

Abstract for Saeede Kadivar's Dr. Syd S. Peng Scholarship Application

Assessing the environmental footprints of gold production in Nevada

Gold has always been regarded as a valuable commodity and has been in high demand throughout history. Gold mining is an extremely large part of the Nevada's economy. Regardless of how strong and rigorous the environmental management standards are, the reality is that mining does have an impact on the natural environment. However, there is little public information about its environmental footprints. In this regard, as for my research, I am working on evaluating the environmental burdens associated with gold mining activities in Nevada. As we know, like other metal production industries and industrial sectors, gold mining industry come under increased pressure to reduce its environmental footprint over the various processing stages in its supply chain from gold ore mining through to gold refining. Thus, a holistic and comprehensive evaluation of environmental impacts associated with the gold mining should be considered as the starting point to reduce the environmental impacts.

Because Nevada is currently the state's leading gold producer, using one of the mines allowed us to investigate the environmental footprint of gold industry employing Life cycle analysis (LCA) with as little error as possible. The Carlin Complex is a series of both open pit and underground operating mines, advanced projects, and processing facilities and includes a series of integrated facilities to process ores from multiple open pit and underground sources. The processing operations contained on the Carlin Complex include roaster, autoclaves, and leach pads and are listed as: Mill 5 in which the flotation and cyanide leaching occur, Mill 6 (Roaster), South and north area leach, Emigrant area leach, Goldstrike autoclave and Goldstrike roaster. A life cycle analysis is a method for determining a product's environmental impact. This approach has been used in the manufacturing industry to evaluate the product and identify which is more eco-friendly. We simply applied this technique to Goldstrike roaster at the Carlin Mine, using information available in the technical report by Nevada Gold Mines. Using the US EPA's Tool for Reduction and Assessment of Chemicals and Other Environmental Impacts (TRACI), the categories of ozone depletion, global warming, smog, acidification, eutrophication, carcinogenics, non-carcinogenics, respiratory effects, ecotoxicity, and fossil fuel

depletion were evaluated for the processes that occurred for gold extraction at the Carlin Complex.

To conclude, the primary goal of this study is to discuss the current state of LCA for gold in Nevada. These LCA studies is recommended for other steps to create database for gold production in Nevada which represents the environmental footprint in gold industry. Although life cycle assessment of gold face challenges due to the lack of databases for input material, their results will play a key role in developing eco-friendly processes which can be used as great alternatives in recovery of gold and has the potential to assist stakeholders in making informed decisions regarding our future green technology. Until now, we finished the roaster and flotation circuit and we are planning to finish the heap leaching and the autoclave circuit by the end of May 2023.