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HOT ROCKS

High-temp thermal method replaces conventional blasting

By: Russell Noble

The mining industry has always been a leader when it comes to new and innovative ideas, but few technological developments in recent years can match that of the emerging popularity of thermal fragmentation mining.

As veteran miners will contest, the technology is not entirely new. In fact, it's been used in Russia for more than 40 years but here in Canada, the use of heat in place of chemical explosives to break rock, is still relatively new.

One company that firmly believes in the technique is Rocmec Mining Inc. of Pointe-Claire, Quebec. Rocmec is a Canadian junior mining and exploration company involved in the acquisition, exploration, and development of gold projects.

The company currently owns 100% of five properties in the Abitibi-Temiscaminque region of Quebec where it is now using the thermal fragmentation process to mine its high-grade precious metals.

"The thermal fragmentation mining method is a new and innovative way of mining narrow vein ore bodies and a foremost solution to solving the problem of ore dilution," says Rocmec President Donald Brisebois.

"It is a unique tool, a powerful burner, to mine with precision, a narrow mineralized corridor in an effective and productive manner. The technology is positioned to meet the growing challenges of skilled labour shortage, tougher environmental guidelines, and the depletion of traditional large-scale ore deposits mined using conventional methods.

"As we continue to develop the technology and spread it through the mining community, our objective remains to optimize the productivity and profitability of mining narrow high-grade precious metal ore bodies and to make a substantial, lasting contribution to this sector of activity."

Brisebois says the thermal fragmentation mining method is ideal for mineralized structures with widths of 30 cm to a meter. Depending on the width of the precious-metal vein, a thermal fragmentation unit can be set up to extract a specific mining

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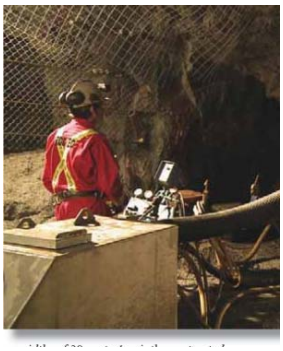

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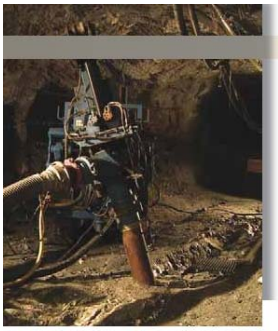

The entire thermal fragmentation process requires a minimal amount of equipment and manpower by comparison to conventional rock-br...
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corridor.

The principle factor that has undermined the profitability and effectiveness of mining such ores in the past has been the substantial dilution that occurs when blasting with explosives during extraction.

"There is a clear need to develop mining techniques that minimize ore dilution and development costs in order to make the mining of high-grade narrow vein ore deposits more profitable," said Brisebois.

Here's a quick look at how the system works.

Using a burner powered by diesel fuel, a probe is inserted into a 152 mm pilot hole drilled into the vein using a conventional drill. The intense 1800 deg C heat from the burner spalls the rock, quickly increasing the diameter of the hole to 30 -100 cm and producing the rock fragments.

Leftover rock between fragmented holes is broken loose using soft explosives and a narrow mine corridor with widths of 30 cm to 1 m is then extracted. Since waste walls are left intact, the dilution factor and according to Rocmec engineers, the inefficiencies associated with traditional mining methods are greatly reduced.

Until recently, the use of chemical explosives was the only cost-effective way of breaking hard rock but this thermal fragmentation method is proving to be equally affective. At closer look, the spalling is considered as a form of decrepitation caused by an unequal expansion of rock crystals that overcomes molecular cohesion. The broken material produced during this process ranges in size from fine-grained to 4 cm. A portion of the material is ejected out of the hole as burning progresses and the rest can either be blown out of the hole by compressed air or aspirated.

Each work site is organized within two drift levels, approximately 20 m apart. Drift development is performed directly into the ore at intervals of 15 to 20 m in accordance with the geology of the ore body. Using a re-suing method, the ore is blasted and recovered in the first cut then the waste is blasted and hauled away in the second cut.

Following the creation of the two sub-level drifts, a pilot hole is drilled between two levels and enlarged by way of the thermal fragmentation process. This allows for selective ore extraction; high-grade sections can be prioritized and extracted first leaving waste walls on each side of the mineralized zone intact and minimizing the damage caused to the drift structure.

Rocmec's engineers say that the area mined can then be easily rehabilitated using cables and panels to cover the narrow opening in the hanging wall of the undercut drift. Mine residue can then be used to fill the extracted zone and a cement floor laid, if needed, on the footwall of the overcut drift to permit future access.

Rocmec says that by using this method, the stability of the rock is maintained and access to the ore body is never compromised. Furthermore, thermal fragmentation is a continuous mining method; it uses no explosives and is operated in a continuous chain, with one person drilling a pilot hole, followed by a second who enlarges it by way of thermal fragmentation.

Regardless of what method of mining is used to extract minerals from the ground, the impact on Mother Nature is always a concern and there is an ever-growing need to develop sustainable mining methods that minimize the environmental footprint left behind in mining operations.

"In all corners of the world, local populations have expressed their concerns about mine operations being established in their region, as awareness about the negative impact of industrial activities has spread," said Donald Brisebois.

"While developing the thermal fragmentation mining method, important factors were made to address and reduce environmental effects mine operations have on the surrounding area. Using this method, mine development is performed directly into ore resulting in less waste rock being extracted and displaced into large piles at the surface.

"By solely extracting the mineralized zone, only the necessary excavations are made. In fact, four-times less rock needs to be mined for the equivalent mineral content. As a result of less rock being mined, fewer tonnes need to be processed at the mill to extract the precious metals and more importantly, the quantity of chemical agents needed in the process is greatly reduced, as is the amount of energy required by the mill to process the ore."

And finally on an environmental note, Brisebois says the reduced quantity of energy for hauling and processing the ore results in fewer greenhouse gases being emitted. The mining residue that remains once the precious metal contents are removed is four times less abundant, using the earlier example, meaning much smaller tailing areas need to be constructed, maintained, and rehabilitated once mining operations have ceased.

The space needed to host a mine is also greatly reduced, alterations to the landscape are significantly diminished, and the result is a cleaner and more responsible approach to mine operations.

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