



MINING & CONSTRUCTION



A Magazine from Epiroc Vol 1, 2018

New Epiroc Canada GM
Hütte compact drill
Longer lasting drill string

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**The
automation
zone** [Page 4]



Here to serve you even better

I respectfully take this opportunity to introduce myself as the new General Manager of the Canadian Customer Center for Epiroc. I started not long after the announcement was made that Atlas Copco would potentially become two separate companies by the middle of 2018 pending final Board approval during their April Board Meeting.

The mining, civil engineering and natural resources side of the Atlas Copco Group will become Epiroc worldwide and is planned to be listed separately on the NASDAQ in Stockholm during 2018.

Here in Canada we got an early start by registering our entity and organizations, enabling us to operate as Epiroc – Part of the Atlas Copco Group since September 1, 2017.

The transition took place relatively smoothly. You might not have noticed the change unless you were curious that a technician or sales

rep signed in at your gate using our new name. Or perhaps you've noticed an air of excitement in your dealings with our more than 420 employees based in one of our 18 branch offices within our nationwide customer sales, service and support network. You will, however, start to see the new Epiroc brand on our vehicles



With this new set up, we will be much more focused on your industry, with the ability to advance our innovations at a faster pace.

and facilities as our appearance changes during the coming months.

Our name Epiroc comes from Greek and Latin roots meaning “at the rock” – epi, Greek for “at, close, or upon,” and roc, Latin for “rock.” It perfectly reflects our dedicated industry focus, proximity to the people we serve, and the strength of our relationships/partnerships.

With this new set up, we will be more focused on your industry, with the ability to advance our innovations at a faster pace. Epiroc is devoted to continue providing customers with products and services that enhance their productivity, energy efficiency, safety and ergonomics.

Operating as an independent company simply means that now we get to focus 100 percent of our energy on technologically advanced and efficient civil and mining equipment, drilling tools, hydraulic attachments and superior services, while Atlas Copco will continue to focus its attention on its industrial customers.

So, while we appear new in many ways, you can trust that we are still the same company – our passion and roots deeply grounded in 145 years of experience. We have a solid and strong history with our future together only getting stronger.



JASON SMITH

General Manager, Epiroc Canada Customer Center

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SAFETY FIRST

Epiroc is committed to comply with or exceed all global and local safety rules and regulations for personal safety. Some photographs in this magazine may, however, show circumstances that are beyond our control. All users of Epiroc equipment are urged to think safety first and always use proper ear, eye, head and other protection as required to minimize the risk of personal injury.

 **Epiroc**

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All clear in the automation zone

Barrick's Hemlo mine goes deeper with teleremote and automation

Teleremote, autonomous mining is helping Barrick Gold Corporation reach a deeper section of its Hemlo mine in Canada. Running an Epiroc Scooptram ST14 load-haul-dump from the surface enhances worker safety while reducing ventilation and climate control requirements underground.



Patrick Marshall,
Hemlo Manager
Automation
Projects, Innovation



Graham Hanson,
Hemlo Innovation
and Technology
Manager

Operator Wayne Locht trams his Epiroc Scooptram ST14 to the automation zone, passing white Wi-Fi boxes mounted on the access walls at 30 meter intervals. He stops short of the first “light curtain,” a laser-actuated barrier marking the zone’s boundary. Crossing a light curtain will trip a shutdown of the level and alarm those at the surface.

Equipment at Hemlo is tagged to display its location in the mine with Mobilaris real-time tracking software. The same Mobilaris technology is planned for miners’ hardhats by the end of 2018. Exiting the cab Locht says, “We still personally walk the area to make sure no one is in the zone.” Reassured the zone is clear, he takes an electronic “key” from a safety box near the light curtain.

“This key gives the rig permission to enter. It tells the rig where it is and gives it its instructions.” He inserts the key into a socket beneath his operator’s seat. The red status light on the pole turns to flashing yellow. Locht may proceed to the second light curtain.

Parking the rig between the first laser barrier and the next, Locht sets the brake and flips a switch on the operator console from Automation 1 to 2. He leaves the cabin a final time, removing the key from below the seat. Plugging it back into the safety box, it rearms the first light barrier and mutes the second. The level-status light turns green.

Locht radios the operator waiting at the

control room operator station on the surface 1.3 kilometers above. The rig is now in his hands and Locht catches a 40-minute ride to the surface.

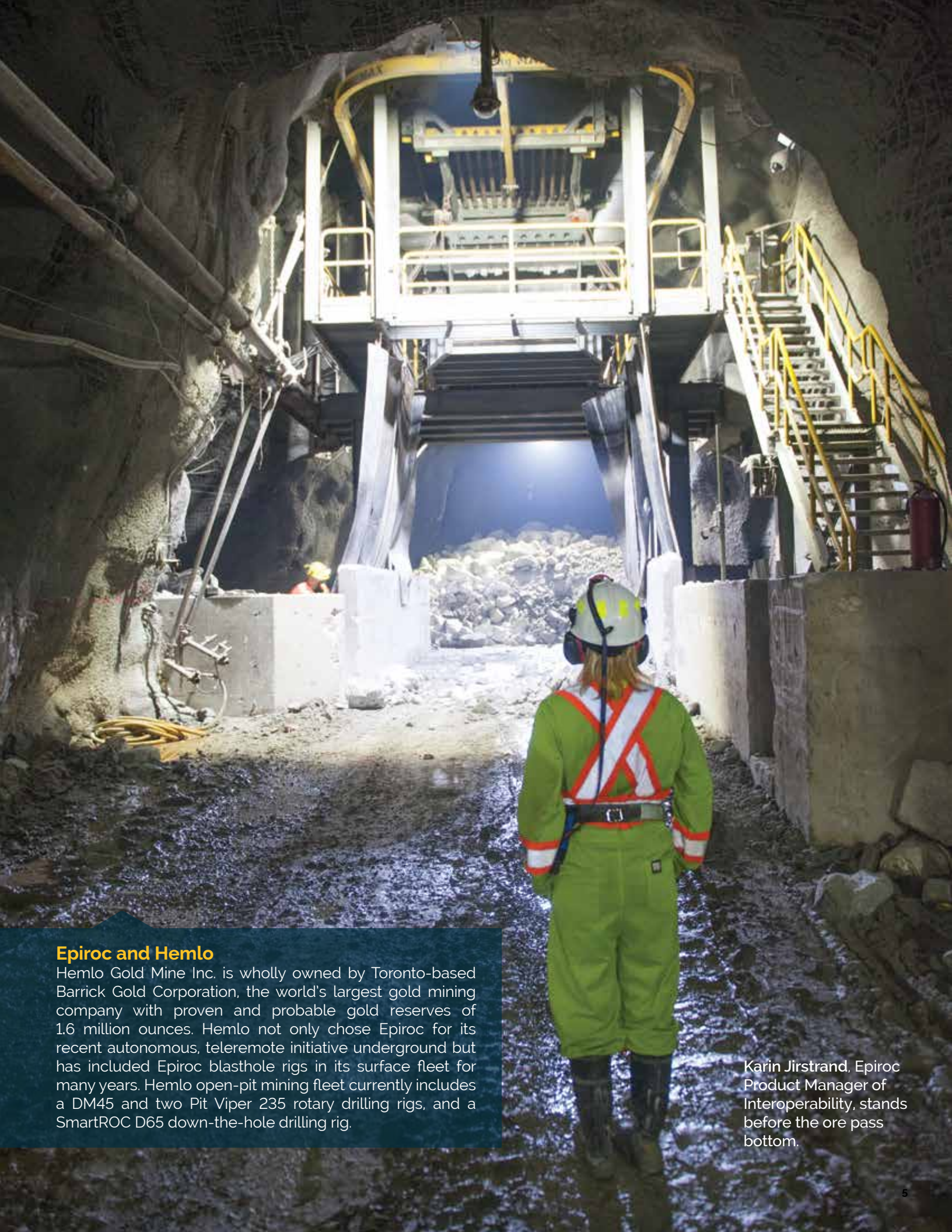
Autonomous tramming and teleremote operation are the most recent addition to an automation program at Barrick Gold Corporation’s Hemlo open-stopping operation near Marathon, Ontario, that began with an autonomous truck circuit in 2007. It is accelerating its automation program with a five-year plan after a year-long search for a solution offering the lowest cost, quickest implementation and solid product support.

“We studied all available technology. We had conferences with manufacturers and visited their facilities. We toured operations where their equipment was at work,” says Patrick Marshall, Manager Automation Projects, Innovation. “We believe the Epiroc package featured the product support we wanted, had the best integration capability for our multi-vendor operation, had the right pricing model and, in general, was the best fit for our needs.”

Barrick preferred to use Cisco for wireless infrastructure. “Commonality was important to us,” Marshall explains. “Epiroc’s system is easily adaptable for use with third-party wireless systems.”

For Hemlo, safety is the greatest benefit of the high-tech Scooptram ST14. Combining autonomous tramming with teleremote operation also increases productivity.





Epiroc and Hemlo

Hemlo Gold Mine Inc. is wholly owned by Toronto-based Barrick Gold Corporation, the world's largest gold mining company with proven and probable gold reserves of 1.6 million ounces. Hemlo not only chose Epiroc for its recent autonomous, teleremote initiative underground but has included Epiroc blasthole rigs in its surface fleet for many years. Hemlo open-pit mining fleet currently includes a DM45 and two Pit Viper 235 rotary drilling rigs, and a SmartROC D65 down-the-hole drilling rig.

Karin Jirstrand, Epiroc Product Manager of Interoperability, stands before the ore pass bottom.

2016 Hemlo Mine operation

- ▶ Combined open pit and underground mining operation.
- ▶ Production: 235 000 oz.
- ▶ Mineral reserves: 1.6 million oz.
- ▶ Graded at 1.92 g/t.
- ▶ Received Mining Association of Canada's "Towards Sustainable Mining" Leadership Award.



Scooptram ST14 autonomously unloads ore at the ore pass.



Anna Ronning, Epiroc Project Manager Automation, with **Graham Hanson**, Hemlo Innovation and Technology Manager

"Automation and teleremote control removes workers from the operating environment to an office on the surface – the ultimate in safe operation," says mine superintendent Jon Laird. "And since it continuously mucks from stopes at a steady rate even through shift changes, it eliminates having to move operators to it every shift."

Laird says the 14-tonne-capacity Scooptram is "so efficient it threatens to outpace crushing operations at the ore pass." He smiles broadly when he adds, "Over-production is a good problem to have."

One solution under discussion is creating



Steve Germain, left, turns teleremote ST14 operation over to **Wayne Locht**, who has just returned to the surface from driving the rig to the automation zone and ensuring no personnel are on that level.



Scooptram operator **Wayne Locht** retrieves the automation transfer key. You can see the laser barrier that confirms whether rigs can proceed.

► Keys to success

Mobilaris real-time location tracking

► Mine-wide use of Epiroc Mobilaris not only gives Hemlo real-time equipment tracking, but upgrading to also track locations of personnel will be a vital advantage in case of an emergency.

Designed with operators in mind

► Operators report high satisfaction regarding the ergonomics, power, comfort and features of the Scooptram ST14. Transitioning to teleremote and autonomous operations is quick and easy to learn.

Capacity and speed boost productivity

► The Scooptram ST14 with 14-tonne bucket capacity gives fast, fully loaded tramming speeds rated up to 29.5 km/h on level ground and up to 4.8 km/h up a 25 percent grade.

Safer, more comfortable

► Automated load-haul dump operation reduces ventilation and climate control requirements of deep mining and moves operators to a safer, more comfortable environment than possible with line-of-site radio remote control.

additional ore passes to give one crushing operation time to clear ore between dumps. The Scooptram can easily learn multiple routes and alternate between them. Other systems Hemlo looked at took up to a full shift for the route-learning process. Graham Hanson, Innovation and Technology Manager, who heads up teleremote operations at Hemlo, says, “This rig, you just run the route to learn it and it’s ready to go.”

Trevor Kelly, Barrick Technical Excellence Director, says implementation requires faith and patience. “While we are seeing what we expect in general, we can’t precisely measure overall results for some time yet. How much are we saving? How

much more productive and efficient are we?”

Certiq, the telematics system installed on the Scooptram, will be essential for tracking, documenting and analyzing operational data to learn how much they gain from their investment in automation.

However, it isn’t all about numbers. Introducing advanced technology raises concerns about job security. Hemlo has actually added personnel to build and maintain its Wi-Fi infrastructure. And automation has opened paths for other employees to more fully realize their potential with expanded skillsets, achieving at higher levels in an improved working environment.

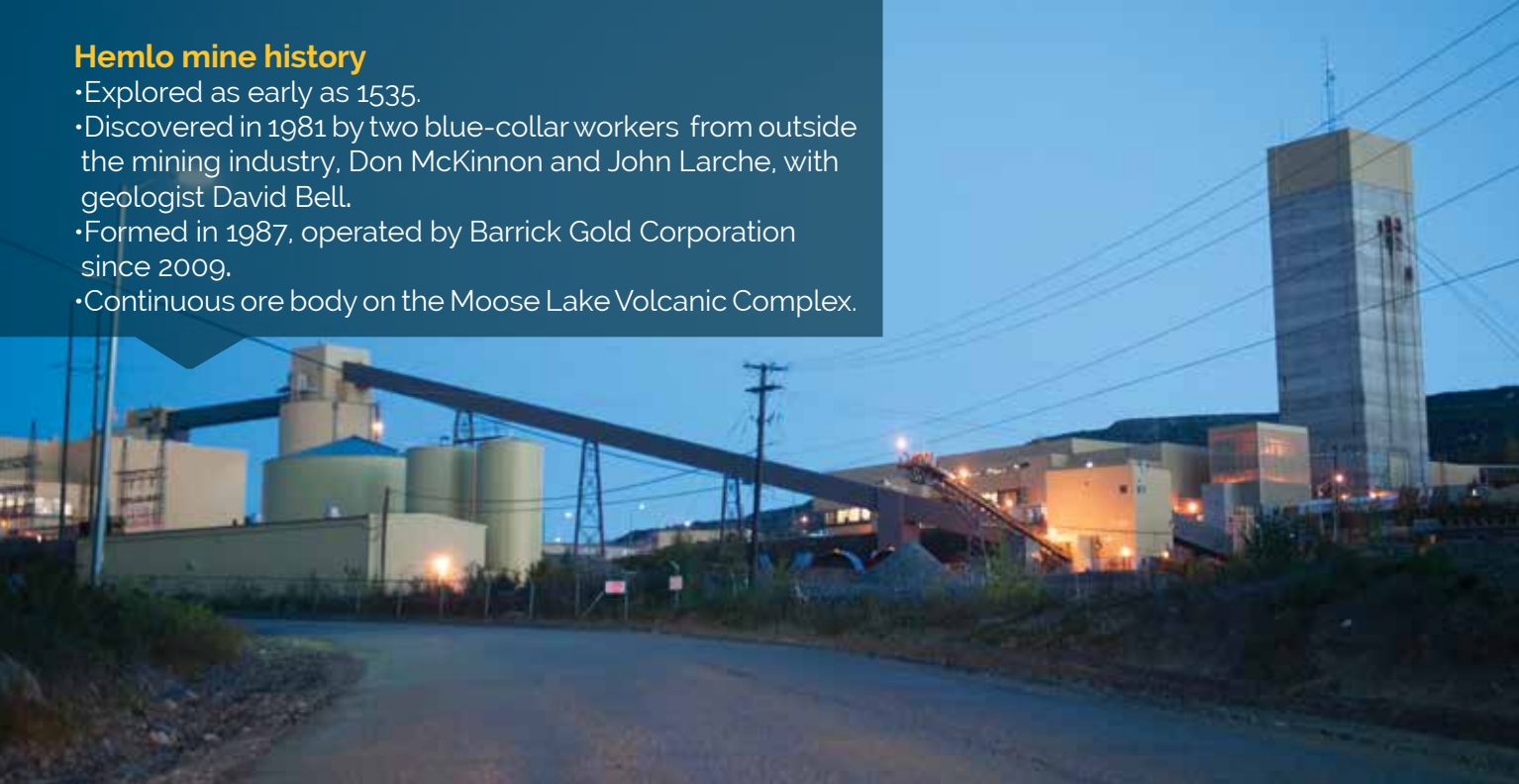


Trevor Kelly,
Barrick Technical
Excellence
Director



Hemlo mine history

- Explored as early as 1535.
- Discovered in 1981 by two blue-collar workers from outside the mining industry, Don McKinnon and John Larche, with geologist David Bell.
- Formed in 1987, operated by Barrick Gold Corporation since 2009.
- Continuous ore body on the Moose Lake Volcanic Complex.



Scooptram operator Wayne Locht

returns to the surface to complete his shift from the Automation Room. Its size and appearance are that of a small classroom. Windows span the full length of the far wall, offering a panoramic view of the Ontario landscape.

There is an electronics cabinet beside a table with an array of computer monitors behind a single control pad.

Locht crosses to the desk to see how things have gone for the operator who has monitored the Scooptram ST14 since Locht left it in the automation zone. Then he's off to

the locker room just down the hall to get out of his underground gear. He returns minutes later showered and in his street clothes, takes his seat in the padded office chair and rolls up closer to study live footage from the Scooptram. It's pulling up to the ore pass with a full bucket. Mucking is not yet an automated feature, so Locht takes the joysticks in hand.

For the next shift teleremote operators will monitor its routine, taking control only during loading and dumping operations.

Barrick's next step is finishing the wireless infrastructure throughout the

Hemlo mine, expanding the automation zones, and getting more load-haul dumps. A single operator will run more than one machine from a control station, and the mine will have more than one station. Operators at any station will be able to control any of the automated Scooptrams, anywhere in the mine.

Patrick Marshall says, "Today, we're connected. Tomorrow we'll have optimized fleet management. In the near future, we'll achieve our ultimate goal – fully autonomous mining underground executed by our operators from the surface." ●



Epiroc personnel proudly present the new Scooptram:
(from left)
Steve Germain,
Mathieu Bergeron,
Patrick Marshall
(Hemlo)
Carman Patry,
Wayne Martin.



Cut to the chase

Epiroc carries full line of steel cutter attachments

The range of steel cutters Epiroc offers gives contractors a quick and efficient way to cut down nearly any size steel with precision. The steel cutter (SC) attachments offer some of the fastest cycle times in the industry.

Crystal Sanders, Sales Manager for Hydraulic Attachment Tools in Western Canada said, “The growing demolition and recycling market will really benefit from these steel cutters. Some jobsites that have large steel structures are suited to be

tackled by a shear like this.”

The steel cutters range from 2,313 to 8,251 kg and can be used by being mounted to the boom or stick, on carriers ranging from 12 to 110 tonnes.

Sanders added, “The jaw features an enclosed tip that forces material deep into the jaw for the strongest, most effective cutting power.”

The attachments feature a service window that allows technicians to access any service port. Each blade features four cutting edges so users can rotate the blade as needed once

a side dulls, minimizing blade replacement costs. The Auto Guide feature allows operators to easily adjust the jaws for proper blade gap to ensure precision operation.

Epiroc designed the steel cutter attachments with well-balanced hydraulics for dual opening and closing of the cutter’s jaws. This allows oil to enter and exit the cylinder quickly to deliver some of the industry’s quickest cycle times – as fast as five seconds. The hydraulic system design also results in less load and fuel consumption, minimizing downtime and costs. ●

Replaceable blades

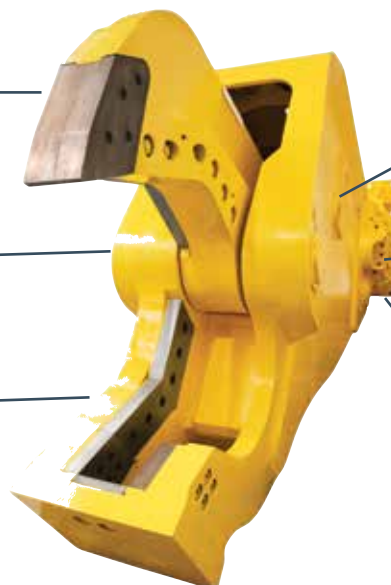
Comes with replaceable cutting blades. The piercing tip is completely enclosed.

Auto Guide

Easy jaw adjustment to ensure proper blade gap.

Fast cycle time

A speed valve, integrated into the hydraulic cylinder, supports fast closing cycles and automatically changes from speed to power mode.



Service window

Allows easy access to all service points.

Well balanced hydraulics

Less restrictions, less load, less fuel consumption.

Optional Bidirectional 360-degree rotation

Fast and precise positioning. Large slewing ring for work in horizontal position.

Capitol investment

MSE creates solid foundation for Parliament Buildings with Hütte rig



Those who haven't been to the Parliament Buildings in Ottawa have no problem recognizing the complex's Centre Block. The Library of Parliament is in the window portion of the Canadian \$10 bill, and its Peace Tower is in the window portion of both the \$20 bill and the \$50 bill.

The Centre Block has been undergoing construction as part of a \$1 billion renovation and rehabilitation project of the entire complex, top to bottom. However, the ground

beneath Centre Block had to be addressed first.

Marco Lessard, President & CEO of MSE Drilling & Grouting Inc., the geotechnical specialist contracted for the stabilization project, described the problem. The complex is built above the hard limestone of Parliament Hill. When it was built in the mid-1800s, black powder blasting was the most effective site-leveling technique available for rock. The relatively uncontrolled explosions shattered the underlying rock unpredictably.

This means that the buildings were, in

effect, constructed over leveled rubble. "The formation beneath the buildings is quite hard limestone, but there are massive areas of breakage," Lessard said. "The retrofit's design will shift loads. The voids and crevices beneath the buildings can't be trusted for the new construction."

The current ground conditions also jeopardized a primary project goal, that of upgrading the building's structural integrity to modern earthquake engineering standards. Therefore, the main work for MSE on this job was rock stabilization through injection

“In spite of its size, it’s a tough little drill. It can handle pretty much anything we need it for.”

Marco Lessard
MSE President and CEO

- ▶ MSE Drilling & Grouting Inc. specialized geotechnical company founded more than 35 years ago
- ▶ Drilling with Hütte HBR 202 E for stabilization
- ▶ Marco Lessard, President & CEO
- ▶ MSE specialists are based in three locations in Québec and Ontario.



When headroom isn't a factor, severe angles can be. Some of the TAM bores were drilled under walls at 6 degrees from horizontal.

grouting performed with monitoring and control systems in place.

The drill MSE used was the compact, electric-powered Hütte HBR 202 E, which the company itself helped to create.

“The Hütte 202 E was originally designed for us to our specifications,” Lessard said. “We are always willing to be the guinea pig for new products.” Hütte approached MSE, asking what the contractor would like a drill to be able to do. “We told them what we’d like to see in a drill, and then they went back and built it for us.”

As MSE put the prototype rig to use in the harshest field conditions it might ever encounter, MSE and Hütte continued to work together, making modifications in the design of a second rig. Hütte traded the prototype for the HBR 202 E that MSE owns today. The model is now available as a standard Hütte offering.

Lessard said the main advantages of the HBR 202 E to MSE are its compact size and weight. For this job he could think of no other machine that could have been used to drill grout holes through the subfloors and under the walls of the Parliament Building in the confines of its bottom level.

“In spite of its size, it’s a tough little drill,” Lessard said. “It can handle pretty much anything we need it for. On this job we even used it to ream out a caisson in a place with only 12 feet of headroom.” In some of the areas headroom was limited to just 8 or 9 feet, he said. “And we could crawl it through standard 6 foot 6 inch doorways, only 36 inches wide.”

An electric version of the HBR 202, the rig

was powered by the building’s own power supply when possible. When it was not, a power cord was run to a portable generator outside the building. “Operation was very quiet,” Lessard said. “Plus it eliminated ventilation concerns that would have been necessary for a diesel engine.”

The stabilization system MSE employed is called “tubes à manchettes,” or TAM. The term manchette shares its roots with the special, protective manchette glove cover worn by fencers. The TAM system consists of a manchette tube of PVC or metal with interior rubber sleeves. The sleeves cover holes drilled in the pipe at intervals. The tubes are inserted into the “grout zone” through a hole bored into the formation. A packer in the annulus between tubes creates a bottom seal so that as grout is pumped into the annulus between the tubes it is forced through the tube’s holes past a flexible rubber sleeve into the grout zone.

The TAM system MSE used to stabilize the fractured rock beneath the Parliament Building consisted of a 2 ¼ inch (57 mm) PVC sleeve inside a temporary 4 ½ inch (114 mm) steel casing. The majority of the manchette tubes for this job were about 15.24 meters in length, with some as long as 21 meters. Many of the holes were bored at extreme angles under walls, some just 6 degrees off horizontal, Lessard said.

Due to the existing construction, even ground penetrating radar was unreliable to determine where more grouting was required. The most trustworthy verification of the underlying formation’s integrity was the drilling and grouting application itself.



The Hütte HBR 202 E can tram through doorways less than a meter wide and squeeze into tightly confined areas as in this corner. Confined spaces present no extraordinary ventilation concerns, as the rig neither consumes oxygen nor emits exhaust.

“We grouted to refusal, flushed the tube and grouted again. When we couldn’t get water into the foundation, we moved on.”

The water testing was performed at 8 to 9 psi in a carefully monitored and controlled process.

About 100 grout holes were drilled in all and the job was completed within the set timeline. “In fact, we finished ahead of schedule,” Lessard said. Rehabilitation of the Centre Block structures is expected to take 10 years to complete. ●

Drilling down costs

Tracking data proves that pipe repair cuts cost to less than half of new



①

THE CHALLENGE

When copper prices dropped to record lows in 2015, mines investigated ways to lower operating costs. Some also invited trusted suppliers to submit ideas.

Epiroc representatives visiting one such mine had noticed a pile of discarded pipes lying in the yard on their frequent visits to the mine. Many of the pipes they knew to have life left in them. They recommended the mine let them repair the pipe.

Many mines have already experienced success with rebuilding pipe elsewhere, but others are reluctant to take

up what they mistakenly consider to be a costly, time-intensive change.

Dealing with rebuilding pipe requires a mine's manpower to inspect discarded pipe, load it onto trucks and ship. Mines need the process to give them pipe at less than 60 percent the cost of new to make it feasible – and then only if they can trust the repaired pipe to stand up as good as new.

For many mines, without hard data to back the money-saving claims, the risk can appear too great.

②

THE SOLUTION

In this mine's "junk pile," however, 32 pipes were immediately identified as suitable rebuild candidates.

Ideally, all pipe would be run until it either wore out or was classified as BER – damaged "beyond economic recovery." But all mines pull pipe for other reasons, such as cracks or leaks, or when pipe is bent due to operator error.

This mine's 8 5/8-inch-diameter (219 mm) pipe was suitable for the rebuild program because it met the minimum qualifying diameter of 8 1/8 inches (206 mm) along its full length. Even when a portion of the pipe is below minimum diameter, it can still be a candidate for repair. That section



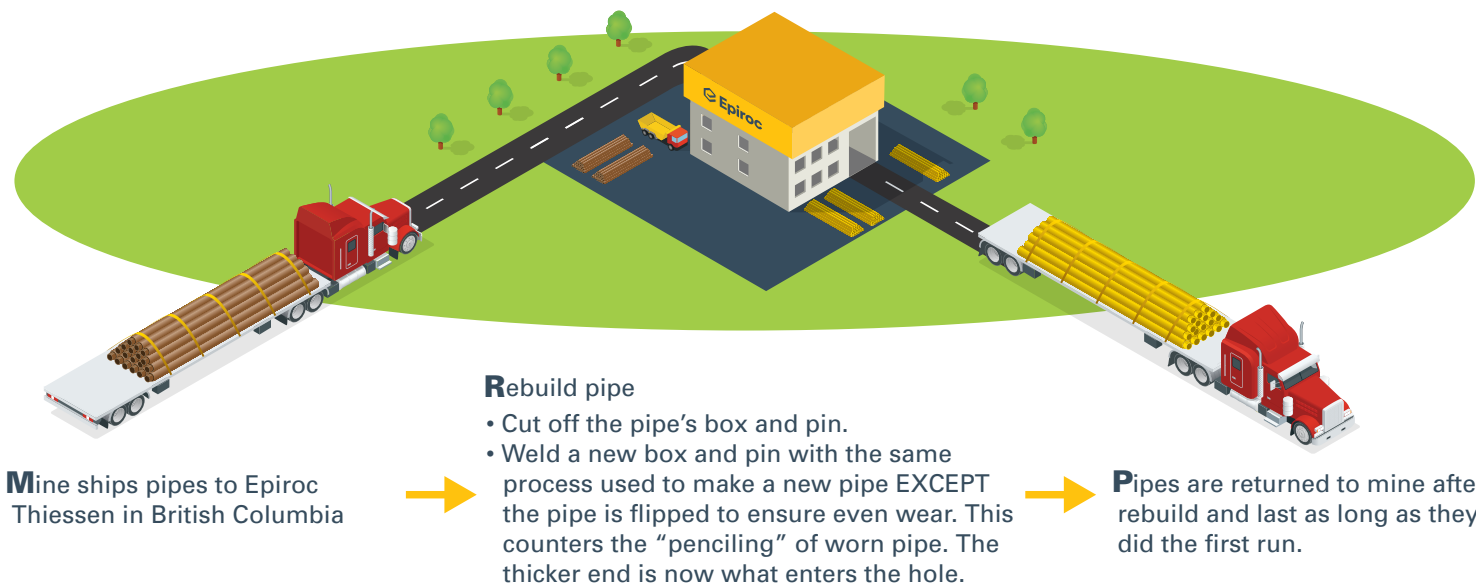
can be cut out and replaced with new material.

Pipe candidates were especially bountiful at this mine due to its large fleet of rigs and pipe-changing routine.

Each Pit Viper PV-271 rig is equipped with two 30-foot-long (9.1 m), 8 5/8-inch-diameter Atlas Copco drill

steels for drilling 15.2 m benches to a 2.1 m subgrade.

To prevent rig downtime between two-week preventive maintenance intervals, the maintenance crew swaps out pipe they suspect will not make it to the next scheduled maintenance. These pipes are taken to the scrap pile. Many are well within the requirements for repair.



3

THE RESULT

The Epiroc Thiessen facility near Vancouver repairs pipe and then re-engraves the pipe's original serial number on it, adding "R1," for first rebuild. Mines can track the pipe through its entire life cycle, comparing its footage as a rebuilt pipe to footage put on pipe before repair.

Since Thiessen tracks the pipe by its original serial number, its full life cycle can be documented, a practice of this mine. The records gave hard data for comparison.

The mine found that in almost every case it had actually put more drill feet on the pipe after a rebuild.

This is in large part due to a combination of variables such as the mine's maintenance practice, drilling conditions and production schedules.

That the mine put more footage on the rebuilds proves how well the rebuilds perform in comparison to a new pipe. Brad Wheeler, Product Specialist at Thiessen, said, "The workmanship from our facility is flawless. We've experienced zero failures from the rebuilds, and product life cycles average 90 percent new drill pipe.

This mine is getting an average of 24,689 m per month on rebuilt pipe. One rebuilt upper pipe drilled 91,440 m and was still running. Some of the steels have now been sent for rebuilding a second time. The number of times a steel can be rebuilt before reaching BER depends on its remaining body diameter.

The savings to this mine is substantial. Repaired steels cost less than half the price of new.

The pipe repair program has proven so successful that one



Brad Wheeler, product specialist for rotary tooling at Thiessen, inspects finished drill pipe.

mine is preparing to do the same in the future for Pit Viper drill rigs running 9 1/4-inch steels.

"Larger diameter pipe often produces even greater savings," Wheeler said. Material costs are higher, but the repair processes and labor are similar for the more expensive, larger-diameter pipe to those used for smaller diameter rebuilds.

It's simply more economical to run a new pipe to its full life expectancy. In practice, every mine pulls pipes for cracks, leaks or bends. Setting them aside until they have a truckload to ship to Thiessen can be a major cost savings for almost any operation. ■

In Memory – Andrew Lyon

Epiroc Canada former GM Lyon leaves lasting impact on Canadian team



Former General Manager Andrew Lyon of Epiroc – Part of the Atlas Copco Group, lost his fight with cancer Dec. 5. Lyon had retired in 2017 to return to his native Australia.

“Andrew will be very dearly missed,” said Michael Playfair, Epiroc Communications Specialist. “His Canadian team will always remember him for his positive outlook on life, his compassion for others and his big welcoming smile. Our organization, and the people within it, have changed for the better as a direct result of his influence.”

Andrew joined Atlas Copco in Australia in 1995 as Rock Drilling Tools Branch Manager in Townsville, Queensland. In 1999 became General Manager of Secoroc based in Newcastle before becoming GM of Sales for the Atlas Copco Australia Mining and Construction in 2002, and Regional GM for Southeast Asia in 2005.

Lyon's wife, Sue, said to Canada employees, “Andrew and I loved Canada and all of you as much as our homeland. ... You were our family when our family were so far away.”



In Memory – Gary Wright

Epiroc – Part of the Atlas Copco Group is mourning longtime friend and colleague Gary Wright, who lost his courageous battle with cancer on April 14.

Gary's more than 30 years with the company began in 1984 with the Thiessen team, starting in the warehouse and working his way up to a specialist in hydraulic rock breakers. Upon Atlas Copco's acquisition of Thiessen in 2005, Gary took on the

role of Account Manager covering a large portion of British Columbia as he worked to establish business in this market. Gary was instrumental in developing existing and new accounts for Atlas Copco, including major success in landing major producers as customers for rotary blasthole drill rigs and tooling.

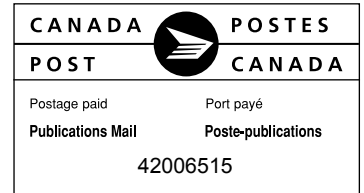
His passion for the Atlas Copco business and customers was paramount as he always

put his customers first and infamously became known for his saying of "make some noise" to ensure the needs of our customers were looked after.

In addition to being an integral part of the sales team, he also mentored others around him. Epiroc sends thoughts of comfort to Gary's wife Carmen and children Ryan and Chelsea. Gary will be missed by everyone who was lucky to work with him.



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