Mining & Construction

A magazine from Epiroc

miningandconstruction.com

INSIDE

The Collaboration Issue 01–2021

[Our Customers]

KGHM miner Kim Rivera hails automated Epiroc drill rigs at Robinson mine.

"It's much safer"

08–13

Collaboration is key to success

DEAR CUSTOMERS, one thing has become abundantly clear during the global pandemic: collaboration is key to success.

Covid-19 and the related restrictions created many difficulties for the industry. Meeting physically on site to solve issues and implement new solutions often remain a challenge. Still, I am pleased to see that, through good collaboration and frequent interaction – often virtually – we have managed to keep operations running and also to deploy new solutions. For example, we have implemented automation solutions at many locations thanks to good collaboration between you and our local teams. Solutions that strengthen your safety and productivity.

We cannot do everything ourselves, especially in an era of more automation, digitalization and electrification. So in addition to the internal resources we have, we are working closely with you and several other competent partners, always with the aim of supporting you on your journey toward safer, more productive and sustainable operations.

Examples of our collaboration partners include Combitech on digitalization and information management, ASI Mining on automation, Mobilaris on situational awareness, and Northvolt and ABB on electrification. Universities are also important partners in developing future technology.

Epiroc's core values are innovation, commitment and collaboration. They have formed our past, created our present, and will guide our future. Enjoy reading this issue, which has one of our core values, collaboration, as the main theme. I am looking forward to continue working together.

On my radar

Mixed-fleet automation
We have ongoing projects in Australia to automate mining operations where the machine fleets are a mix of different manufacturers. I am convinced we will see more of this in the future.

Covid-19 and the global economy
Let us hope for everyone's sake that the pandemic gets under control and that the economy recovers well. Stay safe.

Stay safe!

Helena Hedblom
Epiroc President and CEO

Epiroc is a 145+ year old start-up; a dynamic new company built on long and proven expertise and experience from the mining and construction industry.

Epiroc

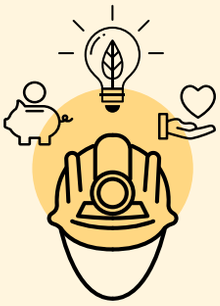
About Epiroc

Epiroc is a global productivity partner for mining and infrastructure customers. We develop and provide innovative and safe equipment, such as drill rigs, rock excavation and construction equipment and tools for surface and underground applications. We offer world-class aftermarket support and solutions for automation, digitalization and electrification. Epiroc is based in Sweden.

Epiroc Group – get to know us better

Our innovations

Our solutions aim to solve our customers' key issues – including requirements to reduce operating costs, increase productivity, increase utilization of equipment, reduce environmental impact, and enhance health and safety conditions.

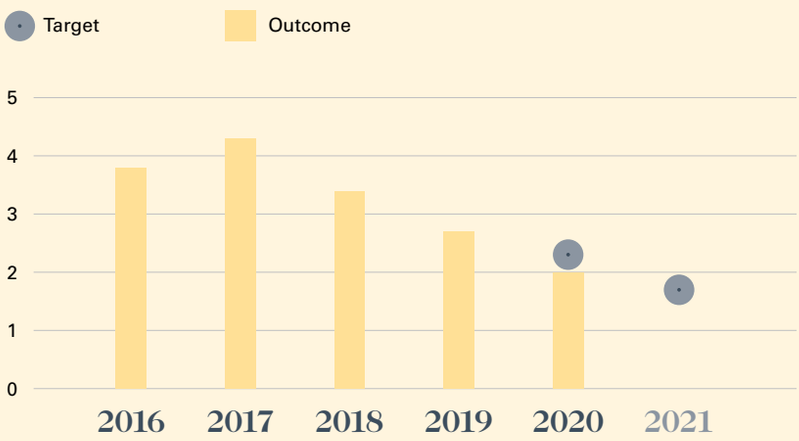


Industries we serve

- **Mining and quarrying**
  Underground mining, surface mining, exploration, quarrying, well drilling, oil and gas.
- **Infrastructure**
  Underground civil engineering, surface civil engineering and urban development, deconstruction and recycling.

Lost-time injury frequency rate (LTIFR) at Epiroc

Number corresponds to lost time injuries per million working hours.



In 2018, the safety reporting changed from accidents and incidents to Lost Time injuries and Medical Treatment injuries for better alignment with the rest of the mining industry.

The Group in numbers

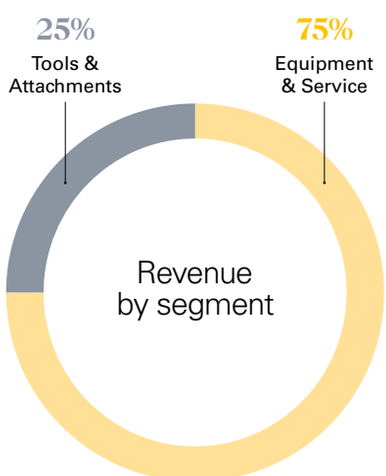
14 000

- About 14 000 employees
- Customers in more than 150 countries
- 145+ years of experience
- Revenue in 2020: SEK 36 billion

Divisions and reporting segments
Equipment & Service / Tools & Attachments

Tools & Attachments
Dedicated to rock drilling tools and hydraulic attachment tools, used for rock excavation, mining, construction, demolition and recycling. Also provides related services.

Technology & Digital
Dedicated to technology solutions, and drives the automation and interoperability expansions for Epiroc's divisions.



Surface
Dedicated to rock drilling equipment for use in surface mining, exploration, construction and quarries, as well as water well and oil and gas applications.

Underground
Dedicated to a wide range of underground mining and tunneling equipment.

Parts & Services
Dedicated to parts and services aimed at maximizing customers' productivity.

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SHUTTERSTOCK

[FEATURE]

Collaboration

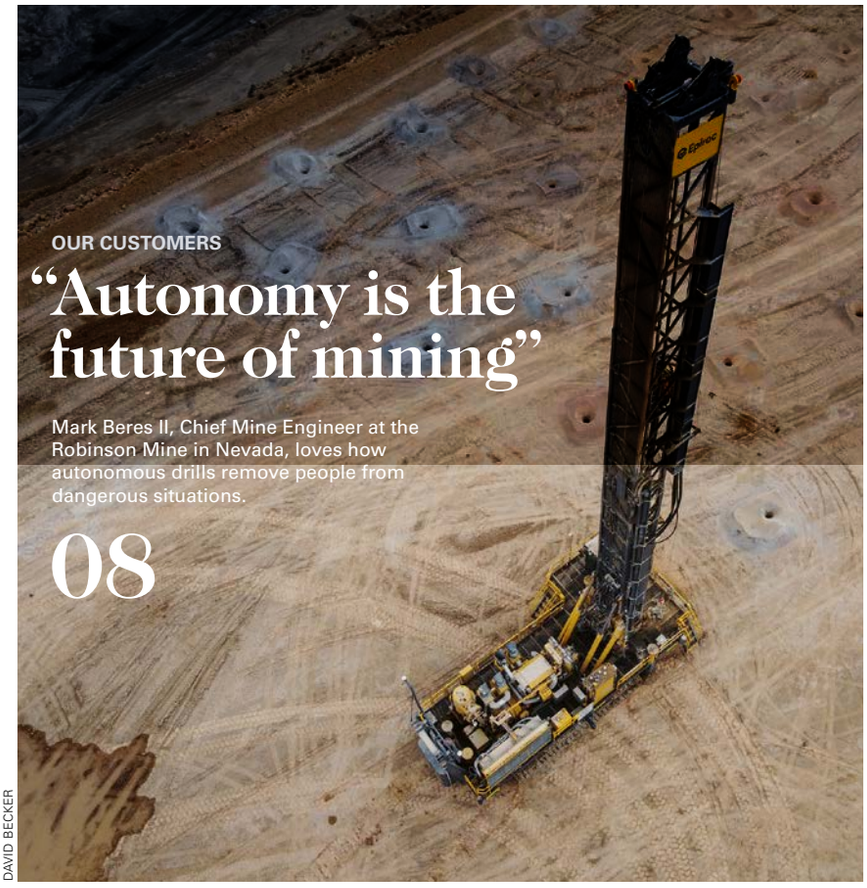
Without collaboration, humankind would still be a herd of scavengers on the savannah. Cooperation allows us to aim for the stars.

DAVID BECKER

ON THE COVER
Autonomous operation is revolutionizing the way miners at KGHM's Robinson Mine in Nevada work. Kim Rivera and her colleagues guide the work from a nearby command center, using cameras and monitors.

The world's largest mining event, MINExpo International, is returning. The rescheduled show will take place September 13–15 at the Las Vegas Convention Center. MINExpo International is sponsored by the *National Mining Association* and covers the entire industry.

www.minexpo.com



DAVID BECKER

OUR CUSTOMERS

"Autonomy is the future of mining"

Mark Beres II, Chief Mine Engineer at the Robinson Mine in Nevada, loves how autonomous drills remove people from dangerous situations.

08

JONAS GAUFFIN

CHRIS CRANFORD

SIMON PYNT

Selected highlights

Mining & Construction is published by Epiroc. The magazine focuses on the company's know-how, products and methods used for mining and construction worldwide.

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Safety always

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

EPIROC IN BRIEF

Mine truck and loader given new lease on life

The mining industry is continually adapting for the future and finding new ways to achieve heightened levels of sustainability, reliability and safety in project planning. Thus, exploring opportunities to breathe new life into one's fleet is a key advantage.

With this in mind, Lake Shore Gold, a subsidiary of Pan American Silver, tasked Epiroc Canada to remanufacture two of their machines – a Minetruck MT5020 and a Scooptram ST1030 – to "as new" condition at Epiroc's facility in Lively, Ontario.

The machines were rebuilt with the latest Original Equipment Manufacturer (OEM) upgrades, cutting costs and retraining time when the machine was returned. As part of the process, the technicians sandblasted the frames – then the front bogies, booms, hoods, doors and steer stops were all repaired. The unit's major damage areas were fixed, and the proper alignments were set to specific tolerances. It was then capped off with a fresh paint job and detailing treatment.

The hydraulic system was completely renewed, and the electrical package updated. We then remanufactured the axles, rear oscillator, transverter and upbox. A new engine with new mounting hardware was also installed.

EPIROC

A Scooptram ST1030 from Lake Shore Gold's Timmins West site was remanufactured to "as new" condition at Epiroc's facility in Lively, Ontario.

Upon reassembly, the entire unit was rigorously tested, including start-up and leak testing, as part of the full predelivery inspection. With the process completed, the machines were equipped with a new warranty agreement.

"In the case of Lake Shore Gold, it was especially important for the remanufactured machines to be tailored to their specific needs on site while also working on a time schedule that allowed them to be reintegrated into the operation without disrupting productivity," said Janis Bite, Business Development Manager, Epiroc Canada.

When the machines were delivered back to the site, they could begin work immediately as Epiroc performed the on-site start-up and commissioning.

Courtney Nunn, Mine Manager at Lake Shore Gold elaborates:

"Epiroc's remanufacturing solutions have allowed our Timmins West site to increase equipment availability by rebuilding two of our prime movers that were at the end of their useful life to 'as new' condition, all while saving on capital spending."

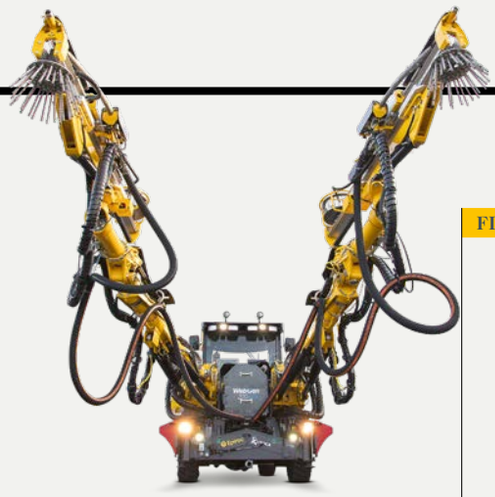
Epiroc has acquired software specialist MineRP

IN MAY 2021, Epiroc completed the acquisition of software company MineRP. Their open integration platform increases productivity for mines through integrated planning, execution and analytics. MineRP has offices in South Africa, Canada, Australia and Chile.

The company supports large and medium-sized mines globally in strengthening and optimizing their operational efficiency. "This acquisition fits well into Epiroc's focus on supporting mining companies on their digitalization journey," says Helena Hedblom, Epiroc's President and CEO.

Our reference books – your go-to guide for success

EPIROC HAS RECENTLY released two valuable reference books: the entirely new book *Exploration Drilling* and an updated version of *Drilling in Surface Mining, Quarrying and Construction*. The books are go-to guides on exploration and surface drill rigs, their applications, geology, automation, rock drilling principles and much more. Both books are available in printed and digital versions. The printed versions can be ordered through Epiroc Customer Centers.



Epiroc and Orica unveil prototype system

A GAME CHANGER in safe and productive development charging. That's true of Avatel, a new machine equipped with the most advanced underground development charging system ever designed, integrated with the proven Boomer M2 carrier. The solution improves safety and combines drilling, charging and blasting in one seamless process. A prototype, the result of a partnership between Epiroc and Orica, was unveiled in late 2020.

FIGURE

34
PERCENT

SmartROC D65 cuts CO_2 emissions

NEWMONT'S PEÑASQUITO MINE in Mexico is taking further steps to embrace sustainability, now using Epiroc's SmartROC D65 surface drill rig. It is packed with smart features, such as automated drilling and rod handling, and is equipped with an intelligent fuel-saving system. In fact, the rig emits 34% lower CO_2 emissions per drilled meter than the comparable FlexiROC D65 rig.

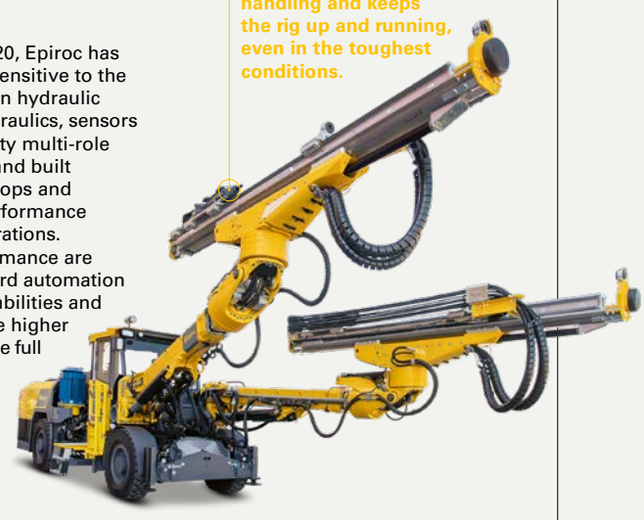
PROJECT NEWS

Boomer M20 more resilient to wear and tear

WITH THE NEW Boomer M20, Epiroc has created a rig that is less sensitive to the everyday wear and tear on hydraulic hoses. With protected hydraulics, sensors and cables, this heavy-duty multi-role face drill rig is designed and built to minimize unplanned stops and maximize uptime and performance in highly demanding operations. High precision and performance are ensured thanks to on-board automation features, tele-remote capabilities and digital drill plans that give higher reliability and quality of the full drill cycle. The Boomer M20 was developed in close collaboration with key customers, and the rig is also available with a battery driveline option.

HOSE-FREE BOOM

The heavy-duty hose-free boom design minimizes unplanned stops for hose repairs, enables digital drill plan handling and keeps the rig up and running, even in the toughest conditions.



More www.epiroc.com/boomerm20

To provide the best possible products and services, it's vital to coordinate efforts.

How do you go about enabling collaboration?

Nikki Wei
Applied Mechanics Engineer, China

"Since good communication leads to efficient collaboration, I would say that working closely across functions, cooperating with an open mind and communicating patiently are critical. Being positive will lead to a final result beyond your expectations."

Per Anders Eriksen
Sales Engineer, Norway

"Knowing the customer is an important key to success. When we know their challenges, it is easier for us to add value. I spend a lot of time on informal visits, but above all, I make sure I am accessible and treat our partners and customers with respect."

Mike Cassidy
Global Process Manager, Canada

"Collaboration is key to my team's success. It's important to communicate and set clear goals, both as a team and individually; to create an environment where team members feel empowered, share responsibility in the results and encourage innovative thinking."

[On Location]
USA

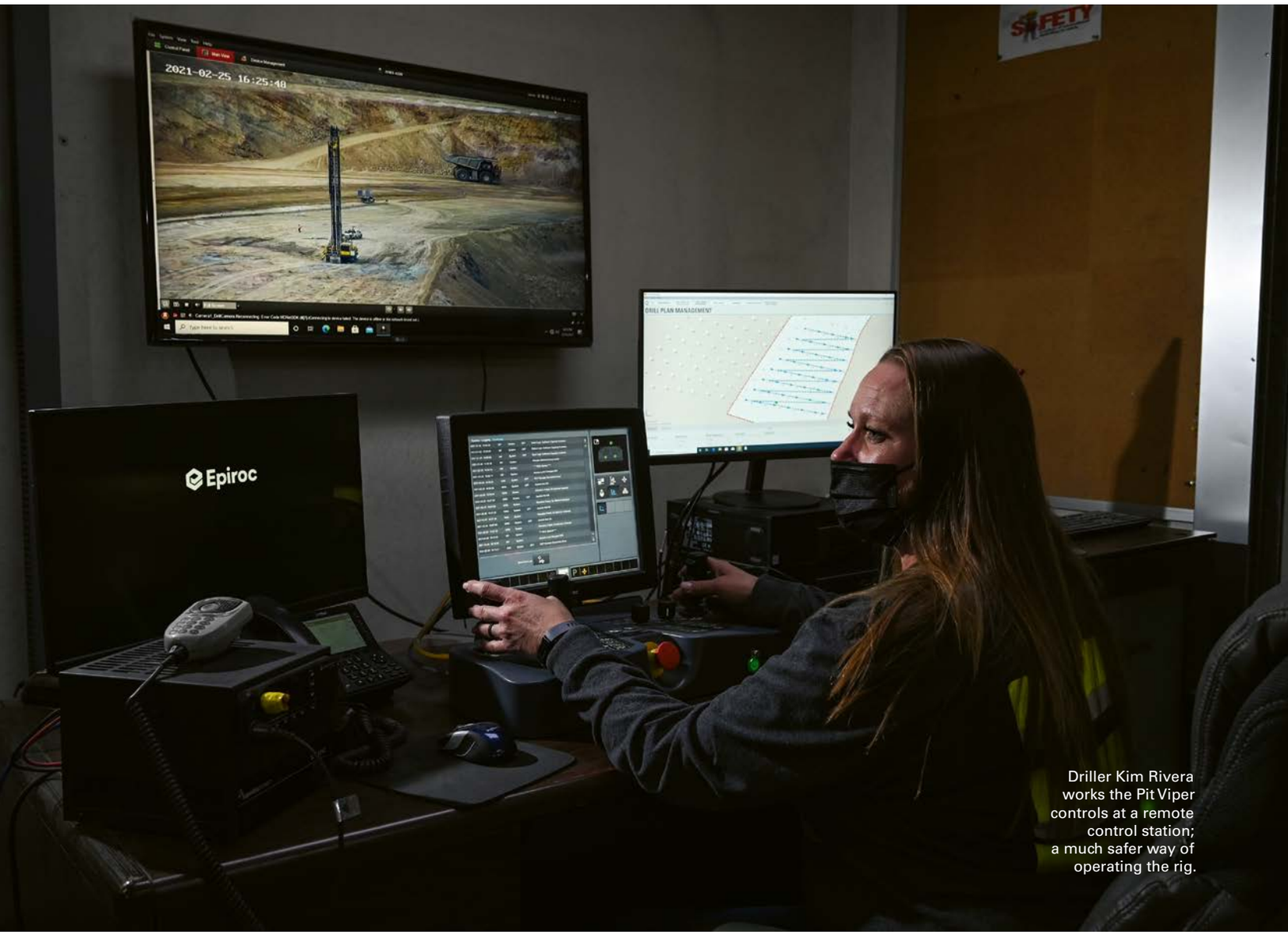
AUTONOMOUS OPERATIONS IS THE FUTURE FOR ROBINSON COPPER MINE

Grand

John Glionna David Becker

plans

In the past, prospectors mined Nevada with mules and pickaxes. Now the KGHM Robinson Mine – in partnership with Epiroc – is taking open-pit copper mining into the future with autonomous drilling. The Pit Viper 271 blasthole drill rig can be managed remotely, making the driller's job safer and more productive.



Driller Kim Rivera works the Pit Viper controls at a remote control station; a much safer way of operating the rig.

KIM RIVERA, a third-generation miner, recalls the not-so-old days as a drill rig operator at the Robinson copper mine in rural White Pine County, Nevada.

A year ago, she was making daily trips into the large pit surrounded by lumbering shovels and mammoth haul trucks everywhere, grinding about, moving earth from here to there. Winter storms blowing down from the towering Eagan Range bring white out conditions and sub-zero temperatures, making the mine feel like the North Pole.

But at Robinson, that was then and this is open-pit mining now.

Last year, mine operator KGHM invested in an Epiroc Pit Viper 271 XC autonomous blast-hole drill rig. As the mine continues to refine autonomous operations, the towering yellow rig will work nearly around the clock, helping KGHM to further increase production while lowering operating costs.

Kim Rivera
Drill Rig Operator, KGHM

It is also revolutionizing the way Rivera does her job. Instead of sitting inside a drill cab, she guides the work from a nearby command center, using cameras and monitors to oversee the drill with the dexterity she would a high-flying drone, though one that weighs in at 100 tons. Learning to operate the drill remotely is as straightforward as forsaking mirrors for your car's rear-view camera.

"You have to trust the drill," said Rivera. "You're not out in the elements – a giant plus. You're in the warmth of a control room. It's much safer."

Autonomous drilling will lead to fewer workers inside the pits, with a single operator remotely controlling several drills at once, and remotely-operated fleets that will communicate with one another via sophisticated software.

"Autonomy is the future of mining," said **Mark Beres II**, Robinson's Chief Mine Engineer. "You have more mines in remote places and autonomous drills can be operated from thousands of miles away. They remove people from dangerous situations."

Mark Beres II
Chief Mine Engineer,
KGHM

Mark Hurlbert
Drill trainer,
KGHM

Nathan Trujillo
Mine Operations
Superintendent,
KGHM

ACCORDING TO Epiroc's analysis of 18 months of Robinson production data, the mine's existing fleet was achieving an average baseline of 175 feet (53 meters) per hour. With an initial goal of 204 feet (62 meters) per hour, the Pit Viper 271 (PV-271), which replaced an aging Pit Viper 351 model and an electric drill, is now doing 235 autonomous feet (71.6 meters) per hour – increasing capacity by more than 34 percent. Without a human operator in the cab, the autonomous drill can work through blasts and mine delays that sideline other manned equipment.

Still, mine operators initially flinched at using space-age technology at a site where, 150 years ago, prospectors worked with donkeys and pickaxes.

Mark Hurlbert, a seasoned drill trainer, articulated the doubts felt by many: "It's hard to swallow. Why have all this experience if the drill does all the work?"

But like others, Hurlbert has been won over by the PV-271 rig's tenacity. "Drillers are no longer out in the pit among the haul trucks and explosions," he said. "The younger people have taken to it quicker. The kids are gamers."

Mine operations Superintendent **Nathan Trujillo** is equally impressed. "Once we brought the Pit Viper 271 online, it really boosted our productivity," he said. "It does the work of two drills and allows us to stay ahead of our shovels. If the real estate is there, this drill is going to do the work."

Driller **Anthony Willis** stood at the edge of the pit, admiring its 1 400-foot depth, a feat he knows he has been a part of. Along with the PV-271 drill behind him.

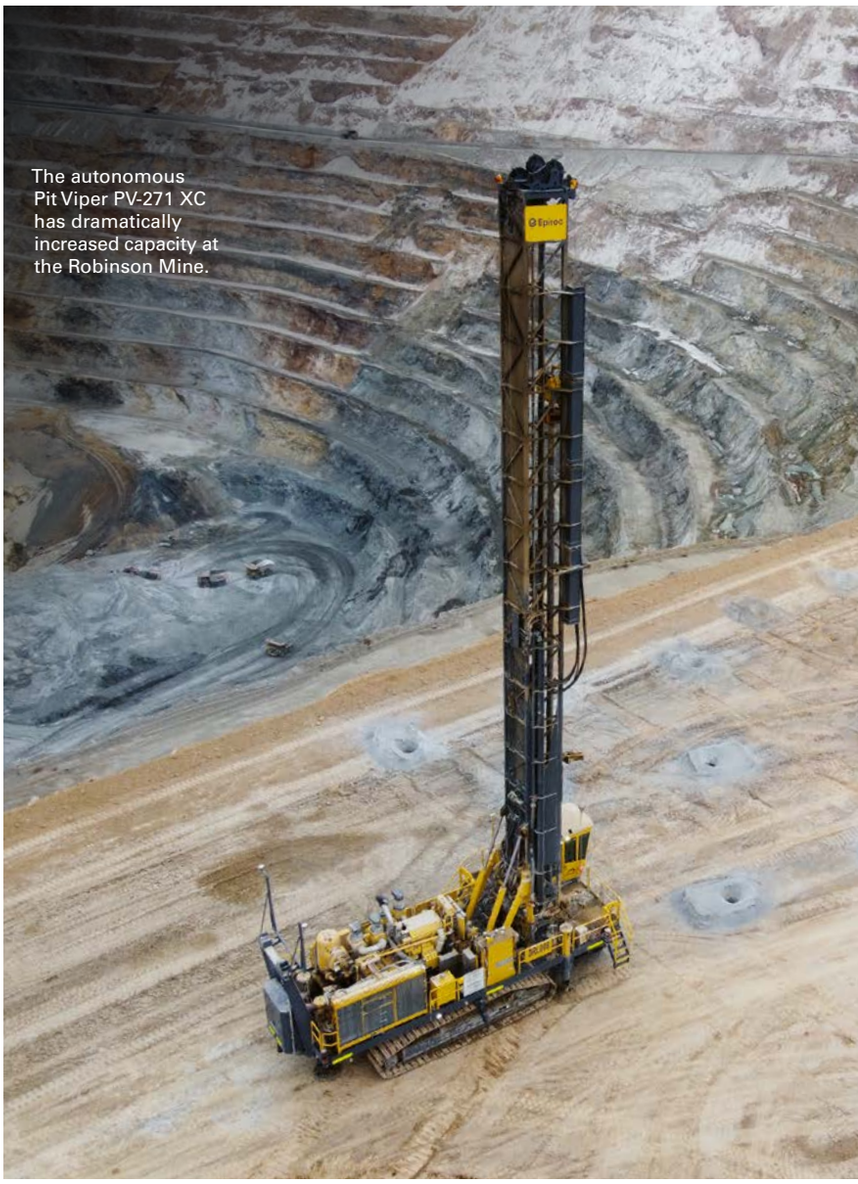
"I was excited to work with this drill and raised my hand to jump into training," he said, looking out at the pit's far edge, nearly a mile away. "It's something new that keeps your job fresh."

And it's performance? "This thing is good," he said. "It stomps those other drills."

The Pit Viper 271 allows **Kim Rivera** to drill 3 000 feet (roughly 900 meters) in a 12-hour shift, nearly tripling her previous output. Once she goes autonomous, the drill does the work by itself, with Rivera as its guide. "It navigates faster on the drill pattern than I could ever do when I'm fishtailing around in the dirt and mud."

Rivera, now one of three female drillers at the mine, is proud of her rig: "It's my girl."

ROBINSON WORKERS say Epiroc made the transition to autonomous mining easier. "They were with us every step of the way," said Rivera. "They came out to show us how to run the drill manually. Six months later, after we were familiar with the drill, they showed us how to do things autonomously."



The autonomous Pit Viper PV-271 XC has dramatically increased capacity at the Robinson Mine.

KGHM

- Founded in 1961, KGHM is a Polish multinational corporation that employs about 34 000 people worldwide.
- The company was established as a state enterprise in 1991.
- KGHM operates 9 open-pit and underground mines located in Poland, Canada, the U.S. and Chile.

Drillers Tanner Peterson, Anthony Willis and Kim Rivera pictured at the Robinson Mine.

"Epiroc came out to show us how to run the drill manually. Six months later, after we were familiar with the drill, they showed us how to do things autonomously"

Kim Rivera
Drill Rig Operator, KGHM

Trujillo agreed. "Epiroc has been a great partner for us from the initial concept to delivery and beyond. I can't stress that enough. It's one-stop service."

Poland-based KGHM, which bought the mine in 2012, reports 2019 output of 100 million pounds of copper – used in everything from wiring to electric cars – and smaller amounts of gold, silver and molybdenum, all milled onsite.

THE ROBINSON mine features a highly-diverse geology that includes areas of hard, highly fractured rock and soft rock and seams of clay that can result in geotechnical challenges. Drillers also encounter the remnants of previous mining sites, historical works that include old timber supports.

That's not the only challenge: Along with attracting a workforce to a rural area far from any big city, mine operators must keep tabs on a fluctuating market. "If the copper price is low, we're not doing nothing," said Hurlbert. "Limits on acquiring permits for new mines could curtail the industry. The concern is that customers will decide it's cheaper to just buy from another country."

Anthony Willis
Drill Rig Operator, KGHM

On a cold February day, several miners watched the detonation of scores of 55-foot-deep holes. The tense countdown felt like a rocket launch, and far below on the pit floor, the muffled blast caused the geology to give way like the tumbling of a glacier wall.

With the autonomous Pit Viper 271, the mine can expect the future to bring a similar bang. "The advanced technology this machine brings is pretty impressive," said Trujillo. "Can you look into the future and see people-less mines? Based on today's advancements in technology, anything's possible."

KGHM and Epiroc

KGHM'S RELATIONSHIP with Epiroc and its predecessors spans decades. The Pit Viper 271 is the second autonomous drill commissioned for work in the U.S. and the nation's first to be used at an open-pit copper mine. This autonomous drill rig features a new XC (extra capacity) package – rolled out in 2019 – that includes improved hydraulics, increased pulldown force and rotary torque that allow for a larger hole size.

Robinson Mine

- The mine and nearby area are named after prospector Thomas Robinson, who discovered gold, silver and copper here in 1868.
- The site includes three large pits – Tripp-Veteran, Liberty and Ruth, the only one currently active.
- The mine employs 700 workers.

FIVE KEYS TO SUCCESS

1 Local support

Following the sale of the Pit Viper 271 drill in 2020, Epiroc provided the Robinson Mine with a resident technician from its Elko service group who gave on-site guidance and technical support for six months, working with both drill operators and maintenance.

2 Safety culture

The Robinson Mine has embraced a safety culture that proved crucial to its partnership with Epiroc in making its transition to autonomous drills; steps that included a review of standard operating procedures (SOP) and risk assessments.

3 Enhanced teamwork

Both sides took ownership of the critical change-management process. Epiroc's team, with local support, joined key stakeholders from throughout the Robinson Mine; both working together to jointly manage the project and tackle challenges.

4 Data analytics

The Robinson Mine initially provided crucial production data so Epiroc could generate a detailed analysis with realistic baselines and projections, with a continuous joint review of the data to make operational improvements.

5 Phased implementation

After getting the base drill into production, Epiroc provided automation training. The process involved teaching drillers to work with the autonomous functions first while onboard the rig and later transitioning to a control room.

Diamec Smart	6 MCR	6M
Rod Handling system capability?	No	Yes
Cabin	No	Yes
Engine	Tier 3	Tier 3 and Tier 4F/Stage V
CE marked	No	Yes
Safety Guard	No	With latest upgrade
Carrier	Old	From latest range

Webdrill runs a fleet of ten Diamec Smart, including eight MCR rigs, and now plans to further expand their fleet with its successor Diamec Smart 6M, offering modern and purpose-built carriers for the underground and all the latest features from Diamec, including Rod Handling System.

Matt Shea Thomas Hunt

Pressure makes diamonds

Epiroc and Webdrill have collaborated to produce "the one rig that can do it all." But how do you perfect a mobile carrier rig? And what comes next? Mining & Construction found out.

SINCE 2014, Jared Webb has used Diamec Smart 6 core drills as the backbone of Webdrill, a thriving underground diamond-drilling business. Starting with just one skid rig, Webb slowly expanded his fleet and now operates another eight mobile Diamec Smart 6 MCR rigs in mines across Australia. Along the way, he worked with Epiroc to customize the rigs to better suit Webdrill's needs.

Mining & Construction caught up with Webb to talk about Webdrill's experiences with the Diamec Smart 6 MCR, his close working relationship with Epiroc, and what he expects from the MCR's successor, the brand-new Diamec Smart 6M.

Why did you go for the mobile, MCR, version of the Diamec Smart 6 back in 2014?

"When I started Webdrill, I went to Sweden and had a look at Diamec Smart rigs in action. I was immediately impressed with the automation, the integrated rod handler, and the control panel with its touchscreen. We took a Diamec Smart 6 skid rig with a rod handler to Nicolson's Gold Mine in Western Australia, and within 12 months we were planning on taking our first MCR. We requested 28 modifications for that rig, which Epiroc helped us with. With rig three, we collaborated on a few more modifications, and from there each successive rig just got better and better."

Has the rig performed according to your expectations?

"We obviously had a hand in customizing the MCRs we operate, but we wanted the smallest, most powerful underground mobile carrier rig for the Australian market. With our modifications, it delivers outstanding performance for our needs. Together with Epiroc, we made some adjustments to perfect the rig for our needs, such as adding a larger water pump for directional drilling jobs. We've got rigs out in the gold sites where we cut in 60 or 70 meter averages which is huge. It can drill fast grade control, and then it can go and sit on a deep directional hole, drill 1 000 meters deep, and put three daughter holes off it, as well. It's the one rig that can do it all."

Your relationship with Epiroc feels much more like a partnership than a straight supplier-customer arrangement. Fair comment?

"If Epiroc say they're going to do something, they do it. Not a lot of companies create that kind of trust, and that comes from working so closely together for over half a decade."

You're about to receive your first next-generation Diamec Smart 6M rig. It's billed as the best of both worlds – a Diamec core drilling rig combined with a robust carrier. What are your expectations?

"It has everything you need. It has the power. It has a 20-year service life. And it has what I think is the best rod handler on the market." ×

Jared Webb
CEO, Webdrill

[On Location]
Australia

More www.epiroc.com/diamec-smart-6

Maximising the benefits of going electric

POWERING UP

Epiroc's collaboration with Fraser McGill on an impact study of battery electric vehicles exceeded expectations, opening up a new frontier in the worldwide underground power revolution.

DON THOMPSON
Manager Global Customer Relationships at Epiroc. Based in Johannesburg, South Africa.

[On Location]
South Africa

ROB MCGILL
Director at Fraser McGill. Based in Johannesburg, South Africa.

IN 2018 EPIROC launched a new suite of battery-powered products. Following that, the company approached one of the partners in the Waterberg Platinum Group Metals project in South Africa to present the equipment. As a greenfield project, the mine will be able to tailor its planned infrastructure to new equipment technologies, thereby maximizing potential benefits. Specialist mining and minerals advisory company Fraser McGill was approached to conduct an impact study of battery electric vehicles and requested help from industry leader Epiroc.

Mining & Construction brought Epiroc's **Don Thompson** and Fraser McGill director **Rob McGill** together to discuss what they found.

How did Fraser McGill come to cooperate with Epiroc on this study?

ROB MCGILL: "I've been involved with the Waterberg project for many years. I'd been interested in battery vehicle technologies, specifically to reduce the ventilation and the cooling requirements, but hadn't had the opportunity to look at battery vehicles in detail. We weren't looking to partner with one supplier. We were conducting a broad assessment, looking at the impact of battery electric vehicles on large underground projects – not specifically Epiroc's equipment. But Epiroc was the furthest ahead in the game, and still is. With the relationship we had with Epiroc, it was a natural fit."

What practical steps did your collaboration entail?

DON THOMPSON: "Epiroc introduced our first generation battery electric fleet in Canada in 2016. We launched the next generation in 2018, with better battery and motor technology. By then we had clocked up more than 100 000 hours, so we had good data, based on actual machines running in production environments. For this study, we provided the technical comparison of diesel versus battery electric, and the benefits thereof, because we can supply the diesel equivalent of a battery electric machine. We could provide a comparison of heat generation – with ventilation, there's a significant reduction of what is required. We could also provide the emissions. That was provided to Rob and his team."

RM: "Diesel vehicles have been around a long time. There is a lot of data from operations, in terms of how they perform, costs, maintenance schedules and replacement schedules. With the electric vehicles being newer, we had to rely on Epiroc to make a lot of theoretical data available related to the design, and data they've been gathering since they rolled out their first generation and the next generation machines. We conducted the study, but relied on Epiroc to provide us with input and insights, and technical and costing information that allowed us to do an assessment. The comparison goes far beyond comparing two vehicle technologies. The battery vehicle certainly is more efficient and, over time, cheaper. But a lot of the benefits relate to the environment that they operate in – to improvements in health, safety and productivity of workers."

How did your collaboration help identify mine infrastructure and design modifications needed?

DT: "We provided the specifications on the chargers required. We provided a number of scenarios and battery selections, and different layouts of charging stations. Fraser McGill would recommend where the client should put the charging station and we could recommend the capacity of the chargers, based on the size and number of vehicles."

In Focus:
Platinum Group Metals Ltd & Fraser McGill

PLATINUM GROUP METALS LTD is a Canadian mining company focused on the development of the palladium and platinum-rich Waterberg project located in the Bushveld Complex in South Africa. The company owns an effective interest of 50.02% in the Waterberg joint venture.

FRASER MCGILL is a South African mining and minerals consultancy that offers strategic advice and decision-making models based on expert analysis of technical data, to help executives conceive, design, engineer and manage their mining projects, to extract maximum value.

More www.platinumgroupmetals.net & www.frasermcgill.com

←
The Waterberg PGM Project is located in South Africa on the northern limb of the Bushveld Complex. This overview shows the exploration camp.

RM: "A crucial opportunity in a greenfield project is that it allows you to consider how an underground mine would be designed differently if you started with a battery electric vehicle in mind."
DT: The technical data Epiroc provided would be applicable to greenfield and brownfield operations, but it's much more suited to a greenfield operation because you can adjust the mine layout. The mine would consider redesigning the tunnel layout to see where we can enhance the regeneration of batteries because it reduces the cost."
RM: "An example is the hauling model. If we predominantly hauled rock on the incline versus the decline, we would significantly increase our battery operating cost. It's something we can quantify already, but it requires that redesign."

Don Thompson
Manager Global Customer Relationships, Epiroc

Rob McGill
Director, Fraser McGill

What made your collaboration a success, and what have you learned from it?
DT: "Interest from the client was probably the main driver. They realized that, with a greenfield project, it made sense to do a trade-off study. But I don't think we could have done this alone. We don't have the resources, here or in Sweden, when it comes to the full package calculation– be it ventilation, the mining layout, or contacts with the different clients."
RM: "Any collaboration is successful if you've got the same vision. We must ensure we provide decision-making tools that are well informed, so we need to speak to people who really know what they're talking about. Then we can comfortably go to our mining customers and say: this is really the way to go. I'm very impressed with what Epiroc has done in this regard."

How was the study received?
RM: "Since completing this study and circulating some of the outcomes, we've had interest in Canada, in Australia and from several customers in South Africa who we are talking to about doing similar studies. The technologies are so attractive, and customers are asking: Where do I start? How do I roll it out? What's the state of the technology?"

Do you foresee future collaboration?
RM: "Absolutely. It's been a good experience, and we rely on working with experts. We are thrilled to have worked with a technology leader like Epiroc."
DT: "Another client has shown an interest in battery electric technology for a new mine they are developing. They want to do a comparative study, and we hope to collaborate with Fraser McGill on this, too." ×

4

KEYS TO A SUCCESSFUL PARTNERSHIP

Pooling data and expertise when stress testing new technologies isn't always plain sailing. Epiroc's Don Thompson and Fraser McGill's Rob McGill share their tips on the magic ingredients needed to make it work.

Client commitment

✓ Interest from the client should be the main driver. The client must be committed to the value of credible and meaningful comparative data when assessing the risks and benefits of applying the new technology to their environment.

Credibility

✓ Both parties must understand where the information used in a study comes from. Data must be benchmarked and tested, including by consulting external sources.

Transparency

✓ Data must be shared freely, including from previous studies, and both partners must be open about the methodology that was used to arrive at conclusions.

Shared vision

✓ Both parties must be on the same page about the value of the technology and the need to provide clients with accurate, detailed information that enables them to make informed decisions.

More www.epiroc.com/zero-emission

AROUND THE WORLD IN BRIEF

MARK CRANITCH

Two-thirds of heavy industrial accidents are rooted in cognitive fatigue, says Canaria Technologies CEO Alex Moss. To predict when an operator is at high risk, the company has developed the Canaria-V, a wearable that gathers biometric and environmental data.

Biometric screening prevents medical issues

BIOMETRIC SCREENING TECHNOLOGY might come to be of great assistance in predicting and preventing health-related issues in industrial operations, *Mining Magazine* reports. Australian company Canaria Technologies has developed the **Canaria-V**, a wearable device the size of a hearing aid. The biometric and environmental data gathered by the device is analyzed in real time by an AI system to predict when the wearer is at a high risk of, for example, cognitive fatigue or heat exhaustion.

Canaria CEO **Alex Moss** states that two-thirds of heavy industrial accidents are rooted in cognitive fatigue, often caused by microsleep during operation of heavy machinery. The predictive biometric system does two things: firstly, it collects data to gain knowledge of health and safety-related problems; secondly, it detects and sends an alarm about medical incidents several minutes before they happen. The system is being tested at the Lake Giles site.

LKAB

Spot the Wonder Dog

SPOT, A ROBOTIC MINING DOG developed by LKAB, has been undergoing on-site trials since September 2020. Spot is equipped with AI technology enabling it to recognize environments, adapt to the terrain and find its way autonomously from point A to point B, even in challenging terrain with moving obstacles. It can carry 14 kilograms of equipment, including cameras, first aid kits and drones.

Charles Dumaresq
VP of Science and Environmental Management, MAC

Stricter guidelines for tailings

MAC – the Mining Association of Canada – has updated its guidelines for tailings management. Why?

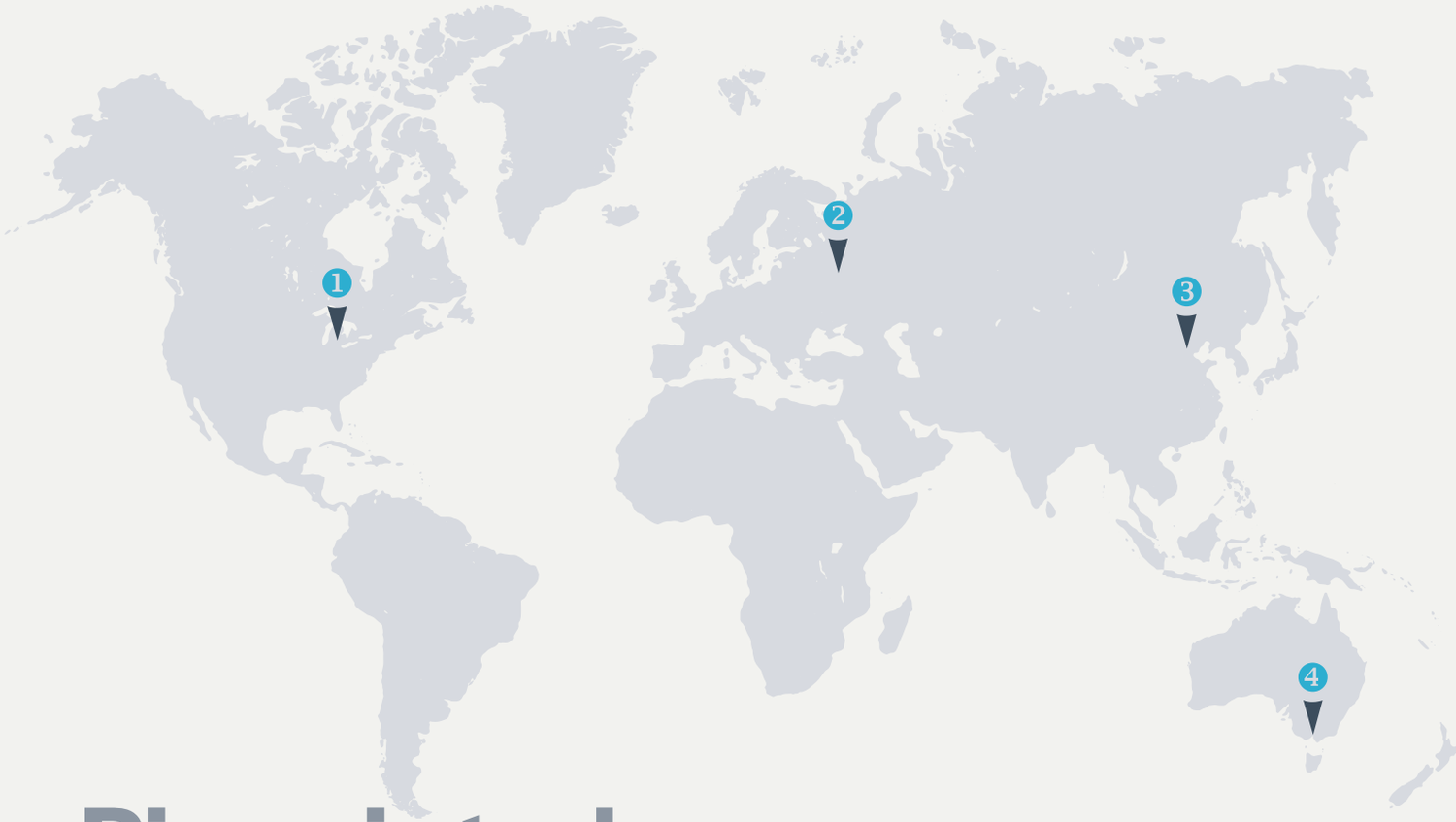
"Failure to safely and responsibly manage tailings can potentially have catastrophic outcomes for safety, health and the environment. A tailings failure in Brazil in 2019, for example, caused almost 300 fatalities. We have revised our guidance on tailings management, which is a part of our Towards Sustainable Mining (TSM) program, to better align with the new Global Industry Standard on Tailings Management. On comparing the two, we found a high degree of alignment with the Standard, with MAC providing more substance and detail in many regards, but we also identified some gaps. The revisions MAC has completed address some of those gaps, thereby helping to ensure that MAC continues to deliver world-leading practice on responsible tailings management."

Can you give us some examples of revisions?

"We have added some levels of specificity on accountability and responsibility, such as the responsibilities of an executive officer within the company and the responsibilities of persons on site with lead responsibility for tailings facilities. We're also making sure there is documentation, throughout the life of a facility, on the facility design and construction, and the closure plan."

More www.mining.ca

Want to keep track of what's happening in the mining and construction industry? Visit **miningandconstruction.com** for links to industry news and other interesting reading.



Pinpointed

1 Discovery of cobalt-mining bacteria
East Lansing, MI, USA

The site *mining.com* reports that scientists at Michigan State University have found that the hardy bacteria Geobacter, found in soil and sediment, can "mine" cobalt from rust without harm to them – not only surviving, but essentially coating themselves with the metal. The discovery is considered Proof of Concept for a number of ideas, including using biotech to reclaim and recycle cobalt from batteries. Geobacter could conceivably also be used to soak up other toxic metals, like cadmium.

2 Blockchain-based tracking of traded metals
Moscow, Russia

Russian mining company **Norilsk Nickel** has launched a blockchain-based range of exchange-traded products to track prices of gold, silver, platinum and palladium, marking the first time a miner has introduced tracking products. The ETCs (Exchange Traded Commodities) can be traded on various European stock exchanges, *mining.com* reports. The platform uses blockchain technology for security and proof of ownership, while also tracing the way the metals were produced and including environmental standards credentials.

3 China sets carbon emission goals for 2025
Beijing, China

China's latest five-year plan, through 2025, addresses steps to achieve carbon neutrality. The plan is to reduce emissions by 18 percent and energy use per unit of GDP by 13.5 percent, *mining.com* reports. For example, the plan would reduce the share of coal in the energy mix while making a major push to develop new energy sources. The target for non-fossil energy sources like wind and solar is 20 percent of the mix by 2025. Electrification of the vehicle fleet will continue at a steady rate.

4 Lobster-inspired 3D-printed concrete
Melbourne, Australia

Researchers from Melbourne's RMIT University have taken inspiration from the shell patterns on lobsters to enhance the strength of 3D-printed concrete, *khl.com* reports. By using a twisting pattern similar to the internal structure of a lobster's shell, combined with a special concrete mix enhanced with steel fibers, the resulting 3D-printed structures were stronger, more efficient and more sustainable than traditionally produced concrete. The lobster-inspired patterns are of particular interest to companies looking for affordable and sustainable methods of delivering large-scale concrete structures.

FLORIAN ELIAS RIESER

Faster bolting with different resin

PUMPED AND READY

The new pumpable resin solution for Boltec rigs is improving the speed and quality of bolting in poor ground conditions. At the Voisey's Bay mine in a remote corner of Canada, cycle times have been significantly reduced.

[On Location] **Canada**

WHEN LEADING mining company Vale started the development required to transition the Voisey's Bay mine in Canada from an open pit to an underground operation, operators found they were jamming up at the bolting phase of the drill-blast cycle.

As a result, overall cycle times at the nickel-copper mine in northern Labrador were slower than expected, and the production timeline was under threat. If Voisey's Bay was to begin producing underground by mid-year 2021, as projected, something had to change.

"Our biggest issue was assuring that the bolt actually adhered properly in the hole," said Voisey's Bay Construction Manager **Will Menheere**. "We'd shoot resin cartridges in the holes, install the bolt, spin it around, mix the resin and let it sit. But we were finding, on a number of occasions, that the resin would creep into fractures in the rock, and the bolt would pull out right away."

Will Menheere
Construction Manager, Voisey's Bay

VOISEY'S BAY IS A fly-in/fly-out operation that began production in 2005 from an open pit. The 6 000 metric-tons-per-day facility, including a mine and a concentrator, produces both a nickel-cobalt-copper concentrate and a pure copper concentrate.

To avoid the delays associated with having to redo bolts as development proceeded, not to mention the dangers of unreliable rock reinforcement, Vale needed a new solution. The company was already using Epiroc's Boltec M drill rig for bolting, but perhaps a different resin and delivery system would work better in fractured rock?

Virginia Heffernan Chris Cranford
Fredrik Saarkoppel, Epiroc & Shutterstock

This Boltec E rig, with the pumpable resin option, was captured in Epiroc's test mine outside of Stockholm, Sweden. A similar rig is operated in Vale's mine in Voisey's Bay.

Enter Epiroc's pumpable resin, designed to be fast-setting and viscous enough to hold the bolt in place within seconds, but runny enough to be pumped easily. In early 2020, Voisey's Bay decided to give the resin and injection system a try, the first mine in Canada to do so. Once the rock reinforcement rigs had been altered to apply the new solution, the improvement was almost instantaneous.

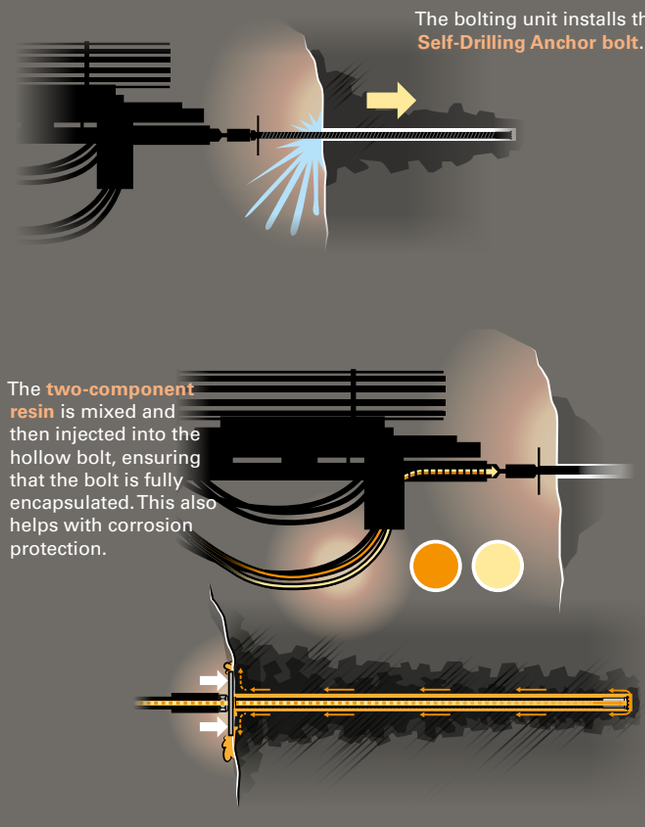
"We are seeing a significant reduction in the cycle time," said Menheere. "Plus, the self-anchoring bolts used with the system, though more expensive than traditional bolts, can be installed faster and with better quality results, so overall costs are lower."

Safety has also improved in both the near and long-term, adds Vale geotechnical engineer Brad King. The Boltec rig keeps the bolting team away from the face and out of harm's way, while the quality of the installation is expected to reduce the need to rehabilitate the reinforcement over the 15-year life of the mine.

LEARN MORE // PUMPABLE RESIN

The cure for successful bolting

ROCK BOLTING IS CHALLENGING, but Boltec combined with the pumpable resin option is a game changer. It increases productivity, improves quality control and is more flexible.



More www.epiroc.com/lightning-bolting

The pumpable resin solution has seen cyclic times significantly reduced at Vale's Voisey's Bay underground mine. Safety has been improved, too.

A bonus is that the bolting operators get more satisfaction, because they don't have to keep redoing their work.

The pumpable resin's magic lies in the chemical reaction that takes place by mixing two substances together before they are injected into the hole. The mixing can leave behind a residue, but by flushing the mixing elements with biodegradable grease, the solution can be used repeatedly in a closed system that avoids any spillage.

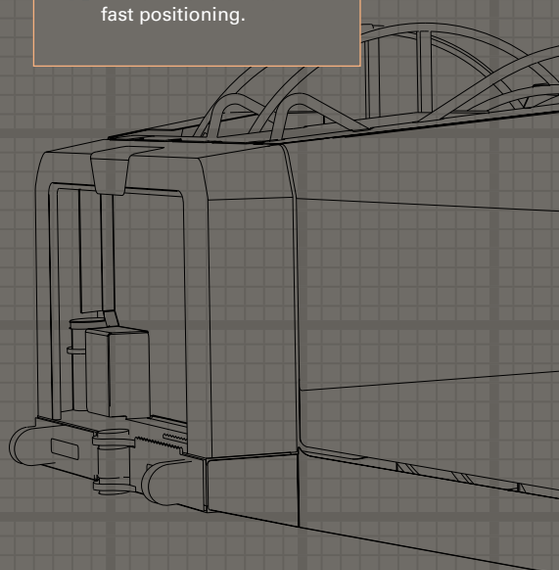
THE BOLTEC RIGS at Voisey's Bay are flexible enough to install multiple bolt types including Swellex, split set, resin rebar, hollow bar for bulk resin and SDA for bulk resin, so the bolts can be adjusted to fit the necessary level of ground support while considering optimal cost and speed.

An Epiroc technician is onsite at Voisey's Bay to resolve issues operators may have adapting to the new technology, troubleshoot potential glitches in the injection system, and advise on the best bolt types based on the ground conditions.

Voisey's Bay is on track to begin production from two underground ore deposits by the middle of 2021, thanks in no small part to Vale's willingness to unclog its bolting bottleneck by adopting new resin technology mid-development.

Technical specifications

1. **Resin tanks** 2x200 liter capacity for pumpable resin system.
2. **Cabin** Optimized operator safety, comfort and visibility.
3. **Mesh handling boom** Mechanical handling of mesh.
4. **Bolting unit** Signature indexing cradle design for accurate and fast bolting.
5. **BUT 45 boom** Strong and stiff for stable and fast positioning.



Vale

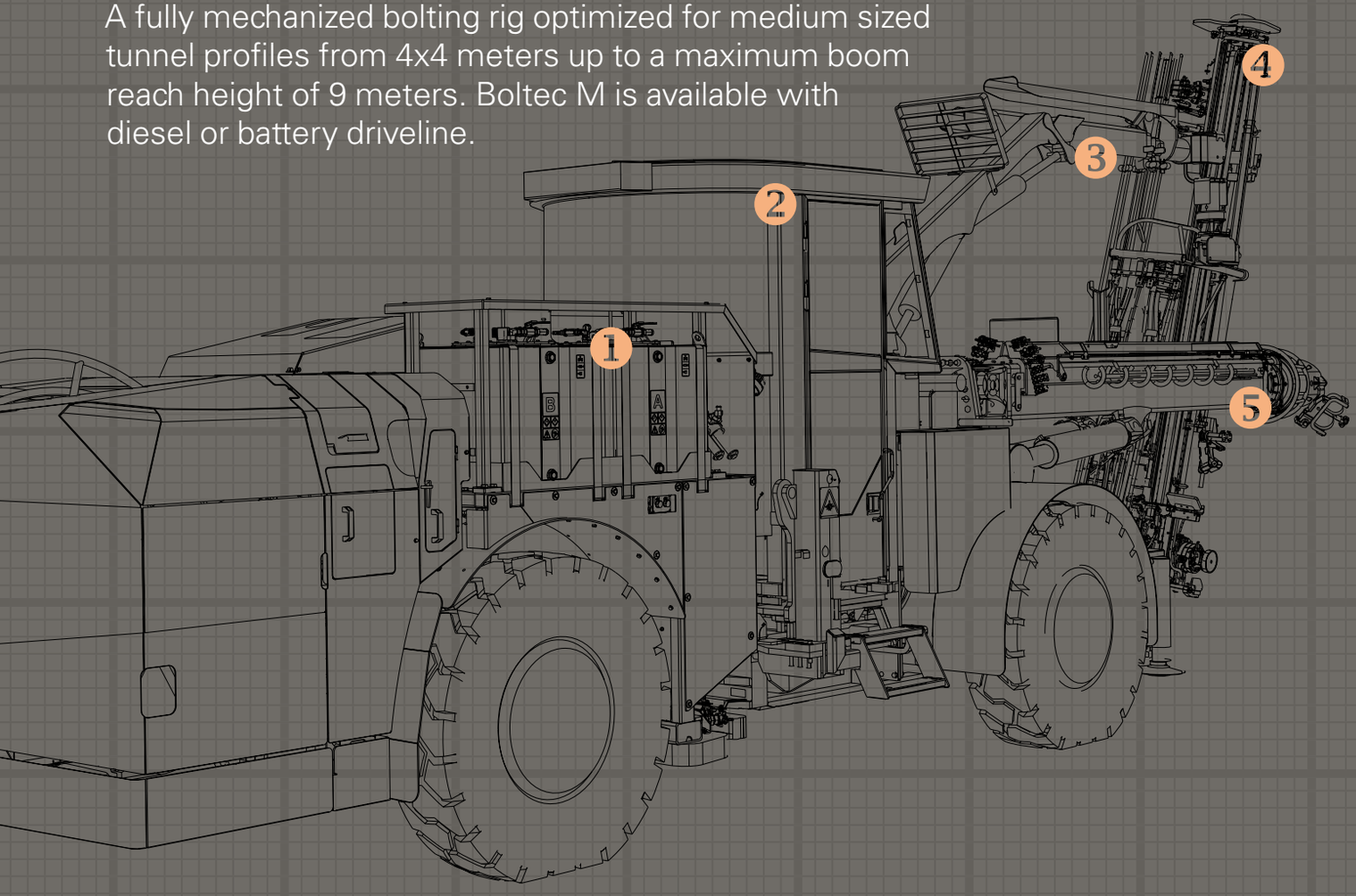
Vale is one of the world's largest mining companies. Based in Brazil, it leads in the production of iron ore and nickel and owns major logistics, power and steelmaking operations.

- **Operations in 27 countries.**
- **World's largest producer of nickel from mines in Brazil, Canada, Indonesia and New Caledonia.**
- **Employs 125 000 people worldwide, including contractors.**

More www.vale.com

BOLTEC M
Making mining safe

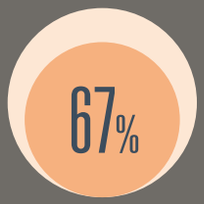
A fully mechanized bolting rig optimized for medium sized tunnel profiles from 4x4 meters up to a maximum boom reach height of 9 meters. Boltec M is available with diesel or battery driveline.



Voisey's Bay mine

The Voisey's Bay nickel-copper-cobalt mine is located in northern Labrador, Canada, about 35 kilometers south-west of the town of Nain. The operation includes a mine and concentrator, as well as port facilities in nearby Anaktalak Bay to ship ore to Vale's processing plant in Long Harbour, Newfoundland. The Long Harbour plant produces finished nickel and associated copper and cobalt products.

Three sides of Vale's production

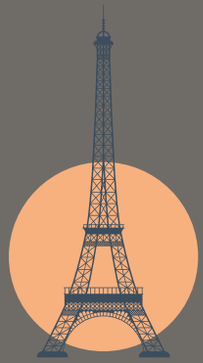


High-content ore

The rocks from Vale's Carajás mines in Brazil have 67% iron ore content – the highest on the planet.

Two types of concentrate

Voisey's Bay is a 6 000 metric-ton-per-day facility producing nickel-cobalt-copper concentrate and copper concentrate.



Big volumes

Vale has produced 5 billion metric tons of iron ore in 70 years of operation, enough to build 375 000 Eiffel Towers.

[Feature]

Collaboration

One of the more defining and successful traits, setting humans apart from other animals, is the power of defining common goals and forming collaborations to achieve them. Cooperation has bridged chasms, shaped societies, pushed innovation, and proved instrumental in both making and breaking empires.

CONTENTS

BJÖRN OBERG, SIMON PYNT, SHUTTERSTOCK

All hands on deck

Christian Tarras Ericsson Björn Öberg Shutterstock

Navigating a successful collaboration can be immensely beneficial to all parties, but the cooperation straits are fraught with perils. To stay afloat, careful preparations need to be made.

Collaboration is the cement that glues human societies together. Healthy cooperation results in synergy; at best, exponentially higher accomplishments than people could reach working separately. Benefits include increased problem-solving capacity, closer relationships brought about by the sense of having a common purpose, increased mutual learning, easier communication and, not least, increased efficiency since collaborators can focus on their own strengths.

In business, collaborations are common and sought for a number of reasons: to get access to products, research or knowledge; to raise capital; or perhaps to expand. Successful collaboration, though, is by no means a given, according to experienced "serial entrepreneur" **Devin Schain**, Founder and CEO of Student Playbook.

"I'm a big fan of list of threes. The first attribute to consider when forming a collaboration is core values – the more similar they are, the more success you'll have. The second is complimentary skill sets. For example, if you're great at marketing and sales, you might want to look into partnering with a good operator. And the third is alignment – the more you're on the same page and your respective expectations fit, the better off you are," says Schain.

According to him, the reasons forming a business partnership can vary.

"A partnership can, for example, be critical if there's an impediment you have to overcome, and you've run out of other options. Another reason reminds me of the saying 'Let's make sure that there's a train to rob before we divvy up the loot.' In other words, is there a market opening up with the partnership? Then go for it! There's another saying, 'You can't do a good deal with a bad guy.' I'd like to amend that: it's hard to do a bad deal with a good guy. I'd say that the 'who' is more important than the 'what'," says Schain.

Devin Schain
Founder and CEO of Student Playbook

Marissa Levin
Founder and CEO of Successful Culture

Marissa Levin is the Founder and CEO of Successful Culture, which helps other companies to build viable corporate cultures. She is on the same page as Devin Schain, promoting alignment in core values, complimentary skill sets, and mission alignment – the holy trinity of successful collaboration. But there are a few more things to consider before setting up a collaboration with someone.

"You need to consider if the long-term goals for your businesses align. Is it taking them public, or are you aiming for liquidation or to be taken over? The work cadences need to match – if one partner is working 24/7, and the other strives for work/life balance, you probably won't succeed. You also need to be matched concerning risk tolerance, since that will affect a lot of decisions along the way," says Marissa Levin.

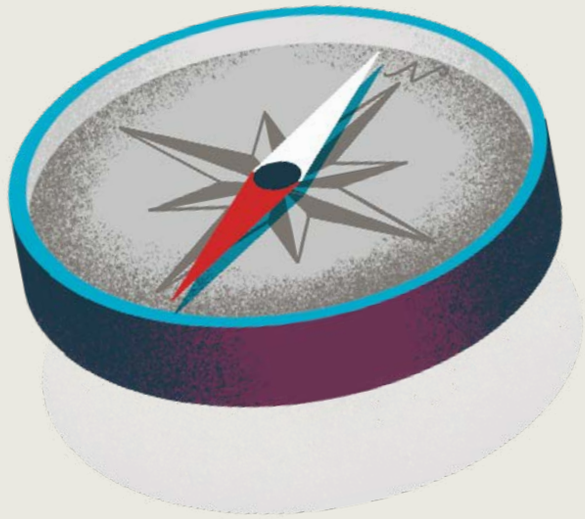
She says that there are very few businesses that wouldn't benefit from collaborations, and that it also can be a critical part of a growth strategy. But, like all relationships, collaborations need to be nurtured to stay healthy.

"After the honeymoon phase, when the rose-colored glasses come off, you want to avoid 'partnership purgatory'. You have to tread intentionally and carefully. If you end up in trouble, it's almost always due to lack of communication and misalignment of expectations. It's always a good idea to compare expectations with your partner regularly – it can make differences come to light. I would also recommend culture checkups every quarter or so. You don't want to wait for the culture to crack and people to start to leave," says Levin.

She adds that when the collaboration ultimately ends – for whatever reason – you need to be able to make a clean getaway. Having airtight documents in place right from the beginning is critical.

"If we can expand knowledge and make products at the same time, it's a win-win situation"

Kenneth R Lutchen
Dean at Boston University



A special kind of collaboration is the one formed between a company and an academic institution. In recent years, businesses and universities have approached each other to form, for example, mutually beneficial research joint ventures. However, there are a few things to consider in these collaborations, as well, says **Kenneth R. Lutchen**, Dean at Boston University.

"There are some potential major benefits for both sides in collaborations. Companies can get early access to potential ideas and do research for which they lack the facilities, and universities get research funding. Another benefit with tight cooperation is that the curriculum can be adjusted to business realities, and graduates can be better prepared for working in the industry," says Kenneth R. Lutchen.

Kenneth R. Lutchen
Dean at Boston University

He has seen quite a few examples of research collaboration in recent years – regrettably, not all of them successful, some being bogged down by conflicts on, for example, intellectual property and publication rights. But there is a right way to bring about successful long-term partnerships.

"You need a relationship-faced approach and to develop a boilerplate agreement general enough to establish a pipeline of future research projects – you don't want to have to start from scratch every time. Universities should expect less financial gain in the early stages and be prepared to give exclusive first rights to results – if they are applicable to the company business model. Companies can expect those rights, provided they develop a product within a reasonable amount of time and also share some of the resulting profits back to the faculty," says Lutchen.

Potentially, these partnerships can be exceedingly beneficial to all parties.

"If we can expand knowledge and make products at the same time, it's a win-win situation."

SUCCESS FACTOR

Internal collaboration – a tool for productivity

COMPANIES THAT CONSCIOUSLY develop a collaborative culture tend to be more innovative and have higher productivity. For example, studies from Stanford have shown that people who are primed to act collaboratively stick to their work longer while also reporting higher engagement levels, lower fatigue levels and a higher success rate compared to their solitary peers.

Common to all successful collaborative company cultures is transparency, the free exchange of knowledge, and the willingness to learn from both success and failure. Hindrances to collaboration are, for example, entrenched cultures of silos preventing sharing, and lack of trust from management leading to unwillingness to voice dissent.

DESIGN TOGETHER

Teamwork

Designed in Sweden and assembled in Australia, a new automated drill rig from Epiroc won't just change the game for RC drilling – it has established a new blueprint for collaborative design.

[On Location]
Australia

Max Veenhuyzen Simon Pynt

"It's been hard at times, but we got there in the end"

Timothy Few
CEO, Metzke

SINCE 1985, Epiroc has been in a long-distance relationship with Metzke, a manufacturer of drilling equipment based in Perth, Western Australia. For almost four decades, the Australian manufacturer has been involved in building RC (Reverse Circulation) drilling rigs for Epiroc customers around the world, as well as supplying them with additional drilling equipment and consumables. In 2019, the two companies embarked on their most ambitious project to date: the Explorac RC30 Smart exploration drilling rig. Based on the successful Explorac 235, this new rig promises big things for the exploration drilling sector when it is released. Chief among its impressive list of features: the ability to generate 30 metric tons of pullback force, fully automated rod handling, and a combined software-hardware interface that ensures the Explorac RC30 Smart can be upgraded over the years.

"Typically, there hasn't been a lot of automation in the exploratory drilling space; this is an absolute game-changer," says **David Benton**, Sales & Product Manager Exploration Drilling Equipment at Epiroc Australia. "The rig is built around our control system, and we engineer it from start to finish, meaning the end-user gets a rig with improved stability, smoother automation and improved machine life."

BUT LIKE SO MANY PROJECTS, the Explorac RC30 Smart was affected by Covid-19. Among the complications that both Epiroc and Metzke had to contend with during the pandemic: market uncertainty, disruptions to the raw material supply chain, and border closures preventing Epiroc staff from Sweden flying to Perth during crucial stages of the project.

"It's been hard at times," admits **Timothy Few**, CEO of Metzke. When Mining & Construction visited the company's headquarters in February, the rig was around a month out from its first set of preliminary tests. "But we got there in the end."

Just as the launch of the Explorac RC30 Smart looks set to change the exploration drilling business, the challenge – and success – of designing such a revolutionary piece of equipment during a

Automated rod-handling and a combined hardware-software interface are two of the key features the new Explorac RC30 Smart drill rig will bring to the market.

David Benton
Sales & Product Manager, Exploration Drilling Equipment, Australia

Timothy Few
CEO, Metzke

Matt Leahy
Engineering Manager, Metzke

global pandemic has also changed the ways that Epiroc and Metzke do business, both individually and when working with each other on joint projects.

Although the Explorac RC30 Smart is being designed by Epiroc in Sweden, Metzke took the lead in the rig's assembly. This unconventional approach has yielded plenty of benefits. For end users, a locally assembled rig means customers will get their machinery faster when compared to ordering a unit from overseas and having it shipped to Australia. From Epiroc's perspective, Metzke's ability to quickly manufacture machinery and parts in-house has made it an important partner throughout the development of the Explorac RC30 Smart, but the relationship between the two companies is about brains as well as brawn.

"Metzke provides Epiroc with a lot of insight and knowledge into the local industry," says Benton. As the Sales & Product Manager, he is in constant contact with Metzke, his Epiroc colleagues in Sweden, as well as potential customers in the Australian marketplace that the rig is being pitched at. "All details relating to machine specification is then established through Epiroc marketing teams in Australia and Sweden."

ESTABLISHED IN 1978, Metzke has seen the evolution of the (West) Australian mining industry from up close. Its senior staff has plenty of runs on the board when it comes to mining experience, not least of all Engineering Manager **Matt Leahy**, who has been with the company for 15 years. Many of those years have been spent collaborating with Epiroc around the world. In addition to providing Epiroc's design team with feedback on how the rig would work in the field, he and Assembly Superintendent **David Mathieson**, also supply Sweden with valuable insight into meeting Australian requirements, as well as practical aspects that the field driller would value. In return, Metzke is given direct access to Epiroc's plans and data.

METZKE'S FACILITIES are a sprawling setup divided between various warehouses in the industrial area of Canning Vale, a suburb south of Perth. As Mining & Construction Magazine pays a visit, Metzke's Sales and CAD teams go about their business in the office. In the warehouse, staff in turret forklifts zip around fulfilling part orders. Most of the premises, however, are given over to Metzke's manufacturing equipment. Welding irons send sparks flying. Operators are programming lathes. A spray-painter, his head covered in protective respiratory equipment, ambles towards the custom-built spray paint room, where his next job awaits. If it has to do with the manufacture of parts, it's somewhere in here.

"What might take someone else several days to do, we can do in several hours," says Leahy about Metzke's vertically integrated facilities. "From a prototyping point of view, that's really important. If something doesn't work, you don't want to wait a week before you can try it again."

Q&A

Markus Johnsson, Technical Product Responsible, Sweden

Based in Epiroc's production facilities in Örebro, Johnsson has been in constant contact with colleagues in Sweden and Australia throughout this project. He talks about the challenges and opportunities involved with long-distance collaboration, particularly during a global pandemic.

Q What has it been like working on such a major project during a global pandemic?

A "The distance has been challenging, for sure. Not being allowed to travel with Covid-19 has been a huge challenge, as has the time zone differences. We've had to learn how to communicate via video, share more information electronically and set up our systems to work with each other."

Q How have the Epiroc and Metzke teams communicated with each other during the pandemic?

A "There have been a lot of daily Webex and Microsoft Teams meetings. These meetings are in the mornings in Sweden and in the afternoons for the Australian team. In addition to these meetings, there have also been phone calls and emails constantly, especially during the phase when we started up the machine."

Q Can you paint a picture of how the relationship between Metzke and Epiroc works?

A "It's a good partnership. Metzke is very agile and moves swiftly. The team can manufacture, design and fit things rather quickly, and it also has good knowledge about drill rigs from past field experience that we can all learn from. We're very transparent with Metzke and work very closely together. Metzke has access to our drawings needed for manufacturing the parts, so it's operating as if they are a part of Epiroc."

Q How has Covid-19 affected the way your team works?

A "It has showed us that we could do more work from home as well and do it electronically. We've also had to learn how to communicate via video and set up our systems to work with each other."

More www.epirocgroup.com/vision-and-beliefs


ED1533
Epiroc
AUSDRILL
NOTICE
EMERGENCY STOP
DANGER
HIGH AIR PRESSURE SYSTEM

Vertically integrated manufacturing facilities – including this CNC lathe – allow the Metzke team to machine parts and components entirely in-house.

Established in 1978, Metzke has plenty of knowledge about the mining industry, both within Western Australia as well as elsewhere around the world.

Eventually, we arrive at the finished prototype of the Explorac RC30 Smart. Decked out in Epiroc's famous hue of yellow, it's an impressive, imposing piece of equipment. Leahy talks me through the various features, drawing particular attention to the all-important automated rod handling system and how the entire rig can be operated remotely – both key factors for creating safer workplaces.

"We didn't have this in my day," he tells me wistfully. "I'd be a driller again if they did."

It's safe to assume that, back in Leahy's day, two companies simultaneously building local versions of the same machine was also a rarity. Throughout the project, a working prototype of the Explorac RC30 Smart has been built in both Sweden and Australia to allow both teams to perform their own tests and analysis.

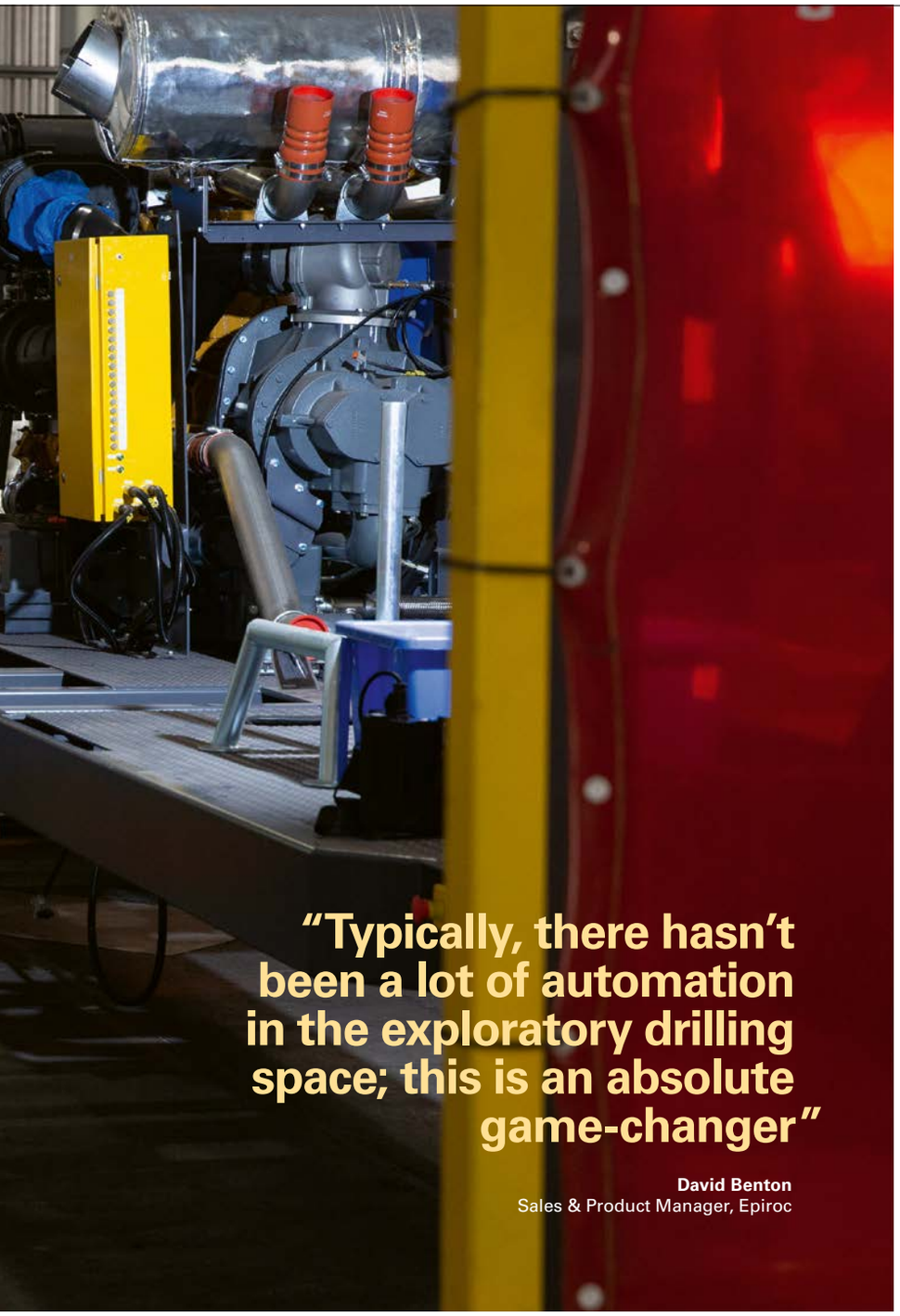
EPIROC'S PROJECT TEAM, based at the Surface division in Örebro, Sweden, is in constant contact with their colleagues at Metzke. Due to the time difference – Sweden is seven hours behind Western Australia – both companies have a five-hour window each day in which they can catch each other: in the morning for the team in Sweden and late afternoon for the team in Australia. Like the rest of the world, Epiroc and Metzke have turned to online meeting platforms for these daily meetings, as well as more traditional email and telephone channels.

David Mathieson
Assembly Superintendent, Metzke

Simon Burt
Chairperson, Metzke

By far the coolest, most Jetsons-like era of the communication mediums, however, are the Realware headsets worn by key members of the assembly team, including Metzke's assembly superintendent, David Mathieson. Originally utilized by Epiroc for troubleshooting purposes, these Wi-Fi headsets are similar to GoPros that record video of what the wearer can see, only with the added benefit of an interface that allows users to open and share computer files. While it looks like a piece of equipment a particularly serious gamer might invest in, it speaks to the agile, fluid nature of Epiroc and Metzke's post-Covid working relationship.

Admittedly, close to four decades of shared history brings a certain amount of familiarity to the



“Typically, there hasn’t been a lot of automation in the exploratory drilling space; this is an absolute game-changer”

David Benton
Sales & Product Manager, Epiroc

Epiroc & Metzke

Epiroc’s Surface division develops, manufactures and markets rock-drilling equipment for surface mining, exploration, construction, quarries and oil and gas applications worldwide. Metzke is a leading designer and manufacturer of RC drilling equipment, RC sampling systems and drilling consumables.

partnership. Parties on both sides of the equator are on a first-name basis with each other and the chats feature a reasonable amount of humor. But more important than length of friendship is having a shared set of values and mutual respect.

“It helps that we’re a technically based company,” says **Simon Burt**, Metzke’s Chairperson. “Culturally, we get on very well. Because a lot of trust has developed over the years between both companies, you can have more open and transparent discussions and speak your mind more readily with someone you’ve got that relationship with. They like the way we solve things quickly without too much noise around it.”

No big fuss, then, but a great partnership that looks set to bear fruit for years to come. ×

Eric Gobbert
General Manager, Exploration at Ausdrill, Australia

Why did you go with Epiroc?

How long has Ausdrill been using Epiroc equipment?

“We have been using Epiroc rigs since the company was building small crawler drill rigs as Atlas Copco. It’s important to work with OEMs that have the capacity to scale up and down with a company of our size and have that support and availability of equipment to drill different diameter hole sizes and different depths. That’s one of the reasons we go to Epiroc: because they have got that sort of range and scale of rigs. We have now ordered four Explorac RC30 Smart rigs for deployment at our operations in the Pilbara region in Western Australia.”

What are your clients expecting from this rig?

“The technological roadmap that our Tier 1 client provided outlined a vision that included more innovation and a move towards autonomous drill rigs; rigs that are much more automated and require less hands-on involvement. A few years back, one of my colleagues went to Epiroc and gave them some specifics around what we needed our machines to do and to be able to continue to develop.”

What does the collaboration mean to Ausdrill?

“We’ve had strong relationships with our clients for a long time. This is a three-way partnership. They have expectations that we’re not just going to be prescriptive about our delivery: they want to see continual improvement and development. I think it helps give them confidence that we’re on that journey with them and that we’re investing in a long-term future with these companies.” ×

More www.ausdrill.com.au

There are always things to be learned from other organizations and other industries. This is how another player has approached the theme of this issue.

Christian Tarras Ericsson
Shutterstock

The genesis of Google

An algorithm for success

GOOGLE CO-CREATORS AND co-founders Larry Page and Sergey Brin disliked each other at first sight. Still, today Google has a market value of over a trillion US dollars. Apparently, the pair got over their initial mutual bad impressions.

In 1995, Sergey Brin was a student at Stanford and assigned to guide Larry Page, a prospective grad student. By some accounts, they disagreed and bickered about nearly everything that first day. But the following year, they started to collaborate on a PhD project – an algorithm first nicknamed *BackRub*, later *PageRank*, that assigned importance to web pages based on the number and nature of backlinks to them. Their co-written paper, *The Anatomy of a Large-Scale Hypertextual Web Search Engine*, became the basis for Google. The name Google, incidentally, is wordplay on "googol", a large number in mathematics that the paper states "fits well with our goal of building very large-scale search engines."

THE SEARCH ENGINE ITSELF was a side project to the paper, but quickly became a hit with fellow students. By the time it received 10 000 hits a day, Brin and Page made the decision to turn it into a business. They maxed out several credit cards to buy a terabyte of disk space, and set off.

Page's specialty was ranking relevance, while Brin's was large-scale data mining. The pair was often in disagreement with each other, but was a perfect match in complimentary skill sets. The disagreements also often led to constructive feedback. At least one biographer has noted a mutual respect for each other's intelligence and a shared understanding as essential ingredients for the company's success.

The project initially had a third member, programmer Scott Hassan, who reputedly wrote much of the code for the original Google search engine. He left the collaboration before Google was officially founded as a company; in retrospect, perhaps not the greatest business decision in history. ×

In November 2016, Google announced that the search engine had indexed, or was aware of, in excess of 130 trillion web pages. That number is much larger today.

Portfolio: A brief history

The first Google data storage disks were encased in a cabinet built from Lego bricks situated in a dorm room. The domain name www.google.com was registered on September 15, 1997, and the company was incorporated in 1998. In 1999, the company moved its offices from a garage in Menlo Park, California, to Palo Alto. By 2000, they had 150 employees, mostly engineers and R&D staff. After a few more relocations, Google leased an office complex in Mountain View, CA, which became known as the *Googleplex*. The initial public offering (IPO) took place in 2004, bringing USD 1.67 billion into the company. Today, the number of employees exceeds 135 000.

More about.google

SURVEY
HOW TO PARTNER UP

Want more input on this theme? Three people from different fields give their views to help paint a broader picture.

Gustaf Höök

01 What are the main benefits of external collaboration?

02 What's important in building a successful partnership?

Linda Fisti

Colloboration Leader, IKEA, Sweden

01 **"IKEA IS A CURIOUS** company. Opening up for new ideas and siding with different people in collaborations is a way to learn, develop, challenge ourselves and make things better. When we collaborate, it always starts with a topic we are curious about or a challenge we want to solve. Then we look at who we could explore this together with. The whole idea of collaborating is to learn and tap into new ideas."

02 **"FOR US, THE MAIN** prerequisite for a collaboration to happen is shared curiosity. We welcome collaborators from different parts of the world and from different industries: it could be an emerging or established designer or artist, a collective of creative individuals, a company or similar. When collaborating, we are curious to get new insight and combine our knowledge, expertise and creativity to come up with solutions that would help the many people to have better, more beautiful and functional homes."

Robert Cross

Professor of Global Leadership, Babson College, USA

01 **"THE MOST COMMON THING** that companies are looking for is to drive innovation or to collaborate in ways that integrate unique capabilities or expertise. By reaching out externally, they can repackage or re-combine to deliver a greater solution. Another benefit by reaching out, for leaders who look to leverage their teams, is to see what others are doing in fields that matter to them. A study that I conducted together with the Institute for Corporate Productivity found that companies that promoted collaborative working were five times as likely to be high-performing."

02 **"WHEN FORMING EXTERNAL** relationships, don't just look for opportunities. Don't isolate out what you can get out of it, immediately trying to convert it into a commercial relationship. The more you can invoke a norm of reciprocity – 'giving first' – the more you tend to get out of it. The best relationships have an element of trust."

Joerg Wuttke

President, EU Chamber of Commerce in China

01 **"IT'S A WAY OF** filling a gap; if there's something you can't do yourself, maybe someone else can. Collaboration is also about helping each other grow. I've lived and worked in China for 30 years. When I first moved here, western companies were sometimes teaching Chinese companies how to operate, but now it's a level playing field. We can all learn from each other and grow together."

02 **"IT'S LIKE A** successful marriage; it's about trust. You are sure that the other party is honest in their proceedings and means well. Trust is not something that is easily won. It's earned – and it can be broken in seconds. Trust grows from transparency. In order to gain trust, it's important that the other party understands not only why you operate in a certain manner, but also that you act in a predictable way. In business, it can be very important to know that the other party will be around for a while. I find that a lack of transparency is always a catalyst for problems."

More www.bit.do/whatiscollaboration

Synergy

Dynamic duos (and trios) have made their mark on history – not surprisingly, since good collaborations are synergistic. Here are some of the very best examples.

07

Ben Cohen & Jerry Greenfield

Childhood friends Cohen and Greenfield decided to start a food business, signing up for a $5 correspondence course in ice cream-making. The first Ben & Jerry's scoop shop opened in 1978 in Vermont, with Jerry making the ice cream while Ben ensured that it tasted yummy.

01

Magic Johnson & Kareem Abdul-Jabbar

Few sports duos are as renowned and successful as the pairing of Johnson and Abdul-Jabbar on the Los Angeles Lakers. The duo brought five NBA championships to L.A., as well as nine combined NBA MVP awards, five NBA finals MVP awards, and 28 All-Star appearances.

06

Jackie Chan, Sammo Hung & Yuen Biao

This Hong Kong actor triumvirate, nicknamed the "Three Dragons", collaborated on a number of hugely successful action movies from *Project A* in 1983 to *Dragons Forever* in 1988. The actors' respective styles meshed perfectly, reinventing the martial arts genre.

02

Srinivasa Ramanujan & G.H. Hardy

Ramanujan was a mostly self-taught Indian math prodigy. He formed a postal partnership with English mathematician G. H. Hardy, who invited him to Cambridge. Deceased at 32, his work has opened up entire new fields and inspired a vast number of research projects.

05

Susan B. Anthony & Elizabeth Cady Stanton

Pioneers of the women's rights movement, Anthony and Stanton formed a friendship and working partnership that lasted five decades – the former as the tactical genius and vocal head of the women's suffrage cause, the latter as a thinker and writer.

04

Louis & Marie Pasteur

The Pasteur couple worked together in bacteriology, discovering the principles of vaccination, microbial fermentation, and pasteurization, saving a vast number of lives over the decades since. They set the standard for professional collaboration by spouses.

03

Zelda & F. Scott Fitzgerald

F. Scott is arguably the better known of the couple, but in actuality the Fitzgeralds were more of a writing team, with Zelda, for instance, suggesting the title of *The Great Gatsby*. She penned numerous works and essays that were published under her husband's name.

Next issue [Feature]

Change is part of life, but how to use it to one's advantage? In business, embracing change can open new doors. Read more in the next issue's Feature.

MY WORK: SENIOR PRODUCT SPECIALIST

Epiroc's greatest asset is our employees. We take pride in offering them an outlet for their creativity in order to provide the best possible value to our customers.

Gustaf Höök
Jonas Gauffin

"No two days are alike"

Robert Arnoldsson has worked with rock drilling since he was a teen. First as a drilling rig operator and then for many years as a product specialist at Epiroc. His background is a huge asset – and he looks forward to continuing his growth in an industry undergoing rapid changes.

"When I was little, I wanted to be a policeman, but when I became a teen, I already started working at the construction company NCC. I was a driller and drilled tunnels for both roads and railroads. We only used Atlas Copco rigs and the work was varied and educational. After ten years, I was offered a position as a service technician for Atlas Copco's Customer Center in Stockholm. I already had a lot of practical knowledge and now I could add drilling theory to it. It could be about energy waves through drill steel and what torque is needed to pull threads out properly. It's incredibly important to have both practical and theoretical knowledge, so the driller you are helping knows that you know what you are talking about.

ROBERT ARNOLDSSON

Age: 43
Job: Senior Product Specialist, Fagersta
Joined the company: 2004
Best part of the job: "Problem-solving! No two rocks are the same, and that affects how the drill steel can be used."

AFTER A FEW YEARS, I moved together with my girlfriend back to Fagersta when we had children. At first, I worked at another company, but within a year, I was back at Atlas Copco. Since 2010, I have been a product specialist at Epiroc Rock Drilling Tools division, specializing in drill steel. My primary job is to provide support to our Customer Centers around the world, so before the pandemic, I was often traveling. I solved problems and kept up customer training for both drillers and site managers. The aim is for customers to increase their productivity and for the drill steel to last as long as possible. If your settings are wrong or you drill wrong, it's easy to destroy the drill steel.

I AM ALSO involved in claims and in developing new products, so the work is varied. No two days are alike, and I love that. That fact that so much is happening in the development of drill steel – for example regarding automation and power – is extra challenging. All that affects the drill steel, and it never ceases to fascinate me." ×

Robert Arnoldsson's primary job is to provide support to Epiroc Customer Centers around the world, but his drill steel and drilling knowledge is also useful in product development. For example, he played a part in the testing of the Powerbit Underground series.

The SmartROC D65 is one of the drill rigs at the Whatley limestone quarry, whose performance has improved thanks to My Epiroc and digital protocols. One of the steps involves the driller checking the GPS coordinates to ensure that the rig's uploaded survey information corresponds to this check.

INSTANT SUCCESS WITH MY EPIROC

The My Epiroc solution has helped EPC Groupe UK at the Whatley quarry to go digital, improving safety and reducing the carbon footprint.

Christian Tarras Ericsson Dave Bridge

1
THE CHALLENGE

EPC GROUPE UK is a subsidiary of a French multinational company, active in the fields of commercial explosives and drilling and blasting services. At the Whatley limestone quarry in Somerset, England, EPC Groupe runs an operation with services that include shotfiring, blast design, drilling and explosive delivery, using SmartROC and FlexiROC surface drill rigs from Epiroc.

Niklas Forsberg
Customer Experience Solutions Manager, Epiroc

All four operators at the site have recently been provided with mobile phones. One of the goals is to minimize paper usage by moving to digitalized solutions, to both increase safety – with better and more reliable handling of inspection protocols – and reduce the carbon footprint.

"EPC Groupe UK is an ambitious, driven and innovative company looking to reduce administrative work and the use of analog solutions with the help of technology. When they were told about My Epiroc, a digital solution intended to help customers increase their fleet efficiency, they quickly saw a number of possibilities," says **Niklas Forsberg**, Customer Experience Solutions Manager at Epiroc.

2
THE SOLUTION

MY EPIROC WAS developed inhouse by Epiroc and launched in 2019. It is a platform-independent solution under continuous development that, when launched, focused primarily on helping customers with collaborative fault reporting.

"The fault reporting solution was developed very closely with select customers, and that is what we always strive to do. There is no point in developing something unless we know there is a real customer willing to use it," says Niklas Forsberg.

EPC Groupe had also needed fault reporting, and in short order suggested adding protocols for daily and weekly inspections, as well as a digital handover sheet to be used at shift changes.

"We began working closely together with EPC Groupe in November 2019. Our UX lead designer and I visited the site in the UK shortly thereafter to experience the operations first-hand to see how they were using My Epiroc on a daily basis. Having that direct line of communication with the end users is crucial. We were informed of some user experience kinks that we managed to straighten out," says Niklas Forsberg.

Then the Covid-19 pandemic broke out, and the UK went into lockdown.

"For several months we had minimal or no contact with either our UK sales company or EPC Groupe. Nevertheless, we made the decision to proceed, to be able to present a finished solution when restrictions lifted and key persons could be reached again," says Niklas Forsberg.

My Epiroc, including the new inspections feature with the first protocols for EPC Groupe, was in place and operational at the Whatley quarry by the end of 2020. The initial trial was with one operator. After only a few days, EPC Groupe decided to expand the trial to all four operators and the fleet manager and also to add the shift handover protocol.

3
THE RESULT

EPC GROUPE IS very happy with the resulting digital protocols, and My Epiroc has replaced the manual paper handling for daily and weekly inspections, as well as the rig handover inspections.

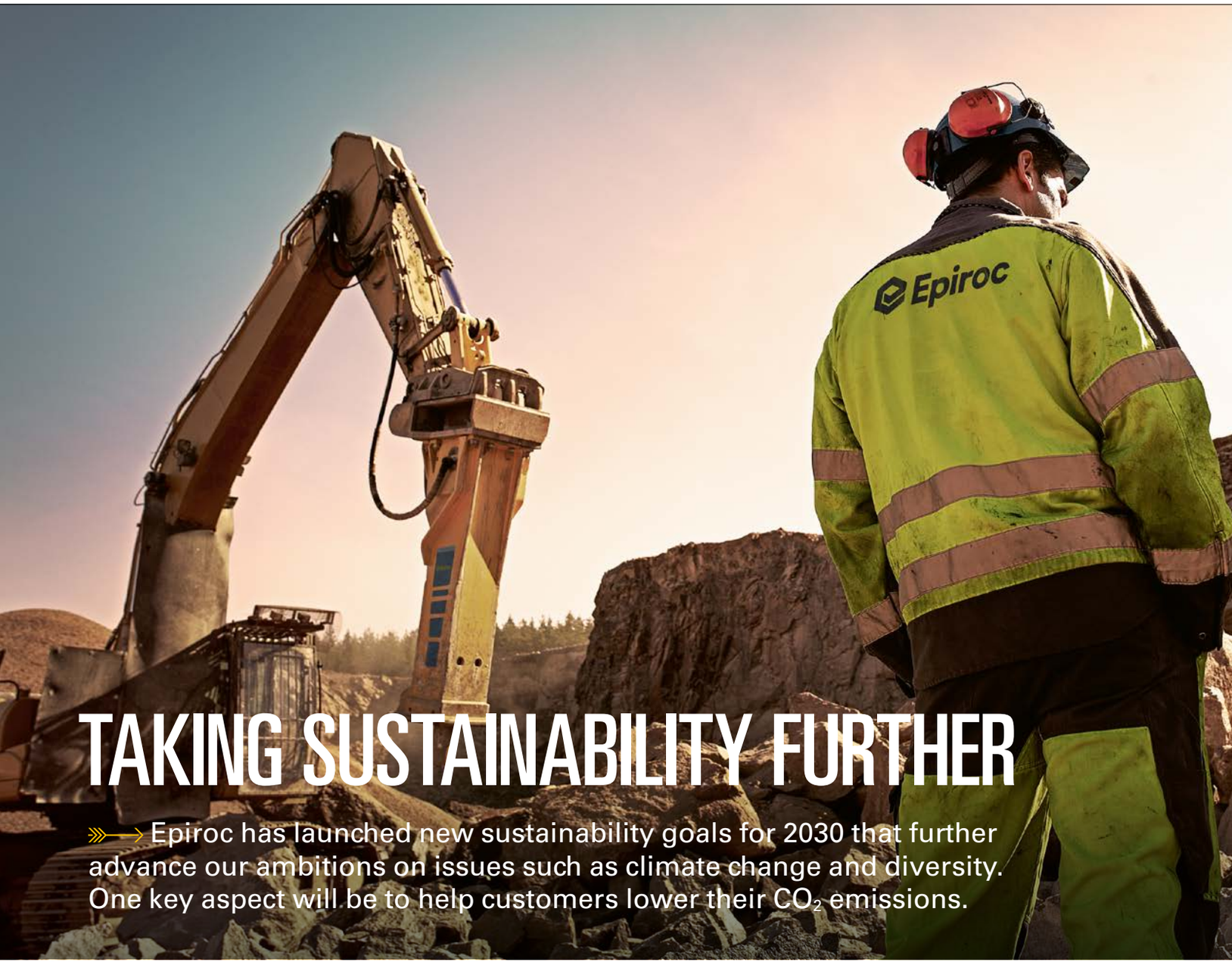
"At the moment, we're looking at how the resulting data can be used to improve reliability and productivity further, as well as merge the data with machine utilization data from the Certiq connected rigs. For example, we can improve the utilization information by gathering data from the operators – data that won't show up on the sensors on the machine," says Niklas Forsberg.

The results from Whatley quarry have been very promising, so much so that the company has lifted and presented the solution at the national level for EPC Groupe UK.

"That's a real receipt for the success of the My Epiroc solution. We're very glad to be working with the people at EPC Groupe in developing more functionality on the platform. They're highly innovative, insightful and open to new solutions," says Niklas Forsberg. ×

More my.epiroc.com

Gustaf Höök Göran Wink



TAKING SUSTAINABILITY FURTHER

Epiroc has launched new sustainability goals for 2030 that further advance our ambitions on issues such as climate change and diversity. One key aspect will be to help customers lower their CO_2 emissions.

Sustainability is already integrated in Epiroc's business operations, and last year the group established long-term sustainability goals that support the Paris Agreement and the UN 2030 Agenda for Sustainable Development. The new sustainability goals for the next decade include halving CO_2 emissions from operations, transportation and major suppliers, as well as from customers' use of Epiroc equipment.

"Since the majority of the CO_2 emissions occur in the use phase of our products, it is crucial that we not only limit our own emissions in operations and transportation, but also take on the greater challenge to reduce the emissions when the products are in use. We are working together with our customers to reduce the impact on the climate," says **Helena Hedblom**, Epiroc's President and CEO.

Epiroc is continuously innovating to make its equipment as climate-friendly and safe as possible. The new generation of battery-electric mining machines is one example. The package of digital solutions, 6th Sense, including automation, also goes a long way toward reducing customers' environmental impact, as well as improving health and safety conditions. After all, the 2030 goals are not only about drastically reducing emissions, but also about sustainability for people.

Helena Hedblom
CEO and President, Epiroc

Camilla Goldbeck-Löwe
VP Corporate Responsibility, Epiroc

"We have defined the goals as *People and Planet*. Being a responsible company, Epiroc will work to improve on all levels, to promote safety and health and to conduct business in a responsible manner. It's hugely important not to neglect the human aspect," says **Camilla Goldbeck-Löwe**, VP Corporate Responsibility, driver of the process that produced the 2030 goals.

DURING THAT PROCESS, all stakeholders – employees, customers, business partners, investors, and external stakeholders – were approached and listened to, resulting in a thorough and ambitious strategy. Epiroc Group Management then decided on the new 2030 sustainability goals.

2030 goals for People and Planet

The new sustainability goals for both human aspects and for and reduction of CO_2 emissions.

People:
Safe, healthy, ethical

Planet:
Halve CO_2 emissions

Safety and health
- No work-related injuries.

Balanced workforce
- Double the number of women in operational roles.

Walk the talk
- Have all employees and business partners comply with our Code of Conduct.
- Responsible Sales Assessment Process implemented.

Operations
- Halve CO_2 emissions in operations.
- 90% renewable energy in own operations.

Transportation
- Halve CO_2 emissions from transportation.

Products
- Offer a full range of emission-free products.
- Halve CO_2 emissions from machines sold (in 2030 compared to machines sold in 2019).

Suppliers
- Require 50% reduction of CO_2 emissions from relevant suppliers.

"With the new sustainability goals for 2030, we are taking our ambitions in this area to a new level. Aiming to halve CO_2 emissions – not only from our own operations, but also during the use phase – is a bold statement, not least since it's not all in our hands. But we are 100% committed to the goal and will continue to develop and manufacture energy-efficient equipment, as well as support our customers," says Camilla Goldbeck-Löwe, continuing:

"As for *People* goals, they include doubling the number of women in operational roles, substantially reducing work-related injuries, and further strengthening the commitment to Epiroc's Code of Conduct."

IN NEXT ISSUE of Mining & Construction magazine, there will be more on Epiroc's new sustainability goals.

More www.epirocgroup.com/2030-sustainability-goals

FROM THE PAST
YEAR 1989

Innovative products and a wide array of customers: Epiroc is a young company with a long and rich history, dating all the way back to 1873. In each issue of Mining & Construction, we take a glimpse in the rearview mirror.

Gustaf Höök
Jim Sugar/Corbis, Getty Images

Portfolio:
Loma Prieta earthquake

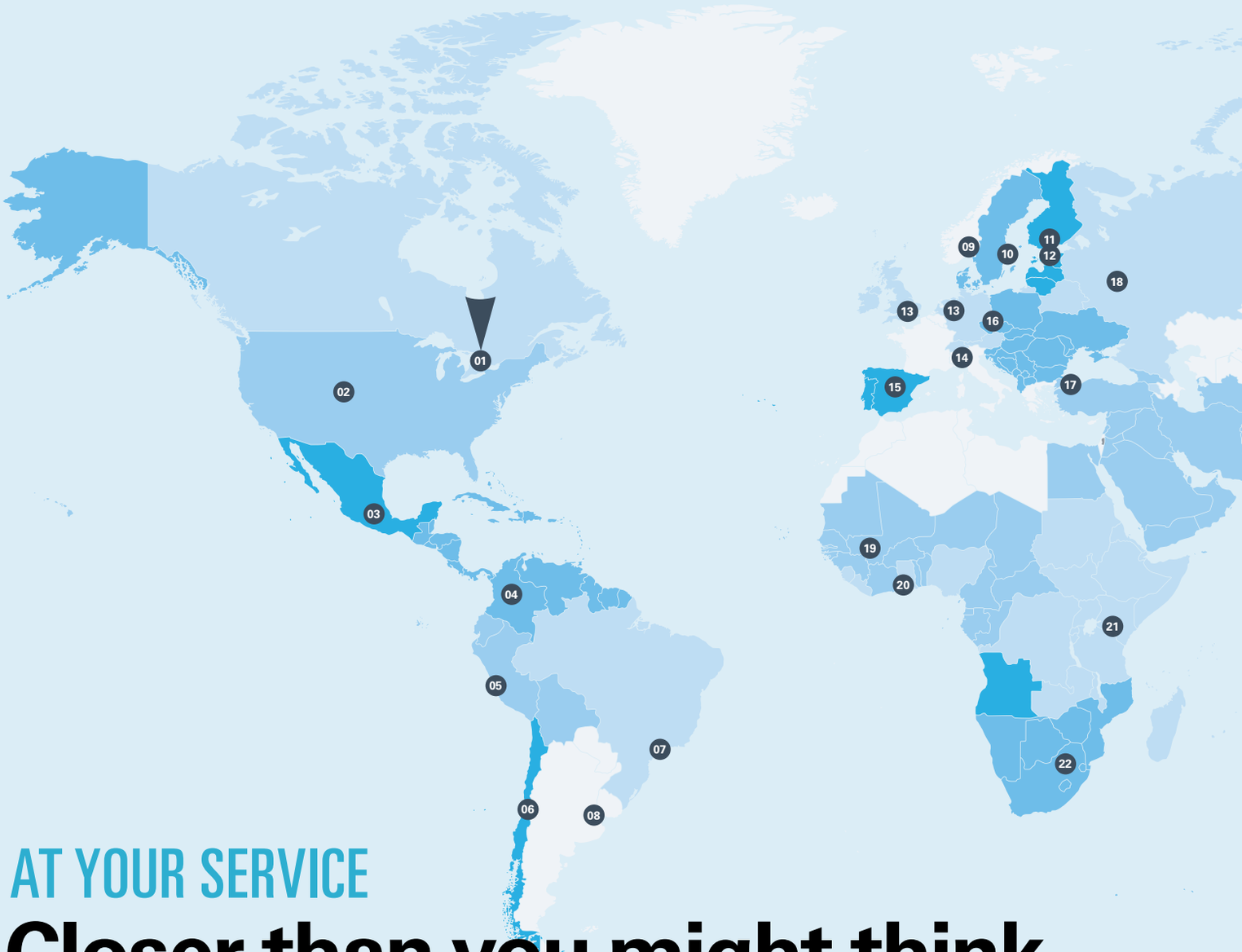
JUST AFTER 5 PM on October 17, 1989, the San Francisco Bay Area began to shake. The notorious earthquake zone was hit once again, and this was the strongest since the San Francisco earthquake of 1906. The earthquake, the Loma Prieta earthquake, was triggered by a shift along the San Andreas Fault and lasted approximately 15 seconds, with a moment magnitude of 6.9. The most severe damage was suffered by San Francisco and Oakland, in particular the transportation system of the Bay Area. A viaduct along the Cypress Freeway collapsed, causing most of the earthquake-related deaths. In total, 63 people were killed, nearly 3 800 were injured, and property damage amounted to an estimated $6 billion. The San Francisco-Oakland Bay Bridge was also damaged when a span of the top deck collapsed.

ONE OF THE first pieces of equipment to be brought into the rescue effort was a gasoline-powered drill/breaker, manufactured by Atlas Copco (which, at the time, Epiroc was a part of). Through holes drilled in the mass of tangled concrete, emergency workers lowered air hoses, miniature search cameras and other material down to trapped victims. Weighing some 20 kilos, the drill breaker could be backpacked into the disaster area, which had been rendered inaccessible to conventional engineering equipment by a disrupted infrastructure.

More www.bit.do/lomaprieta89

The earthquake literally caused the freeway to collapse like a house of cards. This portion of the Interstate freeway I-880 was not rebuilt and reopened until 1997.

Frida Valentin Shutterstock



AT YOUR SERVICE

Closer than you might think

OUR CUSTOMERS ARE located all over the world and so are we. There is always an Epiroc office to turn to, making us truly local. At the same time, we are a global enterprise with worldwide resources. We have Customer Centers in 32 regions. In each one, there are one or more Service Centers.

All this supports our goal: Count on us to listen, collaborate and deliver the right solutions for you.

01 Canada
Toronto

02 USA
Denver

03 Mexico
Mexico City

04 CVCA
Bogota

05 Andean
Lima

06 Chile
Santiago

07 Brazil
São Paulo

08 Argentina
Buenos Aires

09 Norway
Oslo

10 Sweden
Stockholm

11 Finland
Helsinki

12 Estonia
Tallinn

13 Europe West
Essen/Hemel Hempstead

14 Southern Europe & Northern Africa
Milan

15 Iberia
Madrid

16 Central Europe
Prague

17 Turkey & Middle East
Istanbul

18 Russia
Moscow

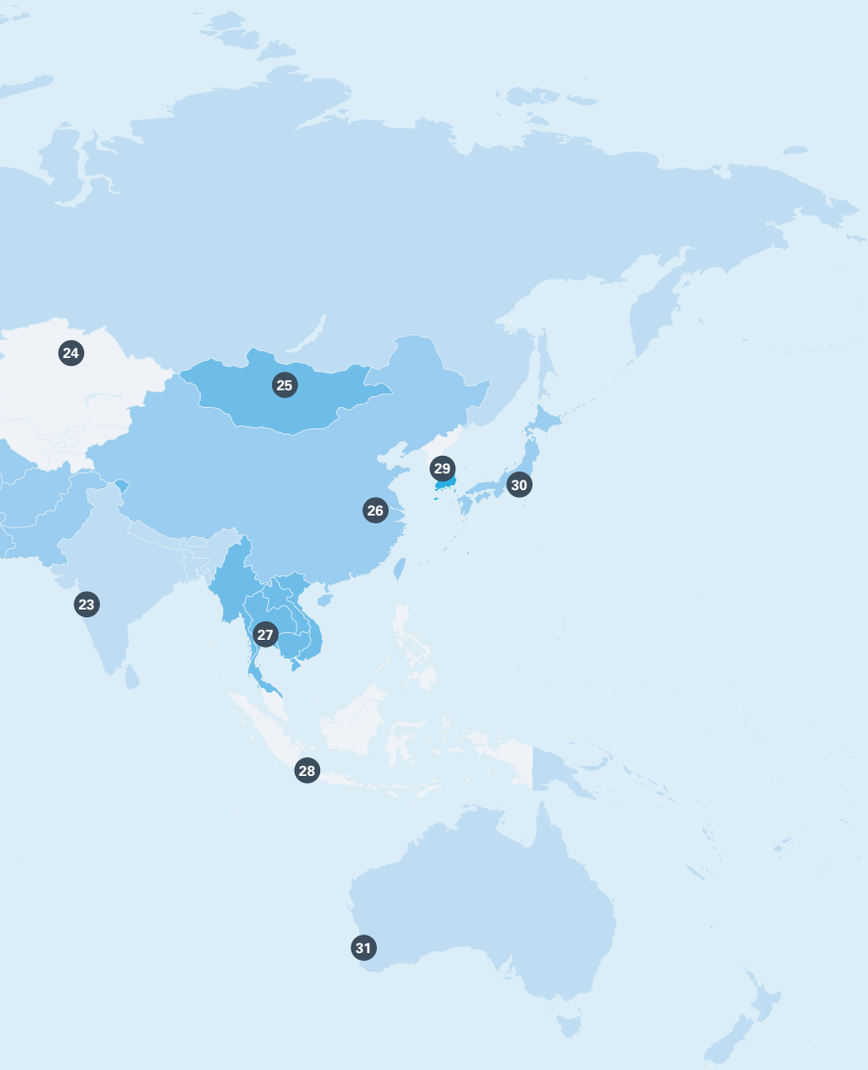
19 Mali & Burkina Faso
Bamako

20 Ghana
Obuasi

21 Eastern Africa
Nairobi

22 Southern Africa
Johannesburg

23 India
Pune



24 Central Asia
Nur-Sultan

25 Mongolia
Ulaanbaatar

26 Greater China
Nanjing

27 Southeast Asia (North)
Bangkok

28 Southeast Asia (South)
Jakarta

29 South Korea
Seoul

30 Japan
Yokohama

31 Australia
Perth

Find Epiroc in your country: www.epiroc.com

[In focus]
Sudbury, Canada

Hello there!
What's happening in Canada?

Martin Champagne
Automation Application Center Manager, Epiroc Canada

SUDBURY, NORTH of Toronto, is Canada's mining town. It's also the location of one of Epiroc's eight Regional Application Centers (RAC). **Martin Champagne**, Automation Application Center Manager at Epiroc Canada, elaborates on the efforts in digitalization, automation and interoperability.

What do your customers say about the Regional Application Center?

"The feedback is that we have higher competence onsite and nearby. Decentralized competence is the strength. We have done a dozen major projects when it comes to helping our customers with implementation and analyzing operations. The purpose is to support them in their digital journey."

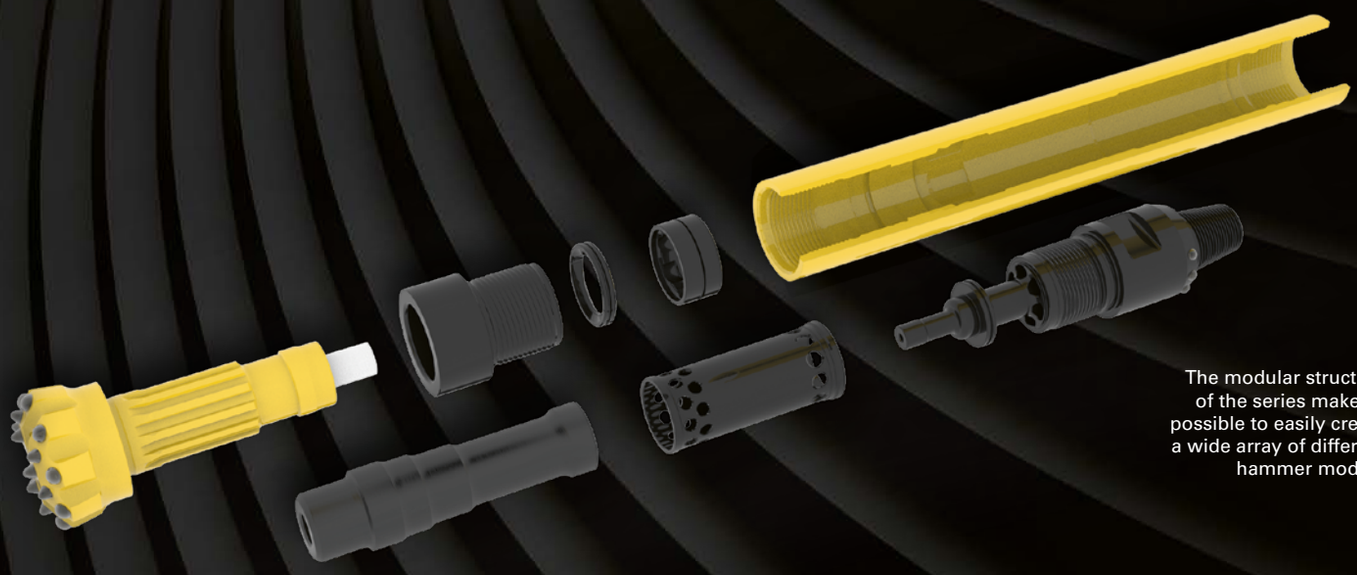
What challenges have you faced, and what are the center's success factors?

"Even though we've hired people specialized in network software, automation and IT, they needed a lot of training in the beginning. For example, our software developers spent six months of training at the Epiroc Excellence Center in Sweden. The key is to have the right competence in the team; it's all about the people."

Why was your project for Hudbay's Lalor mine in northern Canada such a success?

"Hudbay needed to increase the mucking productivity to discover more ore, or the mine might have had to close shortly. Our RAC team implemented operational excellence principles, especially short interval control (SIC), underpinned by digital infrastructure, including Mobilaris Situational Awareness and Certiq Telematics. The result was clear: the mine was able to increase ton hoisted by 350 metric tons per day over baseline." ×

Gustaf Höök Epiroc Shutterstock



The modular structure of the series makes it possible to easily create a wide array of different hammer models.

A hammer for every need

With COP 57P, Epiroc has produced a DTH hammer that can be tailored to each customer's unique challenges. **Daniel Gustafsson**, Project Manager Research & Development, explains how they went about the work.

What distinguishes COP 57P?

"COP 57P is a whole series of hammers with a modular structure. That is unique to DTH hammers and means you can create different models of the hammer just by varying a few details. The hammer can be used in mining and quarrying, as well as in water well drilling and geotechnical drilling. It comes in a total of 19 different versions."

Daniel Gustafsson
Project Manager, Epiroc

What is the benefit to the customer?

"The customer gets a hammer that's tailored to precisely their company. That applies not only to the type of drilling but also to the nature of the rock – is it hard or soft? And the type of compressor the company uses. Moreover, COP 57P is adapted to Epiroc rigs. All this means that both the rig's and the hammer's capacity is optimized. For example, the rate of penetration increases five percent compared to previous hammers, so productivity is higher in the end. And fuel consumption is lower since the hammer is optimized for the compressor's available air flow."

What challenges did you face in the development work?

"Creating a versatile hammer while minimizing the number of unique components. We did this by using proven techniques and taking the best from the COP, QL and QLX series. We took the best features from each and created a new hammer, while improving the plunger piston and instrument."

COP 57P in brief

- **Modular concept introduced, starting with 5" hammers.**
- **By varying just a few internal components, the resulting hammer has different characteristics.**
- **19 different variants available, each customized for a specific application (mining/water well/geotechnical) and rock formation (hard/soft).**
- **Air packages available on various drill rigs on market (high/low airflow & low/high air pressure).**
- **At least 5% higher ROP (rate of penetration) and 10% longer life.**
- **Released in the third quarter of 2021.**

More www.epiroc.com/rock-drilling-tools.com