral recovery projects. Gray is a past chair and a Distinguished Member (1997) of SME’s Pittsburgh Section, an SME Fellow (2009), and received the Howard N. Eavenson Award in 2019.

FRANK F. APLAN AWARD TO PHILIP THOMPSON

The Frank F. Aplan Award is presented to Philip Thompson “for outstanding achievement in the development of advanced flotation techniques to further the art of mineral beneficiation while supporting the growth of the industry’s future generations.”

Philip (Phil) Thompson was born and grew up in Yorkshire, Northern England. After emigrating to the United States he attended the University of Utah where he received a B.Sc. in metallurgical engineering (magna cum laude) in 1972. During his early career he worked as a metallurgical engineer at Cortez Gold Mines in Nevada, Cleveland Cliffs Iron Ore Co. in Michigan and at the U.S. Bureau of Mines in Salt Lake City, UT.

**PHILIP THOMPSON**

He joined Dawson Metallurgical Laboratories as a consulting metallurgist in 1981 and eventually assumed leadership of the 10-person company as president and chief executive officer after the retirement of Harmel Dawson in 1991. He maintained that position until the company was purchased by FLSmidth in 2008. His positions in FLSmidth included laboratory director and then senior minerals processing advisor, a position he still holds.

He is the co-inventor on 22 patents and has authored more than 40 technical articles. Thompson received the Antoine M. Gaudin Award in 2012. He is a member of SME and an adjunct assistant professor of metallurgy at the University of Utah.

HAL WILLIAMS HARDINGE AWARD TO J. RICHARD KYLE

The Hal Williams Hardinge Award is presented to J.

Richard Kyle, “in recognition of his efforts as an educator, mentor, geoscientist, editor and mining professional; and his contribution to the knowledge, education of industrial minerals, and earth resources.”

Kyle currently is a professor emeritus of geological sciences and a senior geological advisor with the Texas Bureau of Economic Geology in the Jackson School of Geosciences at the University of Texas at Austin. He received a Ph.D. in geology from the University of Western Ontario and worked

**J. RICHARD KYLE**

in minerals exploration prior to joining the University of Texas faculty. Kyle taught undergraduate and graduate courses related to economic geology and mineral resources, commonly with local, regional and international field trips to mining and exploration sites. He also served as an informational source for students and the public about the mineral resource industries. Kyle continues to serve as graduate advisor for the Jackson School of Energy and Earth Resources multidisciplinary master's program.

Kyle has received the Robert Peele Memorial Award from the Mining & Exploration Division as well as the SME Mineral Industry Education Award. He is a long-time participant in the Forum on the Geology of Industrial Minerals and is a member of the SME Legion of Honor.

HOWARD N. EAVENSON AWARD TO BARBARA J. ARNOLD

The Howard N. Eavenson Award is presented to Barbara J. Arnold, "in recognition of her unsurpassed contributions to the coal industry."

Arnold is professor of practice in mining engineering at Penn State. Arnold has more than 30 years of experience in the coal and mineral industries. She earned a B.S. (mining engineering), M.S. (mineral processing) and Ph.D. (mineral processing) from Penn State. Much of her research experience has focused on coal properties and their effects on coal processing, especially in the areas of froth flotation and dewatering. She is a recognized international expert in coal preparation. Arnold currently works with Penn State's Center for Critical Minerals (C2M), conducting research related to the physical beneficiation of coal underclays and other horizons that contain rare earth elements and other critical minerals. Other research is focused on respirable dust and the beneficial use of mine tailings.

Arnold is the 2018 SME President, a Penn State Alumni Fellow, SME Fellow and American Institute of Mining, Metallurgical, and Petroleum Engineers Honorary Member.

JAMES DOUGLAS GOLD MEDAL AWARD TO SEVKET ACAR

The James Douglas Gold Medal Award is presented to Sevkett Acar "for his unrelenting efforts and dedication in providing practical, world-class solutions in the processing of refractory gold ores, which advanced the fundamentals of minerals beneficiation in nonferrous metallurgy."

Acar has 30 years' experience in the development and management of projects and laboratory studies for gold and copper/gold ores for the purposes of flowsheet development

and optimization and plant trouble shooting. Acar taught at the Colorado School of Mines as an adjunct professor, presented in short courses, conferences and seminars, and published articles in peer-reviewed journals and industry trade periodicals.

Acar received his B.S. degree in mining engineering and M.S. degree in mineral processing from the Technical University of Istanbul, Turkey. He received his Eng. ScD. degree in surface chemistry and chemical metallurgy in 1985 from Henry Krumb School of Mines, Columbia University, New York City. He is a registered member of SME.

Acar's early career included working as a plant superintendent for a phosphate mine, and teaching as an assistant professor in Turkey. After receiving his doctorate degree he started working for Newmont Mining Corp. in 1985 as a metallurgist. He worked for Newmont until his retirement on April 1, 2015.



SEVKET ACAR

MINERAL ECONOMICS AWARD TO RYAN T. DESKO

The Mineral Economics Award is presented to Ryan T. Desko "for significant contributions, leadership, and dedication to financial modeling, engineering, and economics in the minerals industries."

Desko is a licensed professional engineer who received his B.S. degree in mining engineering from Penn State and MBA from the University of Pittsburgh. His 27-year career has encompassed engineering and financial planning responsibilities at Arch Coal, Murray Energy and Anker Coal Group. He is currently self-employed as a mining and business planning consultant.

As chief engineer at Murray's Century Mine in Ohio, Desko developed a corporate forecasting tool for budgets, feasibility studies, mergers-and-acquisitions due diligence and refinancing. While satisfying his role as director of engineering for Anker, he formulated plans for corporate restructuring and a merger with International Coal Group with a subsequent IPO.

As an independent consultant, Desko conducted 24 due-diligence reviews for GE Energy Financial Services, serving as the Independent Engineer for a \$60 million credit facility for the Bowie Mine in Colorado. He also assisted Murray with annual budget preparation for a dozen years.



RYAN T. DESKO



BARBARA J. ARNOLD

MINERAL INDUSTRY EDUCATION AWARD TO J. RICHARD KYLE

The Mineral Industry Education Award is presented to J. Richard Kyle, “in recognition of four decades of distinguished teaching of mineral resources to University of Texas students and supporting mining industry colleagues through applied research publications, short courses, and field trips.”

For Kyle’s profile, see page 64.

ROBERT H. RICHARDS AWARD TO STEPHEN MORRELL

The Robert H. Richards Award is presented to Stephen Morrell “for his long service and numerous contributions to the science and practice of comminution and mineral processing.”

Morrell is a mineral processing engineer with more than 40 years of research and industrial experience.



STEPHEN MORRELL

He majored in metallurgical engineering at Imperial College, London from 1977 to 1980 and spent the next seven years gaining practical experience working on African mines before moving to Australia and completing master’s and doctorate theses at the Julius Kruttschnitt Mineral Research Centre (JKMRC).

Employed at the JKMRC from 1989 until 2000, he led research projects such as the AMIRA P9, HPGR (high-pressure grinding rolls),

fine grinding and mine-to-mill programs and contributed significantly to many industry breakthroughs that helped improve our understanding of modern comminution processes and technologies.

In 2000, he started his own consultancy (SMCC Pty Ltd), and three years later founded SMC Testing Pty Ltd to license the SMC Test. In 1993 and 2001 he was awarded the Minerals Industry Operating Techniques Award, in 2011 he was awarded the Art MacPherson Prize and in 2018 he

was inducted into International Mining’s Hall of Fame. In 2020 he was awarded the AusIMM Professional Excellence Award.

PERCY NICHOLLS AWARD TO DAVID G. OSBORNE

The Percy Nicholls Award is presented to David G. Osborne “for a lifelong commitment to coal quality at many global coal companies, outstanding reference books on coal, and significant work on standards for coal technology and preparation.”

David (Dave) Osborne is a longstanding and proud member of SME. This year, he is a Legion of Honor member for 50 years of membership in the Society, so this new honor, the Percy Nicholls Award, makes 2022 a very special year for him.

Osborne is a minerals technology specialist, resident of Queensland, Australia with extensive global experience in coal and mineral processing, quality assurance and technical marketing. Internationally renowned with accredited engineering status, he has produced numerous technical publications, has several professional memberships and is a regular participant in conferences and symposia. He maintains active participation in international professional institutions and organizations including the ISO for coal standards and is an adjunct professor in the Universities of Queensland and Western Sydney. His specific skills include technical and commercial resource assessment, ascertaining product value-in-use, and tailings treatment and supply-chain management.

He has a passion for writing and contributing to technical books and is editor of a newly revised coal handbook, which is to be published by Elsevier in early 2023. He is also busy documenting his father’s exploits in the British Navy during World War II, something to keep him busy in avoiding retirement. ■



DAVID OSBORNE

SME Division Awards

The SME Divisions will present awards during the MINEXCHANGE 2023 SME Annual Conference & Expo in Denver, CO Feb. 26–March 1. SME Division award winners will be published in the February 2023 edition of *Mining Engineering*.





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University of Kentucky

The Department of Mining Engineering at the University of Kentucky invites nominations and applications for a tenure-track faculty position at the rank of assistant or associate professor. Candidates for the position must hold a Ph.D. degree in mining engineering, or a closely related field, and must be committed to excellence in the areas of teaching, research, and service. In addition to these qualities, preference will be given to candidates who have experience in the mining industry and have obtained professional licensure.

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The Department of Mining Engineering is one of the larger mineral-related programs in North America. The department consists of seven faculty members who have diverse specialties that cover a wide range of the mining engineering discipline.

Responsibilities of the successful applicant will include teaching and student advising at both the undergraduate and graduate levels. The selected candidate will also be expected to develop a sustainable research program that attracts external research funding and addresses the needs of the mining industry. The position is open to all the specialty areas of mining and geological engineering, including contemporary issues in mining, such as reclamation, health and safety, and mine operations.

Applicants should submit the following: 1) cover letter, 2) curriculum vitae, 3) a teaching statement (upload as specific request 1), and 4) a research statement (upload as specific request 2).

Applications submitted by January 31st, 2023 will receive full consideration. However, the position will remain open until filled.

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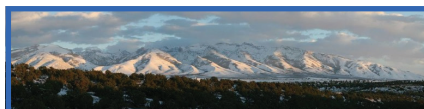


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Building trust in mining starts with ESG policies



William Gleason
Editor

Whether we like to admit it or not, much of the world has trust issues with the mining industry. Some of these are legacy issues created by the sins of our forefathers, and some come from tragic events in recent year. In our defense, the mining industry has made incredible strides to improve its performance in every measure. During his acceptance speech for the St. Barbara's Day Award from the Colorado Mining Association (CMA), Tony Jensen, former president of Royal Gold, spoke about his involvement with the creation of the National Mining

Association's CORESafety program.

"The industry has changed so much," Jensen said. "The idea was to bring together all of the best practices under one umbrella called CORESafety. All of those ideas came together to form a blueprint to distribute to anyone who wanted extra resources for their own program. In 15 years the incident rate dropped by 56 percent and fatalities by more than 60 percent."

Industry-wide efforts like CORESafety and the Global Industry Standard on Tailings Management produced by the International Council on Mining and Metals (ICMM) as well as efforts from individual companies continue around the world as millions if not billions of dollars are being invested to make the industry cleaner, safer and more sustainable.

But when there is an incident in the industry, such as the tragic tailings facility collapse at Brumadinho, Brazil in 2019, or those that preceded it in Brazil and Canada, the entire industry is affected. Some of the trust that was built suffers a setback from a number of stakeholders including investors and insurers who are demanding higher environmental, social and governance (ESG) compliance from the industry.

When the mining industry gathers in Denver, CO Feb. 26–March 1 for the MINEXCHANGE 2023 SME Annual Conference & Expo and CMA 125th National Western Mining Conference it will be under the theme of "Investing in success, building trust in mining."

The opening keynote, "Embracing ESG to build trust in mining investments" will set the tone for the conference. Kimberly Morrison, senior director, global tailings management,

technical services, Newmont and Kelly Ward, vice president, mining, metals and minerals, Marsh, will moderate a panel discussion. The panel includes Ryan Bond, head of climate and sustainability insurance initiatives at Marsh; Aidan Davy, chief operating officer, ICMM; Daniele La Porta, global head of sustainability and ESG, Gerald Group and Casey Nault, senior vice president, general counsel and chief ESG officer, Coeur Mining, Inc.

I recently spoke with Morrison and Ward about the session.

"It started with tailings but then expanded with the thinking that there are so many elements of ESG that the industry needs to be well aware of and needs to be integrating into their day-to-day operations and thought process," Morrison said.

The session was created to present a full view of the importance of ESG to the mining industry and its many stakeholders.

"We have representatives from the insurance and investment industries because it's not just the mining industry involved. These are the external influencers who are requiring that we integrate ESG into everything we do," Morrison said.

On page 16 of this issue, Sidney Schafrik, senior advisor, mining and strategic development for the Tr'ondëk Hwëch'in Government writes about ESG efforts taking place between the Canadian government and First Nations. He notes that many ESG guidance principles include a less-than-favorable view of mining and mineral extraction companies.

During the keynote session, attendees will gain broad insight into ESG issues from some of those who work in that space everyday.

"We all know that we need investment in the industry and this session will discuss the pressures that those stakeholders have in mind," said Ward. "ESG is not a new issue for the mining industry but for many other industries it is new and it is very buzzy. This session will aim to marry it all together and to show that the future of investment really does lie with ESG. It also shows that we have to have good programs because that's what the stakeholders, ultimately the projects funders are calling for."

Registration for the MINEXCHANGE 2023 SME Annual Conference & Expo is now open. You can register and find more information at www.smeannualconference.com. ■



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PRESHOW CONFERENCE GUIDE



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Reducing Maintenance Labor Requirements for Equipment
System Reliability and Efficiency Improvements

COLORADO MINING ASSOCIATION

The Outlook for Commodities in the Current Global, Geopolitical and Economic Environment

Development of Radiological Screening Levels and Gamma Survey Methodologies for US DOE Legacy Uranium Mines

Global Renewable Diesel and Carbon Offsets

What is Human Performance; Why Does it Matter

PFAS/PFOA—What is it? Where is it? What Standards or limits? Legal Implications? Treatment?

Bringing Diversity into the Boardroom and C-Suite.

A Fireside Chat with Gary Goldberg, Former Chairman and CEO of Newmont Corporation

Opportunities to Use Natural Language Processing to Improve Maintenance Management on Mine Sites

COAL & ENERGY

Coal & Energy/ M&E: Legal and Ethical Considerations for Engineers – Panel

Accessing Capital in the Ever-Changing Energy Market

Alternative Energy at Mine Sites

Best of Ground Control

Coal or Rare Earth and Critical Minerals Basinal Assessments

Developments in Airborne Particulate and Silica Measurement Technologies

Geothermal Energy Projects at Mining and Industrial Sites

Innovations in Dust Control and Research

Innovations in Mining Machines and Automation

Operations Projects, Developments, and Innovations I

Operations Projects, Developments, and Innovations II

Subsurface Rock, Gas and Fluid Interactions, Production and Sequestration

Technology and Innovations

Uranium Projects, Exploration, Assessments and Innovations

Ventilation Innovations

ENVIRONMENTAL

Critical Metals, REE, and Environmental Innovation

Environmental Solutions to Protect the Environment

Geosynthetics Applications

Green Mining I

Green Mining II

Mine Closure and Reclamation

Mine Water Management

Mine Water Treatment

Sustainability & ESG Disclosures

Technology's Road to Compliance

GENERAL

Autonomous Mining: Creating a Sustainable Future

Dreyer Lecture

Enabling Industry Transformation with Artificial Intelligence

Ensuring the Cyber Resiliency of Your Operation

ESG: Evolving Perspectives on ESG Reporting

History of Mining

Prospecting Mental Health and Well-Being in the Workplace – Panel Session

What Happens when Mining is Done?

What to Expect When Expecting Mine Financing – Panel

HEALTH & SAFETY

Advancements in H&S Training and Other Hazard Identification Strategies

Case Studies in Direct Reading Instrumentation and Sensor Technology

Exploring the Return on Value of Health & Safety Management Systems (CORESafety) and Credential Programs (CMSP)

Hazard Recognition Using Artificial Intelligence and Machine Learning

Human Factors Issues in the Workplace: Problems and Solutions

Innovations in Emergency Preparedness and Response

National Occupational Research Agenda (NORA): Future Health and Safety Challenges with All-Electric Mobile Equipment

Reducing Occupational Exposures from a Hierarchy of Controls Perspective

INCLUSION & DIVERSITY

Sessions sponsored by Newmont

Allyship – The Benefits of Being an Ally, Steps to Being a Better Ally, and Driving Positive Action

Unconscious Bias and Intentional Inclusion

INDUSTRIAL MINERALS & AGGREGATES

Beneficiation of Industrial Minerals

Critical Battery Minerals

Digitalization and Automation in Industrial Minerals

Health & Safety in Industrial Minerals

Innovations in Industrial Minerals and Aggregates I

Innovations in Industrial Minerals and Aggregates II

Mine Design in Industrial Minerals and Aggregates

Permitting within the Industrial Minerals and Aggregates Industry

Voice of Future Leaders of IMAD

MINING & EXPLORATION

Mining & Exploration/ AIPG: Pure Geology: Discoveries from Geologic Exploration Programs

Geosciences:

Best Practices in Ground Support in Underground Mines

Exploring New Mineral Deposits

Increasing Value and Reducing Risk: Ore Control Best Practices

Integrated and Practical Application of Advanced Computational Geomechanics in Soil and Rock

Reserves and Resource: Reporting Under SK1300

Strategies for Surface Geotechnical Risk Mitigation

Strategies for Underground Geotechnical Risk Mitigation

Using Geometallurgy to Your Advantage

Innovation & Technology

Applications of Data Science & Machine Learning in Mining I

Applications of Data Science & Machine Learning in Mining II

Automation in the Mining Value-Chain I

Automation in the Mining Value-Chain II

Digital Twins Integrating the Mining Industry

Drone Application: the Future and Beyond

Environmental, Social and Governance Aspects in the Innovation Space

New Technologies Enabling Innovation in Mining

Space Resources, a Whole New Era of Exploration and Development

Success Stories of Managing Innovation and Technology Development in Mining and Exploration Sectors

Management

Parental Leave and Flexibility in Mining

Operations

Brownfield, Greenfield and Future Expansion Exploration Projects

Carbon Management: Electric truck technology and Current Renewable Energy Projects

Drilling & Blasting and Fragmentation - Technological Changes & Challenges

Mine Planning and Optimization I

Mine Planning and Optimization II

Safety Considerations in Mine

Planning and Mine Operations

Technological Advances in Health and Safety of Mine Workers

MINERAL & METALLURGICAL PROCESSING

MPD Patrick Taylor Honorary Symposium

Chemical Processing: Battery Metal I: Primary Resource Processing

Chemical Processing: Battery Metal II: Recycling from Secondary Resources

Chemical Processing: Hydrometallurgical Innovation in Copper Extraction

Chemical Processing: Innovative Extractive Processing for Rare Earth Materials

Chemical Processing: Innovative Methods in Metal Processing

Chemical Processing: Precious Metal Refinery and Processing

MPD

Chemical Processing: Challenges and Opportunity for Chemical Metallurgy in Clean Energy Economy: Panel

Comminution I

Comminution II - Grinding Process Control: Panel Discussion

Flotation: Flotation Application in Recycling and Recovering from Secondary Sources

Flotation: Flotation Chemistry and Commemorating the 100th Anniversary of Xanthates

Flotation: Flotation Chemistry at Operations

Flotation: Flotation Operations and Equipment

Flotation: Fundamentals of Flotation

Physical Separation I

Physical Separation II (Mobile/Exhibit Hall)

Plant Design

Plenary Session

RESEARCH

Research: Space Mining

SME YOUNG LEADERS

Artisanal Mining

FE, PE, and other Professional Qualifications

TAILINGS

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Implementations of Tailings Governance Frameworks

Keys Stakeholder Engagement in Tailings Management

Next-Level Innovation in Tailings Technologies

Tailings Assembling your Future Tailings Dream Team

UCA

UCA: Tunnels & Shafts

VALUATION

Valuation I: Case Studies

Valuation II: Lessons Learned



MINE>XCHANGE

2023 SME ANNUAL CONFERENCE & EXPO

CMA 125th National Western Mining Conference

SME Keynote Session: Embracing ESG to Build Trust in Mining Investments – A Panel Discussion

Moderators: Kelly Ward, Marsh and Kim Morrison, Newmont

Panelists: **Ryan Bond**, Head of Climate and Sustainability Insurance Initiative, Marsh
Aidan Davy, Chief Operating Officer, International Council on Mining and Metals (ICMM)
Daniele La Porta, Global Head of Sustainability and ESG, Gerald Group
Casey Nault, Senior Vice President, General Counsel and Chief ESG Officer, Coeur Mining, Inc.

ESG – environmental, social, governance – and the issues it encompasses has come to the forefront of the mining industry. External influencers such as institutional investors are demanding increased attention on ESG drivers and looking beyond financial performance, while insurance companies also consider ESG performance in their coverage pricing and terms. Further, new standards and frameworks have been introduced against which mining companies are being measured. Against this background it can be difficult

for mining companies to navigate what is important and how best to report their performance, with numerous issues on the ESG agenda for the industry including tailings management, climate change and resiliency planning, mine closure, human rights, stakeholder engagement, and transparency, among others. This panel discussion dives into these issues from the perspectives of the mining, investment, and insurance communities.

MAXIMIZE your learning by taking a short course at MINEXCHANGE

Choose from one, two or three-day course. All courses include course materials, PDH credit, coffee breaks and lunch.

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- Certified Mine Safety Professional Review Course
- A Comparison of the new SEC Regulation S-K 1300 on Modernization of Property Disclosures for Mining Registrants to Canadian National Instrument 43-101
- New Digital Technologies and Risk Management in Strategic Mine Planning: Smart Mining Complexes and Mineral Value Chains under Uncertain Metal Supply and Market Demand
- MSHA Part 48 Annual Refresher (Underground and Surface)
- Successful Implementation of Trigger Action Response Plans (TARPs)
- Advanced Geotechnical Numerical Analyses: Managing Limitations, Uncertainties, and Expectations



Additional registration is required to attend a short course.

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Newmont is the world's leading gold company and a producer of copper, silver, zinc and lead. The Company's world-class portfolio of assets, prospects and talent is anchored in favorable mining jurisdictions in North America, South America, Australia and Africa. Newmont is the only gold producer listed in the S&P 500 Index and is widely recognized for its principled environmental, social and governance practices. The Company is an industry leader in value creation, supported by robust safety standards, superior execution and technical expertise. Newmont was founded in 1921 and has been publicly traded since 1925. At Newmont, our purpose is to create value and improve lives through sustainable and responsible mining.

Main Office

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Denver, CO 80237
Phone: (303) 863-7414
www.newmont.com



Influencer



Rio Tinto

Metallic Student Design Competition, Young Leaders, SME Health & Safety 5K Fun Run

We're a leading global mining group focusing on finding, mining and processing the Earth's mineral resources. Finding better ways to provide materials the world needs is at the core of everything we do. For nearly 150 years, we've been looking for new and innovative ways of doing things. Today, you'll find our teams around the world doing just that: seeking opportunities to reduce carbon footprint, partnering to develop new technologies to decarbonize steel and aluminum production, and creating new products from waste. Visit our booth to learn more about what we do, how we do it, and possible career opportunities.

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HEXAGON

Hexagon's Mining division

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Hexagon is a global leader in digital reality solutions, combining sensor, software and autonomous technologies. We are putting data to work to boost efficiency, productivity, quality and safety across industrial, manufacturing, infrastructure, public sector, and mobility applications. Our technologies are shaping production and people-related ecosystems to become increasingly connected and autonomous — ensuring a scalable, sustainable future. Hexagon's Mining division solves surface and underground mine challenges with proven technologies for planning, operations and safety. Hexagon (Nasdaq Stockholm: HEXA B) has 21,000 employees in 50 countries and net sales of approximately 4.6bn USD. Visit our website to learn more.

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www.hexagonmining.com



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The mining industry is always looking for new ways to mine better ? more efficiently and effectively, safely and sustainably, productively and profitably. Just as we have been for nearly 100 years, Caterpillar is here to help. We develop products, services, technologies and solutions for both surface and underground operations, and assemble mining-focused people and expertise to help address their challenges and meet their business needs.

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Freeport-McMoRan

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Freeport-McMoRan operates large, long-lived, geographically diverse assets with significant proven and probable reserves of copper, gold and molybdenum. The company is one of the world's largest publicly traded copper producers. Freeport-McMoRan's portfolio of assets includes the Grasberg minerals district in Indonesia, one of the world's largest copper and gold deposits; and significant mining operations in North America and South America, including the large-scale Morenci minerals district in Arizona and the Cerro Verde operation in Peru. By supplying responsibly produced copper, the company is proud to be a positive contributor to the world well beyond its operational boundaries.

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FLSmidth

*Women of SME Breakfast, Mineral
& Metallurgical Processing Division
(MPD) Scotch Nightcap Title
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Sponsor, MPD Plenary Session*

FLSmidth provides sustainable productivity to the global mining and cement industries. We deliver market-leading engineering, equipment and service solutions that enable our customers to improve performance, drive down costs and reduce environmental impact. Our operations span the globe and we are 12,000+ employees, present in more than 60 countries. In 2021, FLSmidth generated revenue of DKK 17.6 billion. MissionZero is our sustainability ambition towards zero emissions in mining and cement by 2030.

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Midvale, UT 84047 USA
Phone: (801) 871-7000
www.flsmidth.com



Komatsu

*SME Komatsu Student & Professor
Reception, SME Foundation Gala
VIP Table*

Mining operations need collaborative partners they can trust who will empower them with quality, innovative insights and offerings that leverage automation and electrification while providing the freedom of interoperability on an open platform. Komatsu is here to partner with you to deliver the equipment, technologies and solutions needed to help you reach their goals and help position the mining industry to meet the world's need for minerals in increasingly sustainable ways. Learn how we can work with you to create lasting value for your operation by visiting our website.

Main Office

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Phone: (414) 670-7802
www.komatsu.com

Weir Minerals

*MPD Technical Session Series
Sponsor, Environmental*

Technical Session Series Sponsor

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First Majestic is a publicly traded mining company focused on silver and gold production in Mexico and the United States and is aggressively pursuing the development of its existing mineral property assets. The Company presently owns and operates the San Dimas Silver/Gold Mine, the Santa Elena Silver/Gold Mine, the La Encantada Silver Mine and the Jerritt Canyon Gold Mine. Production from these mines is projected to be between 11.2 to 11.9 million silver ounces or 32.6 to 34.6 million silver equivalent ounces in 2022. With annualized production of 45 million silver equivalent ounces by the end of 2024.

Boart Longyear

*Mineral & Metallurgical Processing
Division (MPD) Scotch Nightcap
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Main Office

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West Valley City, UT 84119 USA

Phone: (775) 748 1929
www.boartlongyear.com

Molycop

Mineral & Metallurgical Processing Division (MPD) Scotch Nightcap Title Sponsor, MPD Luncheon Supporting Sponsor

Molycop is a global market leader in the manufacture and supply of grinding media, mining chemicals, and rail consumables. The company has built a strong reputation over many years for outstanding service, industry knowledge, and trusted supply. Molycop produces high-quality products with maximum durability, designed to resist wear and deliver exceptional performance to mining assets. Our business supplies direct to mining, rail, and industrial customers around the globe. Molycop's twelve grinding media operations are strategically located around the world to service the growing global mining industry, particularly in copper, gold, and iron ore sectors. Molycop has manufacturing facilities located in Chile, Peru, Mexico, USA, Canada, Indonesia, Spain, and Australia.

Barr Engineering

Full Week Session Series Sponsor

For 50 over years, Barr has been assisting national and international mining clients with complex, large-scale projects. We offer a single source for the technical and regulatory services needed to take projects from conceptual studies and environmental assessments through facility construction, operations, and closure. Barr's services include environmental review, permitting, and compliance; reserve estimation and resource reporting; mine planning; mineral processing; facility and site design; electrical and process controls; tailings and water management; and mine-site remediation and reclamation. Headquartered in Minneapolis, MN, Barr also has offices in Colorado, Minnesota, Michigan, Missouri, Nevada, North Dakota, Utah, Alberta, and Saskatchewan.

Main Office

4300 MarketPoint Dr, Ste 200
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Phone: (952) 832-2600
www.barr.com

Siemens

Bulk Material Handling Session Series Sponsor

Siemens Large Drives Applications is the world leading manufacturer of motors and converters as well as the inventors of the dynamo machine. Siemens products form the basis for highly efficient drive systems optimized for a wide range of industries and applications. In the area of test rigs, mining and cement, the portfolio is expanded to include complete solutions including electrification and automation. Digitalization solutions and the comprehensive global services complete the offering.

Brooks & Nelson

Young Leaders Professional Development Luncheon, Monday Night Social

Our Vision is to become the "Partner of Choice" for Human Assets in the mining industry.

Brooks & Nelson, a global human resource management and recruiting consulting firm focused on creating the ideal team and an inclusive environment for our client organizations. We are committed to partnering with our clients to create a targeted approach to their organizational objectives, issues, culture, and environment.

Hecla

Mining & Exploration Division Luncheon Title Sponsor, Monday Night Social

Hecla Mining Company (NYSE:HL) is the largest silver producer in the United States. In addition to operating mines in Alaska, Idaho, and Quebec, Hecla owns exploration and pre-development properties in world-class silver and gold districts throughout North America. Founded in 1891, our common stock has been traded on the New York Stock Exchange for over 50 years. Our philosophy is to operate mines safely using a deep-rooted value-based culture and leveraging innovative mining skills developed over our long history. Learn about Hecla's responsibility to the safety and health of our people, our local communities, and the environment at www.hecla-mining.com.

Unified Purchasing Group

Mineral & Metallurgical Processing Division (MPD) Scotch Nightcap Title Sponsor, MPD Luncheon Supporting Sponsor

UPG is a group purchasing organization that connects member companies to discounts on the business products and services they use most. UPG does the negotiating with their nationally-recognized partners and passes the savings on to UPG members, saving them time and money and allowing them to focus on growing their businesses. Membership in UPG is always free and there are no contracts or long-term commitments.

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The EXCHANGE: MXC 2023 Conference Daily e-Newsletter

AspenTech is a global leader in asset optimization software helping organizations run their assets safer, greener, longer, and faster. Its solutions address complex, industrial environments like metals and mining, where it is critical to optimize the asset design, operation, and maintenance lifecycle. In the path to the digital mine, AspenTech can help enable machine learning solutions, pit to port, to support your automation journey.

National Sand, Stone & Gravel Association (NSSGA)

SME/NSSGA 2022-2023 Student Design Competition Platinum Sponsor

NSSGA is the leading voice and advocate for the aggregates industry. Our members include stone, sand and gravel producers and the equipment manufacturers and service providers who support them. NSSGA

advances public policies that protect and expand the safe, environmentally responsible use of aggregates that build America's infrastructure and economy. NSSGA advocates for members' interests on health, safety and environmental issues. In addition, NSSGA offers its members many opportunities to participate in education and trade shows that include CONEXPO-CON/AGG, AGG1 Academy & Expo, Young Leaders and the NSSGA Annual Convention.

MineSense

International Reception Sponsor

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Colorado Mining Association (CMA) Reclamation & Safety Awards Luncheon, EXPO Hall Entrance Floor Cling

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Mineral & Metallurgical Processing Division Luncheon Title Sponsor

Newmont's Malozemoff Technical Facility (MTF) provides expertise in metallurgical research and testing in support of the company's operations, studies and projects. MTF's comprehensive gold and copper metallurgical testing and process development capabilities are complemented by in-house analytical development capabilities, mineralogical analysis expertise and competitive water treatment testing capabilities. With MTF, Newmont creates operational value and a competitive advantage through technological prowess and cost competitive services while leveraging metallurgical

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knowledge and intellectual property in-house.

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SME/INSSGA Student Design Competition Title Sponsor

Vulcan Materials Company is the nation's largest producer of construction aggregates—primarily crushed stone, sand and gravel—and a major producer of aggregates-based construction materials, including asphalt and ready-mixed concrete. Our coast-to-coast footprint and strategic distribution network align with and serve the nation's growth centers.

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Women of SME Breakfast

A global leader in water and process management solutions, Nalco Water, an Ecolab company, works with customers across the mining and mineral processing industries to help maximize outcomes and minimize water and climate impacts at an optimized total cost. Leveraging a global network of technical experts, research and development laboratories, and world-class training programs, we deliver unparalleled service to our customers.

Main Office

1601 W Diehl Rd
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<https://www.ecolab.com/about/industries-we-serve/mining-and-mineral-processing>

ARCADIS

Environmental Division Poster Contest, Monday Night Social

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Hatch

Young Leaders Professional Development Luncheon
Entrepreneurs with a technical soul

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Our experience spans over 150 countries around the world in the metals, energy, infrastructure, digital, and investments market sectors. We are employee-owned and independent—free to bring our best thinking to your business. Our exceptional, diverse teams combine vast engineering and business knowledge, working in partnership with our clients to develop market strategies, manage and optimize production, develop new game-changing technologies, and design and deliver complex capital projects. We work closely with the communities in which we serve to ensure that our solutions optimize environmental protection, economic prosperity, social justice, and cultural vibrancy. We want their businesses, ecosystems, and communities to thrive, both now and into the future.

CONSOL Energy

Coal & Energy Division Luncheon Title Sponsor

CONSOL Energy, a publicly owned Canonsburg-based producer and exporter of high-BTU bituminous thermal coal, is one of the leading energy companies in the United States of America. We own and operate some of the most important productive longwall mining operations in the nation and one of the largest export terminals on the Eastern seaboard. As we like to say, America's energy truly does start here.

GMS Mine Repair

Coal & Energy Division Luncheon Title Sponsor

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Main Office

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Phone: (301) 334-8186
www.gmsminerepair.com

American Consolidated Natural Resources, Inc.

Coal & Energy Division Luncheon Title Sponsor

American Consolidated Natural Resources is the Largest Underground Coal Mining Company in America. We are proud to state that American Consolidated Natural Resources and its Subsidiary Companies employ and manage nearly 5,000 employees and currently manages 9 active coal mines, consisting of 9 underground longwall mining systems and 25 continuous mining units in 5 regions.

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Getman Corporation

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Flottweg Separation Technology, Inc

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Flottweg provides liquid solid separation equipment for mining applications. Their 2 and 3 phase decanter centrifuges and separator centrifuges are used in CRUD separation, gravel washing, drilling mud recovery, solvent extraction, oily water solids separation, solids sorting, and wastewater treatment. Skid mounted and containerized systems are also available. Contact us today for a trial.

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The Nevada Mining Association has existed for more than 100 years—first established in 1913 as the Nevada Mine Operators Association and changed to the Nevada Mining Association in 1952. From debating policy matters in the state legislature and local governments to uniting the voice of the industry in public relations, the Nevada Mining Association can be seen in all corners of the state. The mission of the Nevada Mining Association is to unite, educate, advocate, and serve as the public voice of Nevada's modern mining industry.

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NESL was founded in 1924 as a partnership by J.S. Detwiler and his son, Paul I. Detwiler. The initial operations consisted of a quarry and facilities to crush stone and burn lime, products used in highway construction. Today, NESL continues to be a family owned business and has grown into one of the top 15 aggregate producers in the US, one of the largest aggregate producers in Pennsylvania and one of the largest employers in the region, with construction material locations throughout Pennsylvania and western New York.

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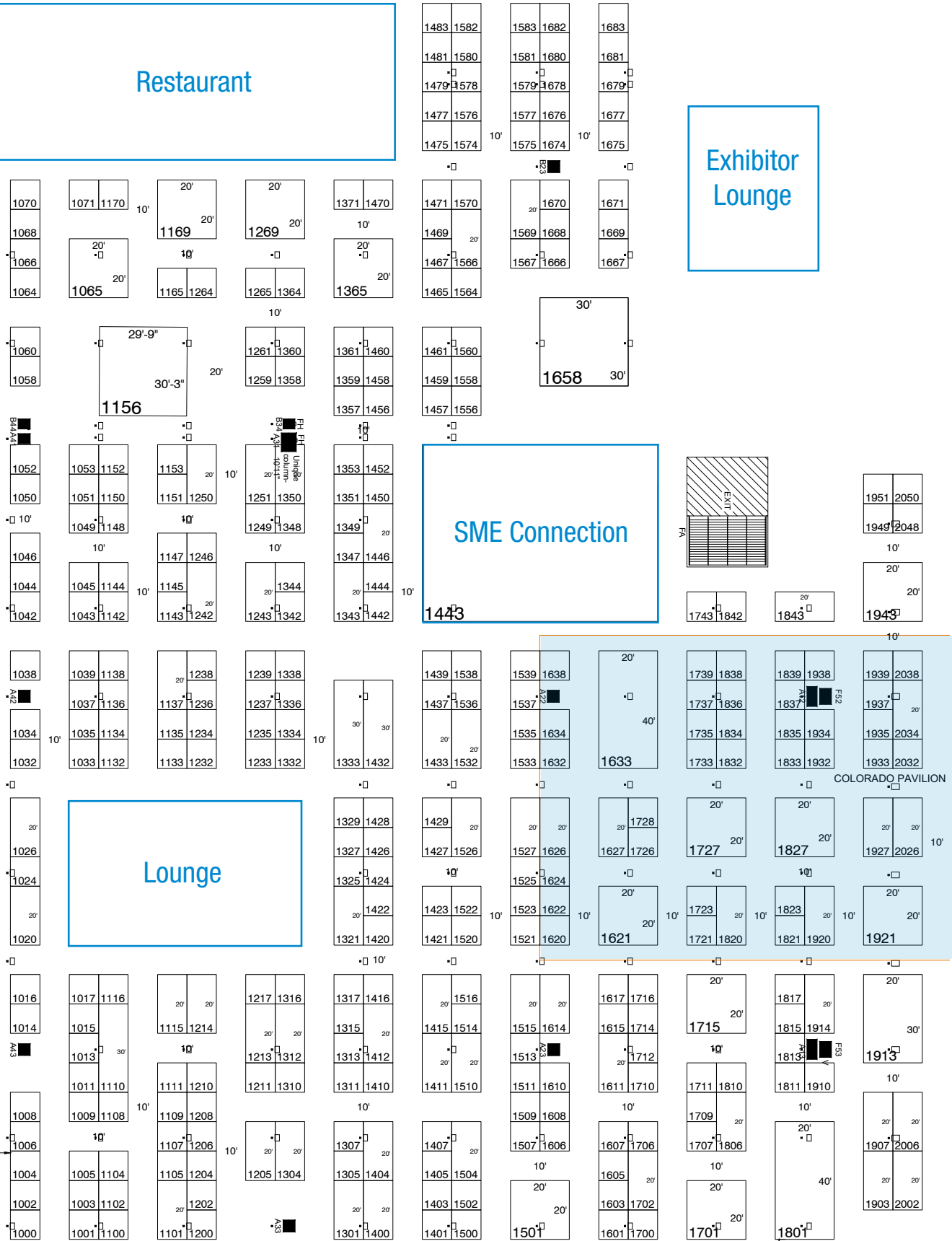
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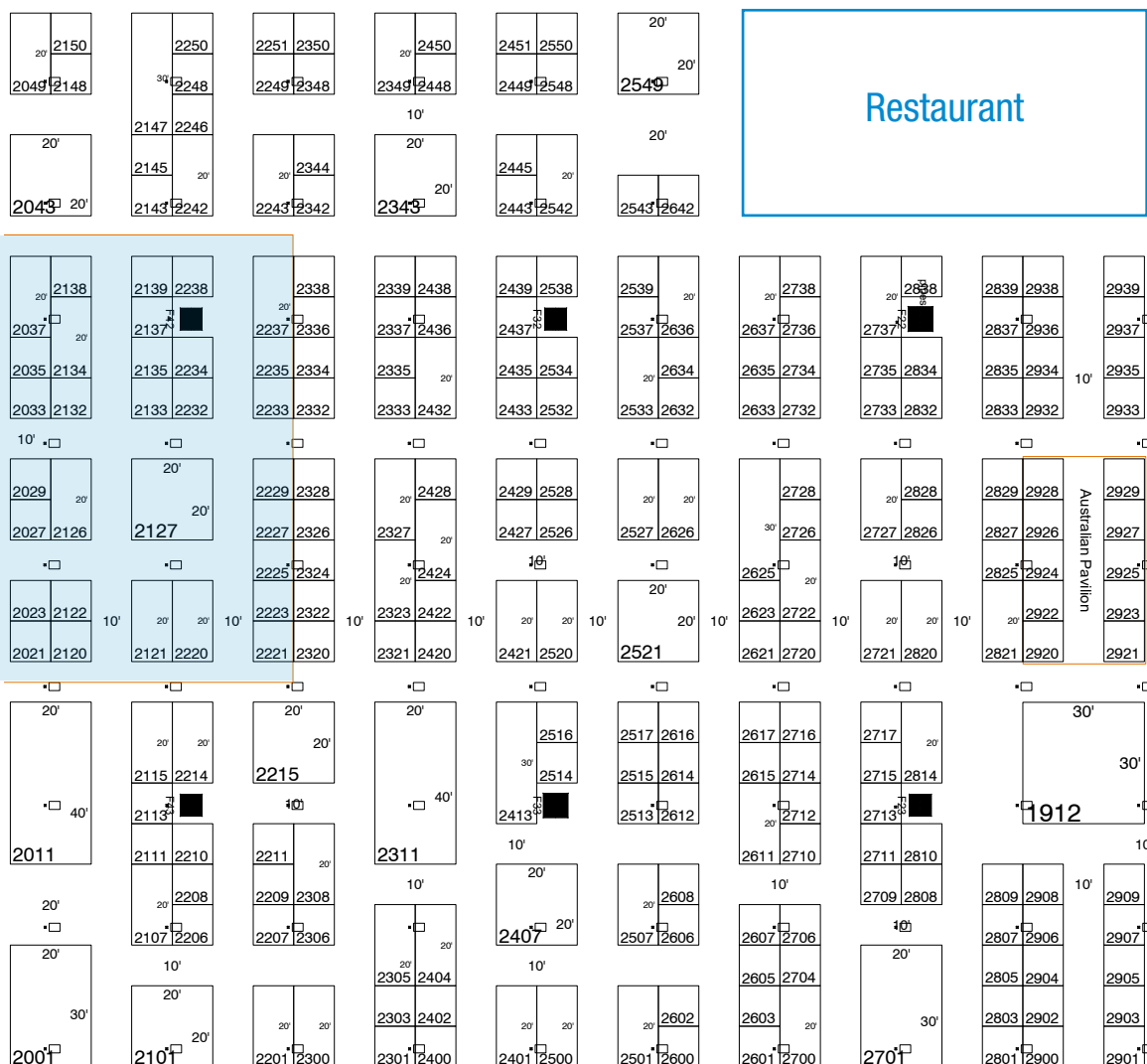


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EXHIBITORS

3D-P

Booth 1560

3D-P enables your digital mine. Through a complete range of wireless connectivity solutions, real time data access and application integration, 3D-P guarantees your operations have continuous and reliable access to the data your digital mine most depends on. We simplify your digital transformation by providing disruptive open data solutions as well as the level of support required throughout your digital journey.

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Measurement and Monitoring Systems
Solar Electric Power System

Main Office

2609 - 15th St NE
Calgary, AB T2E 8Y4 Canada
Phone: (403) 203-3018
www.3d-p.com

6Harmonics

Booth 1060

Technology manufacturer of a wireless ruggedized edge router, for industry 4.0 applications in rural and remote geographies

Products & Services

Information Technology Products

Main Office

21 Concourse Gate, Unit 2
Ottawa, ON K2E7S4 Canada
Phone: (613) 366-1768
Email: info@6harmonics.ca
www.6harmonics.ca

A.W. Chesterton Company

Booth 1001

Products & Services

Coatings (does not include Linings and Claddings)
Lubricants and Equipment
Pumps
Seals
Sensors
Urethane Cast Parts
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Phone: (339) 927-1335
www.chesterton.com

ABB

Booth 1943

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www.baldor.com

Ackcio

Booth 2939

Ackcio builds reliable wireless data acquisition systems for industrial monitoring applications. The company automates monitoring processes and provides remote, intelligent data to enable increased safety and efficient risk management in mission-critical industries, including construction, infrastructure, mining, and rail. Ackcio's flagship solution, Ackcio Beam, is an industrial data acquisition platform that uses a patented long-range wireless mesh network to monitor sensors accurately and reliably in both above ground and underground environments. Ackcio is headquartered in Singapore and supports clients across the world.

Products & Services

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Environmental Control Equipment and Supplies
Geological-Physical-Technical Services and Equip
Maintenance Equipment and Supplies
Measurement and Monitoring Systems
Rail Systems and Supplies

Main Office

75 Ayer Rajah Crescent, #03-01/02,
Singapore 139953 Singapore
Phone: +1 (403) 891 8699
Email: sales@ackcio.com
www.ackcio.com

Acrow Corp. of America (Acrow Bridges)

Booth 1836

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includes leadership in the development and implementation of bridge infrastructure projects in over 150 countries worldwide.

Products & Services

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Mining Contractors
Reclamation Equipment and Services
Temporary Structures
Transportation
Underground - Construction and Structures

Main Office

181 New Rd, Ste 202
Parsippany, NJ 07057-5625 USA
Phone: (973) 244-0080
Email: sales@acrow.com
www.acrow.com



Actenum

See our ad on p. 19

Booth 1151

Actenum's Decision Support Optimization software tool for mining - DSO/Mine - is an advanced AI-driven automatic scheduling tool to rapidly and effectively build and manage operational schedules, addressing multiple aspects of mining operations, including core drilling, drill and blast, mucking, load haul dump, dewatering, and other critical activities.

DSO/Mine creates real-time multiple schedule scenarios, optimized on user-defined criteria. Scheduled activities are linked to KPI metrics, to provide immediate feedback on financial and scheduling impacts, as updates are made in real-time enabling organizations to make important decisions faster and more accurately. DSO/Mine integrates with industry software for seamless analysis and reporting.

Products & Services

Computer - Software and Services
Information Technology Products
Maintenance Services

Main Office

2015 Main St
Vancouver, BC V5T 3C2 Canada
Phone: (604) 245-8266
https://www.actenum.com/

ACZ Laboratories Inc

Booth 2120

Products & Services

Laboratory and Scientific Services

Main Office

2773 Downhill Dr
Steamboat Springs, CO 80487 USA
Phone: (970) 879-6590
www.acz.com

Advanced Terra Testing Inc

Booth 1932

Advanced Terra Testing, Inc. is an independently owned geotechnical testing laboratory which specializes in rock and soil mechanics, construction materials testing, geosynthetic testing, plus the potential interaction between these materials. Rock and soil mechanics capabilities include unconfined and triaxial strength, shear and tensile strength, permeability, consolidation, elastic moduli determinations, and index testing. Construction materials testing includes the physical characteristics of aggregates including abrasion, durability and soundness in addition to concrete strength. Geosynthetic testing capabilities include index testing, peel and shear, tensile, puncture and more comprehensive analysis. ATT services clients from around the world as well as those close to home.

Products & Services

Laboratory and Scientific Services

Main Office

833 Parfet St, Unit A
Lakewood, CO 80215 USA
Phone: (303) 232-8308
www.terratesting.com

AECOM

Booth 1903

AECOM is a premier, fully integrated professional and technical services firm; positioned to design, build, finance and operate infrastructure assets around the world for public- and private-sector clients. With nearly 100,000 employees serving clients in over 150 countries, AECOM is ranked as the #1 engineering design firm and #6 Top 400 Contractor by revenue in Engineering News-Record magazine's annual industry rankings; and is a market leader in transportation, facilities, environmental, energy, oil and gas, water, high-rise buildings and government. As a Fortune 500 firm, AECOM companies, including URS Corporation and Hunt Construction Group, have annual revenue of approximately \$18 billion.

Products & Services

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Consulting - Engineering
Consulting - Environmental
Mine Operators
Mining Contractors

Main Office

7595 E Technology Wy, Ste 200
Denver, CO 80237 USA
Phone: (303) 740 3961
www.aecom.com

Aerix Industries

Booth 1721

Aerix Industries manufactures and globally supplies a dynamic product line of foam liquid concentrates, enabling our customers to produce and install high quality lightweight cellular concretes, and utilize foam technology for a variety of applications. For the mining industry, foam technology can be utilized for mine backfill, annular or tunnel backfill, tailings or material transport,



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**DSO/Mine enables you to ensure the right
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EXHIBITORS

ground support and reclamation. Aerix Industries is always pioneering new technologies and solutions, including foam technology for treating acid rock drainage and coal dust. Drop your card and we can discuss your application and see how foam technology can solve your next project challenge.

Products & Services

Backfilling
Concrete Reinforcement and Equipment
Grouting Services, Equipment and Materials
Reclamation Equipment and Services

Main Office

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Phone: (610) 398-7833
www.aerixindustries.com

Agapito Associates Inc

Booth 2027

Products & Services

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Consulting - Engineering
Exploration Equipment and Services
Geological-Physical-Technical Services and Equip
Laboratory and Scientific Services
Mine Evaluations - Surface and Underground
Mineral Prospecting
Roof - Ground Supports
Ventilation Systems, Materials and Equipment

Main Office

715 Horizon Dr, Ste 340
Grand Junction, CO 81506 USA
Phone: (970) 242-4220
www.agapito.com

AGRU America, Inc

Booth 1539

Since 1988, Georgetown, SC-based AGRU America, Inc. has been on a mission to build a better future through the development of innovative plastics solutions and fostering strong relationships built upon the highest standards of quality, service, and dependability. AGRU America is a subsidiary of AGRU GmbH, an Austrian family-owned business since 1948 with production facilities in Austria, the United States, Germany, and China. AGRU solutions, which include state-of-the-art products such as AGRU geosynthetics, concrete protective liners, pipes and fittings, and semi-finished products, are distributed in over 80 countries worldwide. Visit our website to learn more.

Products & Services

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Geological-Physical-Technical Services and Equip
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Pipes
Sediment & Erosion Control

Main Office

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www.agruamerica.com

AIL Mining

Booth 2736

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Consulting - Engineering
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Steel Pipe
Temporary Structures
Tunnel Lining and Support Materials
Underground - Construction and Structures

Main Office

32 York St
Sackville, NB E4L 4R4 Canada
Phone: (514) 347-6335
Email: sgauthier@ailmining.com
www.ailmining.com

airth.io

Booth 1211

Effectively capturing and leveraging data is your operation's biggest source of untapped value. Airth.io provides connected, data-driven software products that

leverage mine planning, operational, and financial data to improve profitability and sustainability.

Products & Services

Computer - Software and Services

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Aletek

Booth 2835

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Pollution Control Equipment
Safety Equipment

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www.aletek.com

Alfa Laval

Booth 2728

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Products & Services

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Remediation
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Thickeners


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All Weather Air

Booth 2828

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Temporary Structures

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www.allweather-air.com

American Exploration & Mining Association

Booth 2113

AEMA is an effective and proactive advocate for the North American mining community, successfully influencing the outcome of political dialogue, building effective working strategies with key elected officials, developing and coordinating industry's response to legislative and regulatory issues, and galvanizing the grassroots.

The American Exploration & Mining Association's Annual Meeting and Exposition, held the first week of December, is the second largest annual mining convention in the U.S. Our convention consists of short courses, technical sessions, and a 250 booth trade exposition.

Products & Services

Professional Society or Association

Main Office

16201 E Indiana Ave, Ste 3280
Spokane Valley, WA 99216 USA
Phone: (509) 624-1158
www.miningamerica.org

American Institute of Professional Geologists

Booth 1823

The American Institute of Professional Geologists was founded in 1963 to promote the profession of geology and to provide a framework for establishing standards of excellence. AIPG emphasizes competency, integrity and ethics. Its advocacy efforts are focused on the promotion of the role of geology and geologists in society.

Products & Services

Educational
Professional Society or Association

Main Office

1333 W 120th Ave, Ste 211
Westminster, CO 80234 USA
Phone: (303) 412-6205
www.aipg.org

American Rock Mechanics Association (ARMA)

Booth 2735

The American Rock Mechanics Association (ARMA) is a professional and international engineering and scientific society, which promotes interaction among specialists, practitioners, scholars, and educators in rock mechanics and geomechanics. We advocate for individuals and firms in all aspects of rock mechanics and geomechanics, including multi-disciplinary rock physics and rock engineering technology advancement and technological applications for civil engineering, mining engineering and tunneling, oil and gas recovery, and geo-related socioeconomic problem-solving.

Products & Services

Professional Society or Association

Main Office

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armarocks.org

American-Biltrite

Booth 1217

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Linings and Claddings

Main Office

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www.american-biltrite.com

ANDRITZ

Booth 1412

ANDRITZ Automation: is a leading supplier of machine and plant control systems with 110 company locations worldwide. ANDRITZ provides automation services and tools for a wide range of process industries, including pulp and paper, mining, lime and cement, power, and oil and gas.

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the digital era. The result of this powerful combination is Metris: a portfolio of ANDRITZ Digital Solutions.

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Automation
Filters, Filter Cloth and Accessories
Furnaces - Industrial Process
Mine Operators
Process Controls and Instruments
Pumps
Separators and Concentrators
Training Services
Water Clarification and Treatment

Main Office

13560 Morris Rd, Ste 1250
Alpharetta, GA 30004 USA
Phone: (604) 214-9248
www.andritz.com

Antraquip Corporation

See our ad on p. 11

Booth 2332

North American based Antraquip Corp., continues to be a leading manufacturer/supplier of mining/construction equipment worldwide. With 40+ year history of supplying roadheaders, hydraulic rock cutters (ie. drum cutters) and saw attachments, mine/tunnel support systems, their products have become synonymous for quality, reliability and durability for the most challenging underground mining conditions. Whether it is the AQ roadheader line, which is used predominantly for mine development and tunneling operations, or the versatile AQ cutting attachments (scaling, mine development,



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EXHIBITORS

production in soft rock, etc.), Antraquip Corp is your reliable partner.

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Boring Equipment
Concrete Reinforcement and Equipment
Continuous Mining Machines
Remediation
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Roof - Ground Supports
Tunnel Boring Equipment
Tunnel Lining and Support Materials
Underground - Construction and Structures
Underground Excavation Services and Equipment

Main Office

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Hagerstown, MD 21740 USA
Phone: (301) 665-1165
www.antraquip.net

Apollo Valves

Booth 2738

Products & Services

Automation
Valves

Main Office

7913 S Datura Cir E
Littleton, CO 80120 USA
Phone: (720) 312-0384
www.apollovalves.com

Aquatech International

Booth 1570

Aquatech International is a global leader in water technology and services for industrial and infrastructure markets. With a focus on solving water scarcity through desalination, water reuse, and zero liquid discharge (ZLD), Aquatech has executed over 2,000 projects across 60 countries. Leveraging the experience and know-how gained over 40 years handling some of the most difficult-to-treat waters, Aquatech helps the world's most recognized companies solve their complex water-related challenges, including water scarcity, carbon and water footprint reduction, and sustainable water operations.

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Environmental Control Equipment and Supplies
Ion Exchange Equipment and Resins
Pollution Control Equipment
Thickeners
Water Clarification and Treatment

Main Office

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Canonsburg, PA 15317 USA
Phone: (724) 746-5300
Email: aic@aquatech.com
<https://www.aquatech.com/>

ARCADIS

Booth 1614

Arcadis is the leading global natural and built asset design and consultancy firm. Our deep knowledge of the unique and multifaceted mining industry, combined with our extensive global network and decades of experience, uniquely position us to help you manage your asset portfolio while minimizing your operational costs, bringing world-class expertise to support local teams who understand your concerns. Our expertise includes environmental studies, mitigation strategies, planning, engineering, procurement, project and construction management, operations support and improvement. We offer unique services tailored to all areas and disciplines from Pit to Port for the entire mine and project life cycles.

Products & Services

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Consulting - Engineering
Consulting - Environmental
Consulting - Management
Remediation
Water Clarification and Treatment

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Booth 1259

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Sensors
Transportation
Underground Excavation Services and Equipment

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Phone: +1 (956) 662-9652
www.arsenal.mx

ASC Engineered Solutions

Booth 1820

ASC Engineered Solutions is defined by quality—in its products, services and support. With more than 1,400 employees, the company's portfolio of precision-engineered piping support, valves and connections provides products to more than 4,000 customers across industries, such as mechanical, industrial, fire protection, oil and gas, and commercial and residential construction. Its portfolio of leading brands includes ABZ Valve®, AFCON®, Anvil®, Anvil EPS, Anvil Services, Basic-PSA, Beck®, Catawissa, Cooplet®, FlexHead®, FPPI®, Gruvlok®, J.B. Smith, Merit®, North Alabama Pipe, Quadrant®, SCI®, Sharpe®, SlideLOK®, SPF® and SprinkFLEX® with headquarters in Oak Brook, IL.

Products & Services

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Couplings - Mechanical, Flexible and Rigid
Fire Protection
Pipes
Training Services
Valves
Welding Equipment and Supplies

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ASGCO Complete Conveyor Solutions

Booth 1615

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www.asgco.com

ASI Mining

Booth 1358

Products & Services

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Computer - Hardware and Services
Computer - Software and Services
Information Technology Products
Measurement and Monitoring Systems
Safety Equipment
Sensors
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better together

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EXHIBITORS

Assured Partners

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Booth 2450

Assured Partners of Colorado is the SME endorsed broker for professional liability insurance. With over 20 years of experience, Assured Partners provides complete risk management solutions for all lines of insurance including: general liability, workers comp, professional liability, directors and officers liability, inland marine, commercial auto, and employee benefit packages. We insure Mining!

Products & Services

Insurance

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Phone: (303) 228-2205
www.assuredpartnerscolorado.com

Atlas Electric, Inc

Booth 1147

Products & Services

Electrical Equipment and Supplies
Feeder Breakers
Hoists - Controls and Accessories
Maintenance Equipment and Supplies
Parts - Mining Machinery
Shortwall Mining Equipment
Temporary Structures
Tunnel Boring Equipment

Main Office

1203 N Havana St
Spokane, WA 99202 USA
Phone: (509) 534-8389
<https://atlaselectricinc.com/>



AUSTIN POWDER

Austin Powder

Booth 2820

Austin Powder is renowned for its unsurpassed customer service and its broad range of engineered solutions – from bulk trucks to underground units, emulsion technologies to electronic initiation systems, and predictive vibration modeling software to optimized blast design. All solutions are developed to advance the safety, reliability, and efficiency of breaking rock. Find out how the Austin Advantage can help your organization.

Products & Services

Explosive Materials and Services

Main Office

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Phone: (216) 464-2400
www.austinpowder.com

Avanti International

Booth 2517

Avanti International is an American owned and operated injection grout producer located near Houston, TX. Avanti's injection grouts are used in municipal, industrial and geotechnical applications to stop leaks, stabilize soil and rock, and control groundwater - permanently. We have a comprehensive product line of acrylics, polyurethanes, cements, epoxies, pump, injectors, and more. Visit our website or call for more information.

Products & Services

Grouting Services, Equipment and Materials
Pumps
Sediment & Erosion Control

Main Office

822 Bay Star Blvd
Webster, TX 77598 USA
Phone: (800) 877-2570
www.avantigrout.com

Baker Hughes - Flexible Pipe Solutions

Booth 1737

Baker Hughes's Flexible Pipe Systems group manufactures non-metallic spoolable pipe that is unique to the market due to its co-extruded liners that are corrosion and abrasion resistant. The pipe handles much higher pressures than steel and HDPE and is much more easily maintained and installed versus steel and HDPE. As much as ½ mile of pipe can fit on one spool depending on the pipe diameter and therefore only a fraction of the connections is required as opposed to steel and HDPE. The pipe requires no hot work and only needs 2-3, and much less equipment, to install.

Products & Services

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Hoses - Valves and Fittings
Linings and Claddings
Pipes
Sediment & Erosion Control
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Main Office

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Aurora, CO 80202 USA
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BARNARD

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Barnard Construction Company, Inc

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Booth 1145

Founded in 1975, Barnard Construction Company, Inc. (Barnard) is a privately held, debt-free heavy civil contractor headquartered in Bozeman, Montana. Over the last 48 years, Barnard has built a respected resume,

tackling some of the most complex, logistically challenging construction projects in North America. Barnard specializes in tunneling; oil, gas, utility, sewer, and water pipeline projects; dam, reservoir, and hydropower construction and rehabilitation; and power transmission. Our respected tunneling and underground construction experts set the standard for safety and excellence, whether they are building an intake tunnel in remote British Columbia or a gravity pipeline in urban Redwood City, California.

Products & Services

Construction - Contracting Services

Main Office

701 Gold Ave
Bozeman, MT 59715 USA
Phone: (406) 586-1995
www.barnard-inc.com

Baroid Industrial Drilling Products

Booth 1439

Products & Services

Drilling Equipment
Exploration Equipment and Services
Water Clarification and Treatment

Main Office

3000 N Sam Houston Pkwy E
Houston, TX 77032 USA
Phone: (605) 892-5253
www.baroidip.com

Barr Engineering Co

Booth 1400

For 50 over years, Barr has been assisting national and international mining clients with complex, large-scale projects. We offer a single source for the technical and regulatory services needed to take projects from conceptual studies and environmental assessments through facility construction, operations, and closure. Barr's services include environmental review, permitting, and compliance; reserve estimation and resource reporting; mine planning; mineral processing; facility and site design; electrical and process controls; tailings and water management; and mine-site remediation and reclamation. Headquartered in Minneapolis, MN, Barr also has offices in Colorado, Minnesota, Michigan, Missouri, Nevada, North Dakota, Utah, Alberta, and Saskatchewan.

Products & Services

Consulting - Design and Planning
Consulting - Engineering
Consulting - Environmental

Main Office

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EXHIBITORS

BBE Consulting Canada

Booth 1102

BBE Consulting specialize in the design of mine ventilation and mine refrigeration systems and has provided solutions to underground mines worldwide for over 30 years. Our services offered cover the full range of initial conceptual studies through to final turn-key system delivery. BBE's designs, based upon our expert analysis of ventilation and cooling requirements, as carried through technical feasibility studies, detailed design and project execution focus on providing fit-for-purpose solutions for underground mines. BBE's capabilities and services also include: occupational hygiene, fire modelling, computational fluid dynamics, pollutant control, audits, training, automation, energy managements as applied to mine ventilation systems.

Products & Services

Consulting - Design and Planning
Consulting - Engineering
Coolers
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Bekaert

See our ad on p. 23

Booth 2208

Bekaert, your global partner for smart fiber reinforcement of concrete for your Mining operations. We offer a high quality and value adding service with both our steel & synthetic fiber products. We have professionals on staff, to offer solutions for your commercial & technical needs. Safety & production are critically important in the mining industry & requires a continuous effort to optimize the mining process safely without loss of production. We specialize in temporary & permanent support applications, such as shotcrete and shaft lining applications. We offer a selection of bolting options & wire mesh through our subsidiary Prodimin.

Products & Services

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Shotcrete Equipment, Supplies and Services
Steel Wire Ropes/Cables
Tunnel Lining and Support Materials
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Main Office

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www.bekaert.com/underground

Bentley Systems

Booth 1359

Bentley Systems (Nasdaq: BSY) is the infrastructure engineering software company. We provide innovative software to advance the world's infrastructure – sustaining both the global economy and environment. Our industry-leading software solutions are used by professionals, and organizations of every size, for the design, construction, and operation of roads and bridges, rail and transit, water and wastewater, public works and utilities, buildings and campuses, and mining. Our Infrastructure IoT platform provides secure and scalable tools for cost-effective condition monitoring of critical assets, providing operational insights that inform owners and operators, and power connected workflows leveraging our infrastructure digital twin platform, iTwin.

Products & Services

Computer - Software and Services

Main Office

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Exton, PA 19341 USA
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Email: info@infrastructureiot.com
<https://www.infrastructureiot.com>

BEUMER Group

See our ad on p. 25

Booth 2343

For material handling between mine, processing plant and beyond, BEUMER offers complete tailor made-solutions. With our research and development efforts we can guarantee that our solutions will fit your requirements now and in the future. FAM Minerals & Mining GmbH, is also now a part of the BEUMER Group and one of the leading suppliers which offers machines along the complete transport chain for bulk materials. From extraction, conveying, loading and storage to the processing of various raw materials.

Products & Services

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BGC Engineering

Booth 2805

BGC Engineering Inc. (BGC) is an international consulting firm that provides professional services in applied earth sciences.

Our practice was established in 1990 based on a passion and appreciation for the impacts of geology on engineered structures. This appreciation continues to serve as our foundation today as we work to address a broad range of engineering and environmental issues related to challenging terrain and ground conditions. BGC provides specialized engineering and geoscience services for all phases of projects, from pre-feasibility and design, to construction, operation and closure.

Products & Services

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Consulting - Engineering
Consulting - Environmental
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Phone: (818) 842-7170
www.bicoinc.com

Binder+Co USA Inc

Booth 1935

Binder+Co USA is the US based subsidiary of Binder+Co AG out of Austria. We are providing processing equipment in the areas of screening, drying/cooling and sensor-based sorting for a variety of materials in mining, minerals and aggregates as well as recycling.

Products & Services

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Screens
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Blair Rubber Company

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www.blairrubber.com

Blue Coast Research

Booth 1037

Blue Coast Research Ltd. (BCR) is a growing consultancy and metallurgical testwork laboratory located in Parksville, British Columbia. BCR is focused on providing high quality metallurgical testwork, data and interpretation to the global minerals industry.

Products & Services

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Laboratory and Scientific Services

Main Office

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https://bluecoastresearch.ca/

Blue Water Shipping

Booth 1044

Blue Water Shipping is a global provider of all logistics services in modern supply chain management. At the heart of Blue Water is an organization of professionals skilled to offer complete and tailor-made solutions to any shipping and transport requirement anywhere in the world.

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Boart Longyear

Booth 2002

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The Global Products division manufactures, markets, and services drill rigs, drill string products, performance tooling, drilling consumables, and quality parts for customers worldwide.

The Geological Data Services division utilizes innovative scanning technology and down-hole instrumentation tools to capture detailed geological data from drilled core and chip samples.

Products & Services

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Drill Bits - Rock
Drilling Contractors
Drilling Equipment
Exploration Equipment and Services
Mining Contractors
Pumps

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West Valley City, UT 84119 USA
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www.boartlongyear.com



Bosch Rexroth - Häggblunds Drives

See our ad on p. 29

Booth 2043

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Häggblunds is a brand of Bosch Rexroth, a leading global supplier of drive and control technologies. To learn more about Häggblunds solutions, visit our website.

Products & Services

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Conveyor Belting - Accessories and Equipment
Drives - Belt, Chain, Fluid and Gear
Hydraulic System Components
Maintenance Services
Power Transmission Equipment

Main Office

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www.boschrexroth-us.com

Bowman Consulting Group

Booth 2348

Bowman has a well networked and highly collaborative team of more than 1200 engineering, land survey and geoscience professionals that provide exceptional mining services, which include Mineral Process Plant, Mine Facility and Mine Infrastructure design, Survey,

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Consulting - Engineering
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Bradken

Booth 1214

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www.bradken.com

Bray Controls

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Brelko Conveyor Products

Booth 1727

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Conveyor Systems

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www.brelko.com

Bridgestone Americas Tire Operations

Booth 2704

Tires

Products & Services

Transportation

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Brookville Equipment Corp

See our ad on p. 30

Booth 1610

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Booth 1460

Products & Services

Government Agency - Entity

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Booth 1116

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www.Burgex.com

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Booth 1533

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EXHIBITORS

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Tunnel Lining and Support Materials
Underground - Construction and Structures
Ventilation Systems, Materials and Equipment

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Booth 1410

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Booth 2710

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Products & Services

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Conveyor Systems

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www.cambelt.com

Canadian Institute of Mining, Metallurgy & Petroleum (CIM)

Booth 2301

The Canadian Institute of Mining, Metallurgy and Petroleum (CIM) is the leading not-for-profit technical society of professionals in the Canadian minerals, metals, materials and energy industries.

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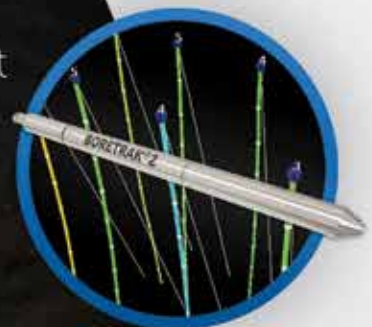
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Canadian Mining Journal

Booth 2711

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Booth 1232

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Cancha Geometallurgy

Booth 2933

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CANTY

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Carlson Software

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Carrier Process Equipment Group, Inc.

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Booth 1108

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Booth 1939

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www.cascade-env.com

Caterpillar

Booth 2701

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Loaders
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Rail Systems and Supplies
Trucks and Haulage Units
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Main Office

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www.cat.com/mining

CCC Group, Inc

Booth 2632

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Products & Services

Construction - Contracting Services
Conveyor Systems

Draglines
Maintenance Services
Mining Contractors

Main Office

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Phone: (210) 661-4251
www.cccgroupinc.com

Cell-Crete

Booth 2435

Main Office

135 E Railroad Ave
Monrovia 91016 USA
Phone: (626) 357-3500

Cementation USA Inc

Booth 2243

Products & Services

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Consulting - Engineering
Mining Contractors
Underground - Construction and Structures
Underground Excavation Services and Equipment

Main Office

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Sandy, UT 84070 USA
Phone: (801) 937-4120
www.cementation.com

Cemvita

Booth 2445

Cemvita is a biotechnology company with a design platform focused on microbial solutions for heavy industries including chemical manufacturing, mining, oil and gas. The use of microbes in mining is not new, 20% of the world's copper is bioleached, and these processes have been proven at scale over the last 40 years. However, recent biotech developments that have revolutionized pharma, agriculture, and food are still nascent in the mining industry. We partner with industrial companies to apply biotechnology, synthetic biology, and interdisciplinary thinking to lower the footprint of mining and provide the metals needed for our renewable energy future.

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Reduction Technologies - Iron Ore, Steel, Mineral
Remediation
Solvents - Extraction, Mixer and Settlers

Main Office

8300 Alcott St, Ste 205
Westminster, CO 80031 USA
Email: info@cemvita.com
cemvita.com



EXHIBITORS

Certech USA Inc

Booth 2326

Products & Services

Linings and Claddings

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Check-6/Biz X Group

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Booth 2513

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Products & Services

Grouting Services, Equipment and Materials
Pumps
Remediation

Main Office

805 E 31st St
LaGrange Park, IL 60526 USA
Phone: (708) 354-7112
Email: cginfo@chemgrout.com
www.chemgrout.com

ChemQuest Chemicals, LLC

Booth 2634

Custom Blending and Manufacturing – With NO PRODUCTS OF OUR OWN. In addition to Blending and Synthesis, ChemQuest produces Dispersions, Suspensions, Emulsions, Micro –Emulsions, and High Shear processing. Water base, Oil base, & Solvent base blending onsite with stand alone Flammables unit. Dry to liquid conversions as well. Our only business is Contract Manufacturing.

Products & Services

Coatings (does not include Linings and Claddings)
Reagents - Chemical and Flocculants
Solvents - Extraction, Mixer and Settlers
Water Clarification and Treatment

Main Office

9730 Bay Area Blvd
Pasadena, TX 77507 USA
Phone: (281) 291-9966
www.chemquestchemicals.com/

Chevron Phillips Chemical

Booth 1706

Chevron Phillips Chemical - Mining Chemicals division provides a complete range of Orfom® solvent extraction diluents, Orfom® collectors for copper-molybdenum-gold/silver sulfide mineral flotation, Orfom® D8 depressant as a complete replacement for NaSH in copper-molybdenum separation, and Philflo® flotation oils for fertilizer minerals.

Products & Services

Reagents - Chemical and Flocculants
Solvents - Extraction, Mixer and Settlers

Main Office

10001 Six Pines Dr
The Woodlands, TX 77380 USA
Phone: (800) 858-4327
www.cpchem.com

CiDRA Minerals Processing Inc

Booth 1606

CiDRA Minerals Processing is a leading supplier of process optimization products including the CYCLON-Etrac™ and SONARtrac® systems. CiDRA's CYCLON-Etrac™ systems are innovative turnkey solutions that provide reliable operation and optimized classification and grind control, identifying events of low efficiency, at the level of a single hydrocyclone. SONARtrac systems are clamp-on, non-contact systems capable of providing multi-variable measurements, such as volumetric flow, speed of sound, and entrained air, in a wide variety of applications - liquids, gases, slurries, and multiphase fluids. CiDRA products and services are being used at more than 400 customer locations in over 45 countries.

Products & Services

Measurement and Monitoring Systems
Meters and Gauges
Process Controls and Instruments
Sensors

Main Office

50 Barnes Park N
Wallingford, CT 06492 USA
Phone: (203) 265-0035
www.cidra.com

Civil & Environmental Consultants, Inc (CEC)

Booth 1510

CEC provides innovative design solutions and integrated expertise to all sectors of the mining industry. We strategically focus on the industry's business drivers and challenges, offering solutions related to air quality, civil engineering, ecological sciences, environmental engineering and sciences, manufacturing infrastructure services, survey/geospatial, waste management, and water resources needs. With deep bench strength to tackle tough problems, CEC has successfully completed projects for the mining industry ranging from the design and permitting of coal refuse disposal areas, to water treatment projects, to large-scale post-mining land-use changes, to ecological resource impact assessments, and to mine reclamation/closure.

Products & Services

Consulting - Design and Planning
Consulting - Engineering
Consulting - Environmental
Emissions Control
Reclamation Equipment and Services
Remediation
Sediment & Erosion Control

Main Office

333 Baldwin Rd
Pittsburgh, PA 15205 USA
Phone: (800) 365-2324
www.cecinc.com

Clariant Corporation

Booth 1433

Clariant Mining Solutions is a trusted provider of specialty chemicals to improve the sustainability and metallurgical performance of mines. Our global network of local application and development centers coupled with our rapid response to customer requirements allow us to deliver customized high performing products. We have several programs and products dedicated to improving sustainability such as: Tailings Management Program, lower toxicity replacements for xanthates and NaSH, advanced pelletizing technology to reduce energy consumption, and our Decarbonization Minerals Program, which focuses on reagents for the processing of the main decarbonization minerals, including lithium, nickel, cobalt, rare earths, and alumina.

Products & Services

Reagents - Chemical and Flocculants
Reduction Technologies - Iron Ore, Steel, Mineral
Remediation
Solvents - Extraction, Mixer and Settlers

Main Office

2750 Technology Forest Blvd
The Woodlands, TX 77381 USA
Phone: (281) 465-9100
www.clariant.com/mining

Clear Edge Filtration

Booth 1143

Clear Edge Filtration is one of the global leaders in supplying industrial filtration products and filter media to customer applications worldwide. With over 200 years of filtration legacy, we have adapted filter media for applications such as filtering liquids from solids, dewatering, collecting and filtering dust, air filtration, filtering and purifying hot gases as well as other industrial processes. With specific products designed for mining applications we can supply every filtration position within the mining flow sheet from Filter Press to Vacuum Belt Filter to Disc Filter to improve performance and extend life.

Products & Services

Filters, Filter Cloth and Accessories

Main Office

7160 Northland Cir
Minneapolis, MN 55428 USA
Phone: 1 (763) 535-3220
Email: clearedge@filtrationgroup.com
www.clear-edge.com

ClearSpan Structures

Booth 2342

ClearSpan Structures has been providing custom and turnkey fabric and metal buildings to businesses for over 40 years. ClearSpan's structures can be built al-

most anywhere and can be highly customized to meet the needs of any operation.

Products & Services

Temporary Structures

Main Office

1395 John Fitch Blvd
South Windsor, CT 06074 USA
Phone: (866) 643-1010
www.clearspan.com

CLEER

Booth 1332

We are a 501(c)3 non-profit organization contracted with the State of Colorado to administer grant funds to help transition Colorado companies from diesel vehicles and machines to zero-emissions equivalents. Grants are up to 45% of total project costs, with no maximum! Be at the leading edge of innovation in Colorado.

Products & Services

Government Agency - Entity

Main Office

PO Box 428
Carbondale, CO 81623 USA
Phone: (970) 704-9200
www.cocleandiesel.org

COGEP Maintenance Software

Booth 2543

COGEP is a rapidly growing leader in Computerized Maintenance Management Systems. For over 30 years, COGEP has been developing and implementing Guide Ti, a powerful world-class CMMS/EAM and procurement software. Our tools and expertise have been helping private and public organizations to plan, organize and control maintenance activities involving their strategic assets.

Products & Services

Computer - Software and Services
Information Technology Products
Maintenance Equipment and Supplies
Maintenance Services
Measurement and Monitoring Systems

Main Office

825 boul Lebourgneuf, Ste 400
Quebec City, QC G2J 0B9 Canada
Phone: (418) 626-2503
www.cogep.com

COLAS SA

Booth 2515

Dust-A-Side Canada, a Subsidiary of Colas Group, is an international company which has more than 40 years' experience in Total Dust Management. The company's global presence is in South Africa, Zambia, Namibia,

CONTINUING EDUCATION AND PROFESSIONAL DEVELOPMENT

Colorado School of Mines offers a wide range of educational programs to audiences beyond the campus, extending the academic services of the school throughout the United States and around the world through specialized courses, programs, conferences, and other activities.



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To learn more about upcoming courses for 2023 visit Learn.mines.edu



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EXHIBITORS

Botswana, Ghana, Mozambique, Morocco, Canada, Australia and Chile. In excess of 650 employees and managing over 70 mines globally, Dust-A-Side is treating in excess of 13 000 000m² of Permanent haul roads both opencast and underground mines globally. DAS's exclusive bitumen and polymer products are specifically designed to bind and stabilize in-situ wearing course materials. Dust-A-Side is at the forefront of dust suppression and prevention systems worldwide.

Products & Services

Dust and Fume Control Technology
Environmental Control Equipment and Supplies

Main Office

4950 Yonge St
Toronto, ON M2N 6K1 Canada
Phone: +33 608547069
<https://dustaside.com/>

Colorado Division of Reclamation, Mining and Safety

Booth 2436

Products & Services

Government Agency - Entity

Main Office

1313 Sherman St, Rm 215
Denver, CO 80203 USA
Phone: (303) 866-3567
www.mining.state.co.us

Colorado School of Mines - Department of Mining Engineering

See our ad on p. 37

Booth 2023

Ranked as the #1 mining school in the world since 2016 by the QS World University Rankings, the Mining Engineering Department at Colorado School of Mines has distinguished itself by developing curriculum and research programs geared toward responsible stewardship of the earth and its resources.

Through collaborations with other Mines departments, academic institutions, government agencies, and industry, we are committed to expanding the international reputation of the department for excellence in education, research, industry service, and community outreach.

Products & Services

Consulting - Engineering
Consulting - Research
Educational

Main Office

1610 Illinois St, Brown Bldg #239
Golden, CO 80401 USA
Phone: (303) 273-3700
mining.mines.edu/

Colorado State Land Board

Booth 1937

The State Land Board earns money for Colorado public schools by leasing trust land and minerals. 95% of lease payments support Colorado schools. We offer solid mineral leases through direct negotiation or competitive sealed bid.

Products & Services

Government Agency - Entity
Mineral Prospecting

Main Office

1127 Sherman St, Ste 300
Denver, CO 80203 USA
Phone: (303) 866-3454
slb.colorado.gov

Concrete Canvas US

Booth 2148

Created specifically for erosion control, containment and shelter applications, Concrete Canvas® (CC) products are part of a revolutionary class of new, innovative materials called Geosynthetic Cementitious Composite Mats (GCCMs). CC is a flexible, concrete filled geosynthetic which provides a thin and durable concrete layer when hydrated. Typically, 10-times faster to install than conventional concrete solutions; essentially, it's Concrete on a Roll™.

Products & Services

Concrete Reinforcement and Equipment
Sediment & Erosion Control

Main Office

1350 Nasa Rd 1, Ste 120
Houston, TX 77058 USA
Phone: (832) 864-2946
www.concretcanvas.us

ConeTec Inc

Booth 1535

ConeTec is an international full-service mining, geoenvironmental, and geotechnical site investigation contractor. ConeTec offers clients superior project management and site investigation services across the globe, with a large presence in North and South America.

ConeTec is able to provide in-depth geophysics, CPTu, in-situ testing, drilling, instrumentation, and final data reporting and analysis services.

All field investigations are performed by specially trained personnel and supported by experienced site investigation professionals in order to provide the highest quality site investigation. This is the ConeTec difference—better information, better decisions.

Products & Services

Consulting - Environmental
Drilling Contractors
Geological-Physical-Technical Services and Equip
Measurement and Monitoring Systems
Remediation

Main Office

PO Box 22082
Salt Lake City, UT 84122 USA
Phone: (801) 973-3801
www.conetec.com

Conifer Systems

Booth 1009

Conifer Systems provides innovative emissions control systems that enable companies to meet regulatory emissions standards, maximize uptime and minimize cost. Through reliable environmental solutions, our commitment to clean energy and creating industrial efficiencies, we strive to be the partner you can rely on for years to come.

Our standardized solutions enable us to provide high quality, reliable systems with shorter project timelines and lower costs. Conifer Systems delivers solutions that meet your emissions control needs while prioritizing your business objectives and environmental and compliance obligations. Our technical expertise has been honed supplying systems to various industries for nearly two decades.

Products & Services

Emissions Control
Environmental Control Equipment and Supplies
Pollution Control Equipment
Ventilation Systems, Materials and Equipment

Main Office

6515 Willowbrook Park
Houston, TX 77066 USA
Phone: +1 (832) 476-9024
Email: sales@conifersystems.com
conifersystems.com

Conspec Controls

Booth 1052

Manufacturer of gas detection/AMS equipment. We provide safety for your personnel and environment while limiting downtime.

Products & Services

Safety Equipment

Main Office

6 Guttman Blvd
Charleroi, PA 15022 USA
Phone: (724) 489-8450
Email: sales.usa@conspec-controls.com
www.conspec-controls.com

Contech Engineered Solutions

Booth 2029

Contech® Engineered Solutions LLC is a leading civil engineering site solutions products and services company. Contech is the only company that can provide bridge, drainage, erosion control, retaining wall, sanitary, soil stabilization, and stormwater solutions on a national scale. Our product offering includes corrugated metal and plastic pipe; steel truss, metal plate and concrete arch bridges and structures; hard armor, geogrid, geotextiles, block and retaining wall systems; and stormwater detention/retention, filtration and treatment systems. Our product portfolio is based on more than a century of research and practical field experience serving the highway, drainage, sewage and site-improvement markets.

Products & Services

Consulting - Engineering



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W56 LINEAR MOTION
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DRY SCREENING MACHINE



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TO DISCOVER MORE VISIT US AT MINEXCHANGE
BOOTH: 1715



MINEXCHANGE

2023 SME ANNUAL CONFERENCE & EXPO

CMA 125th National Western Mining Conference
FEBRUARY 26 - MARCH 1 | DENVER, COLORADO

EXHIBITORS

Pipes
Steel Pipe
Tunnel Lining and Support Materials
Underground - Construction and Structures
Water Clarification and Treatment

Main Office

9100 Centre Pointe Dr, Ste 400
West Chester, OH 45069 USA
Phone: (800) 338-1122
www.conteches.com

Continental

Booth 2215

Continental develops pioneering technologies and services for sustainable and connected mobility of people and their goods. Founded in 1871, the technology company offers safe, efficient, intelligent and affordable solutions for vehicles, machines, traffic and transportation. In 2020, Continental generated sales of €37.7 billion and currently employs around 235,000 people in 58 countries and markets. In 2021, the company celebrates its 150th anniversary.

Products & Services

Belts - Power Transmission
Conveyor Belting - Accessories and Equipment
Hoses - Valves and Fittings
Hydraulic System Components

Main Office

703 S Cleveland-Massillon Rd
Fairlawn, OH 44333 USA
Phone: (330) 664-7055
www.continental-industry.com

Control Station, Inc

Booth 1148

Control Station makes process optimization simple, thereby empowering manufacturers to increase production efficiency and throughput. The company's software-based solutions actively monitor and optimize plant-wide control loop performance. Control Station's solutions are licensed to leading process manufacturers worldwide and they are available direct from Control Station and through the company's network of distribution partners. The company is headquartered in the United States.

Products & Services

Automation
Computer - Software and Services
Consulting - Engineering
Information Technology Products
Measurement and Monitoring Systems
Process Controls and Instruments
Quality Improvement

Main Office

642 Hilliard St, Ste 2031
Manchester, CT 06042 USA
Phone: (860) 248-2137
www.controlstation.com

Copper State Bolt & Nut Co

Booth 1634

Mining is at our core!

Our Manufacturing Division was specifically established to support mining and heavy industrial customers with capabilities to produce large diameter and specialty products. Our newest innovative Load Monitoring Fastener+ is a wireless, accurate, and real-time load monitoring fastener system made for mining, heavy industrial and wind industries. Automated alerts will notify you if tension deviates from desired values. Our distribution, manufacturing, and VMI service operations ensure continuous uptime and support of your critical care equipment. We proudly offer fasteners, construction products, industrial supplies, safety products, cutting tools & abrasives, kits & assortments, and fluid sealing products.

Products & Services

Fasteners - Industrial
Grinding Media and Liners
Grinding Mills
Hoses - Valves and Fittings
Linings and Claddings
Maintenance Equipment and Supplies
Parts - Mining Machinery
Safety Equipment
Training Services

Main Office

3637 N 34th Ave
Phoenix, AZ 85017 USA
Phone: (602) 352-4815
Email: mining@copperstate.com
copperstate.com

CoreLift

Booth 2248

CoreLift™ is a novel Canadian equipment provider for modern core logging facilities based in Sudbury, Ontario. Our flagship product is the fully adjustable logging table that removes risks towards repetitive strain injuries, allows for physical diversity and improves productivity for core logging personnel. We provide consulting expertise as well as robust, innovative equipment to go from core shack to modernized facilities.

Products & Services

Assay Equipment
Consulting - Design and Planning
Consulting - Engineering
Conveyor Systems
Geological-Physical-Technical Services and Equip
Laboratory Equipment and Supplies
Safety Equipment
Sampling Devices

Main Office

Unit 6, 2140 Regent St
Sudbury, ON P3E5S8 Canada
Phone: (705) 507-1266
www.corelift.ca

Cornell Pump Co

Booth 2300

Engineered to be durable, dependable, and efficient, Cornell pumps are found hard-at-work in the mining

and aggregates industries handling water intake, mine dewatering, washing & screening, sumps, cyclone feed, mill circuits, and tailings transfer applications.

MP, SM, and SP series pumps cover the complete range of slurries. MX series produce heads up to 850ft. Cyclo Seal® provides long seal-life without flush water—saving up to \$50,000 per pump annually. The Cornell Co-Pilot® allows remote monitoring of vibration, temperature, location, engine rpm, flow, remote operation, and pressure.

Products & Services

Continuous Mining Machines
Dewatering Equipment
Pumps

Main Office

16261 SE 130th Ave
Clackamas, OR 97015 USA
Phone: (503) 653-0330
www.cornellpump.com

Costmine

Booth 1817

Cost estimating data you can count on. Costmine provides up-to-date mine cost estimating tools for feasibility studies, exploration decisions and economic analysis. Mining Cost Service and Mine & Mill Equipment Costs Guide have been a trusted source for cost estimating data for over 30 years. Our Sherpa software suite of engineering-based cost estimating tools can help you to quickly and accurately determine capital and operating costs. Costmine is a valuable resource for investors, geologists, engineers, financiers, teachers, consultants and suppliers.

Products & Services

Computer - Software and Services
Consulting - Engineering
Educational
Geological-Physical-Technical Services and Equip
Information Technology Products
Mine Evaluations - Surface and Underground
Publishers
Reclamation Equipment and Services

Main Office

100 N Mullan Rd, Ste 102
Spokane Valley, WA 99206 USA
Phone: (509) 328-8023
www.costmine.com

Cowin & Company/Raisebor

Booth 2717

Mining Construction and Engineering services. Raise boring projects. Owner of the largest raisedrill and fleet in the USA

Products & Services

Construction - Contracting Services
Drilling Contractors
Mining Contractors
Underground - Construction and Structures
Underground Excavation Services and Equipment

Main Office

PO Box 19009
Birmingham, AL 35219 USA
Phone: (205) 945-1300
www.cowin-co.com

TRUSTED TECHNOLOGY. UNMATCHED EXPERTISE. EXPLOSIVE RESULTS.



Our expertise goes *beyond the bench* with a mindset focused on outcome-based fragmentation. Together, we can help you maximize your return on investment through solutions that reduce your total cost of operations while increasing your productivity.



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Dyno Nobel

EXHIBITORS

Coyne Chemical

Booth 1325

Products & Services

Reagents - Chemical and Flocculants

Main Office

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Croydon, PA 19021 USA
Phone: (215) 785-3000
www.coynechemical.com

CPM Roskamp Champion

Booth 1000

Premier supplier of size reduction equipment for minerals processing including hammer mills, roll crushers and more.

Products & Services

Automation
Controls - Electrical and Electronic
Coolers
Crushers and Pulverizers
Feeders
Grinding Mills

Main Office

2975 Airline Cir
Waterloo, IA 50703 USA
Phone: (484) 809-1155
www.cpm.net

CR

Booth 1250

CR Mining is on a mission to revolutionize mining productivity. We engineer the most advanced surface, underground, and digital mining solutions so miners across the globe can boost productivity, enhance safety and reduce maintenance requirements. Backed by a meticulous design process, data-based testing protocol, and passionate engineers, our mining equipment sets new standards for performance. Headquartered in Australia, CR has a presence in the US, Canada, Chile, China and 11+ other global locations.

Learn more about CR's mining solutions on our website.

Products & Services

Castings
Drilling Equipment
Excavators
Loaders
Measurement and Monitoring Systems
Parts - Mining Machinery
Safety Equipment
Underground Excavation Services and Equipment

Main Office

10200 SW Greenburg Rd, #410
CR, OR 97223 USA
Phone: (866) 276-4637
www.crmining.com

Custom Linings, Inc

Booth 2133

Products & Services

Coatings (does not include Linings and Claddings)
Linings and Claddings
Maintenance Services
Mining Contractors
Reclamation Equipment and Services
Remediation
Shotcrete Equipment, Supplies and Services
Tunnel Lining and Support Materials

Main Office

1960 Victor Pl
Colorado Springs, CO 80915 USA
Phone: (719) 374-8785
www.customlinings.com

Dahrouge Geological Consulting Ltd

Booth 2837

Products & Services

Geological-Physical-Technical Services and Equip

Main Office

7000 S. Yosemite St, Ste 115
Centennial, CO 80112 USA
Phone: (719) 649-4210
www.dahrouge.com

Datamine North America Inc

Booth 2220

Datamine is a world leading provider of the technology and services required to seamlessly plan and manage mining operations. With operations in thirteen countries, Datamine provides solutions ranging from exploration data management and orebody modelling to mine planning and operations to over 1,400 companies worldwide. Our software solutions integrate with our consulting and training services to ensure that we provide our clients with industry-leading support and expertise.

Products & Services

Aerial Mapping and Surveying
Blending Systems
Computer - Software and Services
Consulting - Design and Planning
Exploration Equipment and Services
Information Technology Products
Laboratory and Scientific Services
Mining Contractors
Training Services
Transportation

Main Office

7900 E Union Ave, Ste 1007
Denver, CO 80237 USA
Phone: (303) 985-7713
www.dataminesoftware.com/

DEA Incorporated

Booth 1567

Experts in Mine Power Distribution & Industrial Control Systems. Founded in 1984 by an Electrical Engineer with extensive mining experience, DEA Incorporated understands heavy industrial conditions. We continue to design & manufacture a complete line of rugged electrical distribution equipment specially created for the harsh mining environment. DEA Inc is an experienced UL508A Industrial Control Panel builder that offers engineering support, design, programming and commissioning for various projects throughout many industries. Proudly built Rugged Tough in the USA. Veteran Owned Business.

Products & Services

Controls - Electrical and Electronic
Electrical Equipment and Supplies
Maintenance Services
Power Transmission Equipment
Process Controls and Instruments

Main Office

16208 E Lacrosse Ln
Spokane Valley, WA 99216 USA
Phone: (509) 214-1498
www.deainc.net

Deister Concentrator, LLC

Booth 2808

Deister Concentrator manufactures single, double and triple-deck mineral concentrating shaking tables along with a complete line of heavy media and classifying cyclones, sieve bends, heated screens and revolving slurry distributors.

Products & Services

Dewatering Equipment
Laboratory Equipment and Supplies
Separators and Concentrators

Main Office

9205 Avionics Dr
Ft Wayne, IN 46809 USA
Phone: (260) 747-2700
www.deisterconcentrator.com

Denver Machine Shop

Booth 1208

Remanufacturing and repair of large mining and rock crushing equipment. Custom replacement parts machined for hard to find or long lead time problems with OEM. Custom forming of wear Plates for chutes and hoppers, blade liners, and other wear surfaces.

Products & Services

Crushers and Pulverizers
Maintenance Equipment and Supplies
Maintenance Services

Main Office

9762 Hanover Ct E
Henderson, CO 80640 USA
Phone: (303) 295-6000
www.denvermachine.com



Derrick Corporation

See our ad on p. 39

Booth 1715

Derrick has pioneered the development of wet and dry fine screening solutions to serve diverse industries throughout the world for more than 70 years. Derrick offers its clients leading-edge solutions to maximize separation efficiency. Using this patented equipment and innovative screen surface technology, offers unmatched performance – increased product recovery and reduced power consumption. Derrick equipment symbolizes rugged reliability, and remains committed to providing the latest technological enhancements that evolve alongside industry best practices and market developments. Derrick's latest patented products – the SuperStack® 8-Deck fine wet screening machine, and G-Vault® urethane interstage screen coupled Trilogy™ Surface Technology.

Products & Services

Centrifuges
Classifiers
Cyanide Process Equipment
Dewatering Equipment
Screens
Separators and Concentrators

Main Office

590 Duke Rd
Buffalo, NY 14225 USA
Phone: (716) 683-9010
www.derrick.com

Deswik

Booth 2612

Products & Services

Computer - Software and Services
Consulting - Engineering

Main Office

1660 Lincoln St, Ste 2610
Denver, CO 80264 USA
Phone: (720) 344-4920
www.deswik.com

DeWind One Pass Trenching LLC

Booth 1017

DeWind has the largest & most powerful One-Pass Trenchers in the World!

DeWind is the leading developer of One-Pass Trenching technology. All of DeWinds machines and attachments are custom built by DeWind. The fleet of trenchers are operated all across the US, Canada, and Mexico. All systems are installed under the water-table, no open excavation.

Installations include: • Cutoff Walls up to 150' deep • Groundwater & Product Recovery Systems up to 60' deep • Sock Tile Dewatering • PRB & Other Backfill

Systems to 60' deep • Soil Stabilization • HDPE Pipe 4" to 24" diameter • Much more!

Products & Services

Construction - Contracting Services
Dewatering Equipment
Reclamation Equipment and Services
Remediation
Sediment & Erosion Control
Underground - Construction and Structures

Main Office

9150 96th Ave
Zeeland, MI 49464 USA
Phone: (616) 875-7580
www.dewindonepass.com

DHI Water & Environment, Inc

Booth 2232

DHI provides independent and trusted advisory and software solutions to solve the world's toughest challenges in water environments. Our knowledge of water environments is second-to-none. It represents 50 years of dedicated research and real-life experience from more than 140 countries.

DHI is an independent, private and not-for-profit organization with over 1,000 dedicated employees worldwide. We are the first people you should call when you have a tough challenge to solve in a water environment – be it a mine, river, a reservoir, an ocean, a coastline, within a city or a factory.

Products & Services

Computer - Software and Services
Consulting - Engineering
Consulting - Environmental
Information Technology Products

Main Office

141 Union Blvd, Ste 320
Lakewood, CO 80304 USA
Phone: (720) 506-5282
Email: chda@dhigroup.com
www.dhigroup.com

Diemme Filtration SRL

Booth 1200

In the solid-liquid separation segment Diemme Filtration has succeeded in conquering a notable portion of the market thanks to its skill in extreme customization of plants, designed to specific customers needs. With our brand Diemme® Filtration we are one of the leading specialists in solid/liquid separation for industrial processes and offer the widest range of filter presses and thickeners currently available in the global market.

Products & Services

Dewatering Equipment
Environmental Control Equipment and Supplies
Filters, Filter Cloth and Accessories
Pumps
Remediation
Thickeners
Water Clarification and Treatment

Main Office

Via Gessi 16, Tax ID #02416280390
Lugo 48022 Italy

Phone: +39 054520611
https://www.diemmefiltration.com

Diesel Laptops

Booth 1101

Diesel Laptops provides diagnostic tools, training, and parts and repair information

Products & Services

Computer - Hardware and Services
Computer - Software and Services
Information Technology Products

Main Office

7440 Broad River Rd
Irmo, SC 29063 USA
Phone: (888) 983-1975
www.DieselLaptops.com

DistributionNOW - Pexgol Distributor

Booth 1133

DistributionNOW is a leading global supplier of industrial products and is a North American distributor of heavy duty Pexgol cross-linked polyethylene (PE-Xa) pipe for mining and other industries. Available in sizes up to 28" diameter and in long spool lengths, Pexgol has some unique benefits for the mining industry including corrosion resistance, excellent abrasion resistance, high and low temperature capabilities, outstanding anti-scaling properties, exceptional durability and resistance to impact, scratching & point loads. It can be used for transportation of slurries, brine transfer, de-watering, water supply, compressed air and other mine applications, as well as for mineral processing.

Products & Services

Pipes

Main Office

1303 E Hwy 350
Big Spring, TX 79720 USA
Phone: (403) 831-9952
https://www.dnow.com/pipe-and-tube/pexgol-pe-xa-pipe

Dodge Industrial, Inc

Booth 1336

Dodge, an RBC Bearings company, designs, manufactures, and supplies reliable mechanical power transmission products and solutions for a wide range of industries and markets across the globe. The industry and application experts at Dodge examine complete systems and provide solutions and services that improve operations and increase safety and efficiency for all stakeholders. Dodge has continuously built upon its reputation of leadership, innovation, and best-in-class service for over 140 years—a legacy that will carry on for years to come.

Products & Services

Belts - Power Transmission
Conveyor Belting - Accessories and Equipment
Couplings - Mechanical, Flexible and Rigid
Drives - Belt, Chain, Fluid and Gear
Gears - Pullers, Reducers and Pinions

EXHIBITORS

Main Office

1061 Holland Rd
Simpsonville, SC 29681 USA
Phone: (864) 297-4800
<https://dodgeindustrial.com/>

Drill Tech Drilling & Shoring Inc

Booth 1626

Products & Services

Construction - Contracting Services

Main Office

2200 Wymore Wy
Antioch, CA 94509 USA
Phone: (925) 978-2060
www.drilltechdrilling.com

Driver Industrial Safety

Booth 1132

Driver Industrial Safety™ is a quality manufacturer of market-driven Safety Products for industrial and commercial industries. We are headquartered in Phoenix, Arizona (USA) with manufacturing and warehouse facilities in the US & Canada and sell through our global distribution channels. We were originally founded in 2004 under our former recognized name SafetyWhips®. Driver was founded on the basis that there is a critical need for well-engineered and dependable products for work site safety. Clients depend on us to keep their worksite safe. Our combined 100+ years in LED and electronics manufacturing provides the best engineered products available for worksite safety.

Products & Services

Construction - Contracting Services
Drilling Contractors
Drilling Equipment
Loaders
Mine Operators

Mining Contractors

Safety Equipment
Scales
Transportation
Trucks and Haulage Units

Main Office

2115 W Mountain View Rd
Phoenix, AZ 85021 USA
Phone: (602) 424-2500
Email: sales@driverindustrial.com
www.driverindustrialsafety.com



DSI Underground LLC

Booth 2626

DSI Underground, a Sandvik company, is back in the US mining ground support and ready to serve you. We once again provide high quality roof support including solid rebar, inflatable and friction bolts, resin and other chemicals, as well as cable bolts and four different dynamic (seismic) bolts including the Sandvik MDX. In addition, we continue to design and manufacture our cold form standing supports, ribs and liner plate, customized for your shafts and slopes as well as continuous threadbar for bolting and slip lining shafts (hanging rods). Come see us!

Products & Services

Backfilling
Drill Bits - Rock
Drilling Equipment
Grouting Services, Equipment and Materials
Inflatable and Mechanical Packers

Roof - Ground Supports

Safety Equipment
Tunnel Lining and Support Materials
Underground - Construction and Structures

Main Office

1032 E Chestnut
Louisville, KY 40204 USA
Phone: (502) 473-1010
www.dsiunderground.com



Dyno Nobel

See our ad on p. 41

Booth 1621

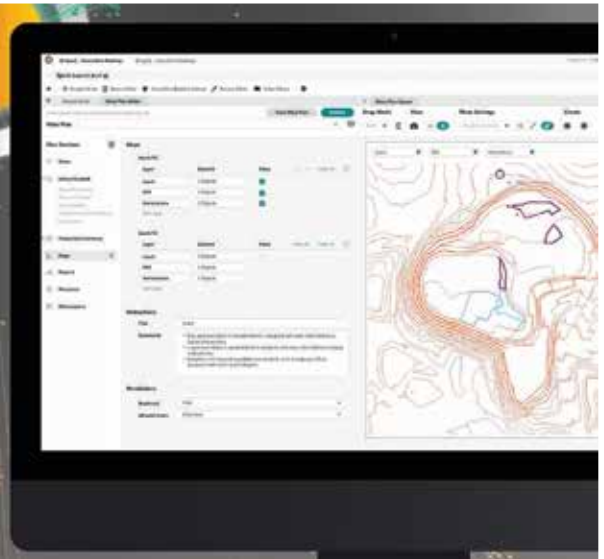
Customers in the mining industry choose Dyno Nobel for quality products, reliable service and technical expertise. Dyno Nobel is the market leader in North America with facilities in Australia, Canada, the United States, Indonesia, Mexico, South America and Papua New Guinea. With a customer driven focus, Dyno Nobel develops practical products that will benefit customers in real time. Customers can count on real solutions to their pain points of today, helping them to reduce costs and increase production. Renowned for excellent safety performance and innovative explosive products and services, Dyno Nobel continuously delivers ground-breaking performance through practical innovation.

Products & Services

Blasting Accessories, Equipment and Agents
Consulting - Design and Planning

SourceOne® **EKPS**
Enterprise Knowledge Performance System

SourceOne® EKPS is a data transformation tool that **delivers the right data to the right people whenever they need it**. With the SourceOne system, your disconnected data evolves into **valuable information**, allowing you to gain insights into your business.



Eclipse Mining Technologies

eclipsemining.com

EXHIBITORS

Consulting - Engineering
Explosive Materials and Services
Laboratory and Scientific Services
Mine Evaluations - Surface and Underground

Main Office

6440 S Millrock Dr, Ste 150
Salt Lake City, UT 84121 USA
Phone: (385) 347-2679
www.dynonobel.com

easyXAFS, LLC

Booth 2350

easyXAFS is the global leader in laboratory XAFS and XES instrumentation. This bulk sensitive, element specific measurement can show changes in oxidation state and local structure. Imagine what you can do with reliable, every day access to advanced x-ray spectroscopy. Our proven laboratory x-ray spectrometers give synchrotron-quality spectra and game-changing scientific freedom.

Products & Services

Laboratory Equipment and Supplies

Main Office

879 Rainier Ave N, Ste A103
Renton, WA 98057 USA
Phone: (253) 347-4480
Email: sales@easyxafs.com
easyxafs.com

EcoMister Evaporator

Booth 2402

The EcoMister Evaporator offers the most durable, cost effective wastewater disposal solution available to the mining industry today. Our NEW HDXL system will extend the life and value of a tailings pond and maintain adequate freeboard. We dramatically accelerate the evaporation process. The EcoMister Evaporator offers the potential to save millions of dollars in water management over the life of a mine.

Products & Services

Aerators
Automation
Dewatering Equipment
Dust and Fume Control Technology
Environmental Control Equipment and Supplies
Fans and Blowers
Pollution Control Equipment
Reclamation Equipment and Services
Remediation
Water Clarification and Treatment

Main Office

559 Okanagan Ave E
Penticton, BC V2A 3K4 Canada
Phone: (778) 476-8432
www.ecomister.ca

Eirich Machines, Inc

Booth 2404

Eirich Machines, part of worldwide Eirich Group, is an international supplier of innovative material processing technology and solutions. Our EIRICH product line includes grinders and mixers with peripheral equipment

for complete systems. EIRICH's cost- and energy effective grinding mills are for dry and wet grinding of brittle materials. You can reduce power consumption by 30-35% and have media consumption rates that are 45% of what conventional mills do. Visit booth 2404 to learn more!

Products & Services

Agitators, Vibrators and Mixers
Bins, Hoppers, Silos and Storage
Dryers
Grinding Mills
Process Controls and Instruments

Main Office

4033 Ryan Rd
Gurnee, IL 60031 USA
Phone: (847) 336-2444
Email: grindingsolutions@eirichusa.com
www.eirichusa.com

Emerson

Booth 1633

Emerson is a global solutions provider focused on helping Miners exceed key performance indicators: Safety, Production, Cybersecurity, Environmental Stewardship, and Sustainability. A long-time supplier of valves, instrumentation, and control systems, today's Emerson leverages OT expertise into enterprise-wide data solutions which leverage machine learning to manage asset performance, optimize mineral recovery, and provide autonomous control solutions.

Products & Services

Analyzers
Automation
Consulting - Engineering
Controls - Electrical and Electronic
Information Technology Products
Measurement and Monitoring Systems
Process Controls and Instruments
Sensors
Training Services
Valves

Main Office

8200 Market Blvd
Chanhassen, MN 55317 USA
Phone: (952) 949-7126
www.emerson.com/mining



Emesent

See our ad on p. 45

Booth 2134

Emesent is a world-leader in drone autonomy, LiDAR mapping, and data analytics. Founded in 2018, Emesent has since built a reputation for delivering high-quality data capture in the mining, infrastructure, survey and mapping industries. Our flagship product, Hovermap, is a smart mobile scanning unit that combines advanced collision avoidance and autonomous



EXTEND
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AUTONOMOUS
REACH

MINE~~X~~CHANGE
BOOTH # 2134



EXHIBITORS

flight technologies to map hazardous and GPS-denied environments. Hovermap is uniquely versatile, it can be mounted to a drone, cage, backpack or vehicle to map challenging, inaccessible areas. With a wide range of applications, Hovermap is being used by customers around the world.

Products & Services

Aerial Mapping and Surveying
Automation
Exploration Equipment and Services
Information Technology Products
Measurement and Monitoring Systems

Main Office

9200 E Mineral Ave, Ste 100
Centennial, CO 80112 USA
Phone: (972) 679-1587
www.emesent.com

EMFluids Ltd

Booth 1058

New Evaporation Technology for brine ponds and tailing ponds.

Products & Services

Dewatering Equipment
Pollution Control Equipment
Quality Improvement
Remediation

Main Office

7670 Mayfield St
Burnaby, BC V5E2J4 Canada
Phone: (604) 813-7331
www.emfluids.com

Endurance Belting

Booth 2611

Endurance Belting is a leading supplier of heavy-duty conveyor belting to the mining industry around the globe. Our success is a result of taking practical real-world insights from the field, translating them into belt design and building a high-quality product. We offer a wide range of belting options and innovative belting solutions that can address the material handling needs of your next project. We encourage you to visit our booth (2611) to learn more about the Endurance Belting approach and the successes we have had supplying heavy-duty belting to the mining sector.

Products & Services

Conveyor Belting - Accessories and Equipment
Conveyor Systems

Main Office

828 Ritson Rd S
Oshawa, ON L1H 5L4 Canada
Phone: (905) 443-0150
www.endurancebelting.com

Englo, Inc

Booth 2336

Products & Services

Consulting - Engineering
Dust and Fume Control Technology

Environmental Control Equipment and Supplies
Fans and Blowers
Fire Protection
Ventilation Systems, Materials and Equipment

Main Office

PO Box 1124
Beckley, WV 25802 USA
Phone: (304) 253-0777
www.engloinc.com

ENTACT

Booth 1838

ENTACT is a national provider of environmental and geotechnical construction solutions. Founded over 30 years ago on the belief that safety, technical excellence, field expertise, and sound business practices are all necessary to deliver outstanding service. Our unique group of experts create and implement field remediation and geotechnical solutions for a wide range of clients at their facilities and properties nationwide.

Products & Services

Construction - Contracting Services
Dredges
Excavators
Reclamation Equipment and Services
Remediation
Sediment & Erosion Control

Main Office

910 S Kimball Ave, Bldg 100
Southlake, TX 76092 USA
Phone: (630) 986-2900
Email: office@entact.com
www.entact.com

ENVECO Environmental Solutions, LLC

Booth 2050

ENVECO Environmental Solutions, LLC provides equipment and personnel services for processing, remediation, and associated waste disposal activities for Mining Operations, Deep Foundations, Slurry Wall Installations, Soil Stabilization, Tunneling, Heavy Civil Work, Ground Improvement, and Earth Retention Processes. We specialize in Liquid and Solid Separation, Water Treatment, Dewatering and Disposal! ENVECO also provides environmental consulting, process planning, and remediation oversight.

Our experienced staff will assist you with development of an all-encompassing plan for sludge and slurry processing, tailings, and waste pond processing. We recommend and apply methods and equipment for an economical and effective waste treatment, processing, and disposal execution plan.

Products & Services

Centrifuges
Consulting - Environmental
Dewatering Equipment
Dredges
Environmental Control Equipment and Supplies
Ion Exchange Equipment and Resins
Reclamation Equipment and Services
Remediation
Sediment & Erosion Control
Water Clarification and Treatment

Main Office

103 MANOR LAKE ESTATES DR, ESTATES DR
Spring, TX 77379 USA
Phone: 7138182930
Email: sales@envecoenvironmental.com
www.envecoenvironmental.com

Envirocon, Inc

Booth 1709

Envirocon safely and reliably delivers projects that protect, remediate, and restore our environment for commercial and government clients nationwide. Helping our clients meet their goals and objectives with innovative approaches in environmental remediation, ecological restoration, and decommissioning & demolition is what we do. Envirocon offers proven safety performance, project delivery, and financial strength and stability unmatched in our industry. We serve our clients with integrity and provide reliable, safe, and high-quality results.

Products & Services

Construction - Contracting Services
Dewatering Equipment
Excavators
Loaders
Reclamation Equipment and Services
Remediation
Sediment & Erosion Control

Main Office

101 International Dr
Missoula, MT 59808 USA
Phone: (406) 523-1150
www.envirocon.com

Environmental Products & Applications, Inc

Booth 2528

Products & Services

Dust and Fume Control Technology

Main Office

78-900 Ave 47, Ste 106
La Quinta, CA 92253 USA
Phone: (760) 777-8035
www.eparhino.com

Epiroc

Booth 1921

Epiroc is a leading productivity partner for the mining, infrastructure and natural resources industries. With cutting-edge technology, Epiroc develops and produces innovative drill rigs, rock excavation and construction equipment, and provides world-class service and consumables. The company was founded in Stockholm, Sweden, and has passionate people supporting and collaborating with customers in more than 150 countries.

Products & Services

Automation
Autonomous Vehicles
Drill Bits - Rock
Drilling Equipment
Loaders

Eriez Concentration & Separation Equipment for Minerals Processing



Eriez offers wet and dry, low-, medium- and high-intensity magnetic separators to concentrate magnetic ores or remove metallic contaminants and industrial minerals.

- High Intensity Magnetic Filters
- Magnetic Flocculators
- LIMS and MIMS Wet Drum Separators
- WHIMS Wet High Intensity Magnetic Separator
- Dry Vibrating Magnetic Filters
- Cross Belt Magnetic Separators
- Magnetic Mill Liner
- Trunnion Magnet System
- Demagnetizing Coils

Eriez designs and manufactures specialty flotation equipment, with more than 1,000 flotation column systems installed worldwide for cleaning, roughing and scavenging applications in base metals, gold, industrial minerals, coal and oil sands, phosphate and potash. Eriez also offers hydraulic separators, slurry distributors, spargers and an array of laboratory and pilot-scale equipment.

- HydroFloat® Coarse Particle Flotation
- StackCell® Small Footprint Flotation
- Column Flotation
- CrossFlow Classifier
- SlamJet™ Spargers
- CavTube Sparging

ERIEZ

Eriez.com | +1.814.835.6000

EXHIBITORS

Parts - Mining Machinery
Roof - Ground Supports
Trucks and Haulage Units

Main Office

8001 Arista Pl, Ste 400
Broomfield, CO 80021 USA
Phone: (844) 437-4762
Email: inquiries@epirocmarketing.com
www.epiroc.com



ERIEZ

See our ad on p. 47

Booth 2214

Eriez offers magnetic separation, magnetic purification and vibratory conveying solutions for the mining industry. Founded in 1942, Eriez' metal removal, wet and dry mineral processing technologies protect downstream equipment, product purity and the efficiencies of mineral processing and mining operations.

Eriez Flotation is a world leader in advanced flotation technology and is a wholly owned subsidiary of Eriez Manufacturing Co. Eriez Flotation provides advanced testing and engineering services, sparging and column flotation equipment, and game changing innovations in process technology such as HydroFloat® and Stack-Cell® for the mining and mineral processing industries.

Products & Services

Feeders
Flotation Machines and Equipment
Gravity Separators
Heavy Media Recovery Units
Magnetic Separators

Main Office

2200 Asbury Rd
Erie, PA 16506 USA
Phone: (814) 835-6000
Email: eriez@eriez.com
www.eriez.com

Esri

Booth 1142

Esri, the global leader in GIS software and location intelligence, helps customers unlock the full potential of data to improve operational and business results

Products & Services

Aerial Mapping and Surveying
Autonomous Vehicles
Computer - Software and Services
Consulting - Environmental
Exploration Equipment and Services
Geological-Physical-Technical Services and Equip
Information Technology Products

Mine Operators
Mineral Prospecting
Surveying Equipment and Supplies

Main Office

380 New York St
Redlands, CA 92374 USA
Phone: (909) 369-2953
<https://www.esri.com/en-us/industries/mining/overview>

Eurofins QTA

Booth 1135

Eurofins QTA, Inc. combines infrared (IR) technology, advanced modeling techniques, and a simple user

interface to provide detailed results—on site, in real time. The analysis is non-destructive, reagent-free, and requires no technical expertise to perform. In just a 60-second test cycle, limestone and dolomite producers can test both raw materials headed to the kiln and finished product. Eurofins QTA offers bench-top units, emission heads and mobile probe units that can test your un-mined, raw and finished material with the flash of a light!

Products & Services

Laboratory and Scientific Services

Main Office

8900 Beckett Rd
West Chester Township, OH 45069 USA

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A Tutor Perini Company

Phone: (216) 213-3736
Email: qtahelp@eurofinsus.com
www.qta.com

Evoqua Water Technologies

Booth 2238

Evoqua Water Technologies is THE global leader in helping municipalities and industrial customers protect and improve the world's most fundamental resource: water. We have a more than 100-year heritage of innovation and industry first, market-leading expertise, and unmatched customer service. From activated carbon, reverse osmosis, and mobile water solutions to membrane ultrafiltration and biological wastewater treatment, our industrial water, industrial wastewater, drinking water and municipal wastewater treatment products and services will provide the solution to meet your water treatment needs.

Products & Services

Controls - Electrical and Electronic
Dewatering Equipment
Fans and Blowers
Hoses - Valves and Fittings
Ion Exchange Equipment and Resins
Pumps
Reagents - Chemical and Flocculants
Valves
Water Clarification and Treatment

Main Office

1441 E Washington Blvd
Los Angeles, CA 90021 USA

Phone: (213) 379-0798
www.evoqua.com

ExcelSense Technologies

Booth 2801

ExcelSense Technologies designs and manufactures rugged, maintenance-free, self-cleaning cameras and lidars for equipment situational awareness, autonomous mining, and remote material process monitoring in dirty and harsh industrial environments.

Uniquely, ExcelSense's patented and award-winning technologies self-clean against abrasive dust, mud, oil, bitumen, potash, salt, and potash without requiring any fluid top-ups, compressed air, or maintenance for many years.

Products & Services

Autonomous Vehicles
Continuous Mining Machines
Conveyor Systems
Crushers and Pulverizers
Drilling Equipment
Electrical Equipment and Supplies
Excavators
Flotation Machines and Equipment
Safety Equipment
Trucks and Haulage Units

Main Office

109-3231 No.6 Road
Richmond, BC V6V 1Z1 Canada

Phone: (800) 914-3193
Email: golareh@excelsensetechnologies.com
www.excelsensetechnologies.com

Exyn Technologies

Booth 1205

Exyn Technologies is pioneering multi-platform robotic autonomy for complex, GPS-denied environments. For the first time, industries like mining, logistics, and construction can benefit from a single, integrated solution to capture critical and time-sensitive data in a safer, more affordable, and more efficient way. Exyn is powered by a team of experts in autonomous systems, robotics, and industrial engineering, and has drawn talent from Penn's world-renowned GRASP Laboratory as well as other storied research institutions. The company is VC-backed and privately held, with headquarters in Philadelphia.

Products & Services

Aerial Mapping and Surveying
Autonomous Vehicles
Computer - Software and Services
Mine Evaluations - Surface and Underground
Safety Equipment
Surveying Equipment and Supplies

Main Office

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Email: hello@exyntechologies.com
www.exyn.com

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EXHIBITORS

FC Mill Liners, Inc

Booth 1264

FC Mill Liners, Inc. is the North American distribution operation of Fundidora de Cananea, S.A. (FUCASA), specializing in the design and manufacturing of high-quality mill liners. Founded in 1970, FUCASA has been producing mill liners since 1980 and has become a principal supplier of cast iron and steel mill liners for AG, SAG, ball and rod mill liners in North America. As we celebrate FUCASA's 52nd year in business, we are building on our history as a proven supplier through innovations that offer our customers the highest-value, easiest and most reliable supply of custom mill liners, period.

Products & Services

Castings
Grinding Media and Liners
Grinding Mills

Main Office

4729 E Sunrise Dr, #502
Tucson, AZ 85718 USA
Phone: (480) 622-1263
www.fcmillliners.com

Federal Screen Products, Inc

Booth 1051

Federal Screen is a custom manufacturer and fabricator of wedge wire screens, delivering high-quality products and unmatched customer service. With over 25 years of experience, we provide filtration solutions that help lower operational and maintenance costs for mineral processors. Through advanced manufacturing capabilities and exceptional engineering, we produce screens in a variety of configurations and slot sizes to meet your specific application needs. We specialize in media retention nozzles, vessel internals, strainer baskets, support grids, resin traps, intake screens, flat panels, sieve bends, wastewater screens, MBBR system screens as well as custom designs.

Products & Services

Screens

Main Office

7524 Bath Rd
Mississauga, ON L4T 1L2 Canada
Phone: (905) 677-4171
federalscreen.com

FEECO International, Inc

Booth 1006

Products & Services

Dryers
Kilns
Maintenance Services

Main Office

3913 Algoma Rd
Green Bay, WI 54311 USA
Phone: (920) 468-1000
FEECO.com

FGX SepTech, LLC

Booth 2400

FGX Septeck, LLC is the world leader in supplying the dry coal (pneumatic) separators. The FGX technology uses air rather than water to beneficiate the run-of-mine coal, as well as other minerals. There are more than 2200 FGX pneumatic coal processing units operating through out the world. FGX have machines capable of processing from 10tph to 500tph of the ROM coal. Pilot-scale testing provided free of charge, at the client site for feasibility study. Currently there are three commercial scale units operating in the USA. It is one of the most economical and environment friendly Green technology.

Products & Services

Coal Preparation Plants
Gravity Separators
Mineral Prospecting

Main Office

289 Blue Sky Pkwy
Lexington, KY 40509 USA
Phone: (859) 263-8300
www.fgxsepteckllc.com

Fibracan LLC

Booth 2603

Products & Services

Conveyor Systems

Main Office

2925 E Ganley Rd
Tucson, AZ 85706 USA
Phone: (520) 294-0123
www.fibracan.com



FKC-Lake Shore

See our ads on p. 48 & 49

Booth 1504

FKC-Lake Shore offers design-build-install services for innovative hoisting and vertical conveyance systems used to transport personnel and material. Our Field Services Division provides 24/7 emergency repair of electrical and mechanical systems. Products & Services: Vertical Conveyors, Skips, Hoists, Sheaves, Cages, Headframes, Brakeman Cars, Controls, Field Services, and Wire Rope NDT. FKC's Mine Development Division provides comprehensive, mine development services to our owners and partners with techniques such as Blind Drilling, Raise Boring, Conventional Shaft Sinking, and Slope/Decline Tunnel Construction. Frontier-Kemper also provides services for shaft repair and grouting for ground stability and water control as well as full-service production mining.

Products & Services

Construction - Contracting Services
Controls - Electrical and Electronic
Conveyor Systems
Drilling Contractors
Hoists - Controls and Accessories
Maintenance Services
Underground - Construction and Structures

Main Office

1695 Allen Rd
Evansville, IN 47710 USA
Phone: (812) 426-2741
www.fkc-lakeshore.com

Flender Corporation

Booth 2424

Products & Services

Brakes - Dynamic, Friction Disk - Block, Magnetic
Clutches - Fluid, Friction and Magnetic
Conveyor Systems
Couplings - Mechanical, Flexible and Rigid
Drives - Belt, Chain, Fluid and Gear
Gears - Pullers, Reducers and Pinions
Grinding Mills
Maintenance Equipment and Supplies
Power Transmission Equipment

Main Office

1401 Madeline Ln
Elgin, IL 60124 USA
Phone: (224) 517-5604
www.flender.com

Flexco

Booth 1321

Whether you are a small farm in the Midwestern United States, or a large mine in eastern Europe, or a global parcel handling operation with facilities around the world, we are focused on becoming your number one resource for products and services that maximize your belt conveyor uptime, productivity, and safety. Visit Flexco at booth 1321 to learn more!

Products & Services

Parts - Mining Machinery
Safety Equipment

Main Office

2525 Wisconsin Ave
Downers Grove, IL 60515 USA
Phone: (800) 541-8028
www.flexco.com

Flottweg Separation Technology, Inc

See our ad on p. 51

Booth 1415

Flottweg provides liquid solid separation equipment for mining applications. Their 2 and 3 phase decanter centrifuges and separator centrifuges are used in CRUD separation, gravel washing, drilling mud recovery, solvent extraction, oily water solids separation, solids sorting, and wastewater treatment. Skid mounted and containerized systems are also available. Contact us today for a trial.

Products & Services

Centrifuges
Dewatering Equipment
Environmental Control Equipment and Supplies
Pollution Control Equipment
Separators and Concentrators
Solvents - Extraction, Mixer and Settlers



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For 25 years, Flottweg centrifuges have been used for organic electrolyte recovery and solids dewatering from CRUD streams. Centrifuges are durable, low maintenance, and provide great operational efficiency.

To learn
more, please
join us at



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Engineered For Your Success

EXHIBITORS

Main Office

10700 Toeppen Dr
Independence, KY 41051 USA
Phone: (859) 448-2300
www.flottweg.com

FLSmidth A/S

Booth 1801

FLSmidth provides sustainable productivity to the global mining and cement industries. We deliver market-leading engineering, equipment and service solutions that enable our customers to improve performance, drive down costs and reduce environmental impact. Our operations span the globe and we are 12,000+ employees, present in more than 60 countries. In 2021, FLSmidth generated revenue of DKK 17.6 billion. MissionZero is our sustainability ambition towards zero emissions in mining and cement by 2030.

Products & Services

Conveyor Systems
Dewatering Equipment
Flotation Machines and Equipment
Grinding Mills
Pumps
Separators and Concentrators
Thickeners

Main Office

7158 S FLSmidth Dr, PO 2876006893-IP
Midvale, UT 84047 USA
Phone: (801) 871-7000
www.flsmidth.com

Fluid Life

Booth 2246

As a leading provider of asset management solutions and lubrication analysis, Fluid Life uses its cutting edge software, training, tools and supported programs to improve customers' bottom line, lower maintenance costs and improve equipment availability. What's more, Fluid Life is the only company of its kind to offer reliability services backed by its in-house labs. Over the past 40 years, Fluid Life has established a great reputation and long-standing partnerships with customers in the mining, construction, industrial plant, oil and gas and transportation industries.

Products & Services

Analyzers
Lubricants and Equipment
Measurement and Monitoring Systems
Sensors
Training Services

Main Office

3710 W Royal Ln, Unit 145
Irving, TX 75063 USA
Phone: (877) 962-2400
www.fluidlife.com



LEADERS IN PROCESS TECHNOLOGY

Fluid Systems // FSI Screens // FSI Industrial

Fluid Systems, Inc

Booth 1251

Fluid Systems is a worldwide provider of process technology to the Mining, Industrial, Environmental, Oil and Gas Industries. Fluid Systems has manufactured its own line of equipment in Houston, TX for more than 40 years. We continue to be innovative with new technologies and make quality improvements to our own line of equipment. Our focus is on process design and process improvement. We pride ourselves on being able to take a customers vision and turn it into a reality. We can customize your needs on zero discharge systems, solids/liquid separation systems, dewatering systems, tank packages and trailer packages.

Products & Services

Agitators, Vibrators and Mixers
Centrifuges
Classifiers
Dewatering Equipment
Quality Improvement
Screens
Water Clarification and Treatment

MAGNASHEAR™

When Brake Failure is Not an Option
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With Oil Shear Technology



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Years of Maintenance Free Service
Ask About Hazardous Duty



Tension-Winches
Downhill-Conveyors
Barge-Spotters
Rail Car-Spotters
Ship-Loaders

Cranes **Hoists**
Winches **Trippers**

Learn More
Booth #2720



Force Control Industries, Inc. Fairfield, Ohio USA
Phone: 513-868-0900 - 800-829-3244
info@forcecontrol.com www.forcecontrol.com

Main Office

18703 Intercontinental Crossing Dr
Houston, TX 47882 USA
Phone: (832) 467-9898
www.fluidsystems.com/

FM Technologies**Booth 2251**

FM Technologies provides the worlds highest performance and most cost effective liquid-solid separation equipment for mining and minerals applications. The all new filter technology was conceived and developed to outperform all existing equipment by a magnitude or more. The Universal Vacuum Filter (UVF) utilizes the newly developed Ceramiguard filter media to provide optimum filtration along with the lowest CAPEX and OPEX. The UVF filter is ideally suited for concentrate and tailings dewatering. Test and compare with all others - nobody comes close!

Products & Services

Backfilling
Continuous Mining Machines
Dewatering Equipment
Filters, Filter Cloth and Accessories
Laboratory and Scientific Services
Separators and Concentrators

Main Office

945 Front St, Ste D
Novato, CA 94945 USA
Phone: (510) 932-5552
www.fmtechnologies.com

Foam Concepts LLC**Booth 1450****Products & Services**

Reclamation Equipment and Services

Main Office

4255 S Eagleson Rd
Boise, ID 83705 USA
Phone: (800) 556-9641
www.foamconceptsllc.com

**Force Control Industries, Inc**

See our ad on p. 52

Booth 2720

Force Control Industries, Inc. manufacturers superior quality, uniquely designed industrial clutches and brakes. Based on oil shear technology, our industrial clutch and brake products provide superior life, as well as smooth operation and quicker response. Force Control clutch and brake products are used on many types of machinery in the manufacturing of steel, coal, paper, concrete, brick, lumber, fiberglass, tires, automotive, wire, and many more. Please see our list of application bulletins for more information.

Products & Services

Automation
Brakes - Dynamic, Friction Disk - Block, Magnetic
Clutches - Fluid, Friction and Magnetic
Power Transmission Equipment

Main Office

3660 Dixie Hwy
Fairfield, OH 45014 USA
Phone: (513) 868-0900
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Forgen**Booth 2526**

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Products & Services

Construction - Contracting Services
Reclamation Equipment and Services
Remediation

Main Office

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www.forgen.com

Formsprag & Marland Clutch**Booth 1421**

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Power Transmission Equipment

Main Office

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Warren, MI 48089 USA
Phone: (815) 389-6244
www.formsprag.com; www.marland.com

Forte Dynamics

Booth 2733

Forte Dynamics is a consulting and engineering firm that specializes in all aspects from mining to production, taking your project from exploration through feasibility. This includes open pit resource and reserve modeling, mine planning, blasting analysis, metallurgical testing, process design, recovery modeling, detailed engineering, NI 43-101 reporting, and EPCM services. It's not only what we bring to the table - deep expertise and cutting-edge innovation in engineering, metallurgy, and systems performance modeling. It's what we bring to the relationship - collaboration, trusted advice, and a commitment to increase mining production and maximize project return.

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Consulting - Engineering
Consulting - Environmental
Consulting - Management
Consulting - Research
Laboratory and Scientific Services
Laboratory Equipment and Supplies
Mine Evaluations - Surface and Underground
Process Controls and Instruments

Main Office

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Fort Collins, CO 80524 USA
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www.fortedynamics.com

Foth Infrastructure & Environment, LLC

Booth 2432

Foth empowers clients to unlock the potential of their key mining projects. Our firm provides a unique and holistic approach to project development that is business enabling and supports optimization and leverages the long-term economics of your mining assets. Our team of mining professionals offers a combination of expertise to strategically manage projects from concept, through sustainable operations, to closure. Since 1938 the firm has thrived in a dynamic and demanding marketplace by solving our clients' toughest science and engineering challenges. Our 600-member, employee-owned firm operates out of 27 locations across the United States and Canada.

Products & Services

Consulting - Design and Planning
Consulting - Engineering
Consulting - Environmental
Consulting - Management

Main Office

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De Pere, WI 54115 USA
Phone: (920) 497-2500
www.foth.com



**FREEPORT-
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Freeport-McMoRan Inc

See our ad on p. 53

Booth 1343

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EXHIBITORS

district in Arizona and the Cerro Verde operation in Peru. By supplying responsibly produced copper, the company is proud to be a positive contributor to the world well beyond its operational boundaries.

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Recruiting/Staffing

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www.fcx.com



Frontier Precision Geospatial/ Unmanned

See our ad on p. 55

Booth 1110

Frontier Precision is a distributor of geospatial survey and mapping products, unmanned aerial and ROV products, as well high precision satellite imagery and software - we have over 34+ years of experience working in mining environments.

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FUCHS LUBRICANTS CO

Booth 1564

Products & Services

Lubricants and Equipment

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G+ Plastics

See our ad on p. 54

Booth 2548

G+ Plastics is a family-owned business founded in 1995 in Rouyn-Noranda, Canada, in the heart of the Abitibi Gold Belt. We have pioneered the use of heavy-duty and long-lasting plastic products in the mining industry; our unique expertise of industrial polymers eventually helped to create the G+ Speed Air Duct, a complete product line designed to meet all auxiliary ventilation needs. It is a nearly frictionless plastic duct with airtight junctions that can forward airflow farther with up to 50% less fan power.

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Ventilation Systems, Materials and Equipment

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plasticminer.com

Garmin International

Booth 2337

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GEA Systems North America LLC

Booth 1470

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General Kinematics

See our ad on p. 57

Booth 1429

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www.gkmining.com

Geobrugg North America, LLC

Booth 2443

Geobrugg manufactures tested and proven steel wire meshes and protection systems for ground support, rockfall protection and slope stabilization to improve safety and productivity for mining operations. Systems include rolled mesh from high-tensile strength steel wire, the MESH@ mesh-unrolling device for bolting machines, rockfall barriers and attenuators, slope drapes, and anchored mesh for slopes. With representatives throughout the USA, Canada, Mexico and the world, and manufacturing at our Algodones, New Mexico factory, we provide solutions and support tailored to the needs of today's open pit and underground mines in a fast and dependable manner.

Products & Services

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Booth 1714

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Phone: (800) 477-2506
www.geo-instruments.com

GEOKON

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GEOKON is a recognized world leader in the manufacture of structural and geotechnical instrumentation. Founded in 1979, GEOKON has grown to more than 130 associates and offers a full complement of instrumentation for a wide range of industries including tunnels, dams, mines, piles, bridges, pipelines, landfills, embankments, transportation and wind turbines. GEOKON incorporates state-of-the-art manufacturing processes and equipment to produce the highest quality and performing products on the market. Mechanical, electrical and software engineering teams collaborate to develop the most innovative, accurate and reliable instrumentation in the industry. For more information, visit our website, email or call.

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www.geokon.com

Geo-Logic Associates

Booth 1728

Products & Services

Consulting - Engineering
Consulting - Environmental

Main Office

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www.geo-logic.com



Geopyrora

Booth 2932

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www.geopyrora.com

Geosyntec Consultants

Booth 2225

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Consulting - Environmental
Mine Evaluations - Surface and Underground
Remediation
Sediment & Erosion Control
Water Clarification and Treatment

Main Office

215 South St, Ste 500
Salt Lake City, UT, UT 84111 USA
Phone: (786) 312-6015
<https://www.geosyntec.com/>

Geotech Environmental Equipment, Inc

Booth 1624

Geotech is an environmental equipment manufacturer who supplies field equipment used to collect and product high-quality and repeatable analytical data. When remedial action is needed, Geotech offers a complete line of remediation technologies that range from passive to automated active recovery systems. Geotech will feature and demonstrate SiteView - a centralized project management cloud-based application that provides real-time remote access to data being collected at one or multiple sites. SiteView features secure log-in credentials with administrative or user permissions to efficiently share information and alerts across all

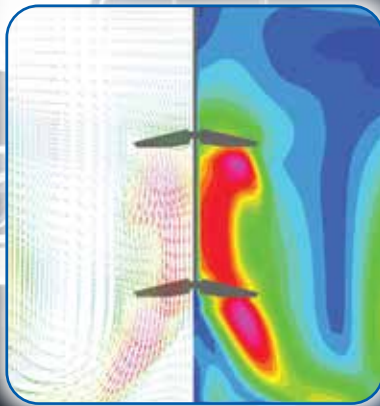


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Geotemps, Inc / Geopros, Inc

Booth 1516

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Mining Contractors
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Geovert LLC

Booth 2642

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Construction - Contracting Services

Main Office

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www.geovert.com

GHD

Booth 2150

GHD is a global professional services company com-

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Main Office

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Phoenix, AZ 85016 USA
Phone: (602) 216-7200
www.ghd.com

Global Mining Guidelines Group

Booth 2602

The Global Mining Guidelines Group (GMG) is a network of representatives from mining companies, original equipment manufacturers (OEMs), original technology manufacturers (OTMs), research organizations, academia, regulatory agencies, consultancies, and industry associations who collaborate to tackle the challenges facing our industry. GMG aims to accelerate the improvement of mining performance, safety and sustainability by creating guidelines and white papers that address common industry challenges, facilitating collaboration and expanding the industry's knowledge base. GMG also hosts and supports events that bring mining stakeholders together along with external industries to address the industry's challenges, successes and innovations. Visit our website to learn more.

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Educational
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Global Mining Review

Booth 1523

A premier source of technical and analytical information, Global Mining Review is essential reading for all mining professionals. Each issue provides unparalleled coverage of the mining industry – including regional and special commodity reports, as well as detailed technical articles and case studies.

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Publishers

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Email: will.owen@globalminingreview.com
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Booth 1104

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Kilns
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Maintenance Equipment and Supplies
Maintenance Services
Solvents - Extraction, Mixer and Settlers

Main Office

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Guideline Geo Americas –**Reutech***Booth 1723***Products & Services**

Mine Operators

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H2E Inc*Booth 1238***Products & Services**

Consulting - Engineering

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Remediation
Roof - Ground Supports
Shotcrete Equipment, Supplies and Services
Tunnel Boring Equipment
Underground - Construction and Structures

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Hatch*Booth 1334*

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Mining Contractors
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Underground - Construction and Structures
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**Hayward Gordon ULC***See our ad on p. 59**Booth 1536*

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The Hayward Gordon Group designs, develops, and delivers durable, reliable pumps and mixers ideal for the mining industry. Our pumps effortlessly move thick, heavy slurries and withstand corrosive and toxic chemicals. Our mixers and agitator systems efficiently help separate metal from ore and handle backfill and wastewater.

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Pumps
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Main Office

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Phone: (905) 693-8595
Email: info@haywardgordon.com
www.haywardgordon.com

EXHIBITORS

Hazen Research

Booth 1327

Products & Services

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Golden, CO 80403 USA
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www.hazenresearch.com



Headwater Technologies

Booth 2727

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Booth 1459

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HEICO Fastening Systems

Booth 2803

Main Office

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Hepburn Engineering Inc

Booth 2538

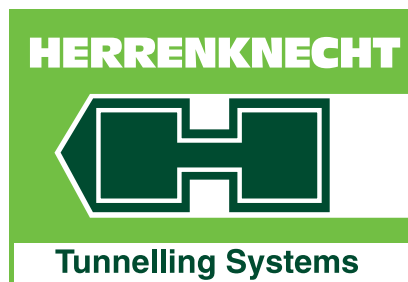
Hepburn Engineering designs and supplies complete mine hoisting systems with fully integrated electrical controls, digital drives, including our state of the art Hepburn Hoist Manager software and digital safety monitors. Our mechanical hoist designs range from shaft sinking up to the largest production requirements: single and double drum, Blair and friction (Koepe) hoisting plants. HEI provides efficient and robust designs and fully integrated hoisting solutions with single source responsibility. Additional services include the design and supply of stage winches, sheaves, automated weighing systems, new braking systems, hoist rebuilding & electrical refits including drives, motors and hoist operator consoles.

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Booth 2206

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Drilling Equipment
Tunnel Boring Equipment

Main Office

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www.herrenknecht.com

Hexagon's Mining division

Booth 2001

Hexagon is a global leader in digital reality solutions, combining sensor, software and autonomous technologies. We are putting data to work to boost efficiency, productivity, quality and safety across industrial, manufacturing, infrastructure, public sector, and mobility applications. Our technologies are shaping production and people-related ecosystems to become increasingly connected and autonomous — ensuring a scalable, sustainable future. Hexagon's Mining division solves surface and underground mine challenges with proven technologies for planning, operations and safety. Hexagon (Nasdaq Stockholm: HEXA B) has 21,000 employees in 50 countries and net sales of approximately 4.6bn USD. Visit our website to learn more.

Products & Services

Aerial Mapping and Surveying
Autonomous Vehicles
Blasting Accessories, Equipment and Agents
Computer - Software and Services
Consulting - Design and Planning
Drilling Equipment
Explosive Materials and Services
Flotation Machines and Equipment
Measurement and Monitoring Systems

Main Office

40 E Congress St, Ste 150
Tucson, AZ 85701 USA
Phone: (520) 440-6418
www.hexagonmining.com

Hexion Inc

Booth 1153

Hexion is a specialty chemical company that has been in business for over 100 years and offers products for the mining industry. Hexion's Hexafloat is a low viscosity, anionic collector for froth flotation/mineral separation. Hexion's Convirj is low viscosity, water soluble depressants for ash and iron sulfide minerals.

Products & Services

Reagents - Chemical and Flocculants

Main Office

180 E Broad St
Columbus, OH 43215 USA
Phone: (281) 796-7964
<https://www.hexion.com/>

Hilfiker Retaining Walls**Booth 2210**

Hilfiker Retaining Walls is a fourth-generation, family-owned business operating in Eureka, California since 1902, and produces a full line of high quality retaining wall systems that have been utilized in projects worldwide. The Welded Wire Wall system is the industry leader for wire-faced MSE walls, used for crusher or truck dump applications and haul road support, regardless of height and loading. Spiralnails are the latest innovations and used to extend the life of existing structures, accommodate emergency situations, construction shoring, and foundation improvement. The company also offers engineering services and on-site technical assistance to aid in construction.

Products & Services

Consulting - Design and Planning
Conveyor Systems
Geological-Physical-Technical Services and Equip
Rail Systems and Supplies
Temporary Structures
Trucks and Haulage Units
Underground - Construction and Structures

Main Office

1902 Hilfiker Ln
Eureka, CA 95503 USA
Phone: (800) 762-8962
www.hilfiker.com

Hilliard Brake Systems**Booth 2327**

Founded in 1905, The Hilliard Corp. has evolved from a one-product business into a special applications engineering company serving customers worldwide. Independently owned for four generations, the company has grown and prospered for nearly a century. Hilliard offers a broad line of motion control products including caliper brakes for conveyors, brake systems for draglines, as well as the New Brake Boss brake control system. Additionally, it manufactures filtration systems, reclaiming equipment, and cartridges under the Hilco brand name. Hilliard products are designed, manufactured, and sold according to the customers' applications. Hilliard Braking Systems, Made in America, Built for the World.

Products & Services

Brakes - Dynamic, Friction Disk - Block, Magnetic

Main Office

100 W Fourth St
Elmira, NY 14901 USA
Phone: (607) 733-7121
www.hilliardcorp.com

Hoffman Manufacturing, Inc**Booth 1246**

HMFG manufactures versatile Mine Door & Bulkhead Systems for mining companies, contractors, & engineering firms around the world. Superior quality, robust design elements, and integrated safety features make our Mine Door & Bulkhead Systems Better, Stronger, & Safer than any others on the market.

Additionally, HMFG provides design/build fabrication solutions with industry leading quality & lead times.

All of our products are designed and manufactured in-house in the USA!

Products & Services

Construction - Contracting Services
Consulting - Design and Planning
Consulting - Engineering
Controls - Hydraulic and Pneumatic
Conveyor Systems
Fans and Blowers
Hydraulic System Components
Mining Contractors
Underground - Construction and Structures
Ventilation Systems, Materials and Equipment

Main Office

602 W Spring Valley Rd
Latah, WA 99018 USA
Phone: (509) 286-3200
www.hoffman-mfg.com

Honeywell**Booth 2037**

Honeywell is a Fortune 500 technology company that delivers industry specific solutions that include aerospace products and services; control technologies for buildings and industry; and performance materials globally. Our technologies help aircraft, buildings, manufacturing plants, supply chains, and workers become more connected to make our world smarter, safer, and more sustainable.

Products & Services

Alarm Systems
Analyzers
Automation

INDEPENDENT

MINING CONSULTANTS, INC.

- Mine Design, Planning and Scheduling
- Mining Feasibility Studies and Technical Reporting
- Documents: (S-K 1300, NI 43-101, JORC)
- Exploration Guidance
- Contract Mine Engineering & Management
- Resource Modeling / Reserve Estimation
- Due Diligence & Technical Advisory
- Surface and Underground Mine Evaluation
- Production Scheduling and Strategic Planning

Serving the Mining Industry Since 1983

Visit Us at Booth 2115



www.imctucson.com

Tel: +1 (520) 294-9861

EXHIBITORS

Computer - Software and Services
Information Technology Products
Measurement and Monitoring Systems
Process Controls and Instruments

Main Office

715 Peachtree St
Atlanta, GA 30308 USA
Phone: (470) 760-7795
www.honeywell.com

Hose Solutions Inc

Booth 2338

Products & Services

Dewatering Equipment
Hoses - Valves and Fittings
Pipes

Main Office

9419 E San Salvador Dr, #104
Scottsdale, AZ 85258 USA
Phone: (480) 607-1507
Email: Sales@HoseSolutions.com
www.HoseSolutions.com

Howden Canada Inc

Booth 1515

For more than a century, Howden has supplied ventilation fans and equipment to every major mining company in the world. Today, Howden's Total Mine Ventilation Solutions (TMVS) is a fully integrated approach to mine ventilation and air quality control. By reducing blast-clearing downtime, Howden can improve energy savings by up to 50%. Howden is able to provide all necessary equipment, services, and Ventsim solutions mine sites require in a fully customizable and integrated product offering: Main and Auxiliary Fans, Mine Heaters, Mine Cooling, VOD, and Turnkey solutions.

Products & Services

Automation
Computer - Software and Services
Construction - Contracting Services
Consulting - Engineering
Controls - Electrical and Electronic
Coolers
Environmental Control Equipment and Supplies
Fans and Blowers
Sensors
Ventilation Systems, Materials and Equipment

Main Office

1381 Rue Hocquart
Saint-Bruno-de-Montarville, QC J3V 6B5 Canada
Phone: (450) 500-5947
<https://www.howden.com/en-us/industries/mining/mine-ventilation>

HUESKER Inc

Booth 1815

HUESKER Minegrid® was developed to help mine operators maximize safety, production and profits, by speeding up longwall recoveries and by providing stronger and more workable grids for rib- and roof mesh and highwall support. HUESKER Minegrid® provides safer and faster methods to increase safety and

profits in all mining operations worldwide. HUESKER offers the most complete product line of geogrids, geocomposites and geotextiles that deliver cost effective engineering solutions.

Products & Services

Consulting - Design and Planning
Consulting - Engineering
Consulting - Environmental
Dewatering Equipment
Longwall Mining Equipment
Roof - Ground Supports

Main Office

PO Box 411529
Charlotte, NC 28241 USA
Phone: (704) 588-5500
www.huesker.com

Hydro, Inc

Booth 2909

Hydro's mission is to work hand-in-hand with our valued customers to optimize the performance and reliability of their pumping systems by evaluating and understanding root causes of pump degradation or failure and by providing unbiased engineering analysis, quality workmanship, and responsive field service for improved plant operation.

Products & Services

Pumps
Sensors
Training Services

Main Office

834 W Madison
Chicago, IL 60607 USA
Phone: (773) 590-6736
<https://hydroinc.com/>

hydroGEOPHYSICS Inc

Booth 2339

HGI is an innovative, solutions oriented geophysical consulting and service provider to the environmental, engineering, groundwater, mining, oil & gas, and natural resource exploration industries. We specialize in the application of 3D geophysical methods for time lapse subsurface characterization and monitoring of fluid flow through geological materials. Additionally, HGI is a leader in providing Leak Location and Leak Detection & Monitoring in geosynthetic lined ponds, landfills, and heap leaches using electrical methods.

Products & Services

Consulting - Engineering
Consulting - Environmental
Consulting - Research
Geological-Physical-Technical Services and Equip
Laboratory and Scientific Services
Linings and Claddings

Main Office

3450 S Broadmont Dr, Ste 100
Tucson, AZ 85713 USA
Phone: (520) 647-3315
www.hgiworld.com/

HydroTech Mining

Booth 1169

Hydrotech Mining is clearly distinguishable in the mining market. The focus of our operations and expertise is based specifically for moving water.

The great versatility of our company lies in the fact that we can offer solutions for pumping dirty water as well as for clean water, unlike others that provide only pumping solutions for clean water. HTM is therefore not limited by the type of mining operations.

Products & Services

Dewatering Equipment
Pumps
Water Clarification and Treatment

Main Office

297, 7e Rue
Val-d'Or, QC J9P 0G5 Canada
Phone: (819) 874-4499
www.hydrotechmining.com

HYTORC, Division of UNEX Corp

Booth 1357

HYTORC makes industrial bolting safer and simpler. With 50 years of experience focused entirely on developing the highest quality industrial bolting systems, HYTORC is the most trusted name in the industry. From steel mills and mining equipment to refineries, power plants, wind turbines, and transportation vehicles; we have developed solutions for every bolting application imaginable. For custom projects, our highly experienced engineering team is at your service to design the most efficient solution for your job with simple operation and economical pricing in mind.

Products & Services

Fasteners - Industrial
Maintenance Equipment and Supplies
Transportation

Main Office

333 Route 17 N
Mahwah, NJ 07430 USA
Phone: (201) 512-9500
Email: info@hytorc.com
www.hytorc.com

Immersive Technologies

Booth 1509

As a global technology leader in the mining industry, Immersive Technologies' mission is to increase your site's profitability by optimizing the safety and productivity of your operators through our workforce optimization strategy - aligning People, Process & Technology. With the largest deployment of mining simulators in surface and underground, a global customer base, industry endorsement, proven real results and engineering expertise, Immersive Technologies is the recognized and trusted leader in mining training solutions. We are the only worldwide equipment simulator supplier with a proven track record of delivering significant and measurable in pit cost reductions, productivity gains and safety improvements.

Products & Services

Autonomous Vehicles

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and tomorrow
and the next day
and next year
and the year after that....



Clear voice communication that you can actually HEAR in a noisy environment is just one of the many capabilities of an IWT *SENTINEL*™ System.

And, because IWT is a trusted partner to the mining industry, we are committed to providing innovative solutions both today and well into the future.



SME MINEXCHANGE Booth 1526 iwtwireless.com

EXHIBITORS

Draglines
Excavators
Information Technology Products
Loaders
Mine Evaluations - Surface and Underground
Mine Operators
Safety Equipment
Training Services
Trucks and Haulage Units

Main Office

1486 S Distribution Dr
Salt Lake City, UT 84104 USA
Phone: (801) 748-0844
www.immersivetechologies.com



Independent Mining Consultants, Inc

See our ad on p. 63

Booth 2115

Since 1983 IMC has earned and gained the reputation as one of the most reliable and cost effective sources of consulting services for the base and precious metals, and industrial minerals marketplaces. IMC not only authors mine feasibility studies but mining studies of all levels with experience in NI 43-101, JORC, and Reg-

ulation S-K 1300/ SEC 10K documents. Our Clients include major and minor commodity producers, junior exploration firms, public sector entities, and financial institutions. IMC has served the mining industry by working for more than 250+ Mining Companies on 500+ Mining Projects across the globe.

Products & Services

Consulting - Design and Planning
Consulting - Engineering
Consulting - Financial Services
Consulting - Management
Exploration Equipment and Services
Geological-Physical-Technical Services and Equip
Mine Evaluations - Surface and Underground
Mine Operators
Quality Improvement

Main Office

3560 E Gas Rd
Tucson, AZ 85714 USA
Phone: (520) 294-9861
www.imctucson.com

InduMar Products Inc

Booth 1437

InduMar has provided innovative solutions for pipe leaks, repair and protection to a range of industrial sectors since 1986. Our products are designed to address pipe and tank leaks, corrosion control, and mechanical pipe rehabilitation, with an emphasis on ease of installation, high performance, and longevity. Our products include Stop It® Pipe Repair System, BoreShield™

line of abrasion resistant outerwraps (AROs), XCorr™ suite of epoxy repair products, and StopCorr™ line of polyolefinic wraps, pastes, and sealants. Contact us at +713-977-4100 in Houston, TX to discuss potential solutions to your repair and remediation needs.

Products & Services

Coatings (does not include Linings and Claddings)
Maintenance Equipment and Supplies

Main Office

2230 W Governors Cir
Houston, TX 77092 USA
Phone: (713) 977-4100
www.indumar.com

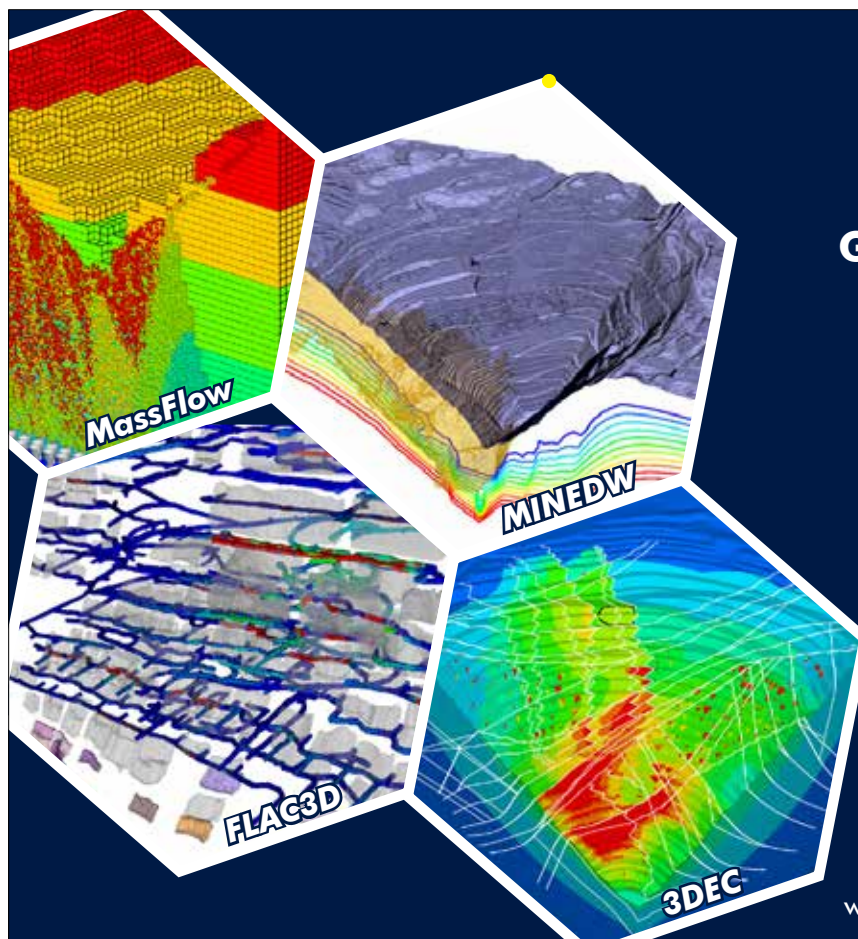
Industrial Scientific

Booth 1144

As the global leader in gas detection, Industrial Scientific provides gas detection products and services that keep workers safe in hazardous environments. The company's more than 1200 employees in 25 countries are committed to preserving human life and have dedicated their careers to eliminating death on the job by the year 2050.

Products & Services

Alarm Systems
Analyzers
Fire Protection
Measurement and Monitoring Systems
Safety Equipment



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FEBRUARY 26 - MARCH 1 | DENVER, COLORADO



JENNMAR has been the innovative leader in ground control for the mining industry for more than forty years. Over the past decade, our growth has led us to structural support in tunneling and civil construction projects, implementing the same vigor and detailed processes. Because we understand the ever changing and demanding conditions above and below ground we have built the richest portfolio of diverse and complementary brands.

JENNMAR sets the bar in every industry we serve and as we continue to grow, our focus will always be on the customer. Our products are made in the U.S.A. and backed by experienced engineers and technicians who are with you every step of the way, from initial consultation to qualified instruction and on-going technical support. We support and are dedicated to rebuilding infrastructure worldwide.

SAFETY,
SERVICE, AND
INNOVATION



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For more information, visit us at www.jennmar.com or email us at info@jennmar.com

EXHIBITORS

Sampling Devices
Sensors
Training Services

Main Office

One Life Way
Pittsburgh, PA 15205 USA
Phone: (412) 788-4353
www.indsci.com

Information Alignment Pty Ltd

Booth 1668

Information alignment has been a major developer and supplier of software for the mining industry since the early 2000's. Recognised as a market leader in this key area of software for mining operations and our products are installed at operations across Australia, North America, South America, Africa and Asia and more recently licensed to Caterpillar globally as their reporting platform. We continue to invest heavily in research and development activities, to meet new requirements in the mining and extractive industries including functionality to support autonomous haulage, autonomous drilling, underground fleet systems, Processing Plant data flow and geo-spatial intelligence and visualization.

Products & Services

Computer - Software and Services
Consulting - Management
Information Technology Products
Measurement and Monitoring Systems

Main Office

1/7 Gympie Way
Willetton 6155 Australia
Phone: +61407464357
www.inapl.com

Inland Tarp & Liner

Booth 1360

Founded 40 years ago, Inland Tarp & Liner grew primarily from the manufacture, sale, and installation of agriculture covers. By 2005, Inland Tarp & Liner ventured into the oil and gas industries becoming a recognized leader in geomembrane fabrication and anti-slip geotextile surfaces with the 40X and 40XGL (both trademarked) product lines in 2014. More recently in 2020, Inland Tarp & Liner rolled out the ITL Reinforced Concrete Roll®, a disruptive new technology reinventing concrete for erosion control, channel, and pond lining. Follow us on Facebook, LinkedIn, and Twitter to learn more about the #ITLAdvantage.

Products & Services

Concrete Reinforcement and Equipment
Linings and Claddings
Sediment & Erosion Control
Tunnel Lining and Support Materials
Underground - Construction and Structures
Well Completion Equipment

Main Office

4172 N Frontage Rd E
Moses Lake, WA 98837 USA
Phone: (800) 346-7744
www.itlcr.com

INR Consulting and Engineering Inc

Booth 2448

INR provides worldwide consulting and engineering services, especially in mining projects mainly associated with geological, geotechnical, and hydraulic engineering disciplines.

Products & Services

Consulting - Engineering

Main Office

Guzeltepe Mh Sedat Simavi Sk 60/2 Cankaya
Ankara 06690 Turkey
Phone: +90 (312) 447-4715
Email: inr@inr.com.tr
inr.com.tr

Integrated Power Services

Booth 2623

Products & Services

Electric Motors and Generators
Maintenance Services
Pumps

Main Office

250 Executive Center Dr, Ste 201
Greenville, SC 29615 USA
Phone: (864) 451-4500
www.ips.us

International Mining

Booth 2143

International Mining (IM) is the leading global technical publication for mining industry management. It covers the full spectrum of the world's extractive industries from exploration through mining and processing to metallurgy and the finished products. It covers the techniques and technologies required to recover all metals, coal, diamonds and industrial minerals. With this technical focus it brings readers important news of new technologies, methods and thinking. The magazine also provides a global overview of which mining company large or small is doing what where.

Products & Services

Publishers

Main Office

2 Claridge Ct, Lower Kings Rd
Berkhamsted HP4 2AF United Kingdom
Phone: +44 144 287 0829
www.im-mining.com

IoT Automation

Booth 2542

The FireFly and DragonFly Smart Lighting Systems by IoT Automation address safety and productivity requirements in underground mining and tunnelling operations. These systems enable Real-Time Situational Awareness and offer mine- and tunnel-wide emergency communications through their customisable colour options and multiple modes of operation. FireFly and DragonFly feature Wi-Fi and Bluetooth

Smart Connectivity and can be integrated with environmental monitoring systems and programmable devices for vehicle awareness along underground declines. Enhancing productivity and safety, the FireFly and DragonFly Smart Lighting Systems are low-cost and easy-to-deploy solutions for asset tracking, communications and primary, emergency and evacuation lighting—in just one system.

Products & Services

Alarm Systems
Automation
Communications Equipment
Controls - Electrical and Electronic
Environmental Control Equipment and Supplies
Geological-Physical-Technical Services and Equip
Lighting Systems and Lamps
Measurement and Monitoring Systems
Safety Equipment

Main Office

1624 Market St, Ste 202
Denver, CO 80202 USA
Phone: (720) 446-6603
www.iotaautomation.com.au

IPI Packers

Booth 2721

Products & Services

Dewatering Equipment
Exploration Equipment and Services
Geological-Physical-Technical Services and Equip
Grouting Services, Equipment and Materials
Inflatable and Mechanical Packers
Underground - Construction and Structures
Well Completion Equipment

Main Office

18 Pepsi Dr
Red Lodge, MT 59068 USA
Phone: (406) 446-9940
www.ipipackers.com

Iracore/Irathane Systems Inc

Booth 1317

Products & Services

Classifiers
Flotation Machines and Equipment
Pipes
Pumps
Screens
Urethane Cast Parts

Main Office

3516 E 13th Ave
Hibbing, MN 55746 USA
Phone: (218) 969-4411
www.iracore.com

Iron Woman Mining Services

Booth 1934

Founded as a Native American-owned company in 1999, Iron Woman is an employee-owned general civil contractor with more than 300 employees, 15 crews, and more than 300 pieces of rolling equipment, includ-

85 YEARS OF SOLUTIONS.

Since 1937, Fletcher has been answering some of underground mining's toughest questions. At Fletcher we provide more than solutions, we provide an atmosphere for an open dialogue with customers to ensure their operations are reaching maximum efficiency. Fletcher provides lifetime support through an experienced, knowledgeable team of sales staff, engineers and field service technicians. Is your operation facing obstacles that mass produced equipment isn't addressing? Get your custom solution started today. [Learn more at www.jhfletcher.com](http://www.jhfletcher.com)

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J.H. Fletcher & Co. cannot anticipate every mine hazard that may develop during use of these products. Follow your mine plan and/or roof control plan prior to use of the product. Proper use, maintenance and continued use of (OEM) original equipment parts will be essential for maximum operating results. 2022 J.H. Fletcher & Co. All Rights reserved.

EXHIBITORS

ing trucks, trailers, and yellow iron. Iron Woman Mining Services, LLC employs a proven staff of mining professionals who have first-hand knowledge of mining challenges and a collective pool of expertise that covers mine operations from hard to soft rock mining using both open pit and underground techniques.

Products & Services

Backfilling
Concrete Reinforcement and Equipment
Construction - Contracting Services
Reclamation Equipment and Services
Remediation
Sediment & Erosion Control
Temporary Structures
Transportation
Underground - Construction and Structures
Underground Excavation Services and Equipment

Main Office

5680 Emerson St
Denver, CO 80216 USA
Phone: (720) 357-6826
www.ironwomancon.com

Itasca International, Inc

See our ad on p. 66

Booth 1832

Itasca is a global, employee-owned, engineering consulting and software firm, focusing on geomechanical and hydrogeological projects. Our consultants solve complex problems in the fields of mining, civil, environmental, energy, and materials engineering. Itasca combines practical engineering and field experience with expert knowledge of advanced numerical simulation and analysis. Itasca's software (3DEC, FLAC, FLAC3D, Griddle, KATS, MINEDW, PFC, UDEC, and XSite) are highly respected and widely used. Our consulting and research activities focus on analyzing the behavior of excavations and engineered structures in soil and rock, including groundwater, thermal, creep, and dynamic effects.

Products & Services

Computer - Software and Services
Consulting - Engineering
Consulting - Environmental
Consulting - Research

Main Office

111 3rd Avenue S, Ste 450
Minneapolis, MN 55401 USA
Phone: (612) 371-4711
www.itascainternational.com



IWT

See our ad on p. 65

Booth 1526

Innovative Wireless Technologies (IWT) is the leading supplier of underground wireless networks for communication, tracking, and sensor data. Our revolutionary high-data rate protocol fixes the data retrieval issues

facing underground operations today, bringing reliable, real-time data from working areas to the people who need it -- wirelessly. IWT provides cohesive, integrated, scalable solutions for enhanced safety, increased productivity, and low maintenance for the lowest total cost of ownership solutions available.

Products & Services

Communications Equipment
Environmental Control Equipment and Supplies
Measurement and Monitoring Systems
Safety Equipment

Main Office

1100 Main St
Lynchburg, VA 24504 USA
Phone: (434) 316-5230
www.iwtwireless.com



J.H. Fletcher & Co

See our ad on p. 69

Booth 1213

Since 1937, Fletcher has been engineering and manufacturing custom solutions for underground mining. Today, Fletcher products expand into a variety of industries. Through the decades, Fletcher has operated with a singular vision: to work with a vigilant focus on finding ways to improve mining and industrial processes and reducing risk for the people who work in those industries.

Products & Services

Diesel Mining Equipment Manufacturers
Drilling Equipment
Longwall Mining Equipment
Roof - Ground Supports
Shortwall Mining Equipment

Main Office

402 High St
Huntington, WV 25705 USA
Phone: (304) 525-7811
www.jhfletcher.com

JAMAR Company

Booth 1014

Products & Services

Construction - Contracting Services

Main Office

4701 Mike Colalillo Dr
Duluth 55807 USA
Phone: (218) 628-6202

JBW Consulting Engineers

Booth 1015

JBW provides responsive engineering for our Mining, industrial, Energy, and infrastructure partners. Our engineering staff members have decades of experience in

mining and industrial equipment design. JBW provides mechanical, structural, civil, electrical and process engineering disciplines to our clients. We provide field services for survey and electrical controls systems. JBW has extensive detailed experience in dust collection and dust emissions control design. Our staff can rapidly solve problems and remove barriers to process and equipment issues for your mining operation.

Products & Services

Consulting - Engineering
Dust and Fume Control Technology

Main Office

345 Sinclair St, Ste 4
Gillette, WY 82718 USA
Phone: (218) 402-5515
Email: jamie.lepage@jbwconsult.com
jbwconsult.com

Jenike & Johanson

Booth 2605

Jenike & Johanson is the world's leading company in powder and bulk solids handling, processing, and storage technology. Over the past 55 years, we've tested over 15,000 unique powders and bulk solids. We have a combined team experience of nearly 1,000 person-years in the field, and worked on more than 7,500 projects, giving our team the broadest real-world and in-depth experience in the industry to address a wide variety of bulk material handling and engineering needs.

Products & Services

Bins, Hoppers, Silos and Storage
Blending Systems
Consulting - Design and Planning
Consulting - Engineering
Conveyor Systems
Educational
Feeders
Laboratory and Scientific Services
Training Services

Main Office

400 Business Park Dr
Tyngsboro, MA 01879 USA
Phone: (978) 649-3300
Email: info@jenike.com
www.jenike.com



JENNMAR

See our ads on p. 67 & Inside Back Cover

Booth 1913

We are diversified manufacturer and services provider for above and below ground infrastructure that sets the standards in terms of quality and safety for our stakeholders. Our mission is total customer support and satisfaction. Our portfolio of brands are rebuilding America's infrastructure.

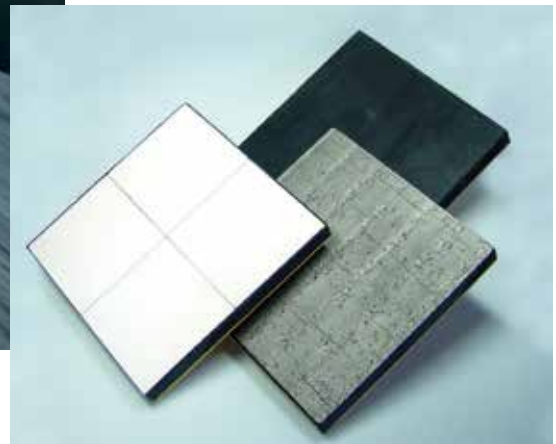
KALIMPACT® Wear Protection Systems

A HARD MATERIAL RUBBER COMPOSITE FOR HEAVY IMPACT AND ABRASIVE RESISTANCE



(left) KALIMPACT lining fitted to a bunker in a loading and unloading plant

(below) KALIMPACT ABRESIST, KALOCER and KALMETALL systems



KALIMPACT combines specific material strengths regarding resistance to wear and against destruction due to impacts. This results in individually tailored and particularly cost-effective solutions to guard against wear.

KALIMPACT is also advantageous in applications where the material being conveyed should not be subjected to additional breakage. Lined plant components provide environmentally friendly noise and vibration insulation. Examples of this include discharge chutes for coal and iron ore in a port transshipment operation. Suitable design ensures that the elements can be replaced. Maintenance can be carried out rapidly.

Depending on the specific abrasion and impact resistance requirements, KALIMPACT comprises either ABRESIST fused cast basalt, KALOCER oxide ceramics or with KALMETALL hard overlay welded plates. Each of the different material variations is formed into a vulcanised composite rubber sheet. KALIMPACT is primarily used where heavy abrasion occurs in combination with high impact loading. Depending on the version, the sheet is fastened with thinbed adhesive, mechanically via a carrier steel plate or with magnets.

KALIMPACT benefits:

- Impact-resistant elements
- Hard, wear-resistant surface
- Impact-dampening characteristics of the rubber
- Easy, secure installation by mechanical, adhesive or magnetic means
- Easy replacement of the elements
- Optimal adaptation to specific needs through different sizes, thicknesses and configurations
- Good insulation against noise and vibration



Kalenborn Abresist Corp.
Wear Protection Solutions

5541 North State Road 13, Urbana, IN 46990
Phone: 260-774-3327 • Toll Free: 800-348-0717
www.kalenborn.us

EXHIBITORS

Because we understand the ever changing and demanding conditions above and below ground we have built the richest portfolio of diverse and complementary brands. From engineering to resin manufacturing, rolled-steel and drill-steel manufacturing, custom steel fabrication, precision wear parts, tools and bits, chemical roof support and sealing products, staffing solutions, transportation and more.

Products & Services

Conveyor Systems
Hydraulic System Components
Inflatable and Mechanical Packers
Longwall Mining Equipment
Pumps
Rail Systems and Supplies
Roof - Ground Supports
Seals
Shotcrete Equipment, Supplies and Services
Ventilation Systems, Materials and Equipment

Main Office

258 Kappa Dr
Pittsburgh, PA 15238 USA
Phone: (412) 963-9071
www.jennmar.com

JHL Constructors

Booth 2137

JHL Constructors is a 100% employee-owned builder with over 35 years in business. We are a fully integrated, Colorado-based and Colorado-focused construction firm, serving our clients in the markets of Infrastructure and Vertical Building. Within Infrastructure, JHL's Mining work program specializes in: Reclamation, Expansion, Decommissioning, and Environmental Controls.

Products & Services

Construction - Contracting Services
Mining Contractors

Main Office

9100 E Panorama Dr, Ste 300
Englewood, CO 80112 USA
Phone: (303) 741-6116
Email: jhlinfo@jhlconstructors.com
www.jhlconstructors.com

Joest Inc

Booth 1350

Joest Inc, a US company, is part of the Germany headquartered Joest Global group, an OEM with 100+ years' experience with the design, manufacturing and deploying of vibratory screens, feeders, conveyors, fluidized bed dryers/coolers. Joest provides precision engineered reliability centric robust machines that are engineered, manufactured and factory tested in for example the USA or Australia depending on the project location.

Products & Services

Agitators, Vibrators and Mixers
Classifiers
Dewatering Equipment
Drives - Magnetic and Variable
Dryers
Feeders
Gravity Separators
Grizzlies - Feeding, Moving and Stationary

Screens
Separators and Concentrators

Main Office

800 Roosevelt Rd, Unit B400
Glen Ellyn, IL 60137 USA
Phone: (630) 469-0900
www.joest-us.com

Johnson Industries Ltd

Booth 2516

Johnson designs and manufactures a range hydraulic, pneumatic, spring set and manually applied caliper and drum brakes systems for use on hoists, conveyors, SAG and Ball Mills, ship loaders, and other rotating equipment. Johnson also produces electro-magnetic and electro-hydraulic thruster drum and disc brakes, which are in service around the world on cranes, hoists, and other material handling and power transmission equipment. We also designs and manufactures storm brakes and systems, including; automatic and manual rail clamps, rail brakes, and wheel clamps for use on cranes, stacker-reclaimers, trippers, and other rail mounted equipment.

Products & Services

Brakes - Dynamic, Friction Disk - Block, Magnetic Controls - Hydraulic and Pneumatic
Hydraulic System Components

Main Office

6500 Dennett Pl
Delta, BC V4G 1N4 Canada
Phone: (604) 940-4555
www.brakes.ca

Johnson Screens

Booth 1202

Mineral processors have discovered dramatic cost-per-ton reductions using Johnson Screens' products in particle separating, reducing, sizing, washing, and dewatering processes. These screening products are standards for processing coal, gold, lithium, phosphate, copper, bauxite, and gravel processes. Johnson Screens also provides guidance and support to ensure the customer's specification is met.

Products & Services

Filters, Filter Cloth and Accessories

Main Office

1950 Old Hwy 8 NW
New Brighton, MN 55112 USA
Phone: (651) 636-3900
www.johnsonscreens.com

Just Refiners USA, Inc

Booth 1667

The total and complete solution for the treatment and processing of by-products generated by the mining community.

Just Refiners excels in providing a service to the mining industry by receiving, preparing, sampling, and processing by-products.

Here at Just Refiners USA, Inc., we take our customer service seriously and our objective is to surpass our customers' expectations.

Our mission is to develop mutually long-lasting and dedicated relationships with our customers, which are beneficial to both parties.

JRI has a current AML program in place to eliminate any risk of breaking the law.

Products & Services

Mining Contractors

Main Office

350 Greg St
Sparks, NV 89431 USA
Phone: (775) 331-1663
www.justrefiners.com

K&M Industrial Valve Supply

Booth 1170

K&M re-manufactures Clarkson knifegate valves. K&M buys used core valves and then sandblasts and paints them prior to installing new OEM parts. K&M offers a 12 month warranty.

Products & Services

Valves

Main Office

8259 Virginia Ely Rd
Babbitt, MN 55706 USA
Phone: (218) 428-5352
Email: kandmptg@hotmail.com
www.kandmvalves.com

K2fly

Booth 1469

Products & Services

Computer - Software and Services

Main Office

Level 4, 502 Hay St
Subiaco 6008 Australia
Phone: +61432401318

Kalenborn Abresist Corporation

See our ad on p. 71

Booth 2323

Kalenborn Abresist USA is a leader in wear solution engineering. Kalenborn supports its claim to be a total piping solution provider. With 3D scanning capability and full line of ceramic and metal solutions it can solve all wear and corrosion challenges related to mining.

Products & Services

Pipes
Steel Pipe

Main Office

5541 N State Rd 13
Urbana, IN 46990 USA
Phone: (800) 348-0717
www.kalenborn.us

Kamengo

Booth 2908

Kamengo specializes in the design and supply of storage bins and feeders for handling difficult flowing sticky and cohesive bulk materials.



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Environmental remediation
Ground improvement
Groundwater control
Instrumentation & monitoring
Liquefaction mitigation
Releveling structures
Slope stabilization
Support of excavation
Underpinning
Design-build

keller-na.com

EXHIBITORS

Products & Services

Bins, Hoppers, Silos and Storage
Feeders

Main Office

275 West 6th Ave
Vancouver, BC V5Y 1K7 Canada
Phone: (604) 270-9995
www.kamengo.com



Keller

See our ad on p. 73

Booth 1716

Keller develops innovative, practical, and cost-effective solutions to geotechnical challenges including deep foundations, ground improvement, groundwater control, liquefaction mitigation, releveling structures, slope stabilization, support of excavation, underpinning, and instrumentation and monitoring. Keller is the largest geotechnical specialty contractor in the world with over 60 offices throughout the US and Canada.

Products & Services

Construction - Contracting Services
Drilling Contractors
Grouting Services, Equipment and Materials
Remediation
Underground - Construction and Structures

Main Office

7550 Teague Rd, Ste 300
Hanover, MD 21076 USA
Phone: (410) 551-8200
www.keller-na.com



Kiewit

Kiewit

See our ad on p. 75

Booth 1827

Kiewit specializes in mine management, production, infrastructure construction, maintenance and contract mining ventures, offering some of the most highly-skilled and experienced professionals in the industry.

Products & Services

Construction - Contracting Services
Consulting - Management
Conveyor Systems
Draglines
Furnaces - Industrial Process
Grinding Mills
Maintenance Services
Mining Contractors
Reduction Technologies - Iron Ore, Steel, Mineral
Underground - Construction and Structures

Main Office

8900 Renner Blvd
Lenexa, KS 66219 USA

Phone: (612) 741-0130

www.kiewit.com

Knight Piésold and Co

Booth 2207

Knight Piésold is an employee-owned, global consulting firm providing specialist services to businesses operating in the mining, power, water resources, and infrastructure industries. We are engineers, environmental scientists, geoscientists, and technologists, focusing on what we do best to create value for clients at every stage of a project.

Products & Services

Consulting - Engineering
Consulting - Environmental
Laboratory and Scientific Services
Remediation

Main Office

1999 Broadway, Ste 900
Denver, CO 80202 USA
Phone: (303) 629-8788
www.knightpiesold.com

KnightHawk Engineering, Inc

Booth 1111

KnightHawk Engineering is a technology-based specialty engineering company that performs consulting, field services, customized testing and metallurgical and materials testing work worldwide. KnightHawk has provided engineering solutions in the copper and gold mining industry, one case was at a copper smelting plant in Indonesia where the project was completely shut down due to a major turbine failure. Another RCFA project was at a copper and gold mine operating in Mongolia's Gobi Desert. The entire operation was shut down due to catastrophic equipment failures. In addition, KnightHawk designs, fabricates, and delivers high pressure/high temperature sealed crushers for custom applications in industry.

Products & Services

Consulting - Engineering
Crushers and Pulverizers
Laboratory and Scientific Services

Main Office

17625 El Camino Real, Ste 412
Houston, TX 77058 USA
Phone: (281) 282-9200
www.knighthawk.com



Kobel Manufacturing Co Ltd

Booth 2437

Products & Services

Brakes - Dynamic, Friction Disk - Block, Magnetic
Castings
Controls - Electrical and Electronic
Controls - Hydraulic and Pneumatic
Hydraulic System Components

Main Office

8238 129th St
Surrey, BC V3W 0A6 Canada
Phone: (604) 572-3935
www.kobelt.com

Komatsu

See our ad on p. 77

Booth 1914

Mining operations need collaborative partners they can trust who will empower them with quality, innovative insights and offerings that leverage automation and electrification while providing the freedom of interoperability on an open platform. Komatsu is here to partner with you to deliver the equipment, technologies and solutions needed to help you reach their goals and help position the mining industry to meet the world's need for minerals in increasingly sustainable ways. Learn how we can work with you to create lasting value for your operation by visiting our website.

Products & Services

Continuous Mining Machines
Conveyor Systems
Draglines
Drilling Equipment
Excavators
Feeder Breakers
Loaders
Longwall Mining Equipment
Parts - Mining Machinery
Trucks and Haulage Units

Main Office

401 E Greenfield Ave
Milwaukee, WI 53204 USA
Phone: (414) 670-7802
www.komatsu.com

KP Ventures Well Drilling & Pump Co LLC

Booth 1100

Mineral exploration and water well drilling performed since 1997. KP Ventures is licensed in 8 states of the Southwestern US. We perform R/C drilling and sampling, dewatering well construction, in-situ injection & extraction well construction, vertical turbine pump installation and pump repair. We are based in Northern Arizona to cover the entire Southwestern US.

Products & Services

Drilling Contractors

Main Office

PO Box 2411
Cottonwood, AZ 86326 USA
Phone: (928) 639-1709
www.kpventureswelldrilling.com

Kraft Power Corp

Booth 1237

Kraft Power's Power Transmission Division has a diverse product offering including gear couplings, clutches & brakes, fluid couplings, precision motors, automation solutions, linear systems, engineered gear drives, power generation, VFDs, soft-starts and various mechanical and electrical components.



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Visit us at MINEXCHANGE 2023, booth #1827, to discuss these services:

**MINE DEVELOPMENT
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OWNED OPERATIONS**

**PROJECT DEVELOPMENT
FEASIBILITY
ENGINEERING
PROCUREMENT
CONSTRUCTION**



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EXHIBITORS

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Products & Services

Clutches - Fluid, Friction and Magnetic
Controls - Electrical and Electronic
Controls - Hydraulic and Pneumatic
Couplings - Mechanical, Flexible and Rigid
Drives - Belt, Chain, Fluid and Gear
Drives - Magnetic and Variable
Electric Motors and Generators
Gears - Pullers, Reducers and Pinions
Hydraulic System Components
Power Transmission Equipment

Main Office

1000B Northbrook Pkwy
Suwanee, GA 30024 USA
Phone: (800) 394-0078
www.kraftpower.com

Kurita America Inc

Booth 1371

Kurita America offers water system harmonization that incorporates chemical, mechanical, and operational components. We identify the root causes of our customers' water challenges and develop mutually beneficial long-term partnerships that enable us to deliver optimal results and overall lower cost of ownership while conserving natural resources for a better, more sustainable world. These water treatment solutions prevent unscheduled downtime and improve system efficiency.

Kurita America's extensive line of pre-treatment equipment is designed to improve water quality by removing impurities that can cause fouling, corrosion, and scale. Coupled with our automation programs, we help reduce excess water and energy consumption.

Products & Services

Aerators
Dewatering Equipment
Filters, Filter Cloth and Accessories
Ion Exchange Equipment and Resins
Maintenance Services
Process Controls and Instruments
Pumps
Reagents - Chemical and Flocculants
Valves
Water Clarification and Treatment

Main Office

6600 94th Ave N
Minneapolis, MN 55445 USA
Phone: (866) 663-7633
<https://www.kuritaamerica.com>

Laser Tech

Booth 2235

Laser Tech's laser-based face profiling solution calculates accurate bench heights, minimum and optimum burdens, drill hole angles, offsets, and depths. Our vol-

ume solution makes it completely safe and efficient to calculate stockpile volumes without the need of occupying the pile. The software is intuitive to use and has advanced calculation capabilities. The laser system is rugged, completely waterproof and offers an LED in-scope display that adjusts to any lighting condition. See the system first-hand and test it against what you currently use to design a blast with an onsite demonstration of our laser profiling system at no cost to you.

Products & Services

Blasting Accessories, Equipment and Agents
Computer - Software and Services
Liquid Level Indicators and Switches
Measurement and Monitoring Systems
Process Controls and Instruments
Sensors

Main Office

6912 S Quentin St, Ste A
Centennial, CO 80112 USA
Phone: (303) 649-1000
www.lasertech.com

Leister Technologies, LLC

Booth 1034

For over 70 years, Leister has been the global leader in plastic welding and industrial hot-air applications. Our products include hot air welding machines, automatic welders, and extruders. Everything a tunnel waterproofing membrane installer might need. In civil engineering, e.g., in tunnel and landfill construction, the quality of the welded seam is a top priority since leaks can have fatal consequences. Therefore, it is essential for the quality of workmanship to use welding equipment of the highest standards.

Products & Services

Welding Equipment and Supplies

Main Office

1275 Hamilton Pkwy
Itasca, IL 60143 USA
Phone: (630) 760-1000
Email: info@leister.com
www.leister.com

LGC Standards

Booth 1071

LGC Industrial offers materials for many stages throughout metal production, including ferro-alloys, high purity material, highly alloyed material and even metal powders for 3D printing.

Our certification process is accredited to ISO 17034 for reference material producers and includes both homogeneity testing of candidate material, and chemical analysis of major, minor, and trace elements using a wide range of analytical methods including XRF, ICP-OES, ICP-MS, Arc-Spark Optical Emission, GD, AES and GD, MS.

Products & Services

Laboratory and Scientific Services
Measurement and Monitoring Systems
Process Controls and Instruments
Quality Improvement
Sampling Devices

Main Office

276 Abby Rd
Manchester, NH 03103 USA
Phone: (603) 622-7660
Email: infousa@lgcgroup.com
www.lgcstandards.com

Line Power Manufacturing

Booth 1601

Custom electrical power distribution and control products for mining, tunneling and dredging applications including portable substations, power centers, vacuum circuit breaker switch houses, longwall controls, belt and pump starters and mine-duty transformers.

Products & Services

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Longwall Mining Equipment
Tunnel Boring Equipment

Main Office

115 Norfolk Ave
Bristol, VA 24201 USA
Phone: (276) 645-8825
www.linepower.com

Linkan Engineering

Booth 1426

Products & Services

Consulting - Design and Planning
Consulting - Engineering
Consulting - Environmental
Water Clarification and Treatment

Main Office

2720 Ruby Vista Dr, Ste 101
Elko, NV 89801 USA
Phone: (775) 777-8003
www.linkan.biz

Louisville Dryer Company

Booth 2608

Louisville Dryer Company is the world-leading provider of high quality rotary processing equipment with over 100 years of experience in mechanical design, process design, manufacture, application, and service. Our engineering staff is qualified in a number of disciplines and has extensive practical application experience.

LDC is a qualified ASME Division I design and manufacturing center. We have completed thousands of installations and pioneered many of the technologies applied to today's direct and indirect heat dryers, coolers, calciners, steam tube dryers, and water tube coolers. Materials processed include organic and inorganic chemicals, petrochemicals, grains, metals, aggregates, and waste byproducts.

Products & Services

Coolers
Dryers
Kilns

Main Office

1100 Industrial Blvd
Louisville, KY 40219 USA
Phone: (502) 969-3163
LouisvilleDryer.com

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komatsu.com/autonomous

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MINE XCHANGE

AMBA

See us at booth 1914

EXHIBITORS



Luff Industries Ltd

See our ad on p. 78

Booth 2527

Luff Industries manufactures quality conveyor components, including idlers with patented polymer end caps and pulleys with an industry leading rim thickness to an international market. Using Luff components, companies have been increasing the performance of their conveyor systems for over 42 years. Recognized for innovative products, quick turnaround times and industry leading warranty, Luff products can be found in a variety of heavy industrial material handling applications. These industries include aggregate, mining, forestry, original equipment manufacturers, construction and recycling. Luff manufactures one of the most complete product lines due to these different application requirements.

Products & Services

Conveyor Belting - Accessories and Equipment
Conveyor Systems

Main Office

235010 Wrangler Rd
Rocky View, AB T1X 0K3 Canada
Phone: (403) 279-3555
www.luffindustries.com

Maccaferri, Inc

Booth 2335

Products & Services

Consulting - Design and Planning
Consulting - Engineering
Dredges
Reclamation Equipment and Services
Remediation
Sediment & Erosion Control

Main Office

10303 Governor Lane Blvd
Williamsport, MD 21795 USA
Phone: (301) 223-6910
www.maccaferri.com/us

Mackay School of Earth Sciences and Engineering

Booth 1342

Internationally renowned for its academic programs in the earth, mineral and engineering sciences, and for its diverse research activities, Mackay has earned its reputation for excellence by providing the mining, engineering and minerals industries with highly trained graduates, by conducting cutting-edge research and its continuous offering of public service to Nevada and the nation.

Products & Services

Educational

Main Office

1664 N Virginia St, Univ of NV, College of Science
Reno, NV 89557 USA
Phone: (775) 784-6987
www.unr.edu/mackay/

Mader Group

Booth 1458

Products & Services

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Maintenance Services

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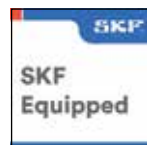
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Email: info@luffindustries.com

www.luffindustries.com

Main Office

2950 E Harmony Rd, Ste 220
Fort Collins, CO 80528 USA
Phone: (970) 889-1298
www.madergroup.com

**Maestro Digital Mine***Booth 1304*

Maestro Digital Mine manufactures IIoT devices and last mile digital networks for the underground mine, enhancing miners lives by the pursuit of safety excellence and productivity. Our cleantech, Industry 4.0 products and solutions deliver worker safety and productivity improvements while reducing energy and GHG footprint, aiding in corporate decarbonization efforts. Maestro provides significant CAPEX and OPEX savings to the mines project delivery, technology (IT/OT), ventilation, energy, and OHS professionals.

Products & Services

Automation
Communications Equipment
Measurement and Monitoring Systems
Sensors
Ventilation Systems, Materials and Equipment

Main Office

87 Magill St
Sudbury, ON P3Y 1K6 Canada
Phone: (705) 805-6918
www.maestrodigitalmine.com

Major Drilling*Booth 1622***Products & Services**

Drilling Contractors

Main Office

2200 S 4000 W
Salt Lake City, UT 84120 USA
Phone: (801) 560-5421
www.majordrilling.com

Malvern Analytical*Booth 1502*

Malvern Analytical creates innovative, customer-focused solutions and services to enhance efficiency and deliver tangible economic impact through chemical, physical and structural analysis of materials for all steps of your mining process. Our mining solutions provide highly reliable, robust elemental, morphological and structural information that can help you confidently explore new materials, design and test materials, and efficiently produce high quality products. Our portable and on-line solutions identify pathfinder minerals, determine quality of ore, and provide certified analysis of your beneficiated material. Ask us how we can optimize your mining process.

Products & Services

Analyzers
Automation
Laboratory Equipment and Supplies
Measurement and Monitoring Systems
Process Controls and Instruments

Main Office


2400 Computer Dr
Westborough, MA 01581 USA
Phone: (508) 647-1100
www.malvernpanalytical.com

MAPEI Corporation*Booth 1702*

Tunneling, underground construction and mining projects have unique and challenging characteristics due to their complexity. MAPEI's UTT (Underground Technology Team) engineers and experts understand these challenges and focus on providing a broad range of products and technologies along with expertise and know-how for the tunneling, underground construction and mining industries. These solutions include chemicals for shotcrete, mechanized tunneling, injection and waterproofing technologies. These products are manufactured by MAPEI with the goal of completely satisfying every technical requirement of our customers, from applicator to the contractor to the client.

Products & Services


Consulting - Design and Planning





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AS YOUR SITE**

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YOUR OPERATION**

At McLanahan, we have never been about a one-size-fits-all approach. We know that your operation comes with its own set of unique processing challenges. That is why we employ a team of process engineers that know how to create and design an equipment processing solution that will allow you to reach your highest level of productivity. We stay with you for the life of your machine, combining proven wear parts with local service from our offices around the world, to make your uptime our priority.

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mclanahan.com

Booth 2308



EXHIBITORS

Lubricants and Equipment
Sediment & Erosion Control
Shotcrete Equipment, Supplies and Services
Tunnel Lining and Support Materials
Underground Excavation Services and Equipment

Main Office

1144 E Newport Center Dr
Deerfield Beach, FL 33442 USA
Phone: (888) 365-0614
<https://utt.mapei.com/>

Maptek

Booth 1501

Maptek™ is a global provider of innovative software, hardware and services. Founded 40 years ago to service the mining industry, Maptek offers a unique combination of domain knowledge, technical expertise and engineering resources. We incorporate automated workflows and optimised algorithms to collect, analyse and circulate critical information within the operational cycle, closing the loop between planning, production and results. With our digital mine solutions, operations can add value to projects. Maptek continually looks for new ways to extend the capability of the mining industry and develops reliable solutions that allow customers to improve safety, productivity and profitability.

Products & Services

Aerial Mapping and Surveying
Computer - Software and Services
Consulting - Design and Planning
Consulting - Engineering
Explosive Materials and Services
Geological-Physical-Technical Services and Equip
Measurement and Monitoring Systems
Reclamation Equipment and Services
Surveying Equipment and Supplies
Training Services

Main Office

14143 Denver W Pkwy, Ste 200
Golden, CO 80401 USA
Phone: (303) 763-4919
www.maptek.com

Marietta Silos, LLC

Booth 2615

MARIETTA SILOS and our sister company USA SILO SERVICE work in tandem to complete bulk storage cleaning, inspections, repairs, and new silo construction. The combined companies have over 130 years industry specific experience to ensure your bulk storage systems operate efficiently, economically, and safely for the longevity of your operations. Email us directly at

askmrsilo.com to see how our companies can benefit your organization.

Products & Services

Bins, Hoppers, Silos and Storage

Main Office

2417 Waterford Rd
Marietta, OH 45750 USA
Phone: (740) 373-2822
www.mariettasilos.com

Masaba Inc

Booth 2514

Products & Services

Conveyor Systems
Crushers and Pulverizers
Screens
Washing Plants

Main Office

1617 317th St
Vermillion, SD 57069 USA
Phone: (605) 624-9555
www.masabainc.com

Master Builders Solutions

See our ad on p. 81

Booth 2107

Products & Services

Reagents - Chemical and Flocculants

Main Office

23700 Chagrin Blvd
Beachwood, OH 44122 USA
Phone: (216) 839-7500
www.master-builders-solutions.com/EN-US

Matrix Design Group

Booth 2401

Products & Services

Communications Equipment
Computer - Software and Services
Hoists - Controls and Accessories
Information Technology Products
Safety Equipment
Sensors

Main Office

3299 Tower Dr
Newburgh, IN 47630 USA
Phone: (859) 967-1712
<https://matrixteam.com/>

Matrix Service Company

Booth 2532

Matrix Service Company is a leader in the design and construction of industrial infrastructure serving the mining and minerals markets across North America. Matrix also provides on-site maintenance, repair, and industrial cleaning services.

Matrix has twice been named by Forbes as one of America's Most Trustworthy Companies, consistently








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EXHIBITORS

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Products & Services

Automation
Bins, Hoppers, Silos and Storage
Construction - Contracting Services
Consulting - Design and Planning
Consulting - Engineering
Consulting - Management
Conveyor Systems
Maintenance Services
Mining Contractors

Main Office

5100 E Skelly Dr, Ste 100
Tulsa, OK 74135 USA
Phone: (866) 367-6879
Email: marketing@matrixservicecompany.com
www.matrixservicecompany.com

Mavrik

Booth 2035

Products & Services

Exploration Equipment and Services

Main Office

1441 Wazee St, Ste 104
Denver, CO 80202-5912 USA
Phone: (909) 854-7020

MBA Energy and Industrial

Booth 1315

MBA Energy & Industrial is a Design/Building Industrial construction company who specializes in turn key solutions for our customer throughout the United States. MBA is listed in 38 states and can handle any of your construction needs.

Products & Services

Construction - Contracting Services
Consulting - Engineering
Consulting - Management
Maintenance Services
Mining Contractors
Transportation
Underground - Construction and Structures

Main Office

33126 Magnolia Cir
Magnolia, TX 77354 USA
Phone: (832) 299-4844
www.mba-nrg.com

McCrometer, Inc

Booth 1361

With 65+ years of flow expertise, McCrometer is an innovative industry leader providing metering technology to customers worldwide. McCrometer manufactures propeller, electromagnetic, and differential pressure flow meters at their headquarters in Hemet, California. McCrometer's high-performance products and systems are found in thousands of installations worldwide, proudly exceeding many of the world's most demanding industrial, safety and quality standards. McCrom-

eter's flow measurement solutions are backed by a team of engineering experts dedicated to partnering with customers on the most challenging flow projects. For more information on how a McCrometer can bring value to your flow measurement application, visit our website.

Products & Services

Measurement and Monitoring Systems

Main Office

3255 W Stetson Ave
Hemet, CA 92545 USA
Phone: (800) 220-2279
Email: quotes@mccrometer.com
www.mccrometer.com



McLanahan Corporation

See our ad on p. 79

Booth 2308

McLanahan Corporation is an ISO 9001:2015 certified company that manufactures equipment that helps producers do more than ever in today's tough marketplace. From crushing to water management, McLanahan custom engineers processing solutions to help you be more efficient, more productive and more profitable. Sales, engineering and customer service personnel are constantly working together to improve standard designs to help producers do more with their resources.

Products & Services

Crushers and Pulverizers
Feeder Breakers
Feeders
Sampling Devices
Screens
Scrubbers
Thickeners
Washing Plants
Water Clarification and Treatment

Main Office

200 Wall St
Hollidaysburg, PA 16648 USA
Phone: (814) 695-9807
www.mclanahan.com

McLellan Industries, Inc

Booth 1707

McLellan is a major manufacturer of grinding mill liner handlers, liner-bolt removal tools, rod chargers, mobile systems for transporting feed chutes, water-fuel-lube truck bodies, mechanic service trucks, extreme duty hose reels, hydraulic oil pumps, and grease pumps. McLellan, a research and development specialist, has been serving the mining industry for over 56 years. McLellan holds an ASME certification and employs a full engineering staff for design. McLellan uses a computer plasma burn table and both vertical and horizontal CNC milling centers. McLellan is the leader in specialized design of equipment. We offer full on site service with MSHA certified technicians.

Products & Services

Grinding Media and Liners
Grinding Mills
Maintenance Equipment and Supplies
Safety Equipment
Trucks and Haulage Units

Main Office

13221 Crown Ave
Hanford, CA 93230 USA
Phone: (559) 537-7400
www.mclellanindustries.com

ME Elecmetal

Booth 1701

ME Elecmetal offers more than mill liners, grinding media and crusher wear parts — we offer innovation, support, custom designs and valuable tools to develop a total milling and comminution solution specific to your needs. As your trusted partner at every stage of the optimization process, we provide valuable insight based on our decades of experience and advanced technologies. We will help you optimize your process, reduce downtime and increase productivity, resulting in higher profits. Products include: grinding mill liners, grinding media, crusher wear parts, ladles and slag pots, 3D laser scanning services, reline simulation services and 2D/3D simulation services.

Products & Services

Castings
Crushers and Pulverizers
Fasteners - Industrial
Grinding Media and Liners
Grinding Mills
Linings and Claddings
Parts - Mining Machinery
Safety Equipment

Main Office

3901 University Ave, NE
Minneapolis, MN 55421 USA
Phone: (480) 730-7500
www.me-elecmetal.com

Megator-Pumps 2000 America

Booth 1465

Megator-Pumps 2000 are two companies under one umbrella providing pumps, pumping solutions, and pollution control to customers across the globe.

Products & Services

Dewatering Equipment

Main Office

1721 Main St
Pittsburgh, PA 15215 USA
Phone: (412) 963-9200
www.megator.com

MES Mining

Booth 1739

Products & Services

Construction - Contracting Services
Consulting - Engineering
Mining Contractors

Underground - Construction and Structures
Underground Excavation Services and Equipment

Main Office

9125 S Monroe Plaza, Unit D
Sandy, UT 84070 USA
Phone: (303) 567-4174
www.minenv.com

Metcom Technologies Inc

Booth 1608

Products & Services

Consulting - Research
Laboratory and Scientific Services
Training Services

Main Office

501 S Pokegama Ave, Ste 6
Grand Rapids, MN 55744 USA
Phone: (218) 212-4350
www.metcomtech.com

Metsim International

Booth 2614

Metsim International (MSI) was formed in July, 2018 from the core group that has owned and operated the METSIM software since its first version was offered commercially in the early 1980s. Boasting a diverse team in ownership and management, MSI and METSIM are prepared for longevity despite fluctuating world markets. Our focus is to continue to build upon an already sturdy foundation, providing industry-leading software solutions and professional support from our international process engineering team.

Products & Services

Computer - Software and Services
Consulting - Engineering
Consulting - Management
Training Services

Main Office

201 Milwaukee St, Ste 200
Denver, CO 80206 USA
Phone: (404) 368-8313
www.metsim.com

Metso Outotec

Booth 2101

Metso Outotec is a frontrunner in sustainable technologies, end-to-end solutions and services for mining, metals refining, aggregates production, and recycling. We help our customers improve efficiency, increase productivity and reduce environmental and economic risks. Metso Outotec has a complete portfolio of process solutions, equipment and services, as well as plant delivery capability for mining operations.

Products & Services

Crushers and Pulverizers
Dewatering Equipment
Filters, Filter Cloth and Accessories
Flotation Machines and Equipment
Grinding Media and Liners
Grinding Mills
Kilns
Maintenance Services

Parts - Mining Machinery
Pumps

Main Office

20965 Crossroads Cir
Waukesha, WI 53186 USA
Phone: (262) 717-2500
www.mogroup.com

MICROMINE

Booth 1627

MICROMINE is an independent provider of intuitive software solutions to the mining and exploration industry. From capturing, managing, visualizing and understanding data to controlling and reporting on mine production, MICROMINE has a solution.

MICROMINE provides solutions that are relevant to every stage of the mining process. This means that our clients can source all of their software and consulting needs through the one local vendor.

With offices in 18 of the world's mining capitals, MICROMINE's specialists have the local knowledge to provide solutions that are relevant to your geographic location and operation, maximizing the return on your investment.

Products & Services

Automation
Communications Equipment
Computer - Hardware and Services
Computer - Software and Services
Exploration Equipment and Services
Geological-Physical-Technical Services and Equip
Information Technology Products
Mine Evaluations - Surface and Underground
Mine Operators
Trucks and Haulage Units

Main Office

430 Indiana St
Golden, CO 80401 USA
Phone: (303) 996-6270
www.micromine.com

Midwest Industrial Supply, Inc

Booth 2420

Midwest lives, manufactures, and delivers Earth-conscious solutions around the world to clients in the quarry, mining, construction, iron & steel, rail and mass transit and dozens of other industries whose success depends on overcoming dust, erosion, ice, or unstable soil conditions.

Products & Services

Conveyor Belting - Accessories and Equipment
Dust and Fume Control Technology
Environmental Control Equipment and Supplies
Lubricants and Equipment
Mine Evaluations - Surface and Underground

Main Office

1101 3rd St SE
Canton, OH 44707 USA
Phone: (800) 321-0699
www.midwestind.com

Mill Man Steel, Inc

Booth 2033

Products & Services

Steel Pipe

Main Office

1441 Wazee St, Ste 104
Denver, CO 80202 USA
Phone: (303) 220-8545
www.millmansteel.com

Millcreek Engineering Co

Booth 1511

Our engineering group is a full-service engineering company with a complete menu of engineering capabilities and extensive expertise. We take Hands-On, On-site responsibility for the entire facility delivery process, from conceptual design through detailed engineering, construction management, commissioning, and operator training. With our understanding of our client's needs coupled with effective management corporate structure, allows us to provide an excellent and highly competitive service to the mining and heavy industrial sectors. We are highly skilled in a variety of areas, extending these skills to solving, Mechanical Engineering, Conveyor Design, Structural/Civil Engineering, Electrical and Instrumentation, Process Engineering, Rail and Track Engineering.

Products & Services

Consulting - Design and Planning
Consulting - Engineering

Main Office

1011 Murray-Holladay Rd, Ste 200
Salt Lake City, UT 84117 USA
Phone: (801) 456-8163
Email: kevinm@millcreekeng.com
www.millcreekeng.com

MILLER

MILLER

Booth 2501

Products & Services

Boring Equipment
Construction - Contracting Services
Hoists - Controls and Accessories
Underground - Construction and Structures

Main Office

5905 Walnut Grove Rd
Carrier Mills, IL 62917 USA
Phone: (618) 994-4616
millercontracting.us

Miller Sales & Engineering Inc

Booth 2242

Products & Services

Dewatering Equipment

EXHIBITORS

Pumps

Main Office

1641 W Commerce Ct, Ste 151
Tucson, AZ 85746 USA
Phone: (520) 888-4101
www.mseinc.net

Miner Elastomer

See our ad on p. 80

Booth 1333

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Products & Services

Continuous Mining Machines
Conveyor Systems
Drilling Equipment
Parts - Mining Machinery
Trucks and Haulage Units
Underground Excavation Services and Equipment

Main Office

1200 E State St
Geneva, IL 60134 USA
Phone: (630) 232-3129
Email: jbechaud@minerelastomer.com
www.minerelastomer.com

Mineral Technologies

Booth 1416

Products & Services

Consulting - Design and Planning
Consulting - Engineering
Continuous Mining Machines
Gravity Separators
Grinding Mills
Laboratory and Scientific Services
Magnetic Separators
Separators and Concentrators

Main Office

24 Cathedral Pl, Ste 208
St Augustine, FL 32084 USA
Phone: (904) 342-8354
Email: mtnaorders@mineraltechnologiesusa.com
www.mineraltechnologies.com

MINETEK

Booth 1026

Products & Services

Dewatering Equipment
Fans and Blowers

Parts - Mining Machinery
Quality Improvement
Safety Equipment
Ventilation Systems, Materials and Equipment

Main Office

1 Civic Ave, Singleton, NSW
Singleton, NB 2287 Australia
Phone: +61439066814
www.minetek.com

Mining & Metallurgical Society of America (MMSA)

Booth 1603

MMSA is a non-profit association of mineral resources professionals whose members represent all facets of mining and metallurgical interests, both domestic and globally. We are a flexible organization able to respond quickly to opportunities to support and promote the industry. MMSA is dedicated to supporting regulatory and public awareness through webinars, seminars and other advisory activities, and active collaboration with other minerals industry organizations.

Products & Services

Professional Society or Association

Main Office

PO Box 271794
Littleton, CO 80127 USA
Phone: (720) 203-2380
www.mmsa.net/

Mining & Metals - Information Sharing and Analysis Centre

Booth 2600

Main Office

#142-757 W Hasting St
Vancouver, BC V6C 1A1 Canada
Phone: (514) 216-4545
www.mmsiac.org

Mining Equipment, Ltd

Booth 1927

Products & Services

Fans and Blowers
Underground Excavation Services and Equipment
Ventilation Systems, Materials and Equipment

Main Office

484 Turner Dr, Ste 201C
Durango, CO 81303 USA
Phone: (970) 259-0412
www.miningequipmentltd.com

Mining Magazine

Booth 2333

As part of the Aspermont group (the largest publisher of mining-related titles globally), Mining Magazine is mining's global source of operational and technology news. Founded in 1909 by Herbert Hoover, it is the industry's oldest and most respected international title. Mining Magazine is published 10 times a year. It offers

in-depth, technical insight into all operational aspects of mining.

Other titles/brands in the Aspermont stable include Future of Mining (365 and live events), Mining Journal, Australia's Mining Monthly and GeoDrilling International.

Products & Services

Publishers

Main Office

WeWork, 1 Poultry
London EC2R 8EJ United Kingdom
Phone: +44 207 216 6060
www.MiningMagazine.com

Mining Media International

Booth 2111

Mining Media International (MMI) publishes Engineering & Mining Journal (E&MJ), Coal Age and Equipo Minero. E&MJ is the gold standard among trade journals for the mining and mineral processing sector. Coal Age is the voice of authority throughout the coalfields. Equipo Minero, E&MJ's Spanish language quarterly, is a respected source for technical information throughout Latin America. MMI also publishes a free weekly e-Newsletter. Through its print and digital products, which includes Email campaigns and webinars, MMI provides a means for suppliers to market to decision makers in the mining business.

Products & Services

Publishers

Main Office

11655 Central Pkwy, Ste 306
Jacksonville, FL 32224 USA
Phone: (904) 721-2925
www.mining-media.com

Mining People Magazine

Booth 2825

Mining People Magazine reports on People, Places, and Products related to all mining sectors, including aggregates.

Whether you want to kick up your feet and read a relaxing article, or be updated on the latest news and innovations, Mining People is your magazine! Available in-print and on-line to suit any reader's preference.

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Products & Services

Publishers

Main Office

PO Box 6247
Charleston, WV 25362 USA
Phone: (864) 278-8227
www.miningpeople.org

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EXHIBITORS

Mining Plus US

Booth 1422

Mining Plus is a mining technical services provider, consisting of professionals specialising in geology, mining engineering (surface and underground), geo-technical engineering, mine ventilation, and operational management.

Products & Services

Consulting - Engineering
Consulting - Management
Geological-Physical-Technical Services and Equip

Main Office

10185 Park Meadows Dr, Flr 3, Ste 411
Lone Tree, CO 80124 USA
Phone: (303) 668-5925
Email: info@mining-plus.com
www.mining-plus.com

Minova

Booth 2533

137 years of development and innovation Minova is known for high quality products, technical expertise and problem solving. Unstable and changing environments is one of the greatest challenges. Our expert technical services teams work to find the perfect solution. Minova has over 200 patents but our work is far from over. Our laboratories and manufacturing plants work tirelessly to develop new chemical formulations and bolting technologies to help improve safety, cost savings and increase efficiencies. Our engineers and chemists, use their vast expertise and experience to provide you the best solutions.

Products & Services

Concrete Reinforcement and Equipment
Consulting - Engineering
Roof - Ground Supports
Seals
Sediment & Erosion Control
Shotcrete Equipment, Supplies and Services
Steel Wire Ropes/Cables
Training Services
Tunnel Lining and Support Materials
Underground - Construction and Structures

Main Office

150 Summer Ct
Georgetown, KY 40324 USA
Phone: (502) 868-6251
www.minovaglobal.com

Missouri S&T

Booth 1457

Missouri University of Science and Technology (S&T) is a STEM-focused research university of over 7,200 students and is part of the four-campus University of Missouri System. Located in Rolla, Missouri, Missouri S&T offers 101 different degree programs in 40 areas of study and is ranked by CollegeFactual as the best public university to study engineering. For more information about Missouri S&T, visit our website.

Products & Services

Educational

Main Office

1400 N Bishop St, 230 McNutt Hall
Rolla, MO 65409 USA
Phone: (573) 341-4753
mining.mst.edu

Mitsubishi Materials USA Corp

Booth 2706

Products & Services

Drill Bits - Rock
Drilling Equipment
Underground - Construction and Structures
Well Completion Equipment

Main Office

105 Corporate Center Dr, Ste A
Mooresville, NC 28117 USA
Phone: (980) 312-3150
mmus.com

Mixtec North America

Booth 1432

Mixtec North America has over 4,000 agitator installations in 15 countries. Built on Mixtec's global install base of 50,000+ agitators, we have the experience to

meet the most demanding mixing requirements. By working with the other Mixtec global entities, we are able to find the most efficient and economical way to design, fabricate, and deliver your mixing system anywhere in the world.

Products & Services

Agitators, Vibrators and Mixers

Main Office

454 W 600 N
Salt Lake City, UT 84103 USA
Phone: (801) 290-3770
www.mixteca.com

MMD Mineral Sizing (America) Inc

Booth 1532

Products & Services

Crushers and Pulverizers
Feeders

Main Office

41 Excellence Wy
Vonore, TN 37885 USA
Phone: (423) 884-6100
www.mmdsizers.com

MOGAS Industries, Inc

Booth 2737

MOGAS Industries is the dominant severe service technology company offering severe service valves, surface engineering, coating and modular process units.

Products & Services

Agitators, Vibrators and Mixers
Coatings (does not include Linings and Claddings)
Consulting - Design and Planning
Consulting - Engineering
Linings and Claddings
Maintenance Services
Measurement and Monitoring Systems
Quality Improvement
Valves

Main Office

14204 E Hardy Rd
Houston, TX 77039 USA
Phone: (281) 810-5952
<https://www.mogas.com/en-us>

Monico Monitoring, Inc

Booth 1537

Products & Services

Communications Equipment
Electrical Equipment and Supplies
Information Technology Products
Measurement and Monitoring Systems

Main Office

18530 Klein Church Rd
Spring, TX 77379 USA
Phone: (281) 350-8751
www.monicoinc.com

NewFields
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OFFICE LOCATIONS
Elko, Nevada, 775.738.3399
Reno, Nevada, 775.525.2575
Denver, Colorado, 720.508.3300
Queretaro, Mexico, +52.442.404.9670

Providing customized solutions to meet the unique challenges of the mining industry.

www.NewFields.com

Montana Technological University - School of Mines & Engineering

Booth 1338

Products & Services

Educational

Main Office

1300 W Park St
Butte, MT 59701 USA
Phone: (406) 496-4262
www.mtech.edu

Montgomery & Associates

Booth 1835

Products & Services

Consulting - Design and Planning
Consulting - Environmental
Consulting - Research
Geological-Physical-Technical Services and Equip
Measurement and Monitoring Systems
Remediation

Main Office

1550 E Prince Rd
Tucson, AZ 85719 USA
Phone: (520) 881-4912
www.elmontgomery.com

Montrose Environmental

Booth 2249

Montrose is a leading environmental services company focused on supporting commercial and government organizations as they deal with the challenges of today, and prepare for what's coming tomorrow. With more than 2,000 employees and 70+ locations around the world, Montrose combines deep local knowledge with an integrated approach to design, engineering, and operations, enabling effective and efficient responses to unique requirements of each project. From comprehensive air measurement and laboratory services to regulatory compliance, emergency response, permitting, engineering, and remediation.

Products & Services

Aerial Mapping and Surveying
Consulting - Design and Planning
Consulting - Engineering
Consulting - Environmental
Consulting - Management
Consulting - Research
Emissions Control
Laboratory and Scientific Services
Measurement and Monitoring Systems
Remediation

Main Office

5120 Northshore Dr
North Little Rock, AR 72118 USA
Phone: (501) 900-6400
www.montrose-env.com

MST Global

Booth 1045

Products & Services

Information Technology Products

Main Office

13301 W 43rd Dr, Unit 15
Golden, CO 80403 USA
Phone: (303) 524-5167
mstglobal.com

Mudwizard

Booth 2244

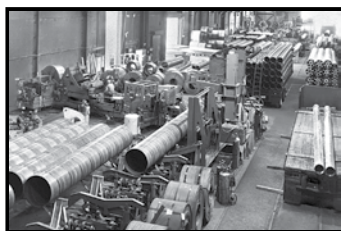
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Rouyn-Noranda, QC J9X 4K8 Canada
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NAYLOR PIPE COMPANY

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EXHIBITORS

NALCO Water

An Ecolab Company

Nalco Water, an Ecolab Company

See our ad on p. 85

Booth 1242

A global leader in water and process management solutions, Nalco Water, an Ecolab company, works with customers across the mining and mineral processing industries to help maximize outcomes and minimize water and climate impacts at an optimized total cost. Leveraging a global network of technical experts, research and development laboratories, and world-class training programs, we deliver unparalleled service to our customers.

Products & Services

Automation
Dewatering Equipment
Flotation Machines and Equipment
Reagents - Chemical and Flocculants
Thickeners
Water Clarification and Treatment

Main Office

1601 W Diehl Rd
Naperville, IL 60563 USA
<https://www.ecolab.com/about/industries-we-serve/mining-and-mineral-processing>

National Institute for Occupational Safety & Health

Booth 2011

The NIOSH Mining Program's mission is to eliminate mining fatalities, injuries, and illnesses through relevant research and impactful solutions. In our current research, we are working hard to reduce miner overexposure to hazardous dust and diesel contaminants, reduce miner overexposure to noise, remediate risk factors for musculoskeletal disorders, eliminate fatalities and injuries caused by mobile and stationary equipment, eliminate fatalities and injuries caused by rock falls and damaged ribs, and reduce the risk of mine disasters. We value relevance, impact, excellence, integrity, innovation, and collaboration as we join our stakeholders in fostering an industry of safe mines and healthy workers.

Products & Services

Government Agency - Entity

Main Office

626 Cochran Mill Rd
Pittsburgh, PA 15236 USA
Phone: (412) 386-6649
www.cdc.gov/niosh/mining

National Mine Map Repository

Booth 1049

Products & Services

Geological-Physical-Technical Services and Equip

Main Office

3 Parkway Ctr
Pittsburgh, PA 15220 USA
Phone: (412) 937-2833

National Stone, Sand & Gravel Association (NSSGA)

Booth 1307

NSSGA is the leading voice and advocate for the aggregates industry. Our members include crushed stone, sand & gravel producers, industrial sand producers and the equipment manufacturers & service providers who support them.

NSSGA advances public policies that protect and expand the safe, environmentally responsible use of aggregates that build America's infrastructure and economy. NSSGA advocates for members' interests on health, safety and environmental issues. In addition, NSSGA offers its members opportunities to participate in education and trade-shows that include CONEX-PO-CON/AGG, AGG1 Academy & Expo, Young Leaders and the NSSGA Annual Convention.

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Products & Services

Professional Society or Association

Main Office

66 Canal Center Plz, Ste 300
Alexandria, VA 22314 USA
Phone: (703) 525-8788
www.nssga.org

Naylor Pipe Co

See our ad on p. 87

Booth 1910

Naylor spiralweld steel pipe is manufactured in accordance with ASTM A-139, ASTM A-252, and ASTM A-211. Applications for Naylor spiralweld in mining service include water, high and low pressure air, ventilation, tailings or slurry lines and shaft casing. It is available in carbon and abrasion-resistant steel in diameters from 4 in. to 96 in. and thicknesses from 1/16 in. to 1/2 in. Also available are the necessary fittings and couplings, including the exclusive Naylor heavy duty wedgelock coupling, coatings and linings to complete your pipe systems.

Products & Services

Couplings - Mechanical, Flexible and Rigid
Dewatering Equipment
Pipes
Steel Pipe

Main Office

1230 E 92nd St
Chicago, IL 60619 USA
Phone: (773) 721-9400
www.naylorpipe.com

Neo Solutions Inc**Booth 1403**

Delivering solutions to your mineral processing, industrial, and water use challenges. We are skilled in both the art and science of mineral processing.

Products & Services

Reagents - Chemical and Flocculants

Main Office

1340 Brighton Rd
Beaver, PA 15009 - 0026 USA
Phone: (724) 728-1847
www.neosolutionsinc.com

Netafim USA**Booth 1607**

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water conservation products that maximize efficiency of precious metal recovery through the heap leaching process. Together, we can create a more sustainable future and grow more with less.

Products & Services

Couplings - Mechanical, Flexible and Rigid
Dewatering Equipment
Filters, Filter Cloth and Accessories
Leaching Sprinklers
Meters and Gauges
Pipes
Valves
Water Clarification and Treatment

Main Office

5470 E Home Ave
Fresno, CA 93727 USA
Phone: (559) 453-6800
https://www.netafimusa.com/mining/

NETZSCH Pumps North America, LLC**Booth 2625**

NETZSCH Pumps North America, LLC is the North American subsidiary of the globally operating group of NETZSCH companies. For over six decades NETZSCH has been manufacturing and supplying NEMO® Progressing Cavity Pumps and TORNADO® Rotary Lobe Pumps (the Classic T1 version and now the most technologically advanced RLP on the market – the T2), NO-

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EXHIBITORS

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Products & Services

Pumps

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www.netzsch.com

Nevada Gold Mines

Booth 2700

Products & Services

Mine Operators

Main Office

1655 Mountain City Hwy
Elko, NV 89801 USA
Phone: (775) 213-3452
www.nevadagoldmines.com

New Mexico Institute of Mining & Technology

Booth 1444

Products & Services

Educational

Main Office

801 Leroy Pl, Mineral Engr Dept
Socorro, NM 87801 USA
Phone: (575) 835-5836
www.nmt.edu



NewFields

See our ad on p. 86

Booth 1839

NewFields staff has over 25 years of experience in the design, permitting and construction of mining projects around the world. These projects include dams/ponds; heap leach facilities; waste rock disposal facilities; tailing storage facilities; storm water management infrastructure; haul roads; process plants and material handling infrastructure; and the closure and decommissioning of these mine components. NewFields has the ability to coordinate design development with environmental and social requirements to ensure that existing environmental conditions are accounted for in the selection of facility location, design, operation, and closure.

Products & Services

Construction - Contracting Services

Consulting - Design and Planning
Consulting - Engineering
Consulting - Environmental
Consulting - Management
Geological-Physical-Technical Services and Equip
Laboratory and Scientific Services
Mine Evaluations - Surface and Underground
Sediment & Erosion Control

Main Office

9540 Maroon Cir, Ste 300
Englewood, CO 80112 USA
Phone: (720) 508-3300
www.newfields.com

Newmont

Booth 1243

Products & Services

Mine Operators
Recruiting/Staffing

Main Office

6900 E Layton Ave, Ste 700
Denver, CO 80237 USA
Phone: (303) 863-7414
www.newmont.com

Nightstick

Booth 2428

Products & Services

Lighting Systems and Lamps

Main Office

640 S Sanden Blvd
Wylie, TX 75098 USA
Phone: (469) 326-9400
https://www.nightstick.com

Nilex Inc

Booth 1033

Since 1977 Nilex has been a leader in the geosynthetics industry, providing Geosynthetic Solutions for Civil and Environmental projects, including Economic Alternatives for access Roads Construction, MSE Walls & Slopes (ECOTech Systems), Erosion & Sediment Control, Water Management, Mining & Pipeline Solutions and Contaminated Material Management, providing customers with smart choices and proven to conventional construction practices for less money.

Products & Services

Environmental Control Equipment and Supplies

Main Office

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Centennial, CO 80112 USA
Phone: (720) 737-8778
Email: info@nilex.com
www.nilex.com

NobleMEIR, Inc

Booth 1234

Physical Separation and Filtration equipment. Home of the CRYO-HGMS 5T, North America's strongest High Gradient Magnetic Separating mineral processing mag-

net. NobleMEIR, Inc. specializes in advanced mineral separation equipment, components, and service. With an experienced staff of over 100 years experience - our PhysSep brand is celebrating it's 10th year 2012 - 2022. Magnetic, Gravity - Classifiers, and concentrators, lab - pilot plant - and industrial sizes. NobleMEIR, Inc. also provides laboratory testing and analysis, annual service contracts and preventative maintenance.

Products & Services

Separators and Concentrators

Main Office

9775 Mining Dr
Jacksonville, FL 32257 USA
Phone: (904) 693-1090
Email: sales@noblemeir.com
www.noblemeir.com

Normet Americas, Inc

Booth 2433

Normet is an industry-leading technology company offering continuous improvement to underground mining and tunnelling processes for increased safety, productivity, and profitability. We work in close collaboration with customers and utilise our process expertise amassed over thousands of mine and tunnel projects all over the globe.

We have a broad underground equipment offering; concrete spraying and transport, explosives charging, scaling, lifting, installation, and logistics. Our services are to ensure safety and productivity for our customers throughout the lifecycle this includes the supply of spare parts, rental equipment, remanufacturing and upgrades, field services, and training.

Products & Services

Diesel Mining Equipment Manufacturers
Maintenance Services
Parts - Mining Machinery
Shotcrete Equipment, Supplies and Services
Training Services
Underground - Construction and Structures

Main Office

1414 S Gladiola St, Ste 100
Salt Lake City, UT 84104 USA
Phone: (216) 780-4627
Email: erik.hopperton@normet.com
www.normet.com

Norseman Structures

Booth 2829

Norseman Structures offers ShelterSolutions in the pre-engineered building industry, specializing in steel framed fabric covered buildings. We offer turnkey solutions with fully integrated services including design and engineering, manufacturing, construction, financing, and documentation. Norseman Structures is a leading provider of pre-engineered buildings for mining companies around the world. Our solutions include truck shops, wash bays, warehouses, bulk material handling facilities, core cutting and processing facilities, water treatment plants, gymnasiums, and more. Norseman has been delivering Fiercely Reliable ShelterSolutions for over 100 years, and has designed solutions fit for the needs of some of the world's most advanced mining companies.



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EXHIBITORS

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Linings and Claddings
Temporary Structures

Main Office

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Phone: (306) 385-2888
www.norsemanstructures.com

Northwest Towers

Booth 2549

Industrial communications infrastructure, design, deployment, and maintenance. Northwest Towers provides LTE, WIFI, millimeter wave, and all other forms of wireless communication. In addition to the active wireless components, we design, and construct the infrastructure necessary to support a cohesive, resilient network. This includes tower construction, component installation, and complete commissioning that includes in depth training.

Products & Services

Automation
Communications Equipment
Computer - Hardware and Services
Computer - Software and Services
Construction - Contracting Services
Consulting - Design and Planning
Consulting - Engineering
Controls - Electrical and Electronic
Maintenance Services
Training Services

Main Office

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Phone: (503) 548-2005
www.nwtowers.com

Nouryon

Booth 1525

Nouryon is your partner in essential solutions for a sustainable future. Harness our expertise in mining through our application know-how on flotation collectors, frothers, and depressants such as NaSH and Carboxymethyl cellulose (CMC); dewatering and anticaking processing aids; sulfidizing agents; hydrometallurgical oxidizing agents; organic peroxides; and thermoplastic microspheres.

Visit us in Booth #1006 and learn how Nouryon can help you meet environmental regulations while enhancing metallurgical recovery and providing high-quality concentrate.

Nouryon supplies essential solutions to consumers and markets around the world and our commitment to sustainability has earned us the EcoVadis Gold rating.

Products & Services

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Reagents - Chemical and Flocculants
Thickeners
Water Clarification and Treatment

Main Office

100 Matsonford Rd, Bldg 5, Ste 550
Radnor, PA 19087 USA
Phone: (312) 544-7000
<https://www.nouryon.com/markets/mining/>

NSS Canada

Booth 1204

NSS Canada integrates technology to increase safety, accuracy, and efficiency. As an Authorized Leica Reseller, NSS Canada sells Global Satellite Navigation Systems (GNSS), Global Positioning Systems (GPS), Total Stations, GeoMos Automatic Deformation Monitoring Systems, High Definition (HDS) Laser Scanners, SmartNet RTK Corrections and a full line of Machine Control construction positioning products for excavating, grading and paving applications.

Products & Services

Surveying Equipment and Supplies

Main Office

1351 E Kelly Lake Rd, Unit 10
Sudbury, ON P3E 5P5 Canada
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<https://www.nsscanada.com/>

Odin Construction Solutions

Booth 1150

Odin is an award-winning contractor specializing in turnkey environmental remediation, geotechnical, and heavy civil construction projects nationwide. We became a communal ally through our commitment to safety, quality, collaboration, and community. Through initial project development and engineering design, field construction, and remedial action implementation, we ensure that the impact of every step forward results in enhancing the balance between site construction requirements and the surrounding communities through protection and preservation. Our team specializes in working alongside public and private sector clients on diverse Environmental Remediation, Heavy Civil Construction, Geotechnical Construction, Habitat & Wetland Construction, and Emergency & Disaster Service projects.

Products & Services

Backfilling
Mining Contractors
Reclamation Equipment and Services
Remediation
Underground - Construction and Structures

Main Office

4740 Rocklin Rd
Rocklin, CA 95677 USA
Phone: (916) 251-5500
odinconstruction.com

Open Loop Energy, Inc

See our ad on p. 88

Booth 1329

Open Loop Energy, Inc. was founded in 1992 as an Arizona corporation. It began operations in Safford, Arizona to serve the Southwestern mining and construction industries. Our core business is centered on hydraulic component repair and reclamation. Open Loop expanded its capabilities to Winnemucca, Nevada in 1998, Cedar Fort, Utah in 2012, and Farmington, New Mexico in 2016. Open Loop is now positioned far beyond any other hydraulic repair facility in the West and is known for providing solutions to customers' problems with quality customer care.

Products & Services

Dust and Fume Control Technology
Environmental Control Equipment and Supplies
Hydraulic System Components
Mine Operators

Main Office

1722 N 8th Ave
Safford, AZ 85546 USA
Phone: (575) 644-2907
www.openloop.net

O-pitblast LDA

Booth 1471

Products & Services

Computer - Software and Services
Consulting - Engineering
Continuous Mining Machines

Main Office

Rua Prof Manuel Baganha, 249/257
Porto 4350-009 Portugal
Phone: +351910094304
<https://www.o-pitblast.com/pt-pt/>

ORE-MAX

Booth 1500

Ore-Max's emitterline (drip line) is made with plug-resistant emitters (drippers) specifically designed for heap leaching. Because Ore-Max's emitter has more screen area and wider flow paths than any other emitter available, it will operate longer without plugging, ensuring ongoing mineral recovery. Ore-Max supplies a full range of lay flat hose, valves, fittings, sprinklers and drainage piping, and our experienced engineers can design your heap leach system from the ground up.

Products & Services

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Cyanide Process Equipment
Filters, Filter Cloth and Accessories
Hoses - Valves and Fittings
Leaching Sprinklers
Meters and Gauges
Pipes
Valves

Main Office

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Portland, OR 97281 USA
Phone: (503) 692-5353
www.ore-max.com

Orica USA

Booth 2122

Products & Services

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Consulting - Engineering
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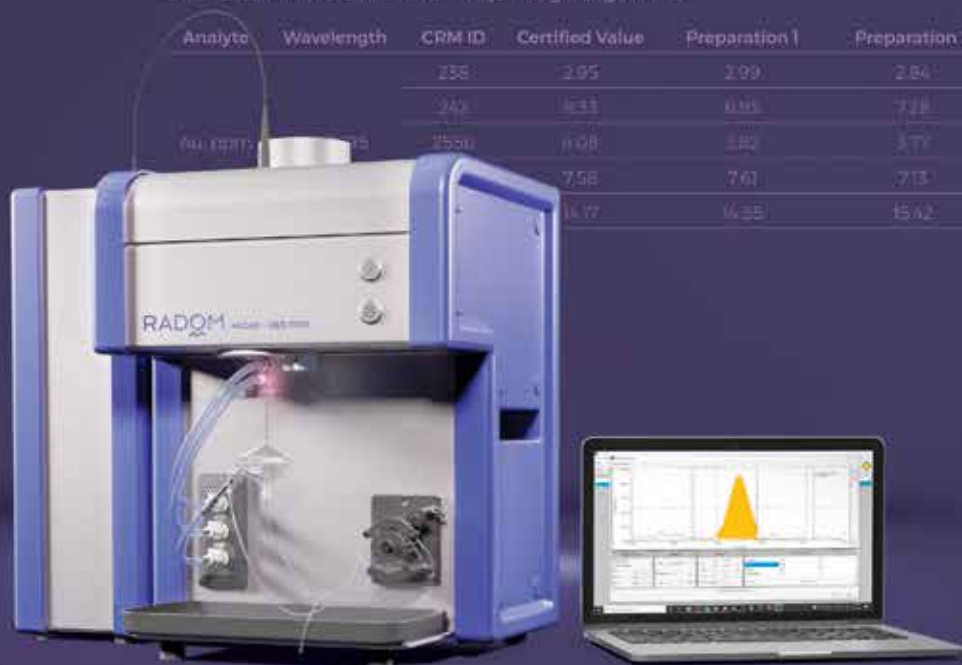
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	242	633	0.05	7.28	1x	83%	87%	
	255	608	3.82	5.77	1x	89%	90%	
	758	760	7.13	7.13	1x	100%	94%	
	847	635	15.62	15.62	1x	103%	100%	



EXHIBITORS

Sensors

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<https://www.orica.com/Products---Services/Blasting/>

Original Creations Inc

Booth 2500

The world's largest collection of mining related bronze sculptures.

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Products & Services

Mining Gifts
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Parkland USA

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Lubricants and Equipment

Main Office

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Calgary, AB T2P 4H4 Canada
Phone: (403) 567-2500
www.parkland.ca

Paterson & Cooke USA, Ltd

Booth 2138

Paterson & Cooke is a recognized leader in the design and implementation of slurry systems and associated processes. Since our formation in 1991, we have consistently provided technologically superior slurry systems for projects located through out the world. Our key areas of expertise include: Laboratory Testing, Dewatering Circuit Design, Tailings System Engineering (conventional, cycloning, high density paste, thickened and filtered), Long Distance Slurry Pipeline Systems, Leak Detection Systems, Mine Backfill Systems, Optimization Services, Process Engineering, Process Control, Pilot Plants and Specialized Training Courses.

Products & Services

Backfilling
Consulting - Engineering
Laboratory and Scientific Services

Main Office

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www.patersoncooke.com

PETRA

Booth 1666

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Our geological model digital twin software enables mining operations to increase productivity, efficiency and yield by providing operational decision support tools that show engineers how to achieve their 'best performance' 24 hours a day, seven days a week.

We empower mining professionals to analyse, design and make better operational decisions. Discover how our implementations can help with higher recovery rates and increased profit.

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Main Office

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Phone: +61 7 3310 8774
www.petradatascience.com

Petroleum Solids Control, Inc

Booth 2832

Products & Services

Centrifuges

Main Office

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Philippi-Hagenbuch, Inc

Booth 1949

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Products & Services

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Explosive Materials and Services
Grizzlies - Feeding, Moving and Stationary
Transportation
Trucks and Haulage Units

Main Office

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Peoria, IL 61604 USA
Phone: +1 (309) 697-9200
Email: sales@philisystems.com
<https://www.philisystems.com>

Phillips & Jordan, Inc

Booth 1834

Phillips & Jordan, Inc. (P&J) is a woman-owned, heavy civil and infrastructure contractor established in 1952. Our Core Values and Priorities – Integrity, Safety, Quality, and Production – guide our daily business practices. We hold safety as imperative above all other objectives. P&J works closely with mine owners, developers, engineers, and designers to deliver turnkey site development packages for a variety of mining project types that have included new dam and tailings construction and expansions; commercial and industrial; rail and roadway construction; HDPE pipe and liner construction; unloading & loading facilities; contract mining; and reclamation and remediation.

Products & Services

Construction - Contracting Services

Main Office

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Broomfield, CO 80021 USA
Phone: (865) 228-2722
www.pandj.com

Phoenix Industrial

Booth 1311

Phoenix Industrial is a mid-sized heavy industrial gen-

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Within the industrial industry we are known for our excellent safety record and ability to complete tough jobs in remote locations. Each project receives the full attention of everyone on our team, from the skilled craftsmen on the ground all the way up to the company president.

Products & Services

Construction - Contracting Services
Mining Contractors

Main Office

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www.phxind.com

Phoenix Lighting

Booth 2732

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Blasting Accessories, Equipment and Agents
Conveyor Belting - Accessories and Equipment
DC Power
Diesel Equipment Lighting Systems
Electrical Equipment and Supplies
Lighting Systems and Lamps
Parts - Mining Machinery
Safety Equipment
Underground Excavation Services and Equipment

Main Office

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Milwaukee, WI 53224 USA
Phone: (414) 973-3330
www.phoenixlighting.com/mining

PHOENIX Process Equipment

Booth 2616

PHOENIX provides systems for sand and mining minerals classification; fines slurry separation, thickening, and dewatering; separating lightweight, deleterious materials from aggregate and minerals products; and for dewatering tailings slurries from aggregate and minerals processing plants. Equipment includes: HS HYDROSORT™ hindered settling classifiers for sand classification and/or deleterious material separation,

PHOENIX/KISA Bucket Wheels for sand classification and dewatering, HiFlo™ and AltaFlo™ Thickeners for slurry thickening, volume reduction, and water clarification, Paste Thickeners for high density dry stack tailings disposal and PHOENIX Belt Filter Presses, Recessed Chamber Filter Presses and Membrane Filter Press for tailings dewatering and water recovery.

Products & Services

Centrifuges
Classifiers
Dewatering Equipment
Filters, Filter Cloth and Accessories
Laboratory and Scientific Services
Screens
Separators and Concentrators
Thickeners
Washing Plants
Water Clarification and Treatment

Main Office

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Louisville, KY 40299 USA
Phone: (502) 499-6198
www.dewater.com

PhotoSat

Booth 1349

Founded in 1993, PhotoSat is a technology company committed to providing better data for better decisions. Using deep learning algorithms, we produce engineering grade surveys from satellite imagery. Each elevation survey is equivalent to a DTM/DEM and produced without site access. With PhotoSat, engineers get quality elevation data that can be used for development, tailings management, mine site operations, and more. We work with operating mines, exploration companies, and engineering consultants around the world and have delivered more than 1,300 mine site surveys in over 75 countries.

Products & Services

Aerial Mapping and Surveying

Main Office

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Vancouver, BC V6E 4A2 Canada
Phone: (604) 681-9770
https://www.photosat.ca/

Pinnacle Drilling Products

Booth 1020

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Products & Services

Drill Bits - Rock
Grouting Services, Equipment and Materials

Main Office

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Calgary, AB T3S 0B9 Canada
Phone: (403) 236-3393

Email: sales@pinnacledrilling.ca
pinnacledrilling.ca

Pioneering the Field: Women in Mining

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Mine Operators
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Leadville, CO 80461 USA
Phone: (719) 486-1229
https://www.mininghalloffame.org/



Piteau Associates Engineering Ltd

See our ad on p. 91

Booth 2344

Products & Services

Consulting - Engineering

Main Office

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Reno, NV 89521 USA
Phone: (775) 324-8881
www.piteau.com

Pocock Industrial, Inc

Booth 1712

Products & Services

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Consulting - Research
Dewatering Equipment
Filters, Filter Cloth and Accessories
Ion Exchange Equipment and Resins
Laboratory and Scientific Services
Reagents - Chemical and Flocculants
Thickeners
Water Clarification and Treatment

Main Office

EXHIBITORS

6188 S 300 W
Salt Lake City, UT 84107 USA
Phone: (801) 703-8055
www.pocockindustrial.com

Polydeck

Booth 2429

Since 1978, Polydeck has been the leading provider of the most dependable synthetic screen media in the aggregate, coal, and mining industries across North and South America. We are pioneers, inventors and we take pride in putting our customers first and providing custom solutions for any of your screening needs.

We love the work but your success is our reward. To know that you have the screens you need to keep your plant running, producing faster and producing more, is what we call Together Strong.

Products & Services

Screens

Main Office

1790 Dewberry Rd
Spartanburg, SC 29307 USA
Phone: (864) 579-4594
Email: info@polydeck.com
www.polydeck.com

Polymathian

Booth 2921

We are industrial mathematics experts. Polymathian adds significant value by solving complex planning and scheduling problems for the resources industry by developing advanced industrial mathematics software solutions. We are an Australian-owned team of innovators, software engineers and mathematicians who are transforming how the mining industry makes decisions.

Products & Services

Computer - Software and Services

Main Office

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South Brisbane, QLD 4101 Australia
Phone: +61 1800 951 252
www.polymathian.com



Precision Pulley & Idler

Booth 1711

Products & Services

Conveyor Belting - Accessories and Equipment

Main Office

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Phone: (641) 628-3115
www.ppi-global.com

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Products & Services

Computer - Software and Services
Consulting - Management
Information Technology Products
Training Services

Main Office

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Phone: (202) 262-4081
www.predictivecompliance.com

Presto Geosystems

Booth 1452

Presto Geosystems® partners with engineers and owners to solve soil stability problems in all aspect

Products & Services

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Geological-Physical-Technical Services and Equip
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Pollution Control Equipment
Rail Systems and Supplies
Reclamation Equipment and Services
Remediation
Sediment & Erosion Control
Underground - Construction and Structures

Main Office

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Appleton, WI 54914 USA
Phone: (920) 738-1328
www.prestogeo.com

Propeller Aero

Booth 1735

Propeller Aero unleashes the power of data for anyone moving or digging the earth to easily, accurately, and instantly track progress and make faster, safer, and more profitable decisions. Propeller empowers customers to collaborate better, regardless of technical knowledge, streamlining the entire process from bid and design through completion.

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Computer - Hardware and Services
Computer - Software and Services
Mine Operators
Surveying Equipment and Supplies

Main Office

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Denver, CO 80205 USA
Phone: (720) 336-9927
propelleraero.com

PROVIX

Booth 1353

PROVIX is well recognized for Vision Enhancement and Collision Avoidance Solutions in surface and underground mining. Provix supplies and installs Remote Control systems with IP and analog Video Systems on mobile and stationary equipment for remote operations and process monitoring that offer increased safety and productivity.

Provix supplies collision avoidance and safety systems. Provix cameras are deployed on bolters, jumbos, drills, scoops, haul trucks, loading chutes, breakers, bin, stope, borehole inspection, raised bore, ITH drills, back/paste fill, and more. Contact Provix for Cost-Effective custom video solutions for any application.

Products & Services

Alarm Systems
Communications Equipment
Controls - Electrical and Electronic
Lighting Systems and Lamps
Maintenance Equipment and Supplies
Process Controls and Instruments
Rail Systems and Supplies
Safety Equipment
Sensors
Tunnel Boring Equipment

Main Office

3 Greengage Rd
New Lowell, ON L0M 1N0 Canada
Phone: (519) 803-5805
Email: sales@provix.net
www.provix.net

Pumpaction

Booth 2834

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Products & Services

Dewatering Equipment
Parts - Mining Machinery
Pumps
Shotcrete Equipment, Supplies and Services

Main Office

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Pointe-Claire, QC H9R 1E5 Canada

Phone: (514) 697-8600
Email: info@pumpaction.com
www.pumpaction.com

PumpEng

Booth 2920

PumpEng is an independent Australian company that designs, manufactures and services dewatering pumps for mining companies worldwide. With a 20-year track record, PumpEng uses state-of-the-art pump designs and materials to support modern mines and conditions.

Products & Services

Dewatering Equipment
Pumps

Main Office

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Buhl, ID 83316 USA
Phone: +1(208)749-7636
https://www.pumpeng.com.au/

Putzmeister Shotcrete Technology

Booth 2621

Products & Services

Grouting Services, Equipment and Materials
Pumps
Shotcrete Equipment, Supplies and Services
Steel Pipe
Tunnel Lining and Support Materials
Underground - Construction and Structures

Main Office

1733 90th St
Sturtevant, WI 53177 USA
Phone: (262) 886-3200
www.putzmeister.com



Quadra Chemicals Inc

Booth 1016

Products & Services

Reagents - Chemical and Flocculants
Training Services
Water Clarification and Treatment

Main Office

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The Woodlands, TX 77380 USA
Phone: (800) 681 2313
www.quadrausa.com

Quinn Process Equipment Co

Booth 1726

Quinn Process Equipment Company specializes in the design and manufacture of the free-standing FRP QPEC SX Mixer-Settler systems for a broad range of applications and sizes and are available in a wide range of FRP resins to cover just about any situation involving cor-

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Solvents - Extraction, Mixer and Settlers

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Radom Corporation

See our ad on p. 93

Booth 1035

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Products & Services

Laboratory Equipment and Supplies

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Phone: (954) 592-7799
radomcorp.com

Rail-Veyor Technologies Global Inc

See our ad on p. 89

Booth 2407

Railveyor is a safe, clean and profitable material haulage system for the smarter, Net Zero mine of the future. Rail-veyor Technologies Global Inc. (RVTG) offers the low emission, fully-electric, battery-free and TrulyAutonomous solution to the mining and industrial materials sectors and more. The unique light rail system results in high energy efficiency, industry-leading OPEX and enhanced worker safety. The RVTG international headquarters and John McCall Testing Facilities are located in Sudbury, Ontario. The Technology Center and United States regional office is located in Houghton, Michigan. Railveyor has installed eight systems globally.

Products & Services

Autonomous Vehicles
Conveyor Systems
Rail Systems and Supplies
Transportation
Trucks and Haulage Units

Main Office

40 Larch St, Unit 201
Sudbury, ON, ON P3E 5M7 Canada
Phone: 1 (844) 288-0450
Email: info@railveyor.com
www.railveyor.com

Rain for Rent

Booth 1833

Rain for Rent is a leading provider of temporary liquid handling solutions including pumps, tanks, filtration and spill containment. Projects range from flood relief to construction site dewatering, sewer bypasses and industrial plant turnarounds.

The company is known for its systems engineering expertise and its ability to tackle complex jobs cost effectively, providing an exceptionally high value.

Family owned and operated since 1934, it serves all 50 states and Canada from over 60 locations.

Products & Services

Dewatering Equipment
Pipes
Pumps
Refinery Equipment
Safety Equipment

Main Office

5101 Office Park Dr, Ste 100
Bakersfield, CA 93309 USA
Phone: (800) 742-7246
www.rainforrent.com

RAM Enterprise, Inc

Booth 2507

RAM Enterprise provides specialized industrial services as well as manufacture and distribute products to the bulk material handling industry.

Products & Services

Coatings (does not include Linings and Claddings)
Construction - Contracting Services
Conveyor Belting - Accessories and Equipment
Conveyor Systems
Crushers and Pulverizers
Feeders
Linings and Claddings
Parts - Mining Machinery
Pipes
Underground - Construction and Structures

Main Office

1225 W Main St
Elko, NV 89801 USA
Phone: (775) 738-3997
www.ram-enterprise.com

Ramboll

Booth 2038

A leading engineering, architecture and consultancy company, Ramboll employs more than 16,000 experts worldwide. We leverage local and global expertise to deliver sustainable, comprehensive and integrated solutions for our clients in both the public and private sector.

Our globally recognized Environment & Health practice has earned a reputation for technical and scientific excellence and innovation. We are trusted by clients to manage their most challenging environmental, health

EXHIBITORS

and social issues, and continually strive to achieve inspiring and exacting solutions that make a genuine difference to our clients, the environment and society as a whole.

Products & Services

Consulting - Engineering
Consulting - Environmental
Remediation

Main Office

1999 Broadway, Ste 2225
Denver, CO 80202 USA
Phone: (303) 382-5460
www.ramboll.com/environment-and-health

Rapat Corporation

Booth 2145

Rapat offers a full line of material handling equipment, including structural steel trussed, structural steel channel, and enclosed frame belt conveyors, bucket elevators, corrugated sidewall belt conveyors, chain conveyors, and distributors. These individual pieces of equipment can be customized and integrated into a material handling system with all the necessary structural steel support bents, towers, service platforms, stairs, ladders, and interconnecting chute work required for your specific application.

Products & Services

Conveyor Systems

Main Office

919 O'Donnell St
Hawley, MN 56549 USA
Phone: (218) 483-3344
Email: info@rapat.com
www.rapat.com

Rapid Fire Protection Inc

Booth 2826

Rapid Fire Protection Inc. is a full service fire protection and fire alarm company providing pre-construction, design, engineering, construction, management, service and inspection of all types of fire protection systems. In addition to these services Rapid Fire Protection provides specialty fire protection systems including clean agent, water mist, encapsulation technologies, and fire fighting foam solutions. We have offices located throughout the United States and service Alaska, Hawaii, the Caribbean, Latin America and the North coast of South America.

Products & Services

Alarm Systems
Construction - Contracting Services
Consulting - Design and Planning
Consulting - Engineering
Fire Protection

Main Office

1530 Samco Rd
Rapid City, SD 57702 USA
Phone: (605) 348-2342
Email: sales@rapidfireinc.com
www.rapidfireinc.com

RCT

Booth 1068

RCT is the world's trusted technology partner, offering an array of genuinely interoperable machine solutions to revolutionise the mining and industrial sectors, reducing operational costs and improving bottom-line profit.

Our objective is to advance businesses by integrating our state-of-the-art automation, information and protection systems designed for any machine make or model.

An industry leader since 1972 and with clients in over 70 countries worldwide, RCT are continually evolving – investing heavily in research and development to remain at the forefront of the technologies of the future.

Products & Services

Alarm Systems
Automation
Autonomous Vehicles
Communications Equipment
Computer - Software and Services
Electrical Equipment and Supplies
Fire Protection
Information Technology Products
Safety Equipment
Training Services

Main Office

7174 S, 400 W, Ste 1 Midvale
Salt Lake City, UT 84047 USA
Phone: +61 8 6272 4112
rct-global.com

RDI Technologies

Booth 1569

RDI Technologies is pioneering the camera as the sensor of the future. Our proprietary Motion Amplification® technology enables users to see and measure motion that was previously not visible to the human eye and could only be measured by contact sensors. By providing both simple videos and in depth data, we enable our users to quickly, safely, and accurately solve their toughest problems.

Products & Services

Consulting - Engineering
Exploration Equipment and Services
Laboratory and Scientific Services
Laboratory Equipment and Supplies
Measurement and Monitoring Systems
Sensors

Main Office

10024 Investment Dr
Knoxville, TN 37932 USA
Phone: (239) 691-6980
<https://rditechnologies.com/>

RDO Integrated Controls

Booth 2936

RDO Integrated Controls is the exclusive dealer for Carlson Machine Control in the United States and industry-leading Wingtra UAS/UAV dealer, master Topcon dealer of GPS, lasers, survey, mobile mapping, GIS and LiDar equipment, iVolve fleet management, as well as Rajant Wireless MESH.

Products & Services

Aerial Mapping and Surveying
Communications Equipment
Consulting - Engineering
Controls - Electrical and Electronic
Drilling Equipment
Information Technology Products
Maintenance Services
Process Controls and Instruments
Surveying Equipment and Supplies

Main Office

5221 Midland Rd
Billings, MT 59101 USA
Phone: (406) 259-5536
RDOIC.com

RECO Mining Solutions

Booth 1269

RECO is a family owned company that has been in business since 1995. We have an extensive inventory of parts and services that we are able to provide to our customers, and pride ourselves in the high quality of everything that we design, engineer and construct. Our goal is to help our customers achieve their maximum productivity with minimum cost through the highest quality material and products we provide. With our state of the art technology and engineering equipment, we are able to reverse engineer and redesign products to solve problems in order to fit the needs of our customers.

Products & Services

Construction - Contracting Services
Conveyor Systems
Crushers and Pulverizers
Excavators
Feeders
Hydraulic System Components
Lubricants and Equipment
Maintenance Services
Parts - Mining Machinery
Water Clarification and Treatment

Main Office

4120 N Flowing Wells Rd
Tucson, AZ 85705 USA
Phone: (520) 887-2292
recomining.com

REESCO

Booth 2814

Reesco is a full-service provider of portable crushing services, screening plants, turnkey plants, and custom steel fabrication for mining, construction, and industrial projects.

In addition to designing and building much of the equipment we use in the field ourselves, we're able to manufacture equipment for our customers to meet the custom needs of a project. Our capabilities include equipment such as conveyors, feeders, fuel containers, generators, jetways, observation towers, rotors, screens, tunnels, and more. Whether you're looking to purchase or rent a piece of equipment for your upcoming job, we've got you covered.

Products & Services

Belts - Power Transmission

Bins, Hoppers, Silos and Storage
 Conveyor Belting - Accessories and Equipment
 Conveyor Systems
 Crushers and Pulverizers
 Feeders
 Maintenance Equipment and Supplies
 Mining Contractors
 Screens
 Washing Plants

Main Office

1045 S Hoystville Rd
 Coalville, UT 84017 USA
 Phone: (435) 336-5345
www.reescoms.com

Regal Rexnord

Booth 1365

Regal Rexnord's comprehensive gearbox portfolio dependably supports mining operations' uptime and efficiency. Led by Falk V-Class and Rexnord Planetgear, our gearboxes are carefully designed to withstand shock loads in heavy-duty applications and torque loads exceeding one-million inch-pounds.

The Industrial Powertrain is end-to-end electromechanical solution based on level of need. More than just products, it utilizes custom-engineered assets to drive application efficiency, performance, and reliability. Bundled - Simplify product acquisition with one source for power transmission need; Optimized - Collaborate with industry experts to engineer performance; Intelligent - Combine reliable products and optimized solutions with Perceptiv digital solutions to prevent failures

Products & Services

Belts - Power Transmission
 Conveyor Belting - Accessories and Equipment
 Conveyor Systems
 Couplings - Mechanical, Flexible and Rigid
 Drives - Belt, Chain, Fluid and Gear
 Electric Motors and Generators
 Gears - Pullers, Reducers and Pinions
 Measurement and Monitoring Systems
 Power Transmission Equipment
 Sensors

Main Office

111 W Michigan St
 Milwaukee, WI 53203 USA
 Phone: (414) 882-0300
www.regalrexnord.com

REI Drilling, Inc

Booth 2633

REI Drilling, Inc. contracts a fleet of drills for various mining and civil applications, on the surface or from underground, including directional drilling for geologic exploration, water drainage or transfer, methane drainage, abandoned mine verification, solution mining, remediation, utilities installation, and gravity drainage of oil.

Products & Services

Consulting - Design and Planning
 Consulting - Engineering
 Dewatering Equipment
 Drill Bits - Rock
 Drilling Contractors

Drilling Equipment
 Exploration Equipment and Services
 Remediation
 Steel Pipe

Main Office

250 W Berger Ln
 Salt Lake City, UT 84107 USA
 Phone: (801) 270-2140
www.reidrilling.com

Rema Tip Top

Booth 1301

We help our customers prevent, reduce or repair wear caused by abrasion, corrosion or impact. REMA TIP TOP is the leading manufacturer of rubber adhesives, conveyor belt repair materials, vulcanizing equipment, sheet rubber linings, skirt rubber, chute linings, rubber, ceramic pulley lagging and high quality protective coatings and industrial rubber products for wear and corrosion protection. REMA TIP TOP provides expert factory and field installation of rubber linings, tankage corrosion linings, coating systems (including secondary containment) and wear linings.

Products & Services

Belts - Power Transmission
 Coatings (does not include Linings and Claddings)
 Conveyor Belting - Accessories and Equipment
 Conveyor Systems
 Fasteners - Industrial
 Linings and Claddings

Maintenance Equipment and Supplies
 Maintenance Services

Main Office

240 Pegasus Ave
 Northvale, NJ 07646 USA
 Phone: (800) 334-7362
www.rematiptop.com


RESPEC


Booth 1811

Explore. Develop. Operate. Close & Reclaim. RESPEC's integrated solutions mean clients, worldwide, trust us to partner with them and propel their mines forward with innovative, clear vision. RESPEC unites applied sciences with technology to solve any challenge in any market. Metals. Salt. Potash. Aggregates. Storage. Oil & Gas. RESPEC does it all. We study, test, and report. We plan and permit. We design roads and facilities. We monitor stability, creep, and water quality. We move data to dashboards. With RESPEC, clients get cutting-edge outcomes. RESPEC. Solving the Impossible.


Products & Services

Computer - Software and Services
 Consulting - Design and Planning
 Consulting - Engineering
 Consulting - Environmental
 Consulting - Research
 Geological-Physical-Technical Services and Equip
 Information Technology Products
 Laboratory and Scientific Services







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ritechoiceducting.com

EXHIBITORS

Measurement and Monitoring Systems
Mine Evaluations - Surface and Underground

Main Office

3824 Jet Dr
Rapid City, SD 57703 USA
Phone: (605) 394-6400
www.respec.com

Richard Goettle, Inc

Booth 1024

Main Office

12071 Hamilton Ave
Cincinnati, OH 45231 USA
Phone: (513) 825-8100
www.goettle.com

Richwood

Booth 2838

Richwood designs innovative solutions for the world-wide bulk material handling industry. For over 40 years the busiest mines in the world have put their confidence in our problem solving expertise. Clean conveyors and sealed and protected load zones for site specific solutions mean lowered maintenance costs, safer work areas and more productive operations. Rely on Richwood for dependable conveyor accessories.

Products & Services

Conveyor Systems

Main Office

707 7th St W
Huntington, WV 25704 USA
Phone: (304) 525-5436
www.richwood.com

Rio Tinto

Booth 1137

We're a leading global mining group focusing on finding, mining and processing the Earth's mineral resources.

Finding better ways to provide materials the world needs is at the core of everything we do. For 150 years, we've been looking for new and innovative ways of doing things.

Today, you'll find our teams around the world doing just that: seeking opportunities to reduce carbon footprint, partnering to develop new technologies to decarbonize steel and aluminum production, and creating new products from waste.

Visit our booth to learn more about what we do, how we do it, and possible career opportunities.

Products & Services

Mine Operators

Main Office

4700 W Daybreak Pkwy
South Jordan, UT 84009 USA
Phone: (801) 204-2000
Email: contactkennecott@riotinto.com
https://www.riotinto.com/en



Rite Choice Ducting, LLC

See our ad on p. 99

Booth 2537

Rite Choice Ducting is a US based Manufacturer and global supplier of flexible ducting for temporary climate control. We are recognized in dozens of industries as being the source of reliable industrial flexible ducting solutions. Thanks to our large inventory, meticulous quality control, and customer-centered service, our clients get exactly what they need, when they need it and with the highest quality.

Products & Services

Dust and Fume Control Technology

Main Office

7265 S 1st St
Oak Creek, WI 53154 USA
Phone: (414) 253-5008

rm wilson co

See our ad on p. 100

Booth 2709

R.M. WILSON CO., founded in 1966 by Richard M. Wilson, is a product specialist and partners with many of the leading longwall machinery and equipment manufacturers around the world to offer engineered optimum solutions to the special requirements of the customer. Headquartered in Wheeling, West Virginia and with locations throughout the United States, we not only supply our customers with the equipment they need when they need it, but also provide unparalleled service and product knowledge that sets us apart from other longwall machinery distributors.

Products & Services

Longwall Mining Equipment

Main Office

3434 Market St, POB 6274
Wheeling, WV 26003 USA
Phone: (304) 232-5860
www.rmwillson.com

Robit Inc

Booth 2722

Robit is publicly listed growth company servicing global



MINE PRODUCTIVITY SYSTEMS AND EQUIPMENT

BETEK • CSE • DRAEGER • EICKHOFF • FLEXCO • KENAMETAL • KRUMMENAUER • KWS • MANSIGN
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LONGWALL CHAIN	FASTENERS
GEARBOX	BITS
COUPLING	TIRES
BRAKES	BOLTERS
SHEARER DRUMS	SPROCKETS
HYDRAULIC VALVES	SAFETY SUPPLIES

R.M. WILSON CO. is a product specialist and partners with many of the leading longwall machinery and equipment manufacturers around the world to offer engineered optimum solutions to the special requirements of the customer.

Headquartered in Wheeling, West Virginia and with locations throughout the United States, we not only supply our customers with the equipment they need when they need it, but also provide unparalleled service and product knowledge that sets us apart from other longwall machinery distributors.

OUR MISSION: To know our customer's needs and support them with superior, high-quality products from reliable manufacturers

3434 MARKET ST, WHEELING, WV 26003 • 800-624-5460 • WWW.RMWILSON.COM
EMAIL: INFO@RMWILSON.COM

customers with drilling consumables for applications in underground and surface mining, construction, geotechnical and well drilling. The company's offering is divided into three product groups: Top Hammer, Down the Hole and Geotechnical.

Robit products are well known for exceptional value; i.e. high quality at competitive price. Let us create you a test plan to see it yourself!

Products & Services

Couplings - Mechanical, Flexible and Rigid
Drill Bits - Rock
Drilling Equipment
Longwall Mining Equipment
Parts - Mining Machinery
Tunnel Lining and Support Materials
Underground - Construction and Structures

Main Office

1522 Baker Rd
Sherman, TX 75090 USA
Phone: (903) 893-2300
Email: sales@robitgroup.com
www.robitgroup.com

Rock Flow Dynamics

Booth 1065

tNavigator, developed by Rock Flow Dynamics, is a fully integrated software solution that allows all domains

through the resource life cycle to work seamlessly together. Our technology offers a comprehensive package for the resource industry by providing advanced 3D geological modelling, geological characterisation and production solutions. With our single solution platform, the user can utilise the full suite of geophysical & geological interpretation tools, where they can explore and make full use of all their data. Construct 3D models and characterise prospects by utilising our advanced geostatistical and machine learning capabilities.

Products & Services

Computer - Software and Services
Geological-Physical-Technical Services and Equip

Main Office

2200 Post Oak Blvd, Ste 1260
Houston, TX 77056 USA
Phone: (403) 998-9299
www.rfdyn.com

RockTech USA, Inc

See our ad on p. 101

Booth 1743

RockTech USA exploration products, formerly Hagby USA, is a supplier of Drillman surface and underground core drills.

We also offer: Inertial Sensing survey tools; Slimgyro, Twingyro, and magnetic survey instruments. Hayden Diamond Products, Alignment instruments for underground and surface equipment, CoreWise high performance automatic core saws, Wax impregnated and

plastic Core Boxes, Service, maintenance & spare parts.

Products & Services

Drill Bits - Rock
Drilling Equipment
Exploration Equipment and Services
Parts - Mining Machinery
Surveying Equipment and Supplies

Main Office

4164 W Industrial Loop
Coeur d'Alene, ID 83815 USA
Phone: (208) 765-4231
www.rocktechusa.com

Rocky Mountain Bio Products - A Division of Bowman Construction Supply

Booth 1109

Rocky Mountain Bio Products supplies organic bio-fertilizers, natural soil conditioners and soil amendments. BIOSOL FORTE is an organic fungal and bacterial bio-mass from the penicillin production, with a unique, stable, & long-lasting nutrient for rebuilding all types of soils for revegetation. MENEFFEE HUMATE is a natural soil conditioner for plant cell and root development. MYCOAPPLY MYCORRHIZAE fungus is the amendment that aids in expanding the plant's root mass 100 to 1000 times larger, helping plants be healthier and handle environmental stress. Our PERMAMATRIX BSA-Hy-

RockTech USA

EXPLORATION PRODUCTS

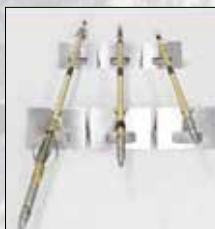
Drilling

- Diamond core bits
- Core drills & parts
- Core boxes
- Core tooling



World's Smallest Dual Gyro

- Fully integrated
- 25mm diameter
- Two gyros in one



Portable Alignment Device

- Compact ergonomic design
- Provides roll, pitch and heading in real time
- Underground / non-GPS environment survey



Automatic Core Saw

- Safe and easy operation
- Durable
- High performance
- Easy maintenance



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EXHIBITORS

dro is a Biotic Soil Amendment, that's a topsoil/com-post, replacement/alternative. Visit: www.WEFIXDIRT.com for product and distributor information.

Products & Services

Reclamation Equipment and Services
Remediation
Sediment & Erosion Control

Main Office

10801 E. 54th Ave
Denver, CO 80239 USA
Phone: (303) 884-2733
www.WEFIXDIRT.COM

Rocvent Inc

Booth 2601

Products & Services

Automation
Consulting - Engineering
Diesel Equipment Lighting Systems
Dust and Fume Control Technology
Electrical Equipment and Supplies
Fans and Blowers
Process Controls and Instruments
Scrubbers
Tunnel Lining and Support Materials
Ventilation Systems, Materials and Equipment

Main Office

3696 Industrial Rd
Chelmsford, ON POM1L0 Canada
Phone: (705) 692-5854
www.rocvent.com

Roxia Inc

Booth 2715

Roxia delivers high-tech dewatering, industrial automation and environmental technologies. Specializing in mining, minerals, metallurgical and industrial industries, our team delivers best performing solutions for each specific need.

We offer our support from Australia, Chile, China, Finland, Germany, Peru, Russia, South Africa, Sweden and the United States.

In the mining industry, our main competences are concentrate and tailings dewatering with our pressure filters and ceramic disc filter products. We also service competitor tower press and ceramic filters with high quality parts.

Products & Services

Aerators
Automation
Dewatering Equipment
Filters, Filter Cloth and Accessories
Water Clarification and Treatment

Main Office

3700 O'Donnell St, Ste 200
Baltimore, MD 21224 USA
Phone: (410) 698-6709
Email: sales-us@roxia.com
www.roxia.com

Roxsyle Systems LLC

Booth 2223

Roxsyle Systems is focused on designing and implementing electrical control systems for the mining industry. We are made up of professionals who have spent 22 years in the mining industry. We have extensive experience with multiple PLC, HMI, and Drive systems and can determine what fits the application. Roxsyle has the expertise to design control systems for many systems including: Mine Hoists, Conveyor Systems, Feeder Systems, Processing Plants, Loadouts, Ventilation Fans, E-Houses, and Power Distribution.

Products & Services

Automation
Consulting - Design and Planning
Consulting - Engineering
Controls - Electrical and Electronic
Electrical Equipment and Supplies
Parts - Mining Machinery

Main Office

12490 Black Forest Rd
Colorado Springs, CO 80908 USA
Phone: (844) 476-9795
Roxsyle.com



RubberSource Inc

Booth 1671

RubberSource Inc. designs and manufactures natural and synthetic protective rubber linings for the protection of capital equipment in mining. With Rubber Technologists, Chemists, state-of-the-art laboratory, in house mixing and calendaring, we are equipped to handle any requirement.

RubberSource has set a new standard of partnering with Rubber Applicators, and Engineering Firms by being involved in the inception and early stages of projects by lending advice, technical experience, and expertise in the form of material recommendations and applicator qualification and training.

Products & Services

Coatings (does not include Linings and Claddings)
Linings and Claddings

Main Office

1-380 Sheldon Dr
Cambridge, ON N1T2C2 Canada
Phone: (519) 620-4440
www.rubbersource.ca

Ruen Drilling, Inc

Booth 1810

Products & Services

Drilling Contractors

Main Office

3441 Todd Ct
Modesto, CA 95350 USA
Phone: (209) 988-4261
www.ruendrilling.com/

Rulmeca Corporation

Booth 1316

Located in Wilmington, NC, Rulmeca Corporation is the designated Motorized Pulley Center of Excellence for Rulmeca Group. Rulmeca Corporation is responsible for sales, assembly and service of Rulmeca Motorized Pulleys for North and South America. Rulmeca Motorized Pulleys were first produced in 1953 to offer conveyor belt operators and designers a compact, hermetically sealed, highly efficient conveyor belt drive. The Rulmeca Motorized Pulley is quick and simple to install and requires almost no maintenance. This conveyor belt drive resists the effects of abrasive dust, water, oil, grease, and many other harmful substances.

Products & Services

Conveyor Systems
Drives - Belt, Chain, Fluid and Gear
Electric Motors and Generators
Gears - Pullers, Reducers and Pinions

Main Office

3200 Corporate Dr, Ste D
Wilmington, NC 28411 USA
Phone: (910) 794-9294
www.rulmecacorp.com

Rulmeca Limited

Booth 1312

Rulmeca is the forefront of technology, design and construction of a vast array of conveyor components. Rulmeca stands alone in its commitment to supply only the most robust conveyor products on the market today. From our engineering and quality control, to our technical sales and field service staff, Rulmeca's dedication to our clients remains as strong today as it did over 60 years ago.

Products & Services

Conveyor Belting - Accessories and Equipment
Conveyor Systems
Drives - Belt, Chain, Fluid and Gear
Parts - Mining Machinery

Main Office

75 Mason St
Wallaceburg, ON N8A 4L7 Canada
Phone: (519) 627-2277
www.rulmeca.ca

RWI Enhanced Evaporation Services

Booth 2026

RWI designs and manufactures wastewater evaporator systems. We engineer our systems to evaporate all types of impacted water including wastewater, produced water, storm water, and much more.

We offer trajectory evaporators and downdraft floating evaporators. Our PittBoss evaporator doesn't require a pump or nozzles making it essentially maintenance



free. The RWI 2.0 series evaporators are the most efficient on the market. Leading the industry with the lowest energy consumption available, the 2.0 evaporation series evaporates water much more efficiently and in a more environmentally safe manner than all other higher horsepower evaporators.

Products & Services

Consulting - Engineering
Dewatering Equipment
Dust and Fume Control Technology
Environmental Control Equipment and Supplies
Pollution Control Equipment
Reclamation Equipment and Services
Remediation
Water Clarification and Treatment

Main Office

2245 Colex Dr
Grand Junction, CO 81505 USA
Phone: (970) 245-7104
www.resourcewest.com

SafeAI®

SafeAI

See our ad on p. 105

Booth 1152

SafeAI delivers next generation autonomous vehicle technology for off-road vehicles by retrofitting mining and construction equipment. SafeAI's solution converts existing fleets, regardless of manufacturer, with a scalable autonomous solution that delivers significant gains in increased worksite productivity, safety and cost savings. This interoperable approach is key to providing easier access and faster deployment of autonomous technology, and in reducing the barriers to entry to a wider swath of market participants.

Products & Services

Autonomous Vehicles

Main Office

5201 Great Americas Pkwy, Ste 332
Santa Clara, CA 95054 USA
Phone: (615) 881-9979
www.safeai.ai

Saint-Gobain Ceramic Materials

Booth 2607

A strong international group, Saint-Gobain Performance Ceramics & Refractories (PCR) leads the industry in the design, development and manufacturing of the highest performing ceramic wear solutions for extreme operating conditions. We strive to deliver value through our global technical expertise and the long-term partnerships we form with our customers.

Our employees are committed to delivering the best solutions and services to meet the unique material and engineering needs of our customers. Ceramic & refractory solutions for broad industrial applications provide an end-to-end solution for your business.

Products & Services

Bins, Hoppers, Silos and Storage
Castings
Classifiers
Conveyor Belting - Accessories and Equipment
Crushers and Pulverizers
Dryers
Dust and Fume Control Technology
Grinding Media and Liners
Linings and Claddings
Separators and Concentrators

Main Office

4702 Route 982
Latrobe, PA 15650 USA
Phone: (724) 554-1869
www.ceramicsrefractories.saint-gobain.com

Salem-Republic Rubber Co

Booth 2324

Products & Services

Dredges
Hoses - Valves and Fittings
Linings and Claddings
Pumps

Main Office

475 W California Ave
Sebring, OH 44672 USA
Phone: (800) 686-4199
www.salem-republic.com

SAM Solutions

Booth 1837

Products & Services

Consulting - Environmental
Dust and Fume Control Technology
Sediment & Erosion Control

Main Office

1745 Shea Center Dr, Ste 400
Highlands Ranch, CO 80129 USA
Phone: (720) 361-6420
www.samsolutionsint.com

Samuel Engineering, Inc

Booth 1733

Samuel Engineering, Inc. (SE) is a full service, multi-discipline engineering, procurement, and construction management company (EPCM). SE's mining team provides solutions anywhere from studies/reports, to engineering, to project management.

Products & Services

Automation
Consulting - Design and Planning
Consulting - Engineering
Consulting - Management
Consulting - Research
Controls - Electrical and Electronic
Mine Evaluations - Surface and Underground
Quality Improvement

Main Office

8450 E Crescent Pkwy, Ste 200
Greenwood Village, CO 80111 USA
Phone: (303) 714-4840
www.samuelengineering.com

Sandvik

Booth 2521

Sandvik Mining and Rock Solutions is a business area within the Sandvik Group and a global leading supplier of equipment and tools, parts, service and digital solutions and sustainability-driving technologies for the mining and construction industries. Application areas include rock drilling, rock cutting, loading and hauling, tunneling and quarrying.

Products & Services

Automation
Continuous Mining Machines
Crushers and Pulverizers
Drill Bits - Rock
Drilling Equipment
Screens
Trucks and Haulage Units
Underground Excavation Services and Equipment

Main Office

3200 Highlands Pkwy SE, Ste 200
Smyrna, GA 30082 USA
Phone: (470) 271-1000
ROCKTECHNOLOGY.SANDVIK

Satellogic

Booth 1008

Founded in 2010, Satellogic (NASDAQ: SATL) is the first vertically integrated geospatial company, driving real outcomes with planetary-scale insights. Satellogic is creating and continuously enhancing the first scalable, fully automated Earth Observation platform with the ability to remap the entire planet at both high frequency and high resolution, providing accessible and affordable solutions for customers.

With more than a decade of experience in space, Satellogic has proven technology and a strong track record of delivering satellites to orbit and high-resolution data to customers at the right price point. To learn more, visit our website.

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<https://satellogic.com/>

Sauls Seismic

Booth 1313

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EXHIBITORS

ensuring environmentally responsible activities in the mining, aggregates, pipeline and construction industries.

Products & Services

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Meters and Gauges

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Phone: (205) 592-2466
Email: sales@saulsseismic.com
www.saulsseismic.com

Savage Services

Booth 2821

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Crushers and Pulverizers
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Rail Systems and Supplies
Transportation
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Main Office

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www.savageservices.com

Scantech International Pty Ltd

Booth 1407

Scantech International is the leading supplier of high specification analyzers to the global minerals market for real time, representative, elemental and moisture analysis of conveyed flows. GEOSCAN GOLD is the only analyzer that representatively measures gold ore grade in primary crushed ore in plant feed. TBM 200 series moisture analyzers consistently outperform other systems and are used by leading resource companies. Scantech has over 35 years experience in bulk ore sorting where proven measurement precision provides unmatched outcomes. SizeScan, COALSCAN and GEOSCAN are our main brands. They provide high quality real time data for improved quality management and process control.

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Underwood 4119 Australia
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www.scantech.com.au

Schauenburg Flexadux

Booth 2139

Optimizing Mining, Tunneling & Construction through Engineered Turn-key Solutions. Schauenburg Flexadux Corp. is dedicated to providing best-in-class design, products, sales and service. Originally a ventilation manufacturer; now also turn-key solutions provider for multitudes of industrial/commercial applications. Over the years, we expanded into a multifaceted manufacturing and distributing company providing flexible lay flat, spiral, K-MAX fiberglass and steel ducting, pumpable crib bags, dust collectors, mine chutes, doors and other custom fabricated equipment for the mining, tunneling and oil industries. With manufacturing locations in Grand Junction, Colorado and Fairmont, West Virginia, Schauenburg provides custom products quickly throughout the continental USA and beyond.

Products & Services

Ventilation Systems, Materials and Equipment

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www.schauenburg-us.com

Schwing Bioset Inc

Booth 2617

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Feeders
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Tunnel Boring Equipment

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Email: marketing@schwingbioset.com
www.schwingbioset.com

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Booth 1039

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seametrics.com

Sefar Inc

Booth 1305

Products & Services

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Centrifuges
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SEMCO Publishing

Booth 1821

Publishers of North American Mining magazine, The Asia Miner, Concrete Products, Cement Products, and Rock Products, SEMCO Publishing has a powerful history of serving the mining, aggregates, and construction materials industries with exceptional editorial, insight, and coverage of technology and events. Contact us today to subscribe or to let us help you develop a customized marketing plan.

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Sempertrans USA

Booth 2438

Sempertrans, a member of the Semperit Group, has been developing, manufacturing and installing a broad range of high-performance conveyor belts for applications in the mining, cement and steel industries, ports, power plants, quarries and chemical industries for more than 50 years. Our knowledge, experience and quality products make us one of the world's leading conveyor belt companies. Contact us today at customerservice.americas@semperitgroup.com to learn more about products, services and solutions that can help your company accelerate your operational performance.

Products & Services

Conveyor Belting - Accessories and Equipment
Conveyor Systems



SafeAI®

A large excavator is shown in the process of loading a red Hitachi dump truck. The excavator's bucket is raised, dumping material into the truck's bed. The truck is marked with the number '202' and the 'HITACHI' logo. The excavator is marked with 'EX99'. The scene is set in a mining environment during sunset or sunrise, with a dramatic sky and a dirt-covered ground.

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SEW-EURODRIVE, Inc

Booth 2349

Products & Services

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Booth 1700

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Shaft Drillers International

Booth 2209

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Simem Underground Solutions, Inc

Booth 1617

SIMEM Underground Solutions has been designing and manufacturing machinery and plants for the mining

and civil industries for over 50 years, employing some 280 people worldwide of which 1/3 are in engineering. SIMEM offers a wide range of products and plants that are specifically designed to produce concrete, shotcrete, cemented rock fill (CRF) and paste fill. With over 50 mixers already supplied into mining backfill operations globally, SIMEM has the experience and expertise required to deliver heavy duty, reliable products and packages. SIMEM Underground Solutions, based in Abbotsford, BC, Canada, specializes in CRF and pastefill applications for the SIMEM Group.

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Conveyor Systems
Grouting Services, Equipment and Materials
Pumps
Shotcrete Equipment, Supplies and Services
Tunnel Boring Equipment
Water Clarification and Treatment

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Tunnel Lining and Support Materials

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www.skaps.com

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Skycatch is an industrial end-to-end data automation solution company focused on indexing and extracting critical information from the physical world. The technology uses a combination of hardware, software, and data science to deliver high-precision data at unprecedented speed, reliability, and ease of use. Built for the enterprise, Skycatch's end-to-end solutions are deployed across global project sites with the world's largest mining, construction, energy, and asset management companies.

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Automation
Computer - Software and Services
Exploration Equipment and Services
Geological-Physical-Technical Services and Equip
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Mine Evaluations - Surface and Underground
Reclamation Equipment and Services
Sediment & Erosion Control
Surveying Equipment and Supplies

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www.skycatch.com

Skyward Specialty Insurance*Booth 2221*

Skyward Specialty Insurance Group, Energy Division specializes in providing insurance protection to the Mining industry...either above or below ground and in quarries as well. We underwrite all types of Mining and Quarry operations and the various servicing contractors that work with those operations. We have four P & C carriers that are A Rated with two being admitted that offer all lines of coverage. These include Workers' Comp, General Liability, Excess Liability, Business Auto, Property and Inland Marine. Mining and Quarry insurance is our specialty and the only thing we do...so it is what we do best!

Products & Services
Insurance**Main Office**

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SOLMAX

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Remediation
Tunnel Lining and Support Materials

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Solvay

Booth 1907

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Booth 1344

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Booth 2807

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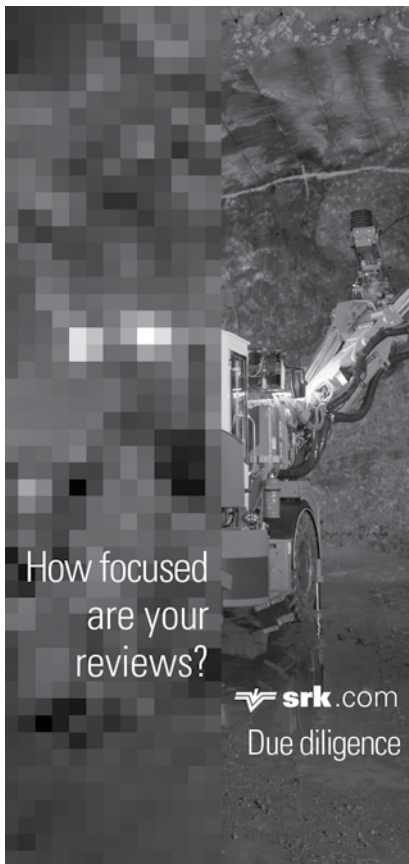
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Springer

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SRK Consulting (US), Inc

See our ad on p. 108

Booth 2121

SRK Consulting is an independent, international consulting practice that provides focused advice and solutions to clients, mainly in the earth and water resource industries. For mining projects, SRK offers services from exploration to mine closure, including feasibility studies, due diligence reviews, and production optimization. Established in 1974, SRK now employs more than 1,600 professionals internationally in over 45 offices on 6 continents.

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Consulting - Engineering
Consulting - Environmental
Consulting - Financial Services
Consulting - Management
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Reclamation Equipment and Services
Ventilation Systems, Materials and Equipment
Water Clarification and Treatment

Main Office

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SRS Crisafulli, Inc

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Booth 2716

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Dredges
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Stantec Consulting

Booth 1920

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Stewart Brothers Drilling Co

Booth 1813

Products & Services

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Mining Contractors

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www.stewartbrothers.com/

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Measurement and Monitoring Systems
Pumps
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Safety Equipment
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Structural Steel & Plate Fabrication

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Sunset Manufacturing

Booth 2637

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Booth 2303

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Supreme Manufacturing, Inc

Booth 1951

Products & Services

Dredges

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Svendborg Brakes USA, Inc

Booth 1520

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Main Office

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Email: sb@svendborg-brakes.com
www.svendborg-brakes.com

Symbioticware

Booth 2227

Established in Canada's mining heartland, Symbioticware is a leading innovator in the industrial Internet of Things (IIoT), delivering real-time, actionable, data-driven insights and smart analytics to streamline remote management of fixed and mobile assets in the natural resources sector. For over a decade, we've been helping customers reduce greenhouse gas emissions, minimize machine downtime, improve safety and optimize productivity. Our intelligent platform, 4-Sight.ai, empowers operations and helps drive better efficiencies with live dashboards and maps, advanced reporting and alerts, AI insights, as well as an ecosystem of integrated, industry-leading third-party technologies.

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EXHIBITORS

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Consulting - Research

Main Office

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Sympatec

Booth 2439

Sympatec develops, manufactures, sells, services and supports an innovative range of modular instruments for particle size and shape analysis in laboratory and process for customers worldwide.

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www.sympatec.com

Sync Mine Safety

Booth 2839

Sync Mine Safety Works with mines to provide Safety Software.

Main Office

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Syntron Material Handling

Booth 2321

Syntron Material Handling has a long history of providing bulk material handling solutions in a variety of markets including mining, aggregates, chemicals, packaging, and food. Our equipment, systems, and services help producers and processors improve their bottom line through increased bulk material handling productivity. The equipment line includes Link-Belt conveyor idlers, underground mining and terminal equipment, screw conveyors, and bucket elevators; and Syntron vibrating feeders, screens, bin vibrators, flow valves, paper joggers, and shaft seals. We also design and manufacture engineered products and systems for customer-specific applications.

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Main Office

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TAKRAF

TAKRAF USA Inc

Booth 2127

TAKRAF Group, through its established and well-known brands, TAKRAF and DELKOR, provides innovative technological solutions to the mining and associated industries. We leverage our experience, acquired over more than a century, to provide equipment, systems and services that best satisfy our clients' mining, comminution, material handling, liquid/solid separation and beneficiation requirements. Owners and operators around the world trust our engineered solutions to lower the total cost of ownership and reduce environmental impact by improving efficiency with safe and reliable equipment. For sustainable solutions backed by expert service you can rely on TAKRAF Group.

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Feeders
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Parts - Mining Machinery
Thickeners

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Tank Connection

Booth 1053

Products & Services

Bins, Hoppers, Silos and Storage

Main Office

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https://www.tankconnection.com/

TDC, LLC

Booth 2809

Our Refinery Services business is a leading producer of Sodium Hydrosulfide (NaHS) and is an established marketer / logistics manager of Caustic Soda (NaOH) and Sulfidic Caustic.

We supply the foundation for many finished products used everyday throughout the world by managing sodium (Na) and sulfur (S) processes in the petrochemical, pulp and paper, mining, tanning, water treatment, specialty chemicals and environmental industries. Solutions of NaHS are available and shipped in concentrations of 20 - 47 percent. Shipments are expedited to our customers around the globe by tank truck, railcar, barge and ship.

Products & Services

Reagents - Chemical and Flocculants
Transportation
Water Clarification and Treatment

Main Office

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www.genlp.com

Technical Translation Services

Booth 2449

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Products & Services

Consulting - Management

Main Office

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www.techtranslation.com

Technogenia Lasercarb Oklahoma Inc

Booth 2714

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Products & Services

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Dredges
Drill Bits - Rock
Excavators
Parts - Mining Machinery
Pumps
Underground Excavation Services and Equipment
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TechStar

Booth 2049

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Products & Services

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Automation
Liquid Level Indicators and Switches
Measurement and Monitoring Systems
Meters and Gauges
Process Controls and Instruments
Valves

Main Office

802 W 13th St
Deer Park, TX 77536 USA
Phone: (281) 542-0205
Email: info@techstar.com
https://techstar.com

Telemark Energy Services

Booth 2810

Telemark Energy Services provides geophysical field operations, data collection, and support across the full geophysical spectrum.

Products & Services

Exploration Equipment and Services
Geological-Physical-Technical Services and Equip

Main Office

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www.telenrg.com

TEMA ISENMANN Inc

Booth 1507

TEMA Isenmann, Inc. manufactures the complete line of polyurethane screen media. Complete with 1 x 1' pin and sleeve, WS 85, Tension screens, bolt in screens, and the patented WS 2.10 wear liners. Our Lexington Kentucky factory is the largest of its kind in North or South America and can custom mold screens to your particular service or duty.

Products & Services

Screens
Urethane Cast Parts

Main Office

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Email: Ayell@temaisenmann.com
www.temaisenmann.com

Terahertz Ventures LLC

Booth 1638

Terahertz Ventures is pioneering a new form of geo exploration that utilizes new discoveries in resonance technology to provide ore grades, depths of ore bodies, hydrocarbons and flow rates for water. Our patent-pending technology is reducing the cost of drilling through passive monitoring and providing precise locations and depths for drilling.

Products & Services

Exploration Equipment and Services

Main Office

1303 N Silvercrest Dr
Saratoga Springs, UT 84045-5029 USA
Phone: (801) 864-8774
https://terahertzllc.com/

TerraSource Global

See our ad on p. 111

Booth 2712

Whether it's mining of gypsum, potash, salt, limestone, coal, or potash, the three flagship brands of TerraSource Global are high-performing and tough. Their rugged design and ability to maximize the necessary product yield is why they are heavily relied upon all over the globe. The Gundlach Crushers, Jeffrey Rader, and Pennsylvania Crusher equipment brands are extensively used in mining, and process a variety of materials, regardless of type, abrasiveness, or grade. We help facilities handle crushing and feeding needs. Major coal companies like Arch Coal, Peabody, Drummond, Consol, and Teck use our equipment.

Products & Services

Consulting - Design and Planning
Consulting - Engineering
Crushers and Pulverizers
Feeders
Grinding Mills
Maintenance Services
Parts - Mining Machinery
Reduction Technologies - Iron Ore, Steel, Mineral

Main Office

200 N Broadway, Ste 1735
St Louis, MO 63102 USA
Phone: (855) 483-7721
www.terrasource.com

Tessenderlo Kerley, Inc. – moleko

Booth 1514

Moleko is a business unit of Tessenderlo Kerley, Inc. and offers customer focused solutions to the global industrial and mining markets, backed by experience technical service. Tessenderlo Kerley, headquartered in Phoenix, Arizona, is a leading manufacturer and marketer of specialty

Sulfur based derivative chemistry.

Tessenderlo Kerley operates 13 manufacturing facilities in North America, in addition to an extensive supply chain network and is part of Tessenderlo Group.

Products & Services

Reagents - Chemical and Flocculants

Main Office

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Phoenix, AZ 85018 USA
Phone: (602) 889-8372
www.moleko.com

Tetra Tech

Booth 1632

Tetra Tech is a leading, global provider of consulting and engineering services. We are differentiated by?Leading with Science@?to provide innovative technical solutions to our clients. We support global commercial and government clients focused on water, environment, sustainable infrastructure, renewable energy, and international development. With 21,000 associates worldwide, Tetra Tech provides clear solutions to complex problems.?

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Consulting - Engineering
Consulting - Environmental
Remediation

Main Office

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www.tetrattech.com/mining

The Koeppern Group

Booth 2328

Specializing in briquetting, compaction, and comminution, the Koeppern Group in the US consists of Koeppern Equipment and Komarek which are owned by Maschinenfabrik Koeppern GmbH in Germany. With the combined force of these industry pioneers, we offer cutting-edge solutions to the chemical, mineral, metal, agricultural, waste, energy, recycling, cement, and mining industries, from small-scale pilot machines to large-scale production systems. At the forefront of briquetting and compaction for over a century, Komarek and Koeppern Equipment operate out of Wood Dale, IL, where the main manufacturing and full-scale research and testing labs are located.

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Briquetters
Compactors
Grinding Mills

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EXHIBITORS

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The Mineral Lab has been providing the domestic and international mining, production and environmental industries with quick, accurate analyses at competitive prices since 1987. We provide chemical, mineralogical and structural analytical data to aid in mineral exploration, process development, product quality control, failure analysis and environmental control. The lab is staffed by a group of professionals with experience in x-ray spectroscopy (XRF, XRD, SEM), mineralogy, chemistry, and biology.

Products & Services

Laboratory and Scientific Services

Main Office

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Phone: (303) 232-8708
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www.theminerallab.com

The Mining Record

Booth 1806

The Mining Record has been in continuous publication for 133 years and is recognized as the industry's leading newspaper. The Mining Record has an international readership. It focuses on timely and credible news reporting on exploration, discovery, development, production, joint ventures, acquisitions, operating results, legislation, government reports and metals prices. Its readership is concentrated in the mining industry proper - mining companies, engineers, geologists, mine supervisory personnel, company officers and individuals engaged in exploration and large or small mine production. Every year, The Mining Record devotes an issue to the major conventions for the industry.

Products & Services

Publishers

Main Office

PO Box 1630
Castle Rock, CO 80104 USA
Phone: (303) 663-7820
www.miningrecord.com

The Okonite Company

Booth 1206

The Okonite Company manufactures Hi-Tensile Verlok cable for United Wire & Cable, which is sold throughout North America in the mining industry.

Products & Services

Electric Wire and Cable

Main Office

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www.okonite.com

THIESS Mining USA Inc

Booth 2833

Thiess is a global mining services provider. We work with our clients to deliver mining excellence in Australia, Asia and the Americas. For more than 85 years, we've operated in diverse commodities, geologies, environments and cultures. Our people channel that global experience and insight to create advantages for each project. A mine plan that optimizes operations. A smarter fleet. A sharper operations culture. An upskilled and mobile team. A community engaged and empowered.

Products & Services

Mining Contractors

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www.thiess.com

Thyssen Mining Group of Companies

Booth 1424

Thyssen Mining Inc is a leading full-service underground development and mining contractor providing a comprehensive range of services across North America and around the globe. As a subsidiary of Thyssen Schachtbau International B.V. and as part of a worldwide team, Thyssen Mining offers shaft sinking, tunneling, civil construction, ground freezing, raise boring, mine development, grouting and contract mining.

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Mining Contractors
Shotcrete Equipment, Supplies and Services
Tunnel Boring Equipment
Tunnel Lining and Support Materials
Underground - Construction and Structures
Underground Excavation Services and Equipment
Ventilation Systems, Materials and Equipment

Main Office

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Regina, SK S4P 3E1 Canada
Phone: (306) 949-6606
www.thyssenmining.com

Timberline Drilling, Inc

Booth 1842

Products & Services

Drilling Contractors

Main Office

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Coeur d'Alene, ID 83816 USA
Phone: (208) 665-7211
www.timberline-drilling.com

Titan Environmental USA

Booth 1233

Products & Services

Construction - Contracting Services

Main Office

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Phone: (306) 519-1773
www.titanenviro.com

TLT-Turbo, Inc

Booth 1310

TLT-Turbo North America supplies ventilation solutions and equipment for a wide range of applications.

Products & Services

Fans and Blowers

Main Office

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www.tlt-turbo.com

TOMRA Sorting

Booth 1938

Sensor-based ore sorting technology for the mineral processing industry.

A more efficient way to process global resources. TOMRA Sorting Mining provides proven sensor-based sorting technology for efficient material separation in various mineral and ore applications such as in the processing of gold, diamonds, gemstones, industrial minerals, and metal recovery from slag. World-wide, numerous sorting systems are already contributing to more energy-efficient and cost effective pre-concentrations as well as material recovery. TOMRA's sensor-based solutions help to extend the life of mining operations and increase the value of the deposit.

Products & Services

Sensors
Separators and Concentrators

Main Office

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Phone: (720) 361-9033
www.tomra.com/mining

Toray Membrane USA

Booth 1235

Toray has extensive experience treating multiple types of tailings ponds with our Toray UF and Toray RO membranes. Toray's product portfolio consists of state-of-the-art cross-linked polyamide spiral-wound reverse osmosis and nanofiltration membrane elements (Toray RO and CSM™), pressurized and submerged PVDF hollow-fiber ultrafiltration membrane modules (Toray UF), and flat-sheet membrane bioreactor modules (Toray MBR). Contact us for additional details.

Products & Services

Water Clarification and Treatment

Main Office

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Phone: (858) 218-2360
Email: innovation@toraymem.com
www.water.toray

Tracerco**Booth 2901**

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Products & Services

Alarm Systems
Measurement and Monitoring Systems
Meters and Gauges
Process Controls and Instruments

Main Office

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Email: tracerco@tracerco.com
www.tracerco.com

Tsurumi Pump**Booth 2421**

Tsurumi Pump is a submersible pump manufacturer that supplies pumps worldwide for underground and open pit mine operations. Tsurumi pumps are capable of handling flows from 50 to 5000 gpm @ heads up to 750 feet. Parts are made of wear resistant materials capable of handling entrained solids commonly found in run of mine dewatering applications. Pump features such as dual inside mechanical seals (which do not require cooling from or come in contact with the abrasive liquid being pumped) is just one of the reasons Tsurumi Pump has become the pump of choice in mines throughout the world.

Products & Services

Pumps

Main Office

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Glendale Heights, IL 60139 USA
Phone: (630) 793-0127
Email: info@tsurumiamerica.com
www.tsurumipump.com

Tunnel Radio of America, Inc**Booth 1364****Products & Services**

Communications Equipment
Safety Equipment

Main Office

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Corvallis, OR 97330 USA
Phone: (541) 758-5637
www.tunnelradio.com

Turner Mining Group**Booth 1042**

Turner Mining Group is a full-service provider to the mining sector with operations throughout the United States. A people company performing mining services, Turner finds success with turnkey solutions for enterprise clients and a values-based culture. The company supplies innovative fleet solutions, continuous engineering services, and sustainable mining practices through final reclamation. Headquartered in Utah and Indiana, Turner Mining Group is a true mining partner.

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Construction - Contracting Services
Consulting - Design and Planning
Consulting - Engineering
Mining Contractors

Main Office

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Bloomington, IN 47404 USA
Phone: (812) 277-9077
Email: info@turnermining.com
www.turnermining.com

Twiflex**Booth 1423**

Twiflex pneumatic and hydraulic brakes have been used extensively in mining applications for more than 50 years. Twiflex brakes ensure safety, reliability and minimum downtime on draglines, shovels, hoists, conveyors and grinding mills in the most extreme mine conditions. High quality of the components and strong lean design ensure easy maintenance and long life of the brakes. The Twiflex engineering department is available to select and customize braking systems to meet specific customer requirements. Service centers and stock of spare parts are available close to mining locations all over the world.

Products & Services

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Clutches - Fluid, Friction and Magnetic
Conveyor Belting - Accessories and Equipment
Conveyor Systems
Fans and Blowers
Power Transmission Equipment

Main Office

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Phone: (940) 723-3483
Email: twiflex.info@twiflex.com
www.twiflex.com

U.S. Geological Survey (USGS), Mineral Resources Program (MRP)**Booth 1236****Products & Services**

Educational
Government Agency - Entity
Information Technology Products

Main Office

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<https://www.usgs.gov/energy-and-minerals/mineral-resources-program>

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Sensors

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www.uesystems.com

Ultra Tech Pipe**Booth 2635**

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Pipes

Main Office

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www.ultratechpipe.com

EXHIBITORS

United Central Industrial Supply

Booth 1933

Products & Services

Conveyor Belting - Accessories and Equipment
Hoses - Valves and Fittings
Mine Evaluations - Surface and Underground

Main Office

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Bristol, TN 37620 USA
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www.unitedcentral.net

University of Arizona Mining and Geological Engineering

See our ad on p. 113

Booth 2305

The University of Arizona is the new face of mining. The School of Mining and Mineral Resources and the Department of Mining and Geological Engineering represent the largest interdisciplinary mineral resources research group in the US. Our students have diverse backgrounds that demonstrate cultural competency; they are adept at creative problem solving, leadership, communication, with strong fundamentals in engineering and science. Our innovative research emphasizes leading technologies that solve tomorrow's problems. Graduate programs are offered both on-campus and online.



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www.mining.vt.edu

Products & Services

Educational

Main Office

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www.mge.engineering.arizona.edu

University of Kentucky Department of Mining Engineering

Booth 1347

Products & Services

Educational

Main Office

230 MMRB, 504 Rose St
Lexington, KY 40506 USA
Phone: (859) 257-8026
www.engr.uky.edu/mng/

University of Utah, Mining Engineering Department

Booth 1239

Products & Services

Educational

Main Office

135 S 1460 E, #313
Salt Lake City, UT 84112 USA
Phone: (801) 585-5176
www.mining.utah.edu

Unmanned Aerial Services

Booth 1265

Unmanned Aerial Services is an underground mining focused remote vehicle, LiDAR mapping and visual inspection service company with a proven track record of safe, efficient onsite work and quality data deliverables. Our team consists of highly skilled geospatial data specialists, drone pilots and field technicians, with strong mine site backgrounds and extensive knowledge of the mobile scanner and drone industry.

Products & Services

Measurement and Monitoring Systems

Main Office

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Butte, MT 59701 USA
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Email: info@uasmining.com
<https://www.uasmining.com>

US Department of Labor/MSHA

Booth 2422

The U.S. Department of Labor's Mine Safety and Health Administration (MSHA) works to prevent death, illness, and injury from mining and promote safe and healthful workplaces for U.S. miners. The agency develops and enforces safety and health rules for all U.S. mines

regardless of size, number of employees, commodity mined, or method of extraction. MSHA also provides technical, educational and other types of assistance to mine operators. We work cooperatively with industry, labor, and other federal and state agencies to improve safety and health conditions for all miners in the United States.

Products & Services

Government Agency - Entity

Main Office

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Phone: (412) 386-6276
www.msha.gov

Valley Forge & Bolt Mfg Co

Booth 2306

VF is a domestic manufacturer of fasteners supplying the mining industry for the last 45+ years with innovative products that save installation time, downtime, and help achieve near perfect loading on a customer's fasteners in any application. Our line of mill fasteners include the Ridgeback®, Sealing Ridgeback®, and regular liner bolts. Our line of Load Indicating fasteners will let you track bolt load data visually with our Maxbolt®, electronically with our SPC4® fasteners or wirelessly with our 700 series of probes using Wi-Fi or Radio Frequency to transmit bolt load data while in service.

Products & Services

Fasteners - Industrial
Meters and Gauges
Parts - Mining Machinery

Main Office

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Phoenix, AZ 85043 USA
Phone: (602) 269-5748
Email: Sales@VFBolts.com
www.vfbolts.com

Valmet Flow Control

Booth 2006

The merger of Neles and Valmet was completed on April 1, 2022 and going forward, Flowrox brand will continue as the Flow Control Business Line within Valmet.

Products & Services

Aerators
Automation
Controls - Hydraulic and Pneumatic
Environmental Control Equipment and Supplies
Pumps
Transportation
Valves
Water Clarification and Treatment

Main Office

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Linthicum, MD 21090 USA
Phone: (410) 636-2250
www.valmet.com



Van Gorp Corporation

Booth 1556

Products & Services

Conveyor Systems
Feeders
Parts - Mining Machinery

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VDG (Van der Graaf)

Booth 2311

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Conveyor Belting - Accessories and Equipment
Conveyor Systems
Drives - Belt, Chain, Fluid and Gear
Drives - Magnetic and Variable
Electric Motors and Generators

Main Office

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Phone: (888) 326-1476
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VEGA

VEGA Americas, Inc

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Booth 1032

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We believe the future of instrumentation lies in the ability to produce high quality, innovative products that keep pace with technology, and provide service and value to our customers.

Products & Services

Process Controls and Instruments

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Cincinnati, OH 45306 USA
Phone: (513) 515-6465
www.vega.com

Veolia Water Technologies

Booth 1611

Veolia Water Technologies partners with exploration, engineering, and mining companies to solve even the most difficult mine water challenges. We provide a full range of mine water treatment services including preliminary and detailed engineering, standard and custom water treatment equipment, maintenance support and mobile water treatment options. We understand the unique requirements of mining operations and our worldwide expertise in mine water issues allows us to offer specialized water treatment solutions that treat water and efficiently remove a wide range of contaminants in order to help comply with discharge requirements and stringent regulations.

Products & Services

Filters, Filter Cloth and Accessories
Ion Exchange Equipment and Resins
Remediation
Water Clarification and Treatment

Main Office

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Cary, NC 27513 USA
Phone: (919) 653-4544
www.veoliawatertech.com



Vermeer Corp

Booth 1513

Vermeer Corporation delivers a real impact on the way important work gets done through the design, manufacture and support of high-quality industrial and agricultural equipment that helps connect people to the necessities of life, manage natural resources and fuel communities. With a reputation for being built tough and built a better way, that equipment is backed by localized customer service and support provided by independent dealers around the world. To learn about Vermeer Corporation, products, the dealer network, financing options and careers, visit vermeer.com.

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Diesel Mining Equipment Manufacturers
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WESTRIVERCONVEYORS.COM

EXHIBITORS

Victaulic

Booth 2320

Products & Services

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Dewatering Equipment
Fire Protection
Pipes
Valves

Main Office

4901 Kesslersville Rd
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Virginia Tech Department of Mining & Minerals Engineering

See our ad on p. 118

Booth 1348

The Virginia Tech Department of Mining and Minerals Engineering is one of the largest minerals and energy related programs in North America, with a strong international reputation for its academic (undergraduate and graduate), research, and public service programs. Housed within a nationally ranked College of Engineering at Virginia's public land-grant research university, the department engages in broad research efforts, to include sustainable mineral and energy resource development, occupational health and safety, optimized separation processes, and coalbed methane recovery. It is home to two research centers: the Virginia Center for Coal and Energy Research and the Center for Advanced Separation Technologies.

Products & Services

Consulting - Research
Educational

Main Office

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Blacksburg, VA 24061 USA
Phone: (540) 231-6671
www.mining.vt.edu

Virta Inc

Booth 2451

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Products & Services

Bins, Hoppers, Silos and Storage
Consulting - Design and Planning

Conveyor Belting - Accessories and Equipment
Conveyor Systems
Feeders

Main Office

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Carlsbad, CA 92010 USA
Phone: (949) 349-7070
Email: info@virtainc.com
www.virtainc.com

Vision X USA

Booth 1261

Established in 1997, Vision X Lighting's products have consistently astounded customers with their lighting's ability to perform in harsh environments and unbeatable light output. The engineering, product development, and marketing are conducted from the Vision X USA office, while Vision X Asia is home to the manufacturing, testing, and inventory logistics departments of Vision X Global Lighting. Today, Vision X Lighting has strong partnerships spanning across the globe where they continue to develop the most advanced lighting products in the world.

Products & Services

Lighting Systems and Lamps
Safety Equipment

Main Office

1601 Boundary Blvd
Auburn, WA 98001 USA
Phone: (888) 489-9820
Email: info@visionxusa.com
www.visionxusa.com

Voith Group

Booth 2211

With over 150 years of experience, Voith has the solution for your drive problems. Whether it be our newest-Belt Genius, Elin Motors, Hese pulleys or the conventional products you've known for years. Voith will display a working model of a Turbo coupling, which is a mechanical soft start device for belt conveyors, crushers, centrifuges as well as AFC drives. We will also exhibit our Safeset torque limiting coupling used on crushers and AFC's for overload protection. Come see and download our newest mobile app Turbo-Guide. It will simplify your filling and technical questions for turbo couplings.

Products & Services

Clutches - Fluid, Friction and Magnetic
Consulting - Engineering
Conveyor Systems
Couplings - Mechanical, Flexible and Rigid
Drives - Belt, Chain, Fluid and Gear
Drives - Magnetic and Variable
Electric Motors and Generators
Longwall Mining Equipment
Power Transmission Equipment

Main Office

25 Winship Rd
York, PA 17406 USA
Phone: (717) 767-3200
https://voith.com/corp-en/industry-solutions.html

WAAIME

Booth 1446

For over 100 years, WAAIME volunteers have been rendering service to the USA and the World itself, by focusing on the professions of Mining, Metallurgical, Petroleum Engineering and related Earth Sciences, and maintaining a scholarship fund to assist young men and women obtain a technical college education in these fields, as well as promoting the interchange of ideas/work among our members. WAAIME proudly has spent millions throughout the years assisting students, and is a division of SME with 13 Sections throughout the USA, Peru, Mexico, and Chile.

Products & Services

Educational

Main Office

12999 E Adam Aircraft Cir
Englewood, CO 80112 USA
Phone: (303) 948-4211
www.waaimc.org

Watson-Marlow Fluid Technology Group

Booth 2734

Products & Services

Pumps

Main Office

37 Upton Technology Park
Wilmington, MA 01887 USA
Phone: (978) 804-6955
www.wmftg.com

WEG Electric Corp

Booth 1427

Founded in 1961, WEG has grown into a global solutions provider of industrial electrical technologies. WEG is the largest industrial electric motor manufacturer in the Americas and one of the largest manufacturers of electric motors in the world producing more than 10 million units annually. Committed to growth on a global scale, WEG continually invests in state-of-the-art manufacturing facilities and processes, and the development of new and improved industrial electrical solutions. WEG offers a diverse and integrated product line that includes motors, drives, controls, transformers, and generators. WEG has committed to an R&D investment of 3% of annual global sales.

Products & Services

Automation
Controls - Electrical and Electronic
Drives - Magnetic and Variable
Electric Motors and Generators
Gears - Pullers, Reducers and Pinions

Main Office

6655 Sugarloaf Pkwy
Duluth, GA 30097 USA
Phone: (678) 249-2000
www.weg.net/us



Blasting? No! Safety? Yes!

 www.wirtgen.com/mining



CLOSE TO OUR CUSTOMERS

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Booth: 55020
March 14-15, 2023
Las Vegas, NV
Learn more and register at:
www.conexpoconagg.com

280 SM(i): Surface Mining combines safe mining operations with modern cost-effectiveness: the 280 SM(i) replaces the entire equipment otherwise needed for blasting, drilling and pre-crushing. It cuts costs, delivers mined raw materials of higher quality, and ensures more efficient exploitation of the deposits. Take advantage of innovative solutions from the technology leader.

 www.wirtgen.com

EXHIBITORS

WEIR Motion Metrics

Booth 1843

Weir Motion Metrics is the WEIR ESCO Canadian based AI centre of excellence. Our artificial intelligence and computer vision expertise inspire a new generation of safe, smart, and sustainable mining.

Weir Motion Metrics has been creating and deploying innovative technology for data-driven and responsible extraction of resources since 1999. Our mine-to-mill optimization technology analyzes particle size data on shovels, haul trucks and conveyor belts without interrupting productivity.

Our monitoring systems for shovels, loaders, and haul trucks also improve worker safety and equipment productivity. We offer missing tooth detection, tooth wear monitoring, particle size analysis, volume monitoring, and boulder detection.

Products & Services

Computer - Software and Services
Conveyor Belting - Accessories and Equipment
Excavators
Information Technology Products
Loaders
Measurement and Monitoring Systems
Safety Equipment
Sensors

Main Office

101-2389 Health Sciences Mall
Vancouver, BC V6T 1Z3 Canada
Phone: (604) 822-5842
Email: Sales@motionmetrics.com
www.motionmetrics.com

Wenco International Mining Systems

Booth 1134

For over 30 years, Wenco International Mining Systems has partnered with mining companies to extract unrealized value from their sites and equipment. With this focus, Wenco has developed an integrated suite of solutions to support the digital transformation of the mining industry. Proven fleet management, machine guidance, safety solutions, and asset health technologies join industry-leading open autonomy and machine learning to raise mine productivity, and lower costs, to establish a safe and effective mining operation. Wenco is a wholly owned subsidiary of Hitachi Construction Machinery headquartered in Vancouver, Canada.

Products & Services

Automation
Autonomous Vehicles
Computer - Hardware and Services
Computer - Software and Services
Safety Equipment
Trucks and Haulage Units

Main Office

100-13777 Commerce Pkwy
Richmond, BC V6V 2X3 Canada
Phone: (604) 270-8277
Email: info@wencomine.com
www.wencomine.com

West River Conveyors & Machinery Co

See our ad on p. 119

Booth 1456

West River Conveyors manufactures underground and overland conveyor systems including conveyors, tail sections, take up units, belt storage units, winches, discharge/transfer stations, chutes, starters, power packs and their own line of both underground and above ground conveyor structure. In addition to new conveyors, West River also sells conveyor belt, conveyor components and new and used conveyor parts. West River has surplus new inventory that can be used in many ways to suit your budgetary needs from parts to complete conveyors.

Products & Services

Belts - Power Transmission
Conveyor Belting - Accessories and Equipment
Conveyor Systems
Drives - Belt, Chain, Fluid and Gear
Gears - Pullers, Reducers and Pinions
Parts - Mining Machinery

Main Office

8936 Dismal River Rd
Oakwood, VA 24631 USA
Phone: (276) 991-4450
Email: westriver@westriverconveyors.com
www.westriverconveyors.com

West Virginia Univ Dept of Mining Engineering

Booth 1442

Products & Services

Educational

Main Office

1374 Evansdale Dr, 365 Mineral Resources Bldg
Morgantown, WV 26506 USA
Phone: (304) 293-7680

West Virginia University - Mining Extension

Booth 1249

Products & Services

Educational

Main Office

PO Box 6070, Mineral Resources Bldg
Morgantown, WV 26506 USA
Phone: (304) 293-9810
mindest.statler.wvu.edu

WesTech Engineering, LLC

Booth 1411

Committed to meeting the global need for clean water through technology treatment solutions since 1973, WesTech Engineering provides industry expertise in equipment and process design for treating mine and minerals processing waters. Our tailored liquid/solids separation, water-treatment, sedimentation, filtration,

and thickening solutions meet customers' needs, providing seamless integration and saving operational costs and time. We specialize in retrofits, replacements, and upgrades of all equipment. Our newest innovations include the patented MudMax™ bed-level monitoring system and the revolutionary EvenFlo® feedwell.

We stand behind our equipment, ensuring quick, reliable, and continued support. With over 500 employees, we are ISO 9001 certified.

Products & Services

Coal Preparation Plants
Dewatering Equipment
Filters, Filter Cloth and Accessories
Gravity Separators
Liquid Level Indicators and Switches
Pollution Control Equipment
Screens
Separators and Concentrators
Thickeners
Water Clarification and Treatment

Main Office

3665 S W Temple
Salt Lake City, UT 84115 USA
Phone: (801) 265-1000
Email: info@westech-inc.com
www.westech-inc.com

Western Environmental Testing Lab (WETLAB)

Booth 1428

Products & Services

Laboratory and Scientific Services

Main Office

475 E Greg St, Ste 119
Sparks, NV 89431 USA
Phone: (775) 355-0202
www.wetlaboratory.com

WestLand Engineering and Environmental Services

Booth 1107

WestLand was established in 1997 to provide an innovative and collaborative approach to engineering and environmental consulting services. Our work is based on sound scientific and engineering principals that are characterized by integrity and quality. Our multi-disciplinary teams are experts in biology, cultural resources, water and waste-water engineering, and landscape architecture. Westland works with federal, state, county, municipal, and tribal regulatory partners to monitor and ensure compliance with the Clean Water Act, Endangered Species Act, National Environmental Policy Act, National Historic Preservation Act, and related regulations and statutes.

Products & Services

Consulting - Engineering
Consulting - Environmental



Main Office

4001 E Paradise Falls Dr
Tucson, AZ 85712 USA
Phone: (520) 206-9585
WestLandResources.com

Westpro Machinery Inc**Booth 2322**

Westpro Machinery Inc. is an innovative Canadian company with an experienced engineering team that designs and manufactures mineral processing equipment. We have a global presence and over 35 years of experience in the mining industry with worldwide manufacturing capabilities and equipment installations in over 25 countries.

Products & Services

Bins, Hoppers, Silos and Storage
Crushers and Pulverizers
Dryers
Flotation Machines and Equipment
Grinding Mills
Reagents - Chemical and Flocculants
Scrubbers
Separators and Concentrators
Thickeners
Washing Plants

Main Office

910 - 1111 W Hastings St
Vancouver, BC V6E 2J3 Canada
Phone: (250) 549-6710
www.westpromachinery.com

Wichita Clutch**Booth 1522**

Wichita Clutch & Industrial Clutch are leading global designers and manufacturers of heavy-duty clutches and brakes that are essential components in industrial process equipment, including mine operations. A full range of solutions are offered, including hydraulic clutches and brakes, air clutches, air brakes, water-cooled clutches and brakes, and fluid couplings. These products are utilized extensively around the world by major mining OEMs and operators. Wichita Clutch provides solutions for starting large equipment such as SAG or ball mills, while Industrial Clutch manufacturers braking packages for shovels and dragline applications.

Products & Services

Belts - Power Transmission
Clutches - Fluid, Friction and Magnetic
Conveyor Belting - Accessories and Equipment
Fans and Blowers
Power Transmission Equipment

Main Office

2800 Fisher Rd
Wichita Falls, TX 76302 USA
Phone: (800) 964-3262
Email: wichita.info@wichitaclutch.com
www.wichitaclutch.com

Williams Form Engineering Corp**Booth 2234**

Williams Form Engineering Corporation has been providing threaded steel bars and accessories for rock, soil and concrete anchors, post-tensioning systems, and concrete forming hardware systems in the construction industry for over 100 years.

Our rock and soil anchor product line includes our Spin-Lock mechanical rock anchors, polyester resin anchors, multiple corrosion protection anchors, soil nails, strand anchors, Manta Ray soil anchors, Geo-Drill Hollow-Bar anchors, and micropiles. For concrete anchoring we offer Spin-Lock anchors, undercut anchors, reusable anchors and cast-in-place anchors. We also have a full line of All-Thread Rebar for tiebacks, micropiles and post-tensioning.

Products & Services

Concrete Reinforcement and Equipment
Couplings - Mechanical, Flexible and Rigid
Drill Bits - Rock
Fasteners - Industrial
Roof - Ground Supports

Main Office

251 Rooney Rd
Golden, CO 80401 USA
Phone: (303) 216-9300
Email: williams@williamsform.com
www.williamsform.com

WINFAB**Booth 1043**

WINFAB® is a premier manufacturer in the USA of geotextile fabrics specifically designed for civil engineering and environmental applications. As one of the top fabric manufacturers in the USA, our product lines of silt fence fabric, geotextile fabric, polypropylene fabric, nonwoven fabric and fabric stabilizers exceed the industry standards for separation, filtration, erosion control and reinforcement applications in construction, agricultural and engineering environments.

Products & Services

Sediment & Erosion Control

Main Office

6857 HWY 135
Nashville, GA 31639 USA
Phone: (229) 237-0512
www.winfab.com

Wingfield Scale & Measure**Booth 1115**

Wingfield Scale & Measure specializes in inventory and measurement services. Consisting of four departments we develop, track, maintain, and optimize your site. Scale— Custom design, maintenance/repair, sales, and certification of laboratory scales, belt scales, haul truck scales, including rail scales. Rental— Wingfield has the largest rental scale fleets. Measure— Specializing in LiDAR & UAV stockpile inventories, underground, and quarry work, Wingfield uses the latest technology to safely map and inventory mines. Wingscan— Real time LiDAR measurements for conveyor haul trucks and rail. Systems are installed at site and help manage invento-

ries and bring true insight to production and stripping operations.

Products & Services

Aerial Mapping and Surveying
Automation
Computer - Hardware and Services
Computer - Software and Services
Consulting - Engineering
Conveyor Belting - Accessories and Equipment
Measurement and Monitoring Systems
Rail Systems and Supplies
Scales
Surveying Equipment and Supplies

Main Office

2205 S Holtzclaw Ave
Chattanooga, TN 37404 USA
Phone: (423) 698-0100
www.wingfieldscale.com

**Wingtra AG****Booth 1136**

Headquartered in Switzerland, Wingtra is the world's leading VTOL drone producer for mapping, survey and mining industry professionals. Since its market entry in early 2017, Wingtra has partnered with more than 70 of the biggest equipment dealers and has been selling mapping drones globally ever since. The WingtraOne drone is rooted in years of robotics research at the Autonomous Systems Lab (ETH Zurich) — one of the world's best drone laboratories. Several of Wingtra's employees have based their doctoral and master projects on VTOL technology and now pursue research and development at Wingtra.

Products & Services

Aerial Mapping and Surveying
Autonomous Vehicles
Surveying Equipment and Supplies

Main Office

Giesshübelstrasse 40
Zurich 8045 Switzerland
Email: sales@wingtra.com
www.wingtra.com

**WIRTGEN GROUP****Wirtgen America**

See our ad on p. 121

Booth 1420

The Wirtgen Group is a group of companies active in the global construction machinery industry that encompasses the products brands WIRTGEN, VÖGELE, HAMM, KLEEMANN, and BENNINGHOVEN, each with their own unique history. As the technology leader, we offer our customers machines for road construction and rehabilitation, systems for mining and processing recycled materials, and for asphalt production.

EXHIBITORS

Products & Services

Continuous Mining Machines

Main Office

6030 Dana Wy
Antioch, TN 37013 USA
Phone: (615) 501-0600
www.wirtgenamerica.com

Wolf Point Engineers & Contractors / North Alabama Fabricating Company, Inc

Booth 1404

Wolf Point Engineers & Contractors is an EPC firm specializing in the design, supply and installation of bulk material handling facilities for a wide variety of industries. NAFCO is a leading structural steel & platework fabricator with over 350,000 square feet of shop space. WPE is a division of NAFCO.

Products & Services

Bins, Hoppers, Silos and Storage
Blending Systems
Coal Preparation Plants
Construction - Contracting Services
Consulting - Design and Planning
Consulting - Engineering
Conveyor Systems

Main Office

One N LaSalle St, Ste 4000
Chicago, IL 60602 USA
Phone: (312) 508-5543
www.wolfpointengineers.com

Women's Mining Coalition

Booth 1605

Since 1993, the Womens Mining Coalition has advocated for today's modern domestic mining industry which is essential to our Nation. WMC communicates that US jobs depend on mining, and that today's industry uses effective environmental and safety protection. WMC is an organization with nationwide representation, with members working as scientists, engineers, miners, and administrators. WMC members work in all sectors, including industrial minerals, metals, and coal mining; energy generation and distribution; manufacturing and transportation; and in the service industries.

Products & Services

Educational
Professional Society or Association

Main Office

PO Box 10101
Reno, NV 89510 USA
Phone: (307) 281-0148
www.wmc-usa.org

Wood

Booth 1538

For over 60 years, we have been trusted to deliver some of the world's most logistically and technically challenging projects. We add value from concept through closure across a diverse range of commodities with capabilities that support mines of the future.

Products & Services

Consulting - Design and Planning
Consulting - Engineering
Consulting - Environmental
Consulting - Management
Laboratory and Scientific Services
Mine Evaluations - Surface and Underground
Remediation
Training Services
Transportation
Water Clarification and Treatment

Main Office

111 Dunsmuir St
Vancouver, BC V6B 5W3 Canada
Phone: (604) 664-4778
<https://www.woodplc.com/solutions/key-markets/energy/mining>

Woodgrove Technologies

Booth 2539

Woodgrove Technologies is the world leader in Flotation Technology and Advanced Process Control. The Direct Flotation Reactor is a paradigm shift and has taken flotation technology to a new level with an order of magnitude savings for clients on installation and operation and our Progressive Control solution will result in a significantly more stable and efficient circuit.

Products & Services

Analyzers
Automation
Flotation Machines and Equipment
Process Controls and Instruments

Main Office

3737 Chesswood Dr
Toronto, ON M3J 2P6 Canada
Phone: (416) 751-4848
www.woodgrovetech.com

Worldsensing

Booth 1138

The solution by IoT pioneer Worldsensing is used in more than 130 mines across 20+ countries to acquire real-time data from geotechnical, geospatial and structural sensors as well as to perform remote device, data and network management.

Mining operators can now connect their instrumentation and monitoring equipment and wirelessly monitor risk points across underground operations, tailings dams and excavations through IoT remote monitoring.

Products & Services

Measurement and Monitoring Systems
Sensors

Main Office

1900 Avenue of the Stars, Ste 2430
Los Angeles, CA 90067 USA
Phone: (323) 395-5120
Email: connect@worldsensing.com
www.worldsensing.com



WSP

See our ad on p. 58

Booth 2021

WSP is one of the world's leading engineering, environmental and professional services firm. With over 3,000 people focused on the mining industry, our experts in Mine Water, Mine Waste, Environment, Mine Infrastructure, Mineral Processing and Mine Engineering & Stability, and Geology have a long history of delivering excellence to our clients across North America and the world. Our global team partners with clients to help them tackle their toughest challenges, meeting the needs of today and preparing for a sustainable and resilient future.

Products & Services

Backfilling
Consulting - Design and Planning
Consulting - Engineering
Consulting - Environmental
Consulting - Management
Grouting Services, Equipment and Materials
Laboratory and Scientific Services
Mine Evaluations - Surface and Underground
Remediation
Transportation

Main Office

7245 W Alaska Dr, Ste 200
Lakewood, CO 80226 USA
Phone: (303) 980-0540
<https://www.wsp.com/en-gl/sectors/mining>

x-Glo North America Inc

Booth 1351

x-Glo North America Inc, distributor of industrial grade LED lighting solutions and is committed to developing and supplying high quality x-Glo LED lighting products and systems that are purpose built for mining, tunneling, oil & gas and other industrial applications.

Products & Services

Alarm Systems
Communications Equipment
Controls - Electrical and Electronic
Lighting Systems and Lamps
Safety Equipment

Main Office

15 Rita St
Markstay, ON P0M 2G0 Canada
Phone: (705) 698-0441
Email: sales@x-glo-na.com
www.x-glo-na.com

Xylem Dewatering Solutions Inc

Booth 1566

Products & Services

Consulting - Engineering
Controls - Electrical and Electronic
Measurement and Monitoring Systems
Pumps
Water Clarification and Treatment

Main Office

84 Floodgate Rd
Bridgeport, NJ 08014 USA
Phone: (469) 416-0347
www.xylem.com

Zitron USA, LLC

Booth 2334

Products & Services

Ventilation Systems, Materials and Equipment

Main Office

4986 John F Nash Blvd
Bluefield, WV 24701 USA
Phone: (304) 222-4178
Zitron.com

Notes:

SourceOne™

«» Eclipse Mining Technologies®



PRODUCTS & SERVICES

Aerators

EcoMister Evaporator – Booth 2402
Hayward Gordon ULC – Booth 1536
Kurita America Inc – Booth 1371
Roxia Inc – Booth 2715
Valmet Flow Control – Booth 2006

Aerial Mapping and Surveying

Call & Nicholas Inc - Call & Nicholas Instruments – Booth 1410
Carlson Software – Booth 2413
Datamine North America Inc – Booth 2220
Emesent – Booth 2134
Esri – Booth 1142
Exyn Technologies – Booth 1205
Frontier Precision Geospatial/Unmanned – Booth 1110
Hexagon's Mining division – Booth 2001
Maptek – Booth 1501
Montrose Environmental – Booth 2249
PhotoSat – Booth 1349
Propeller Aero – Booth 1735
RDO Integrated Controls – Booth 2936
Skycatch – Booth 2048
Wingfield Scale & Measure – Booth 1115
Wingtra AG – Booth 1136

Agitators, Vibrators and Mixers

Eirich Machines, Inc – Booth 2404
Fluid Systems, Inc – Booth 1251
Hayward Gordon ULC – Booth 1536
Joest Inc – Booth 1350
Mixtec North America – Booth 1432
MOGAS Industries, Inc – Booth 2737

Air Compressors

All Weather Air – Booth 2828

Alarm Systems

Honeywell – Booth 2037
Industrial Scientific – Booth 1144
IoT Automation – Booth 2542
PROVIX – Booth 1353
Rapid Fire Protection Inc – Booth 2826
RCT – Booth 1068
Tracerco – Booth 2901

x-Glo North America Inc – Booth 1351

Analyzers

CANTY – Booth 1521
Emerson – Booth 1633
Fluid Life – Booth 2246
Honeywell – Booth 2037
Industrial Scientific – Booth 1144
Malvern Panalytical – Booth 1502
Scantech International Pty Ltd – Booth 1407
Sympatec – Booth 2439
TechStar – Booth 2049
Woodgrove Technologies – Booth 2539

Assay Equipment

BICO Inc – Booth 2427
CoreLift – Booth 2248
Sunset Manufacturing – Booth 2637

Automation

Ackcio – Booth 2939
ANDRITZ – Booth 1412
Apollo Valves – Booth 2738
Arsenal Tire Performance Tech – Booth 1259
ASI Mining – Booth 1358
Caterpillar – Booth 2701
Control Station, Inc – Booth 1148
CPM Roskamp Champion – Booth 1000
EcoMister Evaporator – Booth 2402
Emerson – Booth 1633
Emesent – Booth 2134
Epiroc – Booth 1921
Force Control Industries, Inc – Booth 2720
Honeywell – Booth 2037
Howden Canada Inc – Booth 1515
IoT Automation – Booth 2542
Maestro Digital Mine – Booth 1304
Malvern Panalytical – Booth 1502
Matrix Service Company – Booth 2532
MICROMINE – Booth 1627
Nalco Water, an Ecolab Company – Booth 1242
Northwest Towers – Booth 2549
RCT – Booth 1068
Rocvent Inc – Booth 2601

Roxia Inc – Booth 2715

Roxsyle Systems LLC – Booth 2223
Samuel Engineering, Inc – Booth 1733
Sandvik – Booth 2521
Simem Underground Solutions, Inc – Booth 1617
Skycatch – Booth 2048
Southwestern Scale Co, Inc – Booth 2807
Strata Products Worldwide, LLC – Booth 2520
TAKRAF USA Inc – Booth 2127
TechStar – Booth 2049
Valmet Flow Control – Booth 2006
WEG Electric Corp – Booth 1427
Wenco International Mining Systems – Booth 1134
Wingfield Scale & Measure – Booth 1115
Woodgrove Technologies – Booth 2539

Autonomous Vehicles

ASI Mining – Booth 1358
Caterpillar – Booth 2701
Epiroc – Booth 1921
Esri – Booth 1142
ExcelSense Technologies – Booth 2801
Exyn Technologies – Booth 1205
Frontier Precision Geospatial/Unmanned – Booth 1110
Hexagon's Mining division – Booth 2001
Immersive Technologies – Booth 1509
Rail-Veyor Technologies Global Inc – Booth 2407
RCT – Booth 1068
SafeAI – Booth 1152
Wenco International Mining Systems – Booth 1134
Wingtra AG – Booth 1136

Backfilling

Aerix Industries – Booth 1721
DSI Underground LLC – Booth 2626
FM Technologies – Booth 2251
GMS Mine Repair & Maintenance – Booth 1620
Iron Woman Mining Services – Booth 1934
Odin Construction Solutions – Booth



1150
 Paterson & Cooke USA, Ltd – Booth 2138
 Schwing Bioset Inc – Booth 2617
 Simem Underground Solutions, Inc – Booth 1617
 Victaulic – Booth 2320
 WSP – Booth 2021

Belts - Power Transmission

Continental – Booth 2215
 Dodge Industrial, Inc – Booth 1336
 Formsprag & Marland Clutch – Booth 1421
 REESCO – Booth 2814
 Regal Rexnord – Booth 1365
 Rema Tip Top – Booth 1301
 Sefar Inc – Booth 1305
 Twiflex – Booth 1423
 VDG (Van der Graaf) – Booth 2311
 West River Conveyors & Machinery Co – Booth 1456
 Wichita Clutch – Booth 1522

Bins, Hoppers, Silos and Storage

Eirich Machines, Inc – Booth 2404
 Great Basin Industrial, LLC – Booth 1104
 Jenike & Johanson – Booth 2605
 Kamengo – Booth 2908
 Marietta Silos, LLC – Booth 2615
 Matrix Service Company – Booth 2532
 REESCO – Booth 2814
 Saint-Gobain Ceramic Materials – Booth 2607
 Savage Services – Booth 2821
 Schwing Bioset Inc – Booth 2617
 Simem Underground Solutions, Inc – Booth 1617
 Tank Connection – Booth 1053
 Virta Inc – Booth 2451
 Westpro Machinery Inc – Booth 2322
 Wolf Point Engineers & Contractors / North Alabama Fabricating Company, Inc – Booth 1404

Blasting Accessories, Equipment and Agents

ASI Mining – Booth 1358
 Carlson Software – Booth 2413
 Dyno Nobel – Booth 1621

Hexagon's Mining division – Booth 2001
 Laser Tech – Booth 2235
 Nouryon – Booth 1525
 Orica USA – Booth 2122
 Phoenix Lighting – Booth 2732

Blending Systems

BEUMER Group – Booth 2343
 Carrier Vibrating Equipment, Inc – Booth 1108
 Datamine North America Inc – Booth 2220
 Hayward Gordon ULC – Booth 1536
 Jenike & Johanson – Booth 2605
 Scantech International Pty Ltd – Booth 1407
 Wolf Point Engineers & Contractors / North Alabama Fabricating Company, Inc – Booth 1404

Boring Equipment

Antraquip Corporation – Booth 2332
 Carlson Software – Booth 2413
 Herrenknecht Tunneling Systems USA, Inc – Booth 2206
 MILLER – Booth 2501

Brakes - Dynamic, Friction Disk - Block, Magnetic

Brunel Corp – Booth 1401
 Flender Corporation – Booth 2424
 Force Control Industries, Inc – Booth 2720
 Hilliard Brake Systems – Booth 2327
 Johnson Industries Ltd – Booth 2516
 Kobelt Manufacturing Co Ltd – Booth 2437
 Svendborg Brakes USA, Inc – Booth 1520

Briquetters

The Koeppern Group – Booth 2328

Castings

ASC Engineered Solutions – Booth 1820
 Bradken – Booth 1214
 CR – Booth 1250
 FC Mill Liners, Inc – Booth 1264
 Kobelt Manufacturing Co Ltd – Booth 2437

ME Elecmetal – Booth 1701
 Saint-Gobain Ceramic Materials – Booth 2607

Centrifuges

Alfa Laval – Booth 2728
 CANTY – Booth 1521
 Derrick Corporation – Booth 1715
 ENVECO Environmental Solutions, LLC – Booth 2050
 Flottweg Separation Technology, Inc – Booth 1415
 Fluid Systems, Inc – Booth 1251
 GEA Systems North America LLC – Booth 1470
 Petroleum Solids Control, Inc – Booth 2832
 PHOENIX Process Equipment – Booth 2616
 Pocock Industrial, Inc – Booth 1712
 Sefar Inc – Booth 1305

Classifiers

Derrick Corporation – Booth 1715
 Fluid Systems, Inc – Booth 1251
 General Kinematics – Booth 1429
 Iracore/Irathane Systems Inc – Booth 1317
 Joest Inc – Booth 1350
 PHOENIX Process Equipment – Booth 2616
 Saint-Gobain Ceramic Materials – Booth 2607

Clutches - Fluid, Friction and Magnetic

Brunel Corp – Booth 1401
 Flender Corporation – Booth 2424
 Force Control Industries, Inc – Booth 2720
 Formsprag & Marland Clutch – Booth 1421
 Kraft Power Corp – Booth 1237
 Twiflex – Booth 1423
 Voith Group – Booth 2211
 Wichita Clutch – Booth 1522

Coal Preparation Plants

FGX SepTech, LLC – Booth 2400
 Scantech International Pty Ltd – Booth 1407

PRODUCTS & SERVICES

Victaulic – Booth 2320
WesTech Engineering, LLC – Booth 1411
Wolf Point Engineers & Contractors / North Alabama Fabricating Company, Inc – Booth 1404

Coatings (does not include Linings and Claddings)

A.W. Chesterton Company – Booth 1001
ChemQuest Chemicals, LLC – Booth 2634
Custom Linings, Inc – Booth 2133
Guardian Traxol Chemicals Inc – Booth 1210
InduMar Products Inc – Booth 1437
MOGAS Industries, Inc – Booth 2737
RAM Enterprise, Inc – Booth 2507
Rema Tip Top – Booth 1301
RubberSource Inc – Booth 1671
Technogenia Lasercarb Oklahoma Inc – Booth 2714

Communications Equipment

3D-P – Booth 1560
Ackcio – Booth 2939
IoT Automation – Booth 2542
IWT – Booth 1526
Maestro Digital Mine – Booth 1304
Matrix Design Group – Booth 2401
MICROMINE – Booth 1627
Monico Monitoring, Inc – Booth 1537
Northwest Towers – Booth 2549
PROVIX – Booth 1353
RCT – Booth 1068
RDO Integrated Controls – Booth 2936
Strata Products Worldwide, LLC – Booth 2520
Tunnel Radio of America, Inc – Booth 1364
x-Glo North America Inc – Booth 1351

Compactors

The Koeppern Group – Booth 2328

Computer - Hardware and Services

3D-P – Booth 1560

ASI Mining – Booth 1358
Diesel Laptops – Booth 1101
MICROMINE – Booth 1627
Northwest Towers – Booth 2549
Propeller Aero – Booth 1735
Symboticware – Booth 2227
Wenco International Mining Systems – Booth 1134
Wingfield Scale & Measure – Booth 1115

Computer - Software and Services

3D-P – Booth 1560
Actenum – Booth 1151
airth.io – Booth 1211
ASI Mining – Booth 1358
Bentley Systems – Booth 1359
Canary Systems, Inc – Booth 1232
Cancha Geometallurgy – Booth 2933
Carlson Software – Booth 2413
COGEP Maintenance Software – Booth 2543
Control Station, Inc – Booth 1148
Costmine – Booth 1817
Datamine North America Inc – Booth 2220
Deswik – Booth 2612
DHI Water & Environment, Inc – Booth 2232
Diesel Laptops – Booth 1101
Esri – Booth 1142
Exyn Technologies – Booth 1205
Hexagon's Mining division – Booth 2001
Honeywell – Booth 2037
Howden Canada Inc – Booth 1515
Information Alignment Pty Ltd – Booth 1668
Itasca International, Inc – Booth 1832
K2fly – Booth 1469
Laser Tech – Booth 2235
Maptek – Booth 1501
Matrix Design Group – Booth 2401
Metsim International – Booth 2614
MICROMINE – Booth 1627
Northwest Towers – Booth 2549
O-pitblast LDA – Booth 1471
Orica USA – Booth 2122
PETRA – Booth 1666
Polymathian – Booth 2921

Predictive Compliance – Booth 2032
Propeller Aero – Booth 1735
RCT – Booth 1068
RESPEC – Booth 1811
Rock Flow Dynamics – Booth 1065
Satellogic – Booth 1008
Skycatch – Booth 2048
Symboticware – Booth 2227
WEIR Motion Metrics – Booth 1843
Wenco International Mining Systems – Booth 1134
Wingfield Scale & Measure – Booth 1115

Concrete Reinforcement and Equipment

Aerix Industries – Booth 1721
AGRU America, Inc – Booth 1539
Antraquip Corporation – Booth 2332
Bekaert – Booth 2208
Concrete Canvas US – Booth 2148
Inland Tarp & Liner – Booth 1360
Iron Woman Mining Services – Booth 1934
Minova – Booth 2533
SKAPS Industries – Booth 2713
Strata Products Worldwide, LLC – Booth 2520
Williams Form Engineering Corp – Booth 2234

Construction - Contracting Services

AECOM – Booth 1903
Barnard Construction Company, Inc – Booth 1145
Burns & McDonnell Engineering Company, Inc – Booth 2237
CCC Group, Inc – Booth 2632
Cementation USA Inc – Booth 2243
Cowin & Company/Raisebor – Booth 2717
DeWind One Pass Trenching LLC – Booth 1017
Drill Tech Drilling & Shoring Inc – Booth 1626
Driver Industrial Safety – Booth 1132
ENTACT – Booth 1838
Envirocon, Inc – Booth 1709
FKC-Lake Shore – Booth 1504
Forgen – Booth 2526



Geovert LLC – Booth 2642
 GHD – Booth 2150
 GMS Mine Repair & Maintenance – Booth 1620
 Harrison Western Construction Corporation, Inc – Booth 2233
 Hoffman Manufacturing, Inc – Booth 1246
 Howden Canada Inc – Booth 1515
 Iron Woman Mining Services – Booth 1934
 JAMAR Company – Booth 1014
 JHL Constructors – Booth 2137
 Keller – Booth 1716
 Kiewit – Booth 1827
 Matrix Service Company – Booth 2532
 MBA Energy and Industrial – Booth 1315
 MES Mining – Booth 1739
 MILLER – Booth 2501
 NewFields – Booth 1839
 Northwest Towers – Booth 2549
 Phillips & Jordan, Inc – Booth 1834
 Phoenix Industrial – Booth 1311
 RAM Enterprise, Inc – Booth 2507
 Rapid Fire Protection Inc – Booth 2826
 RECO Mining Solutions – Booth 1269
 Sprung Structures – Booth 2606
 Stewart Brothers Drilling Co – Booth 1813
 Titan Environmental USA – Booth 1233
 Turner Mining Group – Booth 1042
 Wolf Point Engineers & Contractors / North Alabama Fabricating Company, Inc – Booth 1404

Consulting - Design and Planning

3D-P – Booth 1560
 AECOM – Booth 1903
 Agapito Associates Inc – Booth 2027
 AIL Mining – Booth 2736
 ARCADIS – Booth 1614
 ASC Engineered Solutions – Booth 1820
 Barr Engineering Co – Booth 1400
 BBE Consulting Canada – Booth 1102
 BGC Engineering – Booth 2805
 Bowman Consulting Group – Booth 2348

Burgex Inc – Booth 1116
 Burns & McDonnell Engineering Company, Inc – Booth 2237
 Call & Nicholas Inc - Call & Nicholas Instruments – Booth 1410
 Cancha Geometallurgy – Booth 2933
 Cementation USA Inc – Booth 2243
 Check-6/Biz X Group – Booth 1165
 Civil & Environmental Consultants, Inc (CEC) – Booth 1510
 CoreLift – Booth 2248
 Datamine North America Inc – Booth 2220
 Dyno Nobel – Booth 1621
 Forte Dynamics – Booth 2733
 Foth Infrastructure & Environment, LLC – Booth 2432
 GHD – Booth 2150
 Hatch – Booth 1334
 Hazen Research – Booth 1327
 Hexagon's Mining division – Booth 2001
 Hilfiker Retaining Walls – Booth 2210
 Hoffman Manufacturing, Inc – Booth 1246
 HUESKER Inc – Booth 1815
 Independent Mining Consultants, Inc – Booth 2115
 Jenike & Johanson – Booth 2605
 Linkan Engineering – Booth 1426
 Maccaferri, Inc – Booth 2335
 MAPEI Corporation – Booth 1702
 Maptek – Booth 1501
 Matrix Service Company – Booth 2532
 Millcreek Engineering Co – Booth 1511
 Mineral Technologies – Booth 1416
 MOGAS Industries, Inc – Booth 2737
 Montgomery & Associates – Booth 1835
 Montrose Environmental – Booth 2249
 NewFields – Booth 1839
 Northwest Towers – Booth 2549
 ORE-MAX – Booth 1500
 Orica USA – Booth 2122
 Rapid Fire Protection Inc – Booth 2826
 REI Drilling, Inc – Booth 2633
 RESPEC – Booth 1811
 Roxsyle Systems LLC – Booth 2223
 Samuel Engineering, Inc – Booth 1733

Savage Services – Booth 2821
 SLR International Corporation – Booth 2132
 SNC-LAVALIN – Booth 2034
 SRK Consulting (US), Inc – Booth 2121
 Stantec Consulting – Booth 1920
 TAKRAF USA Inc – Booth 2127
 TerraSource Global – Booth 2712
 Tetra Tech – Booth 1632
 Turner Mining Group – Booth 1042
 Virta Inc – Booth 2451
 Wolf Point Engineers & Contractors / North Alabama Fabricating Company, Inc – Booth 1404
 Wood – Booth 1538
 WSP – Booth 2021

Consulting - Engineering

3D-P – Booth 1560
 AECOM – Booth 1903
 Agapito Associates Inc – Booth 2027
 AIL Mining – Booth 2736
 Aquatech International – Booth 1570
 ARCADIS – Booth 1614
 Barr Engineering Co – Booth 1400
 BBE Consulting Canada – Booth 1102
 BGC Engineering – Booth 2805
 Bowman Consulting Group – Booth 2348
 Burns & McDonnell Engineering Company, Inc – Booth 2237
 Call & Nicholas Inc - Call & Nicholas Instruments – Booth 1410
 Canary Systems, Inc – Booth 1232
 Cancha Geometallurgy – Booth 2933
 Cementation USA Inc – Booth 2243
 Civil & Environmental Consultants, Inc (CEC) – Booth 1510
 Colorado School of Mines - Department of Mining Engineering – Booth 2023
 Contech Engineered Solutions – Booth 2029
 Control Station, Inc – Booth 1148
 CoreLift – Booth 2248
 Costmine – Booth 1817
 Deswik – Booth 2612
 DHI Water & Environment, Inc – Booth 2232
 Dyno Nobel – Booth 1621

PRODUCTS & SERVICES

Emerson – Booth 1633
Englo, Inc – Booth 2336
Forte Dynamics – Booth 2733
Foth Infrastructure & Environment, LLC – Booth 2432
GEA Systems North America LLC – Booth 1470
Geo-Logic Associates – Booth 1728
Geosyntec Consultants – Booth 2225
GHD – Booth 2150
GMS Mine Repair & Maintenance – Booth 1620
H2E Inc – Booth 1238
Harrison Western Construction Corporation, Inc – Booth 2233
Hatch – Booth 1334
Hoffman Manufacturing, Inc – Booth 1246
Howden Canada Inc – Booth 1515
HUESKER Inc – Booth 1815
hydroGEOPHYSICS Inc – Booth 2339
Independent Mining Consultants, Inc – Booth 2115
INR Consulting and Engineering Inc – Booth 2448
Itasca International, Inc – Booth 1832
JBW Consulting Engineers – Booth 1015
Jenike & Johanson – Booth 2605
Knight Piésold and Co – Booth 2207
KnightHawk Engineering, Inc – Booth 1111
Linkan Engineering – Booth 1426
Maccaferri, Inc – Booth 2335
Maptek – Booth 1501
Matrix Service Company – Booth 2532
MBA Energy and Industrial – Booth 1315
MES Mining – Booth 1739
Metsim International – Booth 2614
Millcreek Engineering Co – Booth 1511
Mineral Technologies – Booth 1416
Mining Plus US – Booth 1422
Minova – Booth 2533
MOGAS Industries, Inc – Booth 2737
Montrose Environmental – Booth 2249
NewFields – Booth 1839
Northwest Towers – Booth 2549
O-pitblast LDA – Booth 1471
ORE-MAX – Booth 1500

Orica USA – Booth 2122
Paterson & Cooke USA, Ltd – Booth 2138
Piteau Associates Engineering Ltd – Booth 2344
Pocock Industrial, Inc – Booth 1712
Ramboll – Booth 2038
Rapid Fire Protection Inc – Booth 2826
RDI Technologies – Booth 1569
RDO Integrated Controls – Booth 2936
REI Drilling, Inc – Booth 2633
RESPEC – Booth 1811
Rocvent Inc – Booth 2601
Roxsyle Systems LLC – Booth 2223
RWI Enhanced Evaporation Services – Booth 2026
Samuel Engineering, Inc – Booth 1733
Savage Services – Booth 2821
Sefar Inc – Booth 1305
Simem Underground Solutions, Inc – Booth 1617
SLR International Corporation – Booth 2132
SNC-LAVALIN – Booth 2034
SRK Consulting (US), Inc – Booth 2121
Stantec Consulting – Booth 1920
Symbolicware – Booth 2227
TAKRAF USA Inc – Booth 2127
Technogenia Lasercarb Oklahoma Inc – Booth 2714
TerraSource Global – Booth 2712
Tetra Tech – Booth 1632
Turner Mining Group – Booth 1042
Voith Group – Booth 2211
WestLand Engineering and Environmental Services – Booth 1107
Wingfield Scale & Measure – Booth 1115
Wolf Point Engineers & Contractors / North Alabama Fabricating Company, Inc – Booth 1404
Wood – Booth 1538
WSP – Booth 2021
Xylem Dewatering Solutions Inc – Booth 1566

Consulting - Environmental
AECOM – Booth 1903

ARCADIS – Booth 1614
Barr Engineering Co – Booth 1400
BGC Engineering – Booth 2805
Bowman Consulting Group – Booth 2348
Burns & McDonnell Engineering Company, Inc – Booth 2237
Civil & Environmental Consultants, Inc (CEC) – Booth 1510
ConeTec Inc – Booth 1535
DHI Water & Environment, Inc – Booth 2232
ENVECO Environmental Solutions, LLC – Booth 2050
Esri – Booth 1142
Forte Dynamics – Booth 2733
Foth Infrastructure & Environment, LLC – Booth 2432
Geo-Logic Associates – Booth 1728
Geosyntec Consultants – Booth 2225
GHD – Booth 2150
Headwater Technologies – Booth 2727
HUESKER Inc – Booth 1815
hydroGEOPHYSICS Inc – Booth 2339
Itasca International, Inc – Booth 1832
Knight Piésold and Co – Booth 2207
Linkan Engineering – Booth 1426
Montgomery & Associates – Booth 1835
Montrose Environmental – Booth 2249
NewFields – Booth 1839
Presto Geosystems – Booth 1452
Ramboll – Booth 2038
RESPEC – Booth 1811
SAM Solutions – Booth 1837
Sauls Seismic – Booth 1313
SLR International Corporation – Booth 2132
SNC-LAVALIN – Booth 2034
SOLMAX – Booth 1527
SRK Consulting (US), Inc – Booth 2121
Stantec Consulting – Booth 1920
Tetra Tech – Booth 1632
WestLand Engineering and Environmental Services – Booth 1107
Wood – Booth 1538
WSP – Booth 2021

Consulting - Financial Services
Burns & McDonnell Engineering



Company, Inc – Booth 2237
Independent Mining Consultants, Inc – Booth 2115
SLR International Corporation – Booth 2132
SRK Consulting (US), Inc – Booth 2121

Consulting - Management

ARCADIS – Booth 1614
Burns & McDonnell Engineering Company, Inc – Booth 2237
Check-6/Biz X Group – Booth 1165
Forte Dynamics – Booth 2733
Foth Infrastructure & Environment, LLC – Booth 2432
Hatch – Booth 1334
Independent Mining Consultants, Inc – Booth 2115
Information Alignment Pty Ltd – Booth 1668
Kiewit – Booth 1827
Matrix Service Company – Booth 2532
MBA Energy and Industrial – Booth 1315
Metsim International – Booth 2614
Mining Plus US – Booth 1422
Montrose Environmental – Booth 2249
NewFields – Booth 1839
Predictive Compliance – Booth 2032
Samuel Engineering, Inc – Booth 1733
Savage Services – Booth 2821
SLR International Corporation – Booth 2132
SRK Consulting (US), Inc – Booth 2121
Stantec Consulting – Booth 1920
Technical Translation Services – Booth 2449
Wood – Booth 1538
WSP – Booth 2021

Consulting - Research

Blue Coast Research – Booth 1037
Cancha Geometallurgy – Booth 2933
Cemvita – Booth 2445
Colorado School of Mines - Department of Mining Engineering – Booth 2023
Forte Dynamics – Booth 2733
hydroGEOPHYSICS Inc – Booth 2339
Itasca International, Inc – Booth 1832

Metcom Technologies Inc – Booth 1608
Montgomery & Associates – Booth 1835
Montrose Environmental – Booth 2249
Pocock Industrial, Inc – Booth 1712
RESPEC – Booth 1811
Samuel Engineering, Inc – Booth 1733
SLR International Corporation – Booth 2132
SRK Consulting (US), Inc – Booth 2121
Symboticware – Booth 2227
Virginia Tech Department of Mining & Minerals Engineering – Booth 1348

Continuous Mining Machines

Antraquip Corporation – Booth 2332
BEUMER Group – Booth 2343
Cornell Pump Co – Booth 2300
ExcelSense Technologies – Booth 2801
FM Technologies – Booth 2251
Komatsu – Booth 1914
Miner Elastomer – Booth 1333
Mineral Technologies – Booth 1416
O-pitblast LDA – Booth 1471
Sandvik – Booth 2521
Wirtgen America – Booth 1420

Controls - Electrical and Electronic

ABB – Booth 1943
CPM Roskamp Champion – Booth 1000
DEA Incorporated – Booth 1567
Emerson – Booth 1633
Evoqua Water Technologies – Booth 2238
FKC-Lake Shore – Booth 1504
Geotech Environmental Equipment, Inc – Booth 1624
Hepburn Engineering Inc – Booth 2538
Howden Canada Inc – Booth 1515
IoT Automation – Booth 2542
Kobelt Manufacturing Co Ltd – Booth 2437
Kraft Power Corp – Booth 1237
Northwest Towers – Booth 2549
PROVIX – Booth 1353
RDO Integrated Controls – Booth

2936
Roxsyle Systems LLC – Booth 2223
Samuel Engineering, Inc – Booth 1733
Southwestern Scale Co, Inc – Booth 2807
Svendborg Brakes USA, Inc – Booth 1520
Syntron Material Handling – Booth 2321
WEG Electric Corp – Booth 1427
x-Glo North America Inc – Booth 1351
Xylem Dewatering Solutions Inc – Booth 1566

Controls - Hydraulic and Pneumatic

Bosch Rexroth - Hägglunds Drives – Booth 2043
Geotech Environmental Equipment, Inc – Booth 1624
Hepburn Engineering Inc – Booth 2538
Hoffman Manufacturing, Inc – Booth 1246
Johnson Industries Ltd – Booth 2516
Kobelt Manufacturing Co Ltd – Booth 2437
Kraft Power Corp – Booth 1237
Svendborg Brakes USA, Inc – Booth 1520
Valmet Flow Control – Booth 2006

Conveyor Belting - Accessories and Equipment

American-Biltrite – Booth 1217
ASGCO Complete Conveyor Solutions – Booth 1615
BEUMER Group – Booth 2343
Bosch Rexroth - Hägglunds Drives – Booth 2043
Brelko Conveyor Products – Booth 1727
CAB – Booth 1533
Cambelt International – Booth 2710
Continental – Booth 2215
Dodge Industrial, Inc – Booth 1336
Endurance Belting – Booth 2611
Formsprag & Marland Clutch – Booth 1421
Luff Industries Ltd – Booth 2527

PRODUCTS & SERVICES

Midwest Industrial Supply, Inc – Booth 2420

Orica USA – Booth 2122

Phoenix Lighting – Booth 2732

Precision Pulley & Idler – Booth 1711

RAM Enterprise, Inc – Booth 2507

REESCO – Booth 2814

Regal Rexnord – Booth 1365

Rema Tip Top – Booth 1301

Rulmeca Limited – Booth 1312

Saint-Gobain Ceramic Materials – Booth 2607

Sempertrans USA – Booth 2438

Twiflex – Booth 1423

United Central Industrial Supply – Booth 1933

VDG (Van der Graaf) – Booth 2311

Virta Inc – Booth 2451

WEIR Motion Metrics – Booth 1843

West River Conveyors & Machinery Co – Booth 1456

Wichita Clutch – Booth 1522

Wingfield Scale & Measure – Booth 1115

Conveyor Systems

ASGCO Complete Conveyor Solutions – Booth 1615

BEUMER Group – Booth 2343

Brelko Conveyor Products – Booth 1727

CAB – Booth 1533

Cambelt International – Booth 2710

Carrier Vibrating Equipment, Inc – Booth 1108

CCC Group, Inc – Booth 2632

CoreLift – Booth 2248

Endurance Belting – Booth 2611

ExcelSense Technologies – Booth 2801

Fibracon LLC – Booth 2603

FKC-Lake Shore – Booth 1504

Flender Corporation – Booth 2424

FLSmidth A/S – Booth 1801

Formsprag & Marland Clutch – Booth 1421

General Kinematics – Booth 1429

GMS Mine Repair & Maintenance – Booth 1620

Herrenknecht Tunneling Systems USA, Inc – Booth 2206

Hilfiker Retaining Walls – Booth 2210

Hoffman Manufacturing, Inc – Booth 1246

Jenike & Johanson – Booth 2605

JENNMAR – Booth 1913

Kiewit – Booth 1827

Komatsu – Booth 1914

Luff Industries Ltd – Booth 2527

Masaba Inc – Booth 2514

Matrix Service Company – Booth 2532

Miner Elastomer – Booth 1333

Rail-Veyor Technologies Global Inc – Booth 2407

RAM Enterprise, Inc – Booth 2507

Rapat Corporation – Booth 2145

RECO Mining Solutions – Booth 1269

REESCO – Booth 2814

Regal Rexnord – Booth 1365

Rema Tip Top – Booth 1301

Richwood – Booth 2838

Rulmeca Corporation – Booth 1316

Rulmeca Limited – Booth 1312

Savage Services – Booth 2821

Schwing Bioset Inc – Booth 2617

Sempertrans USA – Booth 2438

Simem Underground Solutions, Inc – Booth 1617

Superior Industries – Booth 2303

Syntron Material Handling – Booth 2321

TAKRAF USA Inc – Booth 2127

Twiflex – Booth 1423

Van Gorp Corporation – Booth 1556

VDG (Van der Graaf) – Booth 2311

Virta Inc – Booth 2451

Voith Group – Booth 2211

West River Conveyors & Machinery Co – Booth 1456

Wolf Point Engineers & Contractors / North Alabama Fabricating Company, Inc – Booth 1404

Coolers

BBE Consulting Canada – Booth 1102

Binder+Co USA Inc – Booth 1935

Carrier Vibrating Equipment, Inc – Booth 1108

CPM Roskamp Champion – Booth 1000

Guardian Traxol Chemicals Inc – Booth 1210

Howden Canada Inc – Booth 1515

Louisville Dryer Company – Booth 2608

Couplings - Mechanical, Flexible and Rigid

ASC Engineered Solutions – Booth 1820

Brunel Corp – Booth 1401

Dodge Industrial, Inc – Booth 1336

Flender Corporation – Booth 2424

Kraft Power Corp – Booth 1237

Naylor Pipe Co – Booth 1910

Netafim USA – Booth 1607

Regal Rexnord – Booth 1365

Robit Inc – Booth 2722

Victaulic – Booth 2320

Voith Group – Booth 2211

Williams Form Engineering Corp – Booth 2234

Crushers and Pulverizers

BICO Inc – Booth 2427

Bradken – Booth 1214

CPM Roskamp Champion – Booth 1000

Denver Machine Shop – Booth 1208

ExcelSense Technologies – Booth 2801

KnightHawk Engineering, Inc – Booth 1111

Masaba Inc – Booth 2514

McLanahan Corporation – Booth 2308

ME Elecmetal – Booth 1701

Metso Outotec – Booth 2101

MMD Mineral Sizing (America) Inc – Booth 1532

RAM Enterprise, Inc – Booth 2507

RECO Mining Solutions – Booth 1269

REESCO – Booth 2814

Saint-Gobain Ceramic Materials – Booth 2607

Sandvik – Booth 2521

Savage Services – Booth 2821

Superior Industries – Booth 2303

TAKRAF USA Inc – Booth 2127

Technogenia Lasercarb Oklahoma Inc – Booth 2714

TerraSource Global – Booth 2712

Westpro Machinery Inc – Booth 2322

Cyanide Process Equipment

Baker Hughes - Flexible Pipe Solutions



– Booth 1737
 Derrick Corporation – Booth 1715
 Headwater Technologies – Booth 2727
 ORE-MAX – Booth 1500

DC Power

Phoenix Lighting – Booth 2732

Dewatering Equipment

Alfa Laval – Booth 2728
 Baker Hughes - Flexible Pipe Solutions – Booth 1737
 Boart Longyear – Booth 2002
 Carrier Vibrating Equipment, Inc – Booth 1108
 Cornell Pump Co – Booth 2300
 Deister Concentrator, LLC – Booth 2808
 Derrick Corporation – Booth 1715
 DeWind One Pass Trenching LLC – Booth 1017
 Diemme Filtration SRL – Booth 1200
 EcoMister Evaporator – Booth 2402
 EMFluids Ltd – Booth 1058
 ENVECO Environmental Solutions, LLC – Booth 2050
 Envirocon, Inc – Booth 1709
 Evoqua Water Technologies – Booth 2238
 Flottweg Separation Technology, Inc – Booth 1415
 FLSmidth A/S – Booth 1801
 Fluid Systems, Inc – Booth 1251
 FM Technologies – Booth 2251
 General Kinematics – Booth 1429
 Haver & Boecker Niagara – Booth 2250
 Hose Solutions Inc – Booth 2338
 HUESKER Inc – Booth 1815
 HydroTech Mining – Booth 1169
 IPI Packers – Booth 2721
 Joest Inc – Booth 1350
 Kurita America Inc – Booth 1371
 Megator-Pumps 2000 America – Booth 1465
 Metso Outotec – Booth 2101
 Miller Sales & Engineering Inc – Booth 2242
 MINETEK – Booth 1026
 Nalco Water, an Ecolab Company – Booth 1242

Naylor Pipe Co – Booth 1910
 Netafim USA – Booth 1607
 PHOENIX Process Equipment – Booth 2616
 Pocock Industrial, Inc – Booth 1712
 Pumpaction – Booth 2834
 PumpEng – Booth 2920
 Rain for Rent – Booth 1833
 REI Drilling, Inc – Booth 2633
 Roxia Inc – Booth 2715
 RWI Enhanced Evaporation Services – Booth 2026
 Schwing Bioiset Inc – Booth 2617
 SRS Crisafulli, Inc – Booth 2716
 Superior Industries – Booth 2303
 Vermeer Corp – Booth 1513
 Victaulic – Booth 2320
 WesTech Engineering, LLC – Booth 1411

Diesel Equipment Lighting Systems

Phoenix Lighting – Booth 2732
 Rocvent Inc – Booth 2601

Diesel Mining Equipment Manufacturers

Brookville Equipment Corp – Booth 1610
 J.H. Fletcher & Co – Booth 1213
 Normet Americas, Inc – Booth 2433
 Vermeer Corp – Booth 1513

Diesel Particulate Control Systems

Aletek – Booth 2835

Draglines

Bradken – Booth 1214
 Caterpillar – Booth 2701
 CCC Group, Inc – Booth 2632
 Immersive Technologies – Booth 1509
 Kiewit – Booth 1827
 Komatsu – Booth 1914

Dredges

ENTACT – Booth 1838
 ENVECO Environmental Solutions, LLC – Booth 2050
 Maccaferri, Inc – Booth 2335
 Salem-Republic Rubber Co – Booth

2324
 SRS Crisafulli, Inc – Booth 2716
 Supreme Manufacturing, Inc – Booth 1951
 Technogenia Lasercarb Oklahoma Inc – Booth 2714

Drill Bits - Rock

Boart Longyear – Booth 2002
 DSI Underground LLC – Booth 2626
 Epiroc – Booth 1921
 Mitsubishi Materials USA Corp – Booth 2706
 Pinnacle Drilling Products – Booth 1020
 REI Drilling, Inc – Booth 2633
 Robit Inc – Booth 2722
 RockTech USA, Inc – Booth 1743
 Sandvik – Booth 2521
 Technogenia Lasercarb Oklahoma Inc – Booth 2714
 Williams Form Engineering Corp – Booth 2234

Drilling Contractors

Boart Longyear – Booth 2002
 Cascade Drilling L.P. – Booth 1939
 ConeTec Inc – Booth 1535
 Cowin & Company/Raisebor – Booth 2717
 Driver Industrial Safety – Booth 1132
 FKC-Lake Shore – Booth 1504
 Keller – Booth 1716
 KP Ventures Well Drilling & Pump Co LLC – Booth 1100
 Major Drilling – Booth 1622
 REI Drilling, Inc – Booth 2633
 Ruen Drilling, Inc – Booth 1810
 Shaft Drillers International – Booth 2209
 Stewart Brothers Drilling Co – Booth 1813
 Timberline Drilling, Inc – Booth 1842

Drilling Equipment

Baroid Industrial Drilling Products – Booth 1439
 Boart Longyear – Booth 2002
 Carlson Software – Booth 2413
 Caterpillar – Booth 2701
 CR – Booth 1250

PRODUCTS & SERVICES

Driver Industrial Safety – Booth 1132
DSI Underground LLC – Booth 2626
Epiroc – Booth 1921
ExcelSense Technologies – Booth 2801
Geotech Environmental Equipment, Inc – Booth 1624
Herrenknecht Tunneling Systems USA, Inc – Booth 2206
Hexagon's Mining division – Booth 2001
J.H. Fletcher & Co – Booth 1213
Komatsu – Booth 1914
Miner Elastomer – Booth 1333
Mitsubishi Materials USA Corp – Booth 2706
RDO Integrated Controls – Booth 2936
REI Drilling, Inc – Booth 2633
Robit Inc – Booth 2722
RockTech USA, Inc – Booth 1743
Sandvik – Booth 2521
Thyssen Mining Group of Companies – Booth 1424
Vermeer Corp – Booth 1513

Drives - Belt, Chain, Fluid and Gear

Bosch Rexroth - Hägglunds Drives – Booth 2043
Dodge Industrial, Inc – Booth 1336
Flender Corporation – Booth 2424
Kraft Power Corp – Booth 1237
Regal Rexnord – Booth 1365
Rulmeca Corporation – Booth 1316
Rulmeca Limited – Booth 1312
VDG (Van der Graaf) – Booth 2311
Voith Group – Booth 2211
West River Conveyors & Machinery Co – Booth 1456

Drives - Magnetic and Variable

ABB – Booth 1943
Joest Inc – Booth 1350
Kraft Power Corp – Booth 1237
VDG (Van der Graaf) – Booth 2311
Voith Group – Booth 2211
WEG Electric Corp – Booth 1427

Dryers

Binder+Co USA Inc – Booth 1935
Carrier Vibrating Equipment, Inc –

Booth 1108
Eirich Machines, Inc – Booth 2404
FEECO International, Inc – Booth 1006
GEA Systems North America LLC – Booth 1470
Joest Inc – Booth 1350
Louisville Dryer Company – Booth 2608
Saint-Gobain Ceramic Materials – Booth 2607
Schwing Bioset Inc – Booth 2617
Westpro Machinery Inc – Booth 2322

Dust and Fume Control Technology

Alfa Laval – Booth 2728
COLAS SA – Booth 2515
EcoMister Evaporator – Booth 2402
Englo, Inc – Booth 2336
Environmental Products & Applications, Inc – Booth 2528
GEO-Instruments – Booth 1714
JBW Consulting Engineers – Booth 1015
Midwest Industrial Supply, Inc – Booth 2420
Open Loop Energy, Inc – Booth 1329
Philippi-Hagenbuch, Inc – Booth 1949
Rite Choice Ducting, LLC – Booth 2537
Rocvent Inc – Booth 2601
RWI Enhanced Evaporation Services – Booth 2026
Saint-Gobain Ceramic Materials – Booth 2607
SAM Solutions – Booth 1837
Spendrup Fan Co – Booth 2201

Educational

American Institute of Professional Geologists – Booth 1823
Canadian Institute of Mining, Metallurgy & Petroleum (CIM) – Booth 2301
Colorado School of Mines - Department of Mining Engineering – Booth 2023
Costmine – Booth 1817
Global Mining Guidelines Group – Booth 2602

Jenike & Johanson – Booth 2605
Mackay School of Earth Sciences and Engineering – Booth 1342
Missouri S&T – Booth 1457
Montana Technological University - School of Mines & Engineering – Booth 1338
New Mexico Institute of Mining & Technology – Booth 1444
Pioneering the Field: Women in Mining – Booth 1658
South Dakota School of Mines – Booth 1344
U.S. Geological Survey (USGS), Mineral Resources Program (MRP) – Booth 1236
University of Arizona Mining and Geological Engineering – Booth 2305
University of Kentucky Department of Mining Engineering – Booth 1347
University of Utah, Mining Engineering Department – Booth 1239
Virginia Tech Department of Mining & Minerals Engineering – Booth 1348
WAAIME – Booth 1446
West Virginia Univ Dept of Mining Engineering – Booth 1442
West Virginia University - Mining Extension – Booth 1249
Women's Mining Coalition – Booth 1605

Electric Motors and Generators

ABB – Booth 1943
Integrated Power Services – Booth 2623
Kraft Power Corp – Booth 1237
Regal Rexnord – Booth 1365
Rulmeca Corporation – Booth 1316
VDG (Van der Graaf) – Booth 2311
Voith Group – Booth 2211
WEG Electric Corp – Booth 1427

Electric Wire and Cable

The Okonite Company – Booth 1206

Electrical Equipment and Supplies

Atlas Electric, Inc – Booth 1147
CAB – Booth 1533
DEA Incorporated – Booth 1567

ExcelSense Technologies – Booth 2801
 Line Power Manufacturing – Booth 1601
 Monico Monitoring, Inc – Booth 1537
 Phoenix Lighting – Booth 2732
 RCT – Booth 1068
 Rocvent Inc – Booth 2601
 Roxsyle Systems LLC – Booth 2223

Emissions Control

Aletek – Booth 2835
 Civil & Environmental Consultants, Inc (CEC) – Booth 1510
 Conifer Systems – Booth 1009
 Montrose Environmental – Booth 2249

Environmental Control Equipment and Supplies

Ackcio – Booth 2939
 Aquatech International – Booth 1570
 CARBO Industrial Technologies – Booth 1405
 COLAS SA – Booth 2515
 Conifer Systems – Booth 1009
 Diemme Filtration SRL – Booth 1200
 EcoMister Evaporator – Booth 2402
 Englo, Inc – Booth 2336
 ENVECO Environmental Solutions, LLC – Booth 2050
 Flottweg Separation Technology, Inc – Booth 1415
 Howden Canada Inc – Booth 1515
 IoT Automation – Booth 2542
 IWT – Booth 1526
 Midwest Industrial Supply, Inc – Booth 2420
 Nilex Inc – Booth 1033
 Open Loop Energy, Inc – Booth 1329
 Presto Geosystems – Booth 1452
 RWI Enhanced Evaporation Services – Booth 2026
 Sauls Seismic – Booth 1313
 SRS Crisafulli, Inc – Booth 2716
 Valmet Flow Control – Booth 2006
 Vermeer Corp – Booth 1513

Excavators

Bradken – Booth 1214
 Caterpillar – Booth 2701
 CR – Booth 1250
 ENTACT – Booth 1838

Envirocon, Inc – Booth 1709
 ExcelSense Technologies – Booth 2801
 Immersive Technologies – Booth 1509
 Komatsu – Booth 1914
 RECO Mining Solutions – Booth 1269
 TAKRAF USA Inc – Booth 2127
 Technogenia Lasercarb Oklahoma Inc – Booth 2714
 WEIR Motion Metrics – Booth 1843

Exploration Equipment and Services

Agapito Associates Inc – Booth 2027
 Baroid Industrial Drilling Products – Booth 1439
 Boart Longyear – Booth 2002
 Carlson Software – Booth 2413
 Datamine North America Inc – Booth 2220
 Emesent – Booth 2134
 Esri – Booth 1142
 Independent Mining Consultants, Inc – Booth 2115
 IPI Packers – Booth 2721
 Mavrik – Booth 2035
 MICROMINE – Booth 1627
 RDI Technologies – Booth 1569
 REI Drilling, Inc – Booth 2633
 RockTech USA, Inc – Booth 1743
 Skycatch – Booth 2048
 SRK Consulting (US), Inc – Booth 2121
 Stewart Brothers Drilling Co – Booth 1813
 Sunset Manufacturing – Booth 2637
 Telemark Energy Services – Booth 2810
 Terahertz Ventures LLC – Booth 1638

Explosive Materials and Services

Austin Powder – Booth 2820
 Dyno Nobel – Booth 1621
 GMS Mine Repair & Maintenance – Booth 1620
 Harrison Western Construction Corporation, Inc – Booth 2233
 Hexagon's Mining division – Booth 2001
 Maptek – Booth 1501
 Orica USA – Booth 2122
 Philippi-Hagenbuch, Inc – Booth 1949

Fans and Blowers

BBE Consulting Canada – Booth 1102
 EcoMister Evaporator – Booth 2402
 Englo, Inc – Booth 2336
 Evoqua Water Technologies – Booth 2238
 Formsprag & Marland Clutch – Booth 1421
 Hoffman Manufacturing, Inc – Booth 1246
 Howden Canada Inc – Booth 1515
 MINETEK – Booth 1026
 Mining Equipment, Ltd – Booth 1927
 Rocvent Inc – Booth 2601
 Spendrup Fan Co – Booth 2201
 TLT-Turbo, Inc – Booth 1310
 Twiflex – Booth 1423
 Wichita Clutch – Booth 1522

Fasteners - Industrial

Copper State Bolt & Nut Co – Booth 1634
 HYTORC, Division of UNEX Corp – Booth 1357
 ME Elecmetal – Booth 1701
 Rema Tip Top – Booth 1301
 Valley Forge & Bolt Mfg Co – Booth 2306
 Williams Form Engineering Corp – Booth 2234

Feeder Breakers

Atlas Electric, Inc – Booth 1147
 Komatsu – Booth 1914
 McLanahan Corporation – Booth 2308
 Savage Services – Booth 2821

Feeders

Bradken – Booth 1214
 Carrier Vibrating Equipment, Inc – Booth 1108
 CPM Roskamp Champion – Booth 1000
 ERIEZ – Booth 2214
 General Kinematics – Booth 1429
 Jenike & Johanson – Booth 2605
 Joest Inc – Booth 1350
 Kamengo – Booth 2908
 McLanahan Corporation – Booth 2308
 MMD Mineral Sizing (America) Inc – Booth 1532

PRODUCTS & SERVICES

RAM Enterprise, Inc – Booth 2507
RECO Mining Solutions – Booth 1269
REESCO – Booth 2814
Schwing Bioset Inc – Booth 2617
Superior Industries – Booth 2303
Syntron Material Handling – Booth 2321
TAKRAF USA Inc – Booth 2127
TerraSource Global – Booth 2712
Van Gorp Corporation – Booth 1556
Virta Inc – Booth 2451

Filters, Filter Cloth and Accessories

ANDRITZ – Booth 1412
CANTY – Booth 1521
Clear Edge Filtration – Booth 1143
Diemme Filtration SRL – Booth 1200
FM Technologies – Booth 2251
GEA Systems North America LLC – Booth 1470
Johnson Screens – Booth 1202
Kurita America Inc – Booth 1371
Metso Outotec – Booth 2101
Netafim USA – Booth 1607
ORE-MAX – Booth 1500
PHOENIX Process Equipment – Booth 2616
Pocock Industrial, Inc – Booth 1712
Roxia Inc – Booth 2715
Schwing Bioset Inc – Booth 2617
Sefar Inc – Booth 1305
Veolia Water Technologies – Booth 1611
WesTech Engineering, LLC – Booth 1411

Fire Protection

Aletek – Booth 2835
ASC Engineered Solutions – Booth 1820
Englo, Inc – Booth 2336
Guardian Traxol Chemicals Inc – Booth 1210
Industrial Scientific – Booth 1144
Rapid Fire Protection Inc – Booth 2826
RCT – Booth 1068
Victaulic – Booth 2320

Flotation Machines and Equipment

CANTY – Booth 1521
ERIEZ – Booth 2214
ExcelSense Technologies – Booth 2801
FLSmidth A/S – Booth 1801
Hayward Gordon ULC – Booth 1536
Hexagon's Mining division – Booth 2001
Iracore/Irathane Systems Inc – Booth 1317
Metso Outotec – Booth 2101
Nalco Water, an Ecolab Company – Booth 1242
SRS Crisafulli, Inc – Booth 2716
TAKRAF USA Inc – Booth 2127
Westpro Machinery Inc – Booth 2322
Woodgrove Technologies – Booth 2539

Furnaces - Industrial Process

ANDRITZ – Booth 1412
BICO Inc – Booth 2427
CANTY – Booth 1521
Carrier Vibrating Equipment, Inc – Booth 1108
Kiewit – Booth 1827

Gears - Pullers, Reducers and Pinions

Dodge Industrial, Inc – Booth 1336
Flender Corporation – Booth 2424
Guardian Traxol Chemicals Inc – Booth 1210
Hayward Gordon ULC – Booth 1536
Kraft Power Corp – Booth 1237
Regal Rexnord – Booth 1365
Rulmeca Corporation – Booth 1316
WEG Electric Corp – Booth 1427
West River Conveyors & Machinery Co – Booth 1456

Geological-Physical-Technical Services and Equip

Ackcio – Booth 2939
Agapito Associates Inc – Booth 2027
AGRU America, Inc – Booth 1539
Call & Nicholas Inc - Call & Nicholas Instruments – Booth 1410
Canary Systems, Inc – Booth 1232
ConeTec Inc – Booth 1535

CoreLift – Booth 2248
Costmine – Booth 1817
Dahrouge Geological Consulting Ltd – Booth 2837
Esri – Booth 1142
GEOKON – Booth 1710
GHD – Booth 2150
Hilfiker Retaining Walls – Booth 2210
hydroGEOPHYSICS Inc – Booth 2339
Independent Mining Consultants, Inc – Booth 2115
IoT Automation – Booth 2542
IPI Packers – Booth 2721
Maptek – Booth 1501
MICROMINE – Booth 1627
Mining Plus US – Booth 1422
Montgomery & Associates – Booth 1835
National Mine Map Repository – Booth 1049
NewFields – Booth 1839
PETRA – Booth 1666
Presto Geosystems – Booth 1452
RESPEC – Booth 1811
Rock Flow Dynamics – Booth 1065
SKAPS Industries – Booth 2713
Skycatch – Booth 2048
Telemark Energy Services – Booth 2810

Government Agency - Entity

Bureau of Land Management Colorado – Booth 1460
CLEER – Booth 1332
Colorado Division of Reclamation, Mining and Safety – Booth 2436
Colorado State Land Board – Booth 1937
National Institute for Occupational Safety & Health – Booth 2011
U.S. Geological Survey (USGS), Mineral Resources Program (MRP) – Booth 1236
US Department of Labor/MSHA – Booth 2422

Gravity Separators

Bunting – Booth 1670
ERIEZ – Booth 2214
FGX SepTech, LLC – Booth 2400
Joest Inc – Booth 1350

Mineral Technologies – Booth 1416
WesTech Engineering, LLC – Booth 1411

Grinding Media and Liners

Bradken – Booth 1214
CARBO Industrial Technologies – Booth 1405
Copper State Bolt & Nut Co – Booth 1634
FC Mill Liners, Inc – Booth 1264
McLellan Industries, Inc – Booth 1707
ME Elecmetal – Booth 1701
Metso Outotec – Booth 2101
Saint-Gobain Ceramic Materials – Booth 2607
SKAPS Industries – Booth 2713
SOLMAX – Booth 1527

Grinding Mills

BICO Inc – Booth 2427
Bradken – Booth 1214
Copper State Bolt & Nut Co – Booth 1634
CPM Roskamp Champion – Booth 1000
Eirich Machines, Inc – Booth 2404
FC Mill Liners, Inc – Booth 1264
Flender Corporation – Booth 2424
FLSmidth A/S – Booth 1801
General Kinematics – Booth 1429
Guardian Traxol Chemicals Inc – Booth 1210
Kiewit – Booth 1827
McLellan Industries, Inc – Booth 1707
ME Elecmetal – Booth 1701
Metso Outotec – Booth 2101
Mineral Technologies – Booth 1416
TerraSource Global – Booth 2712
The Koeppern Group – Booth 2328
Westpro Machinery Inc – Booth 2322

Grizzlies - Feeding, Moving and Stationary

Carrier Vibrating Equipment, Inc – Booth 1108
Haver & Boecker Niagara – Booth 2250
Joest Inc – Booth 1350
Philippi-Hagenbuch, Inc – Booth 1949
Superior Industries – Booth 2303

Ground Freezing

Thyssen Mining Group of Companies – Booth 1424

Grouting Services, Equipment and Materials

Aerix Industries – Booth 1721
Avanti International – Booth 2517
ChemGrout, Inc – Booth 2513
DSI Underground LLC – Booth 2626
GMS Mine Repair & Maintenance – Booth 1620
IPI Packers – Booth 2721
Keller – Booth 1716
Pinnacle Drilling Products – Booth 1020
Putzmeister Shotcrete Technology – Booth 2621
Simem Underground Solutions, Inc – Booth 1617
Strata Products Worldwide, LLC – Booth 2520
Thyssen Mining Group of Companies – Booth 1424
WSP – Booth 2021

Heavy Media Recovery Units

ERIEZ – Booth 2214

Hoists - Controls and Accessories

Atlas Electric, Inc – Booth 1147
FKC-Lake Shore – Booth 1504
Hepburn Engineering Inc – Booth 2538
Matrix Design Group – Booth 2401
MILLER – Booth 2501

Hoses - Valves and Fittings

Baker Hughes - Flexible Pipe Solutions – Booth 1737
Continental – Booth 2215
Copper State Bolt & Nut Co – Booth 1634
Evoqua Water Technologies – Booth 2238
Hose Solutions Inc – Booth 2338
ORE-MAX – Booth 1500
Salem-Republic Rubber Co – Booth 2324
United Central Industrial Supply –

Booth 1933

Hydraulic System Components

Bosch Rexroth - Häggglunds Drives – Booth 2043
Continental – Booth 2215
Hepburn Engineering Inc – Booth 2538
Hoffman Manufacturing, Inc – Booth 1246
JENNMAR – Booth 1913
Johnson Industries Ltd – Booth 2516
Kobelt Manufacturing Co Ltd – Booth 2437
Kraft Power Corp – Booth 1237
Open Loop Energy, Inc – Booth 1329
RECO Mining Solutions – Booth 1269

Inflatable and Mechanical Packers

DSI Underground LLC – Booth 2626
IPI Packers – Booth 2721
JENNMAR – Booth 1913

Information Technology Products

3D-P – Booth 1560
6Harmonics – Booth 1060
Actenum – Booth 1151
ASI Mining – Booth 1358
Canary Systems, Inc – Booth 1232
Cancha Geometallurgy – Booth 2933
COGEP Maintenance Software – Booth 2543
Control Station, Inc – Booth 1148
Costmine – Booth 1817
Datamine North America Inc – Booth 2220
DHI Water & Environment, Inc – Booth 2232
Diesel Laptops – Booth 1101
Emerson – Booth 1633
Emesent – Booth 2134
Esri – Booth 1142
Frontier Precision Geospatial/Unmanned – Booth 1110
Honeywell – Booth 2037
Immersive Technologies – Booth 1509
Information Alignment Pty Ltd – Booth 1668
Matrix Design Group – Booth 2401
MICROMINE – Booth 1627

PRODUCTS & SERVICES

Monico Monitoring, Inc – Booth 1537
MST Global – Booth 1045
Orica USA – Booth 2122
PETRA – Booth 1666
Predictive Compliance – Booth 2032
RCT – Booth 1068
RDO Integrated Controls – Booth 2936
RESPEC – Booth 1811
Satellogic – Booth 1008
Skycatch – Booth 2048
U.S. Geological Survey (USGS), Mineral Resources Program (MRP) – Booth 1236
WEIR Motion Metrics – Booth 1843

Insurance

Assured Partners – Booth 2450
Skyward Specialty Insurance – Booth 2221

Ion Exchange Equipment and Resins

Aquatech International – Booth 1570
ENVECO Environmental Solutions, LLC – Booth 2050
Evoqua Water Technologies – Booth 2238
Headwater Technologies – Booth 2727
Kurita America Inc – Booth 1371
Pocock Industrial, Inc – Booth 1712
Veolia Water Technologies – Booth 1611

Kilns

CANTY – Booth 1521
Carrier Vibrating Equipment, Inc – Booth 1108
FEECO International, Inc – Booth 1006
Guardian Traxol Chemicals Inc – Booth 1210
Louisville Dryer Company – Booth 2608
Metso Outotec – Booth 2101

Laboratory and Scientific Services

ACZ Laboratories Inc – Booth 2120
Advanced Terra Testing Inc – Booth 1932

Agapito Associates Inc – Booth 2027
BGC Engineering – Booth 2805
Blue Coast Research – Booth 1037
Call & Nicholas Inc - Call & Nicholas Instruments – Booth 1410
Cemvita – Booth 2445
Datamine North America Inc – Booth 2220
Dyno Nobel – Booth 1621
Eurofins QTA – Booth 1135
FM Technologies – Booth 2251
Forte Dynamics – Booth 2733
Geopyöra – Booth 2932
GHD – Booth 2150
hydroGEOPHYSICS Inc – Booth 2339
Jenike & Johanson – Booth 2605
Knight Piésold and Co – Booth 2207
KnightHawk Engineering, Inc – Booth 1111
LGC Standards – Booth 1071
Metcom Technologies Inc – Booth 1608
Mineral Technologies – Booth 1416
Montrose Environmental – Booth 2249
NewFields – Booth 1839
Paterson & Cooke USA, Ltd – Booth 2138
PHOENIX Process Equipment – Booth 2616
Pocock Industrial, Inc – Booth 1712
RDI Technologies – Booth 1569
RESPEC – Booth 1811
SGS Minerals Services – Booth 1700
The Mineral Lab, Inc – Booth 2135
Western Environmental Testing Lab (WETLAB) – Booth 1428
Wood – Booth 1538
WSP – Booth 2021

Laboratory Equipment and Supplies

BICO Inc – Booth 2427
CANTY – Booth 1521
CoreLift – Booth 2248
Deister Concentrator, LLC – Booth 2808
easyXAFS, LLC – Booth 2350
Forte Dynamics – Booth 2733
Haver & Boecker Niagara – Booth 2250
Malvern Panalytical – Booth 1502

Radom Corporation – Booth 1035
RDI Technologies – Booth 1569
Sunset Manufacturing – Booth 2637

Leaching Sprinklers

Netafim USA – Booth 1607
ORE-MAX – Booth 1500

Lighting Systems and Lamps

IoT Automation – Booth 2542
Nightstick – Booth 2428
Phoenix Lighting – Booth 2732
PROVIX – Booth 1353
Vision X USA – Booth 1261
x-Glo North America Inc – Booth 1351

Linings and Claddings

AGRU America, Inc – Booth 1539
American-Biltrite – Booth 1217
Baker Hughes - Flexible Pipe Solutions – Booth 1737
Blair Rubber Company – Booth 1064
Bradken – Booth 1214
Certech USA Inc – Booth 2326
Copper State Bolt & Nut Co – Booth 1634
Custom Linings, Inc – Booth 2133
hydroGEOPHYSICS Inc – Booth 2339
Inland Tarp & Liner – Booth 1360
ME Elecmetal – Booth 1701
MOGAS Industries, Inc – Booth 2737
Norseman Structures – Booth 2829
Presto Geosystems – Booth 1452
RAM Enterprise, Inc – Booth 2507
Rema Tip Top – Booth 1301
RubberSource Inc – Booth 1671
Saint-Gobain Ceramic Materials – Booth 2607
Salem-Republic Rubber Co – Booth 2324
SKAPS Industries – Booth 2713
SOLMAX – Booth 1527

Liquid Level Indicators and Switches

Laser Tech – Booth 2235
TechStar – Booth 2049
WesTech Engineering, LLC – Booth 1411



Loaders

Bradken – Booth 1214
Caterpillar – Booth 2701
CR – Booth 1250
Driver Industrial Safety – Booth 1132
Envirocon, Inc – Booth 1709
Epiroc – Booth 1921
Immersive Technologies – Booth 1509
Komatsu – Booth 1914
WEIR Motion Metrics – Booth 1843

Longwall Mining Equipment

CAB – Booth 1533
HUESKER Inc – Booth 1815
J.H. Fletcher & Co – Booth 1213
JENNMAR – Booth 1913
Komatsu – Booth 1914
Line Power Manufacturing – Booth 1601
rm wilson co – Booth 2709
Robit Inc – Booth 2722
Voith Group – Booth 2211

Lubricants and Equipment

A.W. Chesterton Company – Booth 1001
Fluid Life – Booth 2246
FUCHS LUBRICANTS CO – Booth 1564
Guardian Traxol Chemicals Inc – Booth 1210
MAPEI Corporation – Booth 1702
Midwest Industrial Supply, Inc – Booth 2420
Parkland USA – Booth 2726
RECO Mining Solutions – Booth 1269

Magnetic Separators

Bunting – Booth 1670
ERIEZ – Booth 2214
Mineral Technologies – Booth 1416

Maintenance Equipment and Supplies

Ackcio – Booth 2939
Aletek – Booth 2835
Arsenal Tire Performance Tech – Booth 1259
Atlas Electric, Inc – Booth 1147
Brookville Equipment Corp – Booth 1610

CAB – Booth 1533
COGEP Maintenance Software – Booth 2543
Copper State Bolt & Nut Co – Booth 1634
Denver Machine Shop – Booth 1208
Flender Corporation – Booth 2424
Guardian Traxol Chemicals Inc – Booth 1210
HYTORC, Division of UNEX Corp – Booth 1357
InduMar Products Inc – Booth 1437
Mader Group – Booth 1458
McLellan Industries, Inc – Booth 1707
PROVIX – Booth 1353
REESCO – Booth 2814
Rema Tip Top – Booth 1301

Maintenance Services

Actenum – Booth 1151
Bosch Rexroth - Hågglunds Drives – Booth 2043
CCC Group, Inc – Booth 2632
COGEP Maintenance Software – Booth 2543
Custom Linings, Inc – Booth 2133
DEA Incorporated – Booth 1567
Denver Machine Shop – Booth 1208
FEECO International, Inc – Booth 1006
FKC-Lake Shore – Booth 1504
GMS Mine Repair & Maintenance – Booth 1620
Guardian Traxol Chemicals Inc – Booth 1210
Hatch – Booth 1334
Integrated Power Services – Booth 2623
Kiewit – Booth 1827
Kurita America Inc – Booth 1371
Mader Group – Booth 1458
Matrix Service Company – Booth 2532
MBA Energy and Industrial – Booth 1315
Metso Outotec – Booth 2101
MOGAS Industries, Inc – Booth 2737
Normet Americas, Inc – Booth 2433
Northwest Towers – Booth 2549
RDO Integrated Controls – Booth 2936
RECO Mining Solutions – Booth 1269

Rema Tip Top – Booth 1301
TerraSource Global – Booth 2712

Measurement and Monitoring Systems

3D-P – Booth 1560
ABB – Booth 1943
Ackcio – Booth 2939
Arsenal Tire Performance Tech – Booth 1259
ASI Mining – Booth 1358
Call & Nicholas Inc - Call & Nicholas Instruments – Booth 1410
Canary Systems, Inc – Booth 1232
CANTY – Booth 1521
Carlson Software – Booth 2413
CiDRA Minerals Processing Inc – Booth 1606
COGEP Maintenance Software – Booth 2543
ConeTec Inc – Booth 1535
Control Station, Inc – Booth 1148
CR – Booth 1250
Emerson – Booth 1633
Emesent – Booth 2134
Fluid Life – Booth 2246
Frontier Precision Geospatial/Unmanned – Booth 1110
GEO-Instruments – Booth 1714
GEOKON – Booth 1710
Geotech Environmental Equipment, Inc – Booth 1624
GroundProbe NA LLC – Booth 2126
Haver & Boecker Niagara – Booth 2250
Hexagon's Mining division – Booth 2001
Honeywell – Booth 2037
Industrial Scientific – Booth 1144
Information Alignment Pty Ltd – Booth 1668
IoT Automation – Booth 2542
IWT – Booth 1526
Laser Tech – Booth 2235
LGC Standards – Booth 1071
Maestro Digital Mine – Booth 1304
Malvern Panalytical – Booth 1502
Maptek – Booth 1501
McCrometer, Inc – Booth 1361
MOGAS Industries, Inc – Booth 2737
Monico Monitoring, Inc – Booth 1537

PRODUCTS & SERVICES

Montgomery & Associates – Booth 1835
Montrose Environmental – Booth 2249
Orica USA – Booth 2122
RDI Technologies – Booth 1569
Regal Rexnord – Booth 1365
RESPEC – Booth 1811
Sauls Seismic – Booth 1313
Scantech International Pty Ltd – Booth 1407
Strata Products Worldwide, LLC – Booth 2520
Sympatec – Booth 2439
TechStar – Booth 2049
Tracerco – Booth 2901
Unmanned Aerial Services – Booth 1265
WEIR Motion Metrics – Booth 1843
Wingfield Scale & Measure – Booth 1115
Worldsensing – Booth 1138
Xylem Dewatering Solutions Inc – Booth 1566

Meters and Gauges

Canary Systems, Inc – Booth 1232
CiDRA Minerals Processing Inc – Booth 1606
Netafim USA – Booth 1607
ORE-MAX – Booth 1500
Sauls Seismic – Booth 1313
TechStar – Booth 2049
Tracerco – Booth 2901
Valley Forge & Bolt Mfg Co – Booth 2306

Mine Evaluations - Surface and Underground

Agapito Associates Inc – Booth 2027
Costmine – Booth 1817
Dyno Nobel – Booth 1621
Exyn Technologies – Booth 1205
Forte Dynamics – Booth 2733
Geosyntec Consultants – Booth 2225
Hatch – Booth 1334
Immersive Technologies – Booth 1509
Independent Mining Consultants, Inc – Booth 2115
MICROMINE – Booth 1627
Midwest Industrial Supply, Inc – Booth 2420

NewFields – Booth 1839
Pioneering the Field: Women in Mining – Booth 1658
RESPEC – Booth 1811
Samuel Engineering, Inc – Booth 1733
Skycatch – Booth 2048
United Central Industrial Supply – Booth 1933
Wood – Booth 1538
WSP – Booth 2021

Mine Operators

Acrow Corp. of America (Acrow Bridges) – Booth 1836
AECOM – Booth 1903
ANDRITZ – Booth 1412
Driver Industrial Safety – Booth 1132
Esri – Booth 1142
Freeport-McMoRan Inc – Booth 1343
Guideline Geo Americas – Reutech – Booth 1723
Hecla Mining Company – Booth 1459
Immersive Technologies – Booth 1509
Independent Mining Consultants, Inc – Booth 2115
MICROMINE – Booth 1627
Nevada Gold Mines – Booth 2700
Newmont – Booth 1243
Open Loop Energy, Inc – Booth 1329
Pioneering the Field: Women in Mining – Booth 1658
Propeller Aero – Booth 1735
Rio Tinto – Booth 1137

Mineral Prospecting

Agapito Associates Inc – Booth 2027
Colorado State Land Board – Booth 1937
Esri – Booth 1142
FGX SepTech, LLC – Booth 2400
Freeport-McMoRan Inc – Booth 1343
Pioneering the Field: Women in Mining – Booth 1658
Stewart Brothers Drilling Co – Booth 1813

Mining Contractors

Acrow Corp. of America (Acrow Bridges) – Booth 1836
AECOM – Booth 1903
Boart Longyear – Booth 2002

CCC Group, Inc – Booth 2632
Cementation USA Inc – Booth 2243
Cowin & Company/Raisebor – Booth 2717
Custom Linings, Inc – Booth 2133
Datamine North America Inc – Booth 2220
Driver Industrial Safety – Booth 1132
Geotemps, Inc / Geopros, Inc – Booth 1516
GMS Mine Repair & Maintenance – Booth 1620
Harrison Western Construction Corporation, Inc – Booth 2233
Hatch – Booth 1334
Hoffman Manufacturing, Inc – Booth 1246
JHL Constructors – Booth 2137
Just Refiners USA, Inc – Booth 1667
Kiewit – Booth 1827
Matrix Service Company – Booth 2532
MBA Energy and Industrial – Booth 1315
MES Mining – Booth 1739
Odin Construction Solutions – Booth 1150
Phoenix Industrial – Booth 1311
REESCO – Booth 2814
Stewart Brothers Drilling Co – Booth 1813
THIESS Mining USA Inc – Booth 2833
Thyssen Mining Group of Companies – Booth 1424
Turner Mining Group – Booth 1042

Mining Gifts

Original Creations Inc – Booth 2500
Pioneering the Field: Women in Mining – Booth 1658

Parts - Mining Machinery

Aletek – Booth 2835
Arsenal Tire Performance Tech – Booth 1259
Atlas Electric, Inc – Booth 1147
Brunel Corp – Booth 1401
Caterpillar – Booth 2701
Copper State Bolt & Nut Co – Booth 1634
CR – Booth 1250
Epiroc – Booth 1921



Flexco – Booth 1321
 Komatsu – Booth 1914
 ME Elecmetal – Booth 1701
 Metso Outotec – Booth 2101
 Miner Elastomer – Booth 1333
 MINETEK – Booth 1026
 Normet Americas, Inc – Booth 2433
 Phoenix Lighting – Booth 2732
 Pumpaction – Booth 2834
 RAM Enterprise, Inc – Booth 2507
 RECO Mining Solutions – Booth 1269
 Robit Inc – Booth 2722
 RockTech USA, Inc – Booth 1743
 Roxsyle Systems LLC – Booth 2223
 Rulmeca Limited – Booth 1312
 TAKRAF USA Inc – Booth 2127
 Technogenia Lasercarb Oklahoma Inc – Booth 2714
 TerraSource Global – Booth 2712
 Valley Forge & Bolt Mfg Co – Booth 2306
 Van Gorp Corporation – Booth 1556
 West River Conveyors & Machinery Co – Booth 1456

Pipes

AGRU America, Inc – Booth 1539
 AIL Mining – Booth 2736
 ASC Engineered Solutions – Booth 1820
 Baker Hughes - Flexible Pipe Solutions – Booth 1737
 Bradken – Booth 1214
 Contech Engineered Solutions – Booth 2029
 DistributionNOW - Pexgol Distributor – Booth 1133
 Hose Solutions Inc – Booth 2338
 Iracore/Irathane Systems Inc – Booth 1317
 Kalenborn Abresist Corporation – Booth 2323
 Naylor Pipe Co – Booth 1910
 Netafim USA – Booth 1607
 ORE-MAX – Booth 1500
 Rain for Rent – Booth 1833
 RAM Enterprise, Inc – Booth 2507
 Ultra Tech Pipe – Booth 2635
 Victaulic – Booth 2320

Pollution Control Equipment

Aletek – Booth 2835
 Aquatech International – Booth 1570
 BICO Inc – Booth 2427
 Conifer Systems – Booth 1009
 EcoMister Evaporator – Booth 2402
 EMFluids Ltd – Booth 1058
 Flottweg Separation Technology, Inc – Booth 1415
 Presto Geosystems – Booth 1452
 RWI Enhanced Evaporation Services – Booth 2026
 WesTech Engineering, LLC – Booth 1411

Power Transmission Equipment

Bosch Rexroth - Hägglunds Drives – Booth 2043
 Brunel Corp – Booth 1401
 DEA Incorporated – Booth 1567
 Flender Corporation – Booth 2424
 Force Control Industries, Inc – Booth 2720
 Formsprag & Marland Clutch – Booth 1421
 Kraft Power Corp – Booth 1237
 Regal Rexnord – Booth 1365
 SEW-EURODRIVE, Inc – Booth 2349
 Twiflex – Booth 1423
 Voith Group – Booth 2211
 Wichita Clutch – Booth 1522

Process Controls and Instruments

ANDRITZ – Booth 1412
 CiDRA Minerals Processing Inc – Booth 1606
 Control Station, Inc – Booth 1148
 DEA Incorporated – Booth 1567
 Eirich Machines, Inc – Booth 2404
 Emerson – Booth 1633
 Forte Dynamics – Booth 2733
 Honeywell – Booth 2037
 Kurita America Inc – Booth 1371
 Laser Tech – Booth 2235
 LGC Standards – Booth 1071
 Malvern Panalytical – Booth 1502
 PROVIX – Booth 1353
 RDO Integrated Controls – Booth 2936
 Rocvent Inc – Booth 2601

Scantech International Pty Ltd – Booth 1407
 Sympatec – Booth 2439
 TechStar – Booth 2049
 Tracerco – Booth 2901
 VEGA Americas, Inc – Booth 1032
 Woodgrove Technologies – Booth 2539

Professional Society or Association

American Exploration & Mining Association – Booth 2113
 American Institute of Professional Geologists – Booth 1823
 American Rock Mechanics Association (ARMA) – Booth 2735
 Canadian Institute of Mining, Metallurgy & Petroleum (CIM) – Booth 2301
 Global Mining Guidelines Group – Booth 2602
 Mining & Metallurgical Society of America (MMSA) – Booth 1603
 National Stone, Sand & Gravel Association (NSSGA) – Booth 1307
 Women's Mining Coalition – Booth 1605

Publishers

Canadian Institute of Mining, Metallurgy & Petroleum (CIM) – Booth 2301
 Canadian Mining Journal – Booth 2711
 Costmine – Booth 1817
 Global Mining Review – Booth 1523
 International Mining – Booth 2143
 Mining Magazine – Booth 2333
 Mining Media International – Booth 2111
 Mining People Magazine – Booth 2825
 SEMCO Publishing – Booth 1821
 Springer – Booth 1558
 The Mining Record – Booth 1806

Pumps

A.W. Chesterton Company – Booth 1001
 ANDRITZ – Booth 1412
 Avanti International – Booth 2517



PRODUCTS & SERVICES

Boart Longyear – Booth 2002
ChemGrout, Inc – Booth 2513
Cornell Pump Co – Booth 2300
Diemme Filtration SRL – Booth 1200
Evoqua Water Technologies – Booth 2238
FLSmidth A/S – Booth 1801
Geotech Environmental Equipment, Inc – Booth 1624
Hayward Gordon ULC – Booth 1536
Hydro, Inc – Booth 2909
HydroTech Mining – Booth 1169
Integrated Power Services – Booth 2623
Iracore/Irathane Systems Inc – Booth 1317
JENNMAR – Booth 1913
Kurita America Inc – Booth 1371
Metso Outotec – Booth 2101
Miller Sales & Engineering Inc – Booth 2242
NETZSCH Pumps North America, LLC – Booth 2625
Pumpaction – Booth 2834
PumpEng – Booth 2920
Putzmeister Shotcrete Technology – Booth 2621
Rain for Rent – Booth 1833
Salem-Republic Rubber Co – Booth 2324
Schwing Bioset Inc – Booth 2617
Simem Underground Solutions, Inc – Booth 1617
SRS Crisafulli, Inc – Booth 2716
Strata Products Worldwide, LLC – Booth 2520
Technogenia Lasercarb Oklahoma Inc – Booth 2714
Tsurumi Pump – Booth 2421
Valmet Flow Control – Booth 2006
Watson-Marlow Fluid Technology Group – Booth 2734
Xylem Dewatering Solutions Inc – Booth 1566

Pyrometallurgical Processing

Heath & Sherwood (1964) Limited – Booth 1467

Quality Improvement

CANTY – Booth 1521

Carlson Software – Booth 2413
Control Station, Inc – Booth 1148
EMFluids Ltd – Booth 1058
Fluid Systems, Inc – Booth 1251
Independent Mining Consultants, Inc – Booth 2115
LGC Standards – Booth 1071
MINETEK – Booth 1026
MOGAS Industries, Inc – Booth 2737
PETRA – Booth 1666
Samuel Engineering, Inc – Booth 1733

Rail Systems and Supplies

Ackcio – Booth 2939
Blair Rubber Company – Booth 1064
Caterpillar – Booth 2701
Hilfiker Retaining Walls – Booth 2210
JENNMAR – Booth 1913
Presto Geosystems – Booth 1452
PROVIX – Booth 1353
Rail-Veyor Technologies Global Inc – Booth 2407
Savage Services – Booth 2821
Wingfield Scale & Measure – Booth 1115

Reagents - Chemical and Flocculants

Cemvita – Booth 2445
ChemQuest Chemicals, LLC – Booth 2634
Chevron Phillips Chemical – Booth 1706
Clariant Corporation – Booth 1433
Coyne Chemical – Booth 1325
Evoqua Water Technologies – Booth 2238
Hexion Inc – Booth 1153
Kurita America Inc – Booth 1371
Master Builders Solutions – Booth 2107
Nalco Water, an Ecolab Company – Booth 1242
Neo Solutions Inc – Booth 1403
Nouryon – Booth 1525
Pocock Industrial, Inc – Booth 1712
Quadra Chemicals Inc – Booth 1016
Solvay – Booth 1907
TDC, LLC – Booth 2809
Tessenderlo Kerley, Inc. – moleko – Booth 1514

Westpro Machinery Inc – Booth 2322

Reclamation Equipment and Services

Acrow Corp. of America (Acrow Bridges) – Booth 1836
Aerix Industries – Booth 1721
Alfa Laval – Booth 2728
Carlson Software – Booth 2413
Civil & Environmental Consultants, Inc (CEC) – Booth 1510
Costmine – Booth 1817
Custom Linings, Inc – Booth 2133
DeWind One Pass Trenching LLC – Booth 1017
EcoMister Evaporator – Booth 2402
ENTACT – Booth 1838
ENVECO Environmental Solutions, LLC – Booth 2050
Envirocon, Inc – Booth 1709
Foam Concepts LLC – Booth 1450
Forgen – Booth 2526
Harrison Western Construction Corporation, Inc – Booth 2233
Iron Woman Mining Services – Booth 1934
Maccaferri, Inc – Booth 2335
Maptek – Booth 1501
Odin Construction Solutions – Booth 1150
Presto Geosystems – Booth 1452
Rocky Mountain Bio Products - A Division of Bowman Construction Supply – Booth 1109
RWI Enhanced Evaporation Services – Booth 2026
SKAPS Industries – Booth 2713
Skycatch – Booth 2048
SmithCo Mfg – Booth 2636
SRK Consulting (US), Inc – Booth 2121
SRS Crisafulli, Inc – Booth 2716

Recruiting/Staffing

Freeport-McMoRan Inc – Booth 1343
Geotemps, Inc / Geopros, Inc – Booth 1516
Newmont – Booth 1243



Reduction Technologies - Iron Ore, Steel, Mineral

Cemvita – Booth 2445
Clariant Corporation – Booth 1433
Kiewit – Booth 1827
TerraSource Global – Booth 2712

Refinery Equipment

Rain for Rent – Booth 1833

Remediation

Alfa Laval – Booth 2728
Antraquip Corporation – Booth 2332
ARCADIS – Booth 1614
BGC Engineering – Booth 2805
Cemvita – Booth 2445
ChemGrout, Inc – Booth 2513
Civil & Environmental Consultants, Inc (CEC) – Booth 1510
Clariant Corporation – Booth 1433
ConeTec Inc – Booth 1535
Custom Linings, Inc – Booth 2133
DeWind One Pass Trenching LLC – Booth 1017
Diemme Filtration SRL – Booth 1200
EcoMister Evaporator – Booth 2402
EMFluids Ltd – Booth 1058
ENTACT – Booth 1838
ENVECO Environmental Solutions, LLC – Booth 2050
Envirocon, Inc – Booth 1709
Forgen – Booth 2526
Geosyntec Consultants – Booth 2225
Geotech Environmental Equipment, Inc – Booth 1624
GHD – Booth 2150
Harrison Western Construction Corporation, Inc – Booth 2233
Headwater Technologies – Booth 2727
Iron Woman Mining Services – Booth 1934
Keller – Booth 1716
Knight Piésold and Co – Booth 2207
Maccaferri, Inc – Booth 2335
Montgomery & Associates – Booth 1835
Montrose Environmental – Booth 2249
Odin Construction Solutions – Booth 1150
Presto Geosystems – Booth 1452
Ramboll – Booth 2038

REI Drilling, Inc – Booth 2633
Rocky Mountain Bio Products - A Division of Bowman Construction Supply – Booth 1109
RWI Enhanced Evaporation Services – Booth 2026
SKAPS Industries – Booth 2713
SOLMAX – Booth 1527
Tetra Tech – Booth 1632
Veolia Water Technologies – Booth 1611
Wood – Booth 1538
WSP – Booth 2021

Roadheaders

Antraquip Corporation – Booth 2332

Roof - Ground Supports

Agapito Associates Inc – Booth 2027
Antraquip Corporation – Booth 2332
CAB – Booth 1533
DSI Underground LLC – Booth 2626
Epiroc – Booth 1921
Geobrugg North America, LLC – Booth 2443
Harrison Western Construction Corporation, Inc – Booth 2233
HUESKER Inc – Booth 1815
J.H. Fletcher & Co – Booth 1213
JENNMAR – Booth 1913
Minova – Booth 2533
Strata Products Worldwide, LLC – Booth 2520
Williams Form Engineering Corp – Booth 2234

Safety Awards

Original Creations Inc – Booth 2500

Safety Equipment

Aletek – Booth 2835
ASGCO Complete Conveyor Solutions – Booth 1615
ASI Mining – Booth 1358
CAB – Booth 1533
Conspec Controls – Booth 1052
Copper State Bolt & Nut Co – Booth 1634
CoreLift – Booth 2248
CR – Booth 1250
Driver Industrial Safety – Booth 1132
DSI Underground LLC – Booth 2626

ExcelSense Technologies – Booth 2801
Exyn Technologies – Booth 1205
Flexco – Booth 1321
Garmin International – Booth 2337
Geobrugg North America, LLC – Booth 2443
Immersive Technologies – Booth 1509
Industrial Scientific – Booth 1144
IoT Automation – Booth 2542
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Matrix Design Group – Booth 2401
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Sunset Manufacturing – Booth 2637
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Vision X USA – Booth 1261
WEIR Motion Metrics – Booth 1843
Wenco International Mining Systems – Booth 1134
x-Glo North America Inc – Booth 1351

Sampling Devices

CoreLift – Booth 2248
Heath & Sherwood (1964) Limited – Booth 1467
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Scales

Driver Industrial Safety – Booth 1132
Southwestern Scale Co, Inc – Booth 2807
Wingfield Scale & Measure – Booth 1115

Screens

Binder+Co USA Inc – Booth 1935
Carrier Vibrating Equipment, Inc –

PRODUCTS & SERVICES

Booth 1108

Derrick Corporation – Booth 1715

Federal Screen Products, Inc – Booth 1051

Fluid Systems, Inc – Booth 1251

General Kinematics – Booth 1429

Haver & Boecker Niagara – Booth 2250

Iracore/Irathane Systems Inc – Booth 1317

Joest Inc – Booth 1350

Masaba Inc – Booth 2514

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PHOENIX Process Equipment – Booth 2616

Polydeck – Booth 2429

REESCO – Booth 2814

Sandvik – Booth 2521

Superior Industries – Booth 2303

TEMA ISENMANN Inc – Booth 1507

WesTech Engineering, LLC – Booth 1411

Scrubbers

McLanahan Corporation – Booth 2308

Rocvent Inc – Booth 2601

Spendrup Fan Co – Booth 2201

Westpro Machinery Inc – Booth 2322

Seals

A.W. Chesterton Company – Booth 1001

JENNMAR – Booth 1913

Minova – Booth 2533

Sediment & Erosion Control

AGRU America, Inc – Booth 1539

Avanti International – Booth 2517

Baker Hughes - Flexible Pipe Solutions – Booth 1737

Civil & Environmental Consultants, Inc (CEC) – Booth 1510

Concrete Canvas US – Booth 2148

DeWind One Pass Trenching LLC – Booth 1017

ENTACT – Booth 1838

ENVECO Environmental Solutions, LLC – Booth 2050

Envirocon, Inc – Booth 1709

Geobrug North America, LLC – Booth 2443

Geosyntec Consultants – Booth 2225

Inland Tarp & Liner – Booth 1360

Iron Woman Mining Services – Booth 1934

Maccaferri, Inc – Booth 2335

MAPEI Corporation – Booth 1702

Minova – Booth 2533

NewFields – Booth 1839

Presto Geosystems – Booth 1452

Rocky Mountain Bio Products - A

Division of Bowman Construction

Supply – Booth 1109

SAM Solutions – Booth 1837

SKAPS Industries – Booth 2713

Skycatch – Booth 2048

SRS Crisafulli, Inc – Booth 2716

WINFAB – Booth 1043

Sensors

A.W. Chesterton Company – Booth 1001

ABB – Booth 1943

Arsenal Tire Performance Tech – Booth 1259

ASI Mining – Booth 1358

Binder+Co USA Inc – Booth 1935

Canary Systems, Inc – Booth 1232

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Emerson – Booth 1633

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GEOKON – Booth 1710

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Industrial Scientific – Booth 1144

Laser Tech – Booth 2235

Maestro Digital Mine – Booth 1304

Matrix Design Group – Booth 2401

Orica USA – Booth 2122

PROVIX – Booth 1353

RDI Technologies – Booth 1569

Regal Rexnord – Booth 1365

Satellogic – Booth 1008

Sympatec – Booth 2439

TOMRA Sorting – Booth 1938

UE Systems, Inc – Booth 1461

WEIR Motion Metrics – Booth 1843

Worldsensing – Booth 1138

Separators and Concentrators

Alfa Laval – Booth 2728

ANDRITZ – Booth 1412

Binder+Co USA Inc – Booth 1935

Deister Concentrator, LLC – Booth 2808

Derrick Corporation – Booth 1715

Flottweg Separation Technology, Inc – Booth 1415

FLSmidth A/S – Booth 1801

FM Technologies – Booth 2251

Joest Inc – Booth 1350

Mineral Technologies – Booth 1416

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Shortwall Mining Equipment

Atlas Electric, Inc – Booth 1147

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SmithCo Mfg – Booth 2636

Shotcrete Equipment, Supplies and Services

Bekaert – Booth 2208

Custom Linings, Inc – Booth 2133

GMS Mine Repair & Maintenance – Booth 1620

Harrison Western Construction Corporation, Inc – Booth 2233

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Normet Americas, Inc – Booth 2433

Pumpaction – Booth 2834

Putzmeister Shotcrete Technology – Booth 2621

Simem Underground Solutions, Inc – Booth 1617

Thyssen Mining Group of Companies – Booth 1424

Solar Electric Power System

3D-P – Booth 1560



Solvents - Extraction, Mixer and Settlers

Cemvita – Booth 2445
ChemQuest Chemicals, LLC – Booth 2634
Chevron Phillips Chemical – Booth 1706
Clariant Corporation – Booth 1433
Flottweg Separation Technology, Inc – Booth 1415
Guardian Traxol Chemicals Inc – Booth 1210
Hayward Gordon ULC – Booth 1536
Quinn Process Equipment Co – Booth 1726
Solvay – Booth 1907

Steel Pipe

AIL Mining – Booth 2736
Contech Engineered Solutions – Booth 2029
Kalenborn Abresist Corporation – Booth 2323
Mill Man Steel, Inc – Booth 2033
Naylor Pipe Co – Booth 1910
Putzmeister Shotcrete Technology – Booth 2621
REI Drilling, Inc – Booth 2633

Steel Wire Ropes/Cables

Bekaert – Booth 2208
Minova – Booth 2533

Surveying Equipment and Supplies

Carlson Software – Booth 2413
Esri – Booth 1142
Exyn Technologies – Booth 1205
Frontier Precision Geospatial/Unmanned – Booth 1110
GEO-Instruments – Booth 1714
Maptek – Booth 1501
NSS Canada – Booth 1204
Propeller Aero – Booth 1735
RDO Integrated Controls – Booth 2936
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Skycatch – Booth 2048
Sunset Manufacturing – Booth 2637
Wingfield Scale & Measure – Booth 1115

Wingtra AG – Booth 1136

Temporary Structures

Acrow Corp. of America (Acrow Bridges) – Booth 1836
AIL Mining – Booth 2736
All Weather Air – Booth 2828
Atlas Electric, Inc – Booth 1147
ClearSpan Structures – Booth 2342
GNB Global Inc – Booth 2147
Hilfiker Retaining Walls – Booth 2210
Iron Woman Mining Services – Booth 1934
Norseman Structures – Booth 2829

Thickeners

Alfa Laval – Booth 2728
Aquatech International – Booth 1570
Diemme Filtration SRL – Booth 1200
FLSmdith A/S – Booth 1801
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Nalco Water, an Ecolab Company – Booth 1242
Nouryon – Booth 1525
PHOENIX Process Equipment – Booth 2616
Pocock Industrial, Inc – Booth 1712
Schwing Bioset Inc – Booth 2617
TAKRAF USA Inc – Booth 2127
WesTech Engineering, LLC – Booth 1411
Westpro Machinery Inc – Booth 2322

Training Services

ANDRITZ – Booth 1412
ASC Engineered Solutions – Booth 1820
Check-6/Biz X Group – Booth 1165
Copper State Bolt & Nut Co – Booth 1634
Datamine North America Inc – Booth 2220
Emerson – Booth 1633
Fluid Life – Booth 2246
Hatch – Booth 1334
Hydro, Inc – Booth 2909
Immersive Technologies – Booth 1509
Industrial Scientific – Booth 1144
Jenike & Johanson – Booth 2605
Maptek – Booth 1501
Metcom Technologies Inc – Booth

1608

Metsim International – Booth 2614
Minova – Booth 2533
Normet Americas, Inc – Booth 2433
Northwest Towers – Booth 2549
Predictive Compliance – Booth 2032
Quadra Chemicals Inc – Booth 1016
RCT – Booth 1068
Wood – Booth 1538

Transportation

Acrow Corp. of America (Acrow Bridges) – Booth 1836
Arsenal Tire Performance Tech – Booth 1259
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Bridgestone Americas Tire Operations – Booth 2704
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Datamine North America Inc – Booth 2220
Driver Industrial Safety – Booth 1132
HYTORC, Division of UNEX Corp – Booth 1357
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MBA Energy and Industrial – Booth 1315
Philippi-Hagenbuch, Inc – Booth 1949
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Valmet Flow Control – Booth 2006
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WSP – Booth 2021

Trucks and Haulage Units

ASI Mining – Booth 1358
Brookville Equipment Corp – Booth 1610
Caterpillar – Booth 2701
Driver Industrial Safety – Booth 1132
Epiroc – Booth 1921
ExcelSense Technologies – Booth 2801
Hilfiker Retaining Walls – Booth 2210
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McLellan Industries, Inc – Booth 1707
MICROMINE – Booth 1627

PRODUCTS & SERVICES

Miner Elastomer – Booth 1333
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Sandvik – Booth 2521
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SmithCo Mfg – Booth 2636
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Tunnel Boring Equipment

Alfa Laval – Booth 2728
Antraquip Corporation – Booth 2332
Atlas Electric, Inc – Booth 1147
Brunel Corp – Booth 1401
Harrison Western Construction Corporation, Inc – Booth 2233
Herrenknecht Tunneling Systems USA, Inc – Booth 2206
Line Power Manufacturing – Booth 1601
PROVIX – Booth 1353
Schwing Bioset Inc – Booth 2617
Simem Underground Solutions, Inc – Booth 1617
Spendrup Fan Co – Booth 2201
Thyssen Mining Group of Companies – Booth 1424

Tunnel Lining and Support Materials

AIL Mining – Booth 2736
Antraquip Corporation – Booth 2332
Bekaert – Booth 2208
CAB – Booth 1533
Contech Engineered Solutions – Booth 2029
Custom Linings, Inc – Booth 2133
DSI Underground LLC – Booth 2626
Geobrug North America, LLC – Booth 2443
Inland Tarp & Liner – Booth 1360
MAPEI Corporation – Booth 1702
Minova – Booth 2533
Putzmeister Shotcrete Technology – Booth 2621
Robit Inc – Booth 2722
Rocvent Inc – Booth 2601
SKAPS Industries – Booth 2713
SOLMAX – Booth 1527

Thyssen Mining Group of Companies – Booth 1424

Underground - Construction and Structures

Acrow Corp. of America (Acrow Bridges) – Booth 1836
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Antraquip Corporation – Booth 2332
Bekaert – Booth 2208
CAB – Booth 1533
Cementation USA Inc – Booth 2243
Contech Engineered Solutions – Booth 2029
Cowin & Company/Raisebor – Booth 2717
DeWind One Pass Trenching LLC – Booth 1017
DSI Underground LLC – Booth 2626
FKC-Lake Shore – Booth 1504
GMS Mine Repair & Maintenance – Booth 1620
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Kiewit – Booth 1827
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MES Mining – Booth 1739
MILLER – Booth 2501
Minova – Booth 2533
Mitsubishi Materials USA Corp – Booth 2706
Normet Americas, Inc – Booth 2433
Odin Construction Solutions – Booth 1150
Presto Geosystems – Booth 1452
Putzmeister Shotcrete Technology – Booth 2621
RAM Enterprise, Inc – Booth 2507
Robit Inc – Booth 2722
Syntron Material Handling – Booth 2321

Thyssen Mining Group of Companies – Booth 1424

Underground Excavation Services and Equipment

Antraquip Corporation – Booth 2332
Arsenal Tire Performance Tech – Booth 1259
Brookville Equipment Corp – Booth 1610
Caterpillar – Booth 2701
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Iron Woman Mining Services – Booth 1934
MAPEI Corporation – Booth 1702
MES Mining – Booth 1739
Miner Elastomer – Booth 1333
Mining Equipment, Ltd – Booth 1927
Phoenix Lighting – Booth 2732
Sandvik – Booth 2521
Technogenia Lasercarb Oklahoma Inc – Booth 2714
Thyssen Mining Group of Companies – Booth 1424

Urethane Cast Parts

A.W. Chesterton Company – Booth 1001
Haver & Boecker Niagara – Booth 2250
Iracore/Irathane Systems Inc – Booth 1317
TEMA ISENMANN Inc – Booth 1507

Valves

A.W. Chesterton Company – Booth 1001
Apollo Valves – Booth 2738
ASC Engineered Solutions – Booth 1820
Bray Controls – Booth 2229
Emerson – Booth 1633
Evoqua Water Technologies – Booth 2238
K&M Industrial Valve Supply – Booth 1170
Kurita America Inc – Booth 1371

MOGAS Industries, Inc – Booth 2737
 Netafim USA – Booth 1607
 ORE-MAX – Booth 1500
 OXO VALVE – Booth 1038
 TechStar – Booth 2049
 Valmet Flow Control – Booth 2006
 Victaulic – Booth 2320

Ventilation Systems, Materials and Equipment

Agapito Associates Inc – Booth 2027
 BBE Consulting Canada – Booth 1102
 CAB – Booth 1533
 Conifer Systems – Booth 1009
 Englo, Inc – Booth 2336
 G+ Plastics – Booth 2548
 Hoffman Manufacturing, Inc – Booth 1246
 Howden Canada Inc – Booth 1515
 JENNMAR – Booth 1913
 Maestro Digital Mine – Booth 1304
 MINETEK – Booth 1026
 Mining Equipment, Ltd – Booth 1927
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 Strata Products Worldwide, LLC – Booth 2520
 Thyssen Mining Group of Companies – Booth 1424
 Zitron USA, LLC – Booth 2334

Washing Plants

Baker Hughes - Flexible Pipe Solutions – Booth 1737
 Haver & Boecker Niagara – Booth 2250
 Masaba Inc – Booth 2514
 McLanahan Corporation – Booth 2308
 PHOENIX Process Equipment – Booth 2616
 REESCO – Booth 2814
 Superior Industries – Booth 2303
 Westpro Machinery Inc – Booth 2322

Water Clarification and Treatment

Alfa Laval – Booth 2728
 ANDRITZ – Booth 1412

Aquatech International – Booth 1570
 ARCADIS – Booth 1614
 Baker Hughes - Flexible Pipe Solutions – Booth 1737
 Baroid Industrial Drilling Products – Booth 1439
 CANTY – Booth 1521
 ChemQuest Chemicals, LLC – Booth 2634
 Contech Engineered Solutions – Booth 2029
 Diemme Filtration SRL – Booth 1200
 EcoMister Evaporator – Booth 2402
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 Toray Membrane USA – Booth 1235
 Valmet Flow Control – Booth 2006
 Veolia Water Technologies – Booth 1611
 WesTech Engineering, LLC – Booth 1411
 Wood – Booth 1538

Xylem Dewatering Solutions Inc – Booth 1566

Welding Equipment and Supplies

ASC Engineered Solutions – Booth 1820
 Leister Technologies, LLC – Booth 1034
 Technogenia Lasercarb Oklahoma Inc – Booth 2714

Well Completion Equipment

Inland Tarp & Liner – Booth 1360
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June 25-28, 2023 | Rapid City, SD

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