about 450 mt, versus 1,300 mt for the long-hole stope," the company reported. Dilution for the long-hole stope "can be up to 196%," while there was "virtually no dilution for the spalling-assisted stope."

The costs for the long-hole stope were 20% higher. "The fragmentation spalling assisted method was approximately 10% quicker," the company said.

The case study adds to the evidence that the technology and method can reduce dilution by at least 30%, Miller said. "Meaning that less material needs to be transported, treated, and disposed. Add to that the costs savings of using less assets and fuel," he said. "We are really confident it will do that."

To instill that confidence in potential clients, the company has been subjecting the technology and method to multiple tests for more than a year. One test is to determine the types of rock on which thermal technology is the most effective. Other tests assess the capabilities of upgrades implemented to the thermal unit and determine the emissions of the technology and method.

Previous tests demonstrated that the technology and method was very effective on rhyolite and quartz. This summer, additional surface tests will be conducted at Montauban les Mines.

Using an "optimized thermal unit, we conducted tests on surface where we characterized the volume or the diameter of the hole and were able to fragment continuously for a certain period of time," Miller said. "Right now, we are working on a type of graph that will identify the spall-ability index for various types of rocks and will attribute a factor or value for each type of rock."

The unit involved was optimized after Technical Director Mark Van Schaik upgraded it to improve performance. "The upgrades and improvements to the lance were implemented last year as an R&D project," Miller said.

An upcoming program involves gas emissions monitoring. "The heat from the lance has the potential to cause sulphur

CSR-driven Aramine Launches Battery-powered Loader With Longer Range

Aramine recently launched the L140B V2, which is powered by a new battery pack. The pack uses a lithium-iron-phosphate battery that is "now the prismatic battery type," said Audrey Beurnier, marketing and communication manager.

"This has allowed our machine to gain 57% autonomy, from 3.5 hours to 5.5 hours, and to reduce by 20% the charging time, from 4 hours and 20 minutes to 3.5 hours," she said. "In other words, the energy in each energy module is going from 24 kWh to 42 kWh with the same volume and weight."

The added autonomy and uptime will improve the performance of the unit.

"The good news for all our customers already using our L140B is that the machine's operating software system just needs to be updated to use the new module energy," Beurnier said. "The update will be free of charge for any purchase of the new battery-powered energy module," she said. "Our new operating software allows our end-users to use the new battery modules but also the original one alternatively as they are totally interchangeable."

Above, a prototype L140B V2 loader on the factory floor. The battery can go up to 5.5 hours between charges, which take as little as 3.5 hours. (Photo: Aramine)

Separately, Aramine partnered with Werecy to launch a recycling program for old lithium-iron-phosphate batteries used by its machines.

"Our partner will get the batteries back from our customers to their site and organize the reuse of the batteries for other purposes," said Catherine Hebert, corporate social responsibility (CSR) director. "Moreover, our partner will also do on-site processing to reuse the batteries in different applications depending on our user."

The development speaks to the supplier's CSR vision, which is "based on three important lines," she said. The first is environmental, and entails "innovating for responsible mining." The second is social, and involves "accomplishment through expertise." The third is societal and is accomplished through "investing for a better world," she said.

"For each point we come up with actual actions to have a positive impact on the world," Hebert said. "For example, battery-powered machines developed for lower CO_2 emissions, narrow vein mining machines, and planting 1,450 trees in Madagascar since 2019."

Other examples include employee promotions and career monitoring, "technical training and skills transfer, and employee share ownership," she said. To accomplish societal responsibility goals, Aramine has been "a member of the United Nations Global Compact since 2017, is building a school cafeteria in Nepal, is renovating a school in Mexico, and donates to associations in the cultural, education and health sectors."

The history of the company shows that CSR is in its DNA, Beurnier said. For example, Aramine launched a standard exchange program for customers in the 1970s. "Our principal argument was to avoid throwing away a component that can have a second or even a third life at a lower cost than a brand new one to produce."

In the 1980s and 1990s, the company developed its remanufacturing program, which scaled up the exchange program. More recently the company has developed "a new generation of underground machines for narrow vein mines, to allow operator's to safely extract the raw materials" with precision, using less resources, Beurnier said. "Our battery-powered machines are in constant evolution, with new innovations to reduce our impact on the environment and protect the users."