Mining & Construction

A magazine from Epiroc

miningandconstruction.com

The Construction Issue 01–2022

INSIDE

[Our Customers]

Standard setters

LKAB heads alliance with ambitious sustainability goals

08–13

We help you transform

DEAR CUSTOMERS, the construction industry, much like the mining business, is evolving quickly. Automation and digitalization are transforming construction, from tunneling and infrastructure to demolition and waste management – optimizing safety, fuel efficiency, and productivity. At Epiroc we provide first-rate equipment and services to give you the cutting edge.

Take HATCON, a remote monitoring device for hydraulic attachment tools. It provides an overview of the entire fleet as well as the status of individual tools via My Epiroc, an easy-to-use application available on any device. Service reminders minimize unplanned stops. Ordering and delivery of parts are integrated, as are reports that can identify bottlenecks and optimize workflow. The effects on efficiency and profitability are substantial.

"Drill and blast" is the most common rock excavation method within the construction industry. We offer a dedicated range of drill rigs for these applications, many with market-leading fuel efficiency and features boosting safety, sustainability, and ergonomics for the operator.

If you work on tunneling and underground infrastructure, we cover your needs for face drills, ventilation, loaders, and trucks. Our Mobilaris solution, which presents real-time positioning and detailed status information, shortens evacuation times, optimizes traffic flow, improves work conditions, and reduces emissions.

IF DEMOLITION AND RECYCLING are your focus points, then our hydraulic breakers, concrete cutters and busters, hydraulic shears, and excavator magnets – among other products – will help you.

We also provide drilling tools for construction in all corners of the world. We have the most versatile portfolio of tophammer and DTH drilling tools on the market. The winning recipe is true partnership, great performance, and superior cost per meter.

Construction is indeed the main theme of this issue.

On my radar

Visiting customers again
After a couple years of not being able to travel due to the Covid-19 pandemic, I am very happy to be able to visit customers again.

The geopolitical situation
The times are uncertain and in some places very difficult. We are following the geopolitical situation closely.

Happy reading and 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

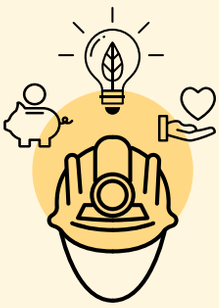
About Epiroc

Epiroc is a leading productivity partner for the mining and infrastructure industries. With cutting-edge technology, Epiroc develops and produces innovative drill rigs, rock excavation and construction equipment, and provides world-class service and consumables. The company was founded in Stockholm, Sweden, and has passionate people supporting and collaborating with customers in more than 150 countries.

Epiroc Group – get to know us better

Our innovations

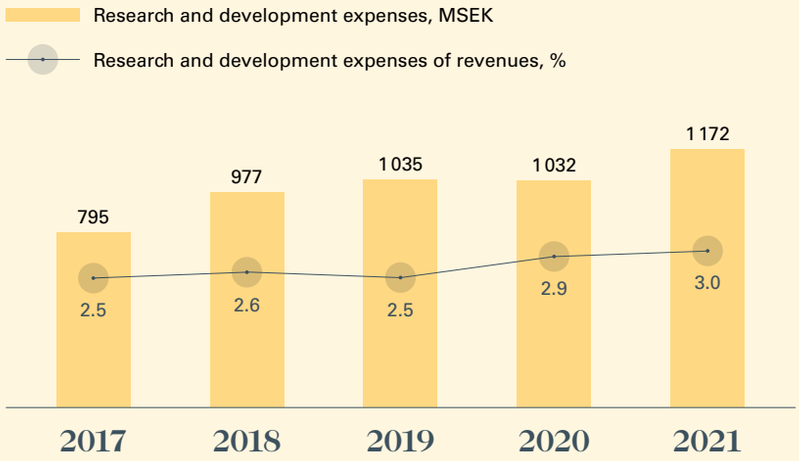
Our solutions aim to solve our customers' key issues – including requirements to reduce operating costs, increase productivity, increase utilization of equipment, reduce environmental impact, and enhance health and safety conditions.



Industries we serve

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

Research and development investments



Innovation is in our DNA and we are investing more than ever in research and development (R&D). Our innovation agenda goes hand in hand with our customers' sustainability goals.

The Group in numbers

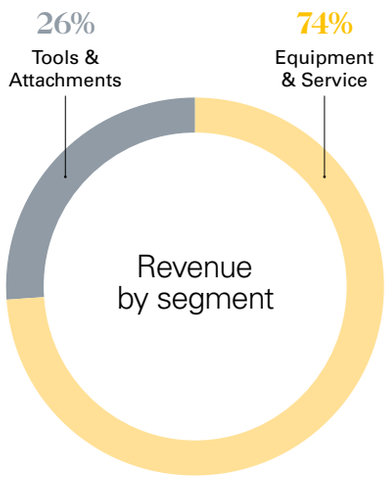
15 500

- **More than 15 500 employees.**
- **Customers in more than 150 countries.**
- **145+ years of experience.**
- **Revenue in 2021: SEK 39.6 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 digitalization 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 energy 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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[FEATURE]

CONSTRUCTION

Climate change is affecting the way most businesses work. Having a substantial carbon footprint, how does construction adapt?

26–41

SHUTTERSTOCK

FREDRIC ALM

ON THE COVER

The *A new world standard for sustainable mining* project is a huge undertaking for LKAB. The goal is to have a fossil-free and safe mine by 2030, at a depth of at least 2 000 meters. Technical manager Johan Enback has been involved since the launch.

The 33rd edition of Bauma will take place at Messe München in Munich, Germany, October 24-30. Bauma offers a comprehensive platform for construction machinery, building materials machinery, mining machinery, construction vehicles and construction equipment.

www.bauma.de/en

FREDRIC ALM

OUR CUSTOMERS

Monitoring progress

Part of the job for Marie Arngren – operator at LKAB's mine in Kiruna, Sweden – is to monitor autonomous machines.

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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 first

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

EPIROC PARTNERS WITH SSAB ON FOSSIL-FREE STEEL

Epiroc is partnering with steelmaker SSAB to secure fossil-free steel for use in the production of Epiroc's mining equipment.

"Sustainability is integrated in everything we do, and we are committed to halving our CO_2e emissions by 2030. This exciting partnership with SSAB will support us and our customers on the journey toward reaching our very ambitious climate goals," says **Helena Hedblom**, Epiroc's President and CEO. "It is clear that our innovation agenda goes hand-in-hand with our customers' sustainability agenda."

SSAB AIMS TO deliver fossil-free steel to the market in 2026, and in August last year the company showcased the first steel made of hydrogen-reduced iron. SSAB works with iron ore producer LKAB and energy company Vattenfall as part of the Hybrit initiative to produce the fossil-free steel, replacing the coking coal traditionally needed for iron ore-based steelmaking with fossil-free electricity and hydrogen. This process virtually eliminates CO_2 emissions in steel production.

Epiroc will initially use fossil-free steel for a prototype underground machine produced at its facility in Örebro, Sweden, and the plan is to increase the usage of fossil-free steel over time.

"Extending the collaboration with Epiroc to include fossil-free steel is a natural next step in our joint efforts to mitigate climate change, and we welcome it. We see an ever-increasing customer demand for steel with almost no carbon footprint," says **Martin Lindqvist**, SSAB's President and CEO.

In the shift to a low-carbon economy, development of new technologies like this is crucial for making the transition possible. The partnership with SSAB fits well with Epiroc's ambitious sustainability goals for 2030, including halving its CO_2 emissions.

Science Based Targets initiative

In 2021, Epiroc received validation from the Science Based Targets initiative (SBTi) for its targets to reduce emissions in its own operations, as well as when customers use the sold products. The SBTi validated Epiroc's climate targets as being in line with keeping global warming at a maximum 1.5 °C, consistent with the latest climate science and the goal of the Paris Agreement.

ALEXANDER VON SYDOW

Epiroc has partnered with steelmaker SSAB. Using fossil-free steel in the production of mining equipment will help Epiroc reduce its carbon footprint.

Helena Hedblom
President and CEO, Epiroc

Martin Lindqvist
President and CEO, SSAB

Epiroc acquires mining vehicle battery conversions specialist

EPIROC HAS ACQUIRED FVT Research Inc., a Canadian company with expertise in converting diesel-powered mining machines to battery-electric vehicles. The Vancouver-based company designs diesel-to-battery conversion kits and rebuilds mining machines to electric versions. The company has also recently been part of a successful project to convert the diesel-powered Epiroc Scooptram ST1030 loader to battery electric. FVT Research has about 25 employees and had revenues in 2020 of CAD 4 million (SEK 27 million).

Epiroc career pages – all new thinkers are welcome

EPIROC'S GLOBAL career pages have gotten a complete makeover. The goal is to provide potential candidates with insight into Epiroc and answer the questions: What does Epiroc stand for? What is it like to work at Epiroc? And what can I expect from Epiroc as an employer? The main message is "It all starts with people," meaning that Epiroc recognizes that our success comes from the commitment and engagement of the people who work here, but also from the people who are our partners, customers and other stakeholders.

CE version of Boyles C6/C6C released

EPIROC IS launching a CE version of the versatile surface core drill rig Boyles C6/C6C. It is equipped with a new Cummins engine with EPA Tier 4 and EU Stage V emission standards. Together with reduced emissions, the new Boyles rig, which will be released on the European and North American markets, will deliver various features focusing on productivity and safety.

FIGURE

500 hrs

NEW ENGINE

A NUMBER OF Epiroc DTH rigs – FlexiROC D50 and D55, SmartROC D50 and D55 plus the SmartROC CL – have been equipped with a new engine model for Tier 4F/Stage V. This upgrade means more power, increased uptime and improved fuel consumption. Service intervals have been increased from every 250 engine hours to every 500 engine hours under normal operating conditions, meaning more time drilling and reduced service costs for customers.

PROJECT NEWS

A game changer in bit changes

HIGHLIGHT

The Automatic Bit Changer carousel can store three rotary tricone bits in varying sizes and cutting structure, for a total of four onboard bits.

EPIROC HAS INTRODUCED the Automatic Bit Changer (ABC) for hands-free bit changes on Pit Viper 270 and Pit Viper 290 series drill rigs. The Automatic Bit Changer option is designed to change rotary tricone bits faster than manual changes and eliminates live work with the drill string for a safer way to operate a drill fleet. It makes it possible to complete drill bit changes with a single touch of a button, which can be done from either a remotely based control room or in the comfort of the cab.

More www.bit.do/epiroc-abc

Sustainability is integrated in Epiroc's business operations.

How do you contribute to sustainability in your role at Epiroc?

Fredrik Gabrielsson

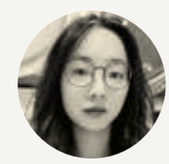
Marketing Manager Digitalization, Sweden

"Digitalization enables increased efficiency that not only reduces transports and time wasted. In addition to that, we strive to get more performance out of every product and thereby use fewer items. All in all, our digitalization efforts help lessen the carbon footprint."

Cemre Akalın

Electrification Product Lead, Turkey

"I try to keep our cross-divisional communication strong and make sure that we support our customers in the best possible way. Not only to choose the most suitable equipment according to mine site conditions, but also in regard to the sale of battery machines."



Tracy Feng

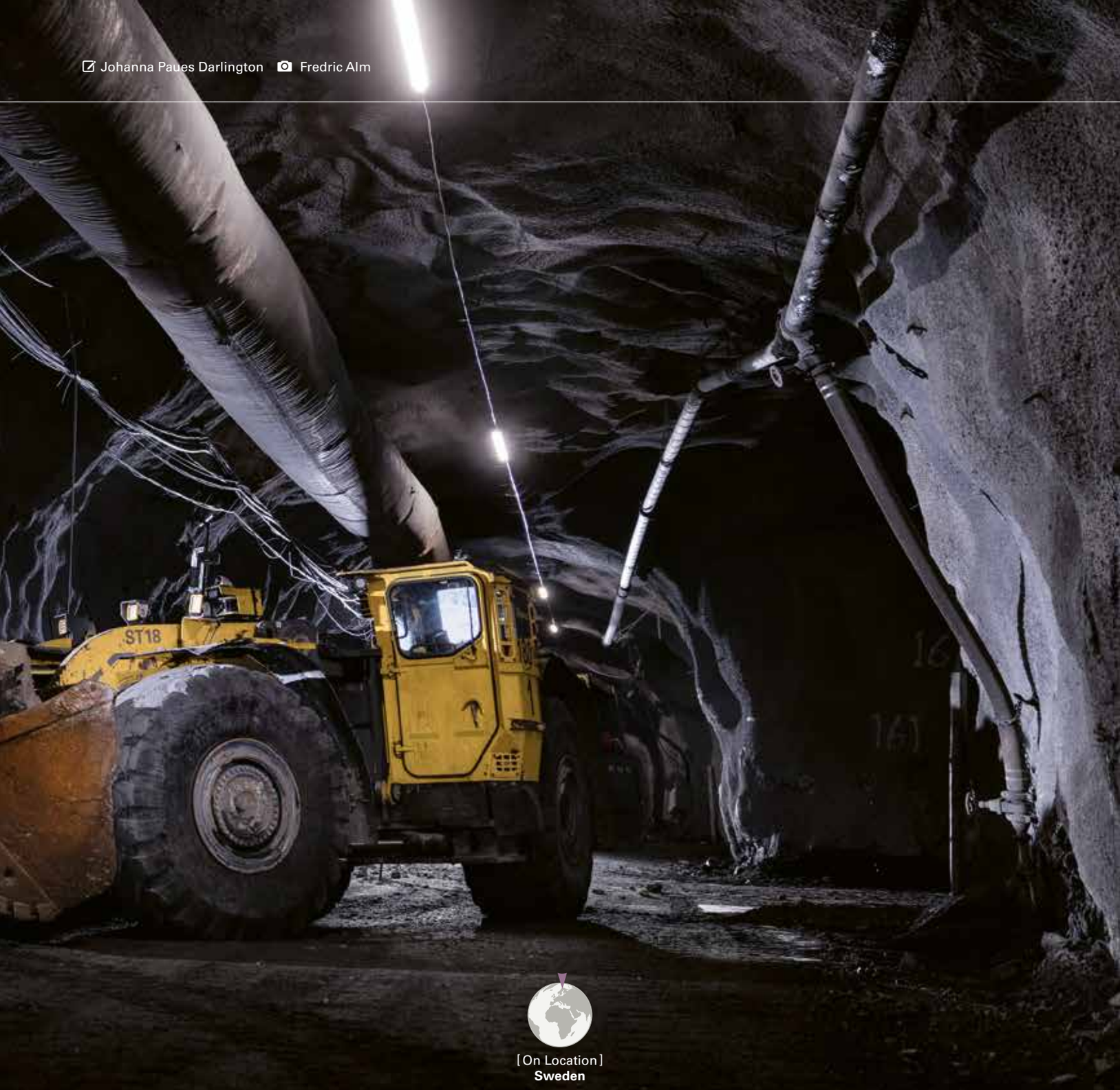
Electrical Engineer, China

"The *Safety first* practice is the basis of all work. Additionally, always keeping the mission and the vision of Epiroc in mind, for instance on digital mines, helps me apply intelligent equipment, automation technology and information technology to our products."

LKAB SETS THE SUSTAINABILITY BAR HIGH IN KIRUNA

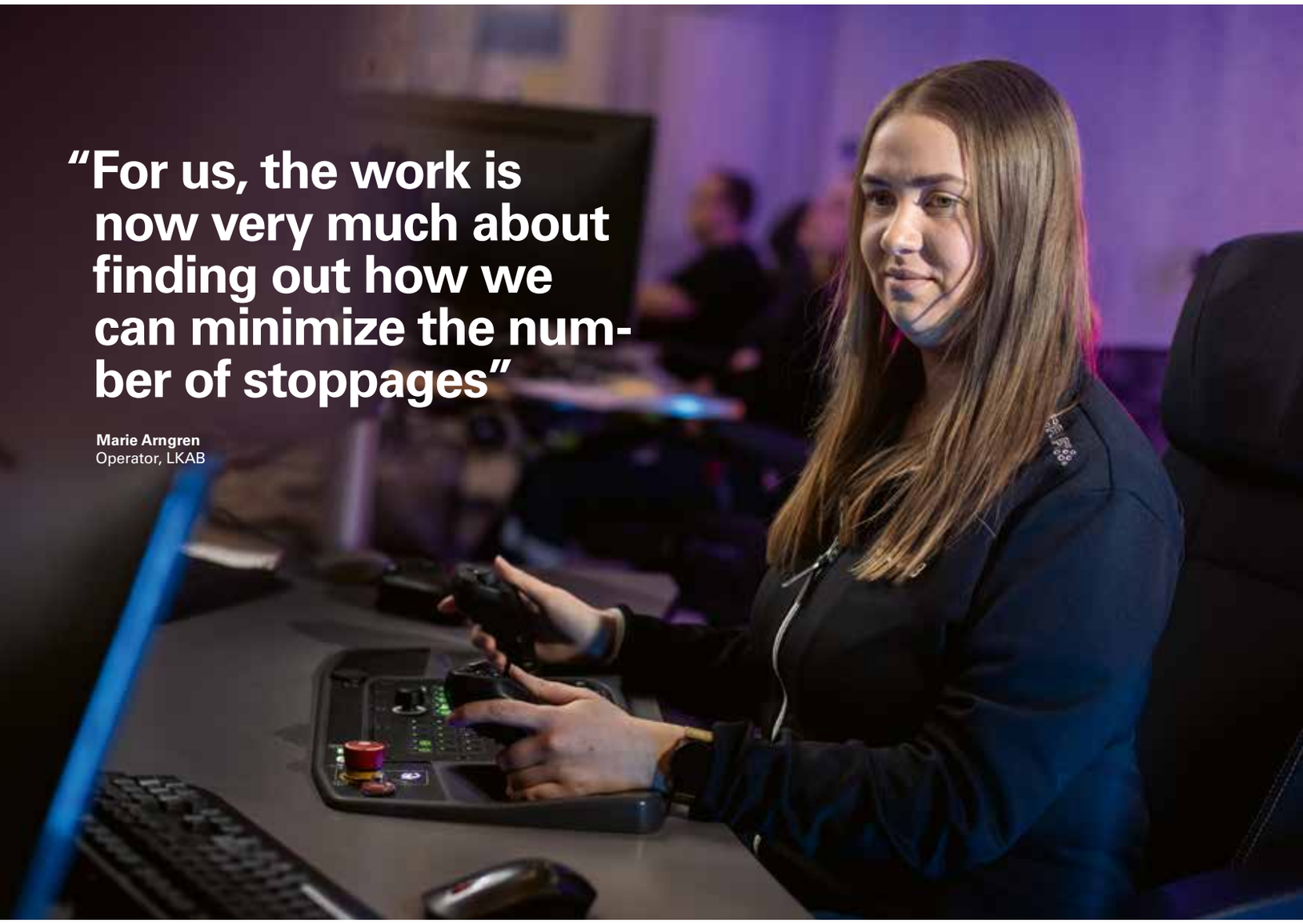
Deeper, smarter and greener

Johanna Paues Darlington Fredric Alm



[On Location]
Sweden

A fossil-free and safe mine by 2030, at a depth of at least 2000 meters. The Swedish mining company LKAB has a clearly defined goal – and once they have reached it, they will have set a new world standard for sustainable mining.



"For us, the work is now very much about finding out how we can minimize the number of stoppages"

Marie Arngren
Operator, LKAB

THE CURSORS MOVE step by step across the screen. Operator **Marie Arngren** sits relaxed in her seat and monitors what is happening. The office, located 1 365 meters below the surface, is furnished in a modern way, with purple lighting along the walls resembling a nightclub rather than a mine.

"We made the LED loop flash in different colors once, but it was so difficult to switch off that we decided to stick to purple," says Marie Arngren, laughing.

We are in one of LKAB's mines at Sweden's northernmost city, Kiruna. The company has been mining here in one of the world's largest ore bodies for 130 years, but in recent years it has also been running a parallel project: to create a new world standard for sustainable mining.

Marie Arngren
Operator,
LKAB

And this is where the cursors on Marie Arngren's screen become part of the story. They show how two autonomous loaders independently get from point A to point B in the mine. This is a procedure that is now in full use, and will eventually be part of the autonomous and emission-free mine of the future. Two, and soon three, of the loaders being tested come from Epiroc.

"For us, the work is now very much about finding out how we can minimize the number of stoppages due to the interruption of the safety circuit on the loaders – for example if someone has entered the area to work. On the Epiroc Scooptram ST18, this can be resolved by shrinking the safety area around the machine, which is good," says Marie Arngren.

JOHAN ENBACK SIPS his coffee in the coffee room in the office next to the mining area, and begins:

"It started with the UN's 17 sustainable development goals."

Johan is the technical manager for the *A new world standard for sustainable mining* project and has been involved since its launch four years ago.

"We asked ourselves what we as a mi-

ning company can do to contribute to achieving the climate goals. We knew we needed to go deeper into our mines to be able to continue mining ore competitively, but the climate goals made us wonder how we could combine sustainability with the ambition to dig deeper. And it was at that point that we realized that we would need external help," he says.

Said and done. LKAB probed the terrain and brought in Epiroc, Volvo, automation company ABB, and engineering consultancy Combitech – eventually Volvo changed places with Sandvik. This alliance decided to jointly find the solutions needed to make mining a sustainable industry.

"For Epiroc, LKAB is not a major customer, internationally speaking. But as companies, we are both at such a technological level that we have the capability of doing this together. We also have an easy time talking to each other," says **Joel Kangas**, Mine Manager at Kiruna Mine.

Johan Enback
Technical Manager, LKAB

Joel Kangas
Mine Manager, LKAB

Peter Keisu
Operator, LKAB

CREATING A NEW world standard for sustainable mining is no small task. Electric and smart autonomous mining machines need to be developed, but also digital systems where machines from different suppliers can communicate with each other. Another requirement of autonomous solutions is that everyone who needs to can see what is happening everywhere in the mine, in real time.

"The mines today are really deep. The major challenges lie in the amounts we need to break to be competitive in the future. We need to develop a method to extract 80 000 to 85 000 metric tons of iron ore a day," says Joel Kangas.

"Moreover," he explains, "new mining techniques and layouts must be developed that are better able to cope with the seismic activity coming from breaking much deeper into the rock than before. But a concept for this is already in place in our Konsuln test mine."

Running the project in partnership with other companies also brings added complexity.

More cameras on the loaders makes it possible to remotely control operations in the mine.

This is LKAB

- **Luossavaara-Kiirunavaara Aktiebolag (LKAB) is Sweden's oldest industrial company.**
- **It is 100% owned by the Swedish state.**
- **The company has 4500 employees in 12 countries.**
- **In 2021, the LKAB Group had a turnover of SEK 48.8 billion.**
- **The company has three main break areas: Kiruna, Malmberget and Svappavaara.**

"It's been a journey in itself, finding a work approach where those of us working together on this have enough confidence in each other to be able to lower our guard and collaborate," says Joel Kangas.

WE ARE BACK at level 1 365. Marie Arngren loads the ore by remote control from her desk. The actual loading is something the machines cannot yet handle themselves.

"The material is too uneven," says operator **Peter Keisu**, who works with Marie Arngren at the office with the purple lighting. He has worked in a mining environment more or less his entire

“It’s been a journey in itself, finding a work approach where those of us working together on this have enough confidence in each other to be able to lower our guard and collaborate”

Joel Kangas
Mine Manager, LKAB

professional life and thinks that the developments that are taking place are exciting.

“Some of the people who have worked in the mine for a long time are a bit worried about everything that’s going on, but I’m in favor of it. Of course, this new way of working will place greater demands on us operators. We must be able to administer the computer systems that control the rigs, go into them and solve problems when they arise. But this is the future,” he says.

THE SUN SHINES over the rugged mining landscape. Snow drifts colored with coal and graystone contrast sharply with the white mountain ranges in the background. A brand new battery-powered Epiroc Minetruck MT42 turns into a provisionally erected charging tent after a trip along its test route on the mountain. The mine truck has not been driven down into the mine yet, because Epiroc and LKAB first have to be sure that everything is working as it should. But the fact that it – like the other electrically-powered and autonomous machines that are now being delivered to the mine – is here at all is a major and important step in the project.

“So far, it’s mostly been theoretical activities and considerations. But now the really exciting work begins, when the machines arrive and we can really start testing them,” says Johan Enback.

With eight years left to achieve the goal, both he and Joel Kangas are pleased. The project is progressing according to plan.

“I’m not at all worried about the technology,” says Johan Enback. He thinks for a while and then adds:

“The biggest challenge is the soft issues, the people. LKAB has always been an innovative company and we are used to change, but what we are facing now is something extra. This will require a lot of us as an organization. A lot of people will be given new tasks and we will need new skills. But we’ll be able to do it, I’m absolutely sure.” ×

Epiroc and LKAB

EPIROC HAS LONG BEEN a supplier to LKAB. They have also been an alliance partner in the *A new world standard for sustainable mining* project since its launch in 2018. This means that Epiroc is involved in developing electric and autonomous solutions. So far, Epiroc has developed and delivered the Epiroc Easer L opening hole drill, one Minetruck MT42 Battery, two (soon three) autonomous Scooptram ST18s and two battery-powered Scooptram ST14s. Epiroc provides the Batteries as a Service solution for the battery-powered machines.

Konsuln, LKAB’s test mine in Kiruna

- **The new solutions are being tested at LKAB’s smaller Konsuln mine.**
- **More and more of the technical solutions are now being implemented in the rest of the production in Kiruna. Konsuln has a production rate of 1.5 million tons of iron ore per year (2022).**

Epiroc's Minetruck MT42 Battery returns from its route on LKAB's site. The mine truck's batteries, weighing five metric tons, take two hours to charge. Fully charged, it can run for around six hours.

FIVE KEYS TO SUCCESS

1 Innovative thinking

Building the mine of the future requires that everyone involved dares to think outside the box and find new solutions that have never been tested before. You cannot simply present what you have already brought to the table.

2 Objectives and communication

Changes often lead to fear and uncertainty. In order to get everyone on board, both internally and in partner companies, there must be a clear, shared vision that everyone works towards.

3 Dare to try – and stop

Daring to try new solutions is key to moving forward in a project like this. But it is just as important to dare to pull the handbrake when a sub-project does not appear to be progressing as intended.

4 Secure partnerships

Working in partnerships requires working methods that enable all parties, even those who are competitors on a daily basis, to feel secure and have the confidence to trust each other in order to be able to cooperate.

5 Production in focus

It is easy to lose track of yourself, get stuck in buzzwords and do things "just because you are supposed to". Production must always be in focus, whatever decisions are made. In the short or long term.

Frida Valentin Epiroc

Boliden Aitik has ambitious goals, and Mobius for Drills – Epiroc's platform to convert data into useful, actionable information – will improve business. Here, operator Felicia Väppling supervises operations.

[On Location]
Sweden

Aitik knows the drill

Real-time machine monitoring, continuous reporting and increased productivity. This will soon be the reality at Boliden Aitik in Sweden's northernmost region thanks to Mobius for Drills, Epiroc's new platform with AI technology.

NORTH OF THE Arctic Circle, just outside Gällivare, lies Aitik, Sweden's largest open pit copper mine and one of Europe's largest copper mines. When the mine opened in 1968, Boliden was hoping for 15 years of mining. Fifty-four years later, at least 23 additional years of mining are planned. In order to achieve production targets, Boliden must remain at the forefront of automated drilling and other modern technology. Mobius for Drills, a new platform to convert data into useful, actionable information, has been in use since last year with the aim of going even further. **Linda-Marie Lantto**, supervisor for preparation, explains more:

This year you aim to drill roughly 350 000 meters. What are the main challenges to achieving this goal?

"That everything works as it should, both autonomously and teleremotely. Aitik is a large, long-distance mine, so we need to do what we can to maximize drilling and be efficient. We save a lot of time being able to start the machines from the control room instead of going down into the mine."

How does Mobius for Drills work in your operation?

"We have been involved since the start and informed Epiroc about the challenges and needs involved in our daily work. Epiroc has been responsive and made changes to the platform during the journey. It's great working with a supplier who looks after the customer's best interests, and it's thrilling to have the latest technology in place."

What do you think Mobius for Drills will mean for the business?

"That we have more time for what we actually have to do. We hope that we can avoid having to write manual drill reports about where our machines are and how deep the holes are. Now we can rely on Mobius for Drills to produce the reports we need to help us with our work. Following our machines in real time and gaining greater insight into the entire drilling process is worth a lot. Our work is easier and more efficient."

How does the platform benefit your work specifically, and what strengths are planners highlighting?

"I mostly handle the drill maps and send them out to the machines, which in the long term will mean more insight into the process. What I've picked up from planners so far is that they get a better overview of where the machines are in the mine and good reports that facilitate planning. We look forward to gaining additional benefits from Mobius for Drills once we really get going."

Linda-Marie Lantto
Supervisor for preparation, Boliden

Mobius for Drills

- Platform with advanced digitalization technology for better planning, increased productivity and greater safety.
- User-friendly and flexible interface for both small and large operations.
- Drill operators and planners can quickly access information and reports to streamline decisions and optimize results.

More www.epiroc.com/mobius-for-drills

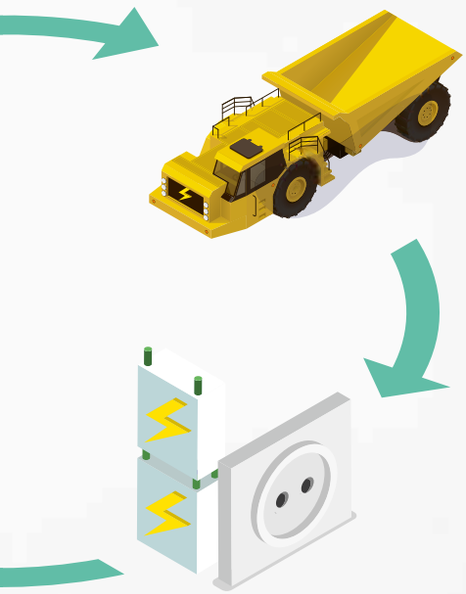
[On Location]
Sweden

Epiroc, ABB, and Boliden join forces

ELECTRIC REVOLUTION

PATRIK WESTERLUND
Boliden Senior Development Engineer, based in Kristineberg, Sweden.

Gustaf Höök Erik Abel (main photo), Jonas Westling (drone photo) Shutterstock



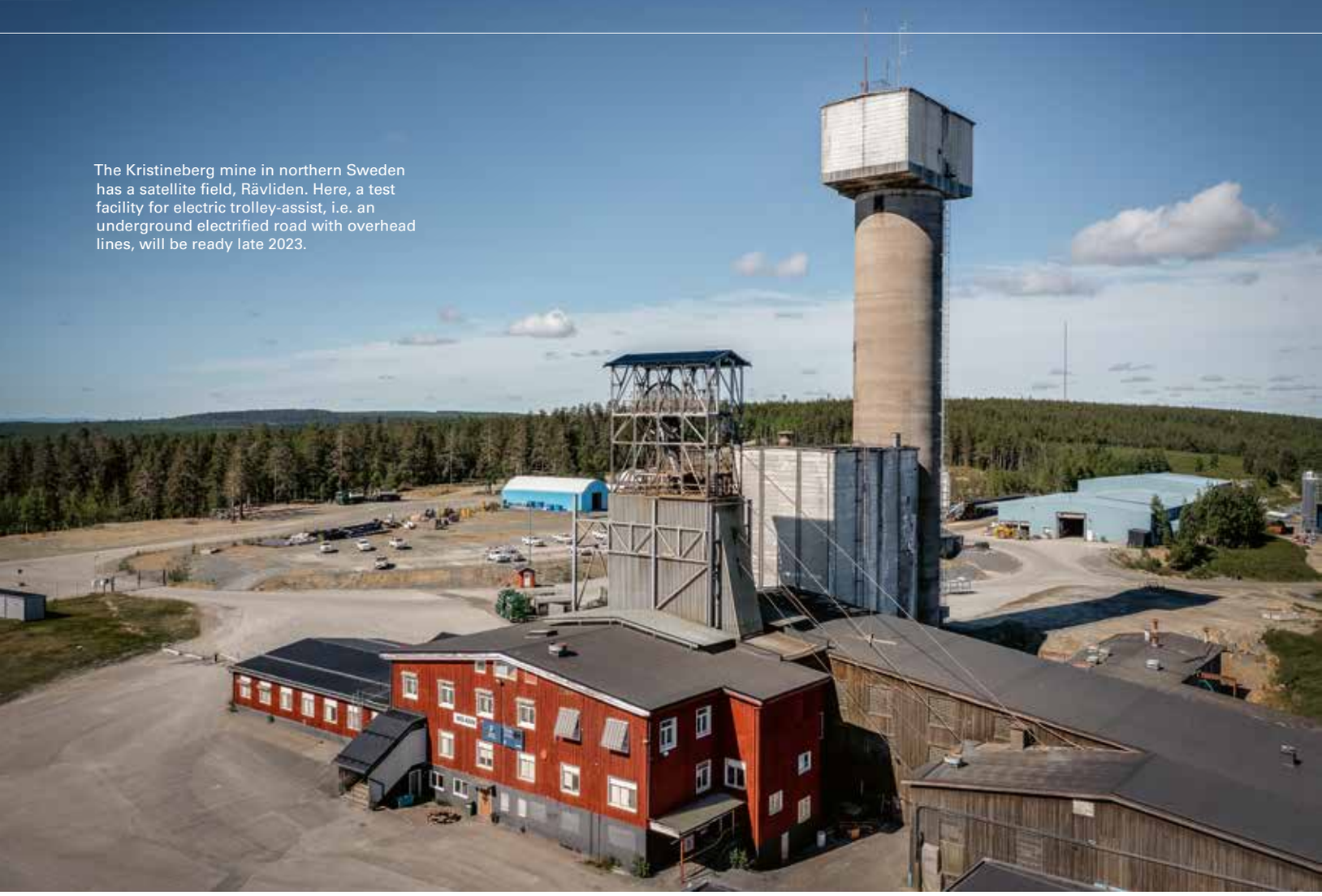
Electrification is an integral part of the mines of the future – but heavy haulage with battery-powered vehicles poses major challenges. Now Epiroc, ABB, and Boliden are collaborating on an electric trolley solution with the potential to revolutionize underground mining.

HOW MINES ARE operated and minerals are extracted is an important part of the transition to a more sustainable society. In order to become fossil-free, electrification is a must, but in particular underground mines face a major challenge. Since ore transport can be long and steep, conventional battery haulers are not always sufficient. Therefore, Swedish metal company Boliden has initiated a partnership with Epiroc and global technology company ABB to develop an electric control system for underground mines. This is being carried out with the support of Vinnova, Sweden's innovation authority, and will result in a test facility in the Kristineberg mine.

Mining & Construction Magazine brought together **Patrik Westerlund**, Senior Development Engineer at Boliden, **Katarina Öquist**, Global R&D Technology and Innovation Manager at Epiroc, and **Lars Brännström**, Strategic Account Manager at ABB, to learn more about the plans and collaboration.

KATARINA ÖQUIST

Epiroc Global R&D Technology and Innovation Manager, Underground division, based in Örebro, Sweden.



The Kristineberg mine in northern Sweden has a satellite field, Rävliden. Here, a test facility for electric trolley-assist, i.e. an underground electrified road with overhead lines, will be ready late 2023.

Tell us about the background to the initiative.

PATRIK WESTERLUND: "Boliden wants to be the most climate-friendly and respected metal supplier in the world. As part of this work, we will be electrifying our vehicle fleet, and in some applications battery machines require assistance from electric trolleys. Underground haulage puts too much strain on the batteries to make pure battery operation profitable."

KATARINA ÖQUIST: "There have been discussions with Boliden before, but now the timing is better. For example, Epiroc has a battery mine truck that is suitable for such a system."

LARS BRÄNNSTRÖM: "As Katarina says, both the technology and timing are right. Sustainability and social responsibility are more important than ever and help drive the development towards electrification."

PW: "The project will result in a test facility in Rävliden, which is a satellite field for the Kristineberg mine. It is an electric trolley-assist, i.e. an underground electrified road with overhead lines. ABB provides the electrical system and Epiroc is supplying the battery-electric hauler."

KÖ: "The mine truck should be able to go outside the trolley but connect to the line on the most energy-intensive routes, where the battery alone is not sufficient."

PW: "The aim of the test facility is to show that the technology works, but it should be possible to scale up the system. If all goes as we hope, a full-scale electric trolley assistance system will be implemented for Rävliden, which is a satellite field at the Kristineberg mine."

How have you set up the collaboration?

PW: "At Boliden, we set requirements and I head a steering group with representatives from all three companies. Then there are separate teams in each company. Everyone involved has ongoing contact and we have weekly status checks."

LB: "No one can succeed with a project like this on their own. It requires three parties and a working climate characterized by openness, respect, and mutual trust. This particular chemistry is in this group, and it's very inspiring."

KÖ: "Exactly, and it's not as easy as you might think. Vinnova is an important party here: partly as a catalyst and partly by putting pressure on it. Development is faster in a collaborative project like this."

In Focus: Boliden

WITH A HISTORY dating back to 1924, Boliden is a high-tech metal company with its own mines and smelters that work over the long term to guarantee society's supply of base metals and precious metals through the mining of ore (minerals) and the production and delivery of high-quality metals to the industry.

- Approximately 6000 employees
- Operations in Sweden, Finland, Norway, and Ireland

More www.boliden.com

PW: "For us, it is important that this is not only a solution for Boliden, but we want to standardize insofar as possible so that other players can also reduce their carbon footprint."

KÖ: "When we wrote the project application, it was striking how similar the three companies' climate goals were, even though we have different perspectives. Boliden wants to 'go green' and both Epiroc and ABB want to be enablers."

Patrik Westerlund
Senior Development Engineer, Boliden

Katarina Öquist
Global R&D Technology and Innovation Manager, Epiroc

Lars Brännström
Strategic Account Manager, ABB

What are the main challenges?

LB: "Even if it is a pilot plant, everything must be built on the basis of the specification of requirements for a production plant. This makes the journey more demanding, but it will be better in the long run. In purely technical terms, it is a challenging application, with high loads on both electrical infrastructure and powertrain."

KÖ: "Some components on the truck must be replaced and combined with the battery. And equipment is needed to 'remove' the voltage from the line and then convert it to the battery and powertrain. In the long term, autonomous functions will also be built in, which we must take into account at this stage."

LB: "Safety is of course very important, and this is about transferring power and energy in a cost-effective and maintenance-friendly way. The future costs must not be unnecessarily high."

How do you tackle the challenges?

PW: "To start with, close dialogue is crucial. Then we use simulation and 3D visualization to efficiently collaborate and work together to find the best solutions."

LB: "Simulation is clearly a key to success. We work with industry 4.0 and digital twins to verify physical properties. How much power and energy do you need to transfer, for example? All electrical equipment must work, while there are more parameters than in a normal system."

KÖ: "Thanks to simulations, we can shorten the time for development and testing, and this is particularly important in a project with three parties. When we arrive at the pilot, we have already identified things we need to look out for."

What do you think about the future potential?

KÖ: "It's big. Many are curious about what we are developing, not least other mining companies. The solution is an important subcomponent in the electrification of the fleet. Working with a standardized approach makes it useful in more mines."

PW: "Electric trolleys is an important technology for Boliden to become fossil-free in the long term. The most important thing for us, of course, is that this works in our own operations, but we see added value in the fact that the system is not developed specifically for us."

LB: "That's really good. Thanks to Boliden's experience, it is quicker to develop sustainable solutions in the industry." ×

4

KEYS TO A SUCCESSFUL PARTNERSHIP

The fact that Epiroc, ABB, and Boliden share a common history and shared vision creates good conditions for the electric trolley project in Rävliden.

Common goals

✓ The parties agreed at an early stage on what they were striving for. The journey there is characterized by clear communication and a solution-oriented way of working.

Transparency

✓ Since the companies have collaborated in the past, there is built-in trust. The project teams dare to talk about everything, even potentially "difficult" issues.

Engagement

✓ Working across borders with other cutting-edge companies contributes to extra drive in the project. Being involved in innovation creates a context. The fact that there is also a higher purpose – social benefit through increased sustainability – creates engagement.

Vinnova

✓ The fact that Sweden's innovation authority is involved as a catalyst and stakeholder creates a clear framework and positive pressure on the three companies.

More www.epiroc.com/zero-emission

AROUND THE WORLD IN BRIEF

SHUTTERSTOCK

A 21 kilometer stretch of the highway between Hallsberg and Örebro will include transformers and technology to transfer electricity to vehicles.

A 21 km section of the E20 in Sweden will have truck-charging capacity

SWEDEN'S TRANSPORT ADMINISTRATION, Trafikverket, has announced the location for its planned electric road, capable of charging heavy electric vehicles. A 21 kilometer stretch of the two-lane E20 highway, between the towns of Hallsberg and Örebro will include transformers and technology to transfer electricity to vehicles. The final road plan is set to be in place by early 2024, and construction work completed by 2026.

Although the technology that will be used on the road has not yet been announced, Trafikverket recently helped to finance a pilot program, named EVolutionRoad, in the city of Lund. Here, a ground-level feeding system charges vehicles (with retractable electrical pick-ups) as they pass over it. The EVolutionRoad program has been running since 2020, gathering data from an electric bus that travels the route for one week each month.

China plans greener, smarter and safer construction

THE CHINESE GOVERNMENT has released a five-year development plan for the construction industry that aims to put the industry on a "greener, smarter and safer path," *International Construction* reports. The industry is to increase the modernization of its industrial chain, develop the preliminary stages of a green and low-carbon production mode, apply information technologies more broadly, and improve the safety and quality of buildings.

SHUTTERSTOCK

Judy Kuszewski
Chief Executive at Sancroft

How do we ramp up sustainability?

The Global Reporting Initiative (GRI) is developing mining sector sustainability standards. As chair of the board, please tell us more.

"The sector standards are designed to facilitate the use of the GRI standards by members of a given industry group. The intention is to help organizations prepare and report information on the sustainability issues that are considered most important. Utilizing the expertise of people in the sector will highlight the topics that stakeholders have coalesced around."

Who will be involved in the process?

"There's a technical committee with multistakeholder membership: business, civil society, mediating institutions – consultancy and academic stakeholders – financial markets and labor."

What about challenges in the process, and future benefits?

"The diversity of the sector is a big challenge. The standards won't all be relevant to all operators in the sector, but a high proportion of the sector is already participating in sustainability reporting-related activities, so there's capacity to do this work well. I hope we will significantly advance the creation of a common language for sustainability in the sector, so that stakeholders can maximize the benefits to society."

More www.globalreporting.org

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 IMF: Future metals demand may exceed supply

Washington DC, USA

Future metal demand from the coming energy transition may be more than current global supplies can provide, the International Monetary Fund (IMF) said in a blog on December 8, noting that the energy transition might require as much as 3 billion tons of metals. Replacing fossil fuels with renewable energies would require investments in green energy to increase eightfold. However, mine development and production are on much longer timelines and may not be able to provide the necessary metals in time, the IMF said.

2 BHP invests $50M in Tanzania green nickel project

Kabanga, Tanzania

HP will invest USD 10 million in UK-based green technology provider Lifezone as part of its plan to participate in the Kabanga Nickel Project in Tanzania, *Mining Magazine* reports. The company is investing a further USD 40 million in Kabanga to improve the development and supply of Class 1 battery-grade nickel, cobalt and copper. "Lifezone's hydrometallurgical technology provides a greener, lower emission and higher margin product and will allow full beneficiation of metals in-country," Kabanga Nickel said.

3 India goes on infrastructure spending spree

New Delhi, India

India's government will step up spending to 39–45 trillion rupees (USD 529.7 billion) in the 2022/23 fiscal year to build public infrastructure and drive economic growth. But this will involve a bigger fiscal deficit than budgeted and record borrowing, according to a news report from *Reuters*. Trillions of rupees will be allocated to expressways, affordable housing and solar manufacturing, to put growth on a firmer footing, said Finance Minister Nirmala Sitharaman, presenting the annual budget to parliament.

4 LEDs combined with copper may open new doors

Sapporo, Japan

Hokkaido University researchers have found a way to use light-emitting diodes (LEDs) in combination with a copper-based molecular catalyst to develop a more sustainable way to make key chemical subunits that have potential uses in pharmaceutical and photoelectronic development, *mining.com* reports. In a paper published in the *Journal of the American Chemical Society*, the scientists explain that the technique allows them to perform what is known as a cross-coupling reaction, in which two molecules are joined via a carbon-carbon bond. This is one of the most widely used types of reactions and is essential for creating most of the chemical products used today.

SHUTTERSTOCK

COP MD20 AT ETI BAKIR

THE TIME SAVER

The COP MD20 hydraulic rock drill significantly reduces set-up time and repair costs for Turkey's largest copper and pyrite mine, extending production time and helping miners work efficiently deep underground.

[On Location]
Turkey

ONE THOUSAND METERS beneath the earth's surface, the humidity is intense. Time is of the essence in 370S21, a tunnel in Turkey's Eti Bakir mine. Pyrite twinkles softly from drill sites in the rock face.

"We are drilling about 37 ore and rock faces each week," said onsite operations manager **Mustafa Genç**, standing ankle-deep in mud behind a Boomer face drill rig equipped with a COP MD20 hydraulic rock drill, the drill-bit tilted and ready to perform on the jagged basalt surface. "The advantage of the COP MD20 is that it saves time, which means less time underground," he said.

The operations team at Eti Bakir decided to upgrade their rock drill to a COP MD20 from Epiroc approximately two years ago and praised it for its time-saving abilities. The COP MD20, they said, requires far less repair time and less setup once inside the mine.

"This particular rock drill is very good; I'm extremely satisfied with how it's performing. It's even good with harder rock surfaces," said drill operator Serçan Ay, who has worked in the mining industry for twelve years, eight of them at Eti Bakir. "There are no delays to finishing the job according to plan with this drill."

"Most of the time I finish early," he continued. "It takes me two, maximum two hours and ten minutes, to finish an ore face. With the previous drill, you were just pushing hard to get the maximum results, and then it had problems." He

Ruth Michaelson Bradley Secker
Fredrik Saarkoppel, Epiroc & Shutterstock

Eşref Karakabak and another miner take a break outside a canteen one kilometer deep inside the Eti Bakir mine.

added that the COP MD20 requires less time to change drill bits and other parts once in operation at the rock or ore face.

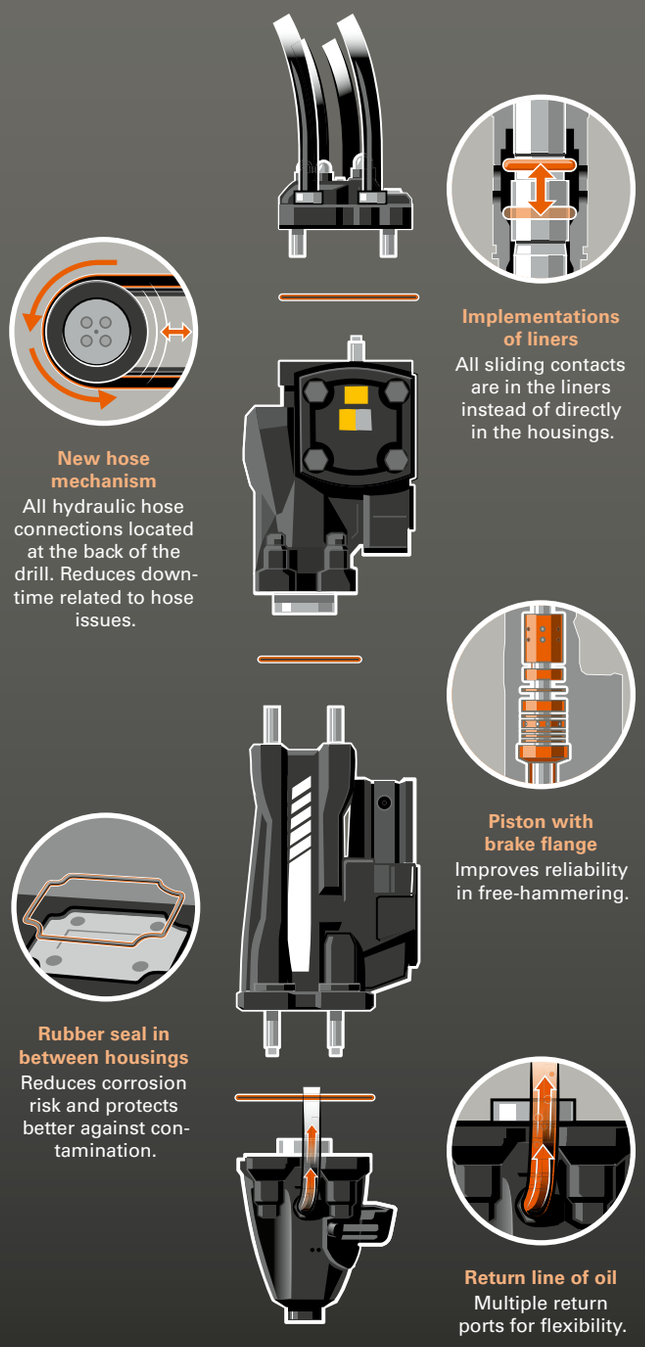
Eti Bakir is Turkey's largest mining and metallurgy operation, producing 1 490 000 metric tons of raw copper ore, 180 000 metric tons of copper concentrate and 450 000 metric tons of pyrite concentrate every year through underground mining. At present, it provides seven percent of Turkey's entire copper supply, with an aim to reach nine percent.

DRILL OPERATORS SPEND a maximum of seven and half hours each day deep underground in Eti Bakir, which requires miners to take an elevator ride deep into the center of a mountain in the Turkish town of Küre high above the Black Sea. For operations managers like Genç and his operators like Ay, finding ways to maximize time spent in the mine is essential. Although the miners can pause for lunch in their underground canteen

LEARN MORE // COP MD20

Less downtime – more productive

THANKS TO MORE efficient percussion mechanism, enabling higher frequency, the rock drill improves production.



New hose mechanism
All hydraulic hose connections located at the back of the drill. Reduces downtime related to hose issues.

Implementations of liners
All sliding contacts are in the liners instead of directly in the housings.

Piston with brake flange
Improves reliability in free-hammering.

Rubber seal in between housings
Reduces corrosion risk and protects better against contamination.

Return line of oil
Multiple return ports for flexibility.

More www.epiroc.com/cop-md20

Maintenance manager Sezeyi Özer stands on the mountain atop the Eti Bakir copper mine, overlooking the Black Sea town of Küre.

Mustafa Genç
Operations Manager, Eti Bakir

Kazım Küçükateş
Mine Manager, Eti Bakir

Sezayi Özer
Maintenance Manager, Eti Bakir

without going above ground, additional minutes spent drilling or changing parts can be costly. For the managerial staff, sending drills to be repaired at Epiroc's operations in Ankara 300 kilometers away can shave up to a week off vital production times.

"Our parameters for choosing equipment are the repair time, the drilling time and the cost. When we look at these benchmarks, the COP MD20 is about one-third better than other drills of a similar type. The design of this drill is simple, which simplifies repairs. Time and cost for the repairs are low, which are the main points for us," said Genç.

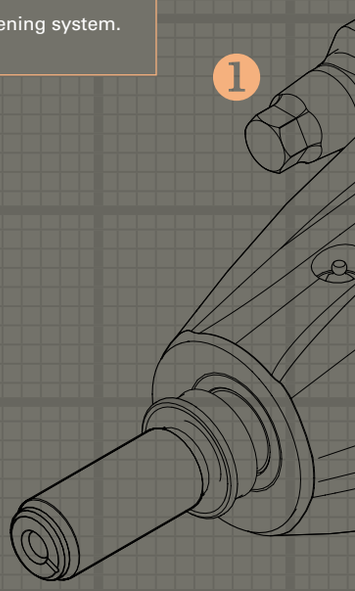
Kazım Küçükateş, who manages Eti Bakir, explained why they chose to invest in a COP MD20 instead of continuing with its predecessor model. "We had too many breakdown issues before, which meant frequent repair periods," he said. "We don't do repairs on-site, which means each drill is off-site for a minimum of four days to one week. The financial loss was between €20 000 and €30 000 each time."

Tests run at Eti Bakir found that the COP MD20 could operate for 938 hours continuously without needing to be serviced. Küçükateş also pointed to drilling speed tests, which showed that the COP MD20 runs 32–35 percent faster than the previous model. "Instead of 1.5 face drilling per shift, it can easily complete around two faces," he said.

Eti Bakir now owns five COP MD20 rock drills, four of them are mounted on jumbos and one is kept as a spare. "I can say that the COP MD20 is fantastic!" said **Sezeyi Özer**, a maintenance manager. "It hardly needs any maintenance and is much faster." ×

Technical specifications

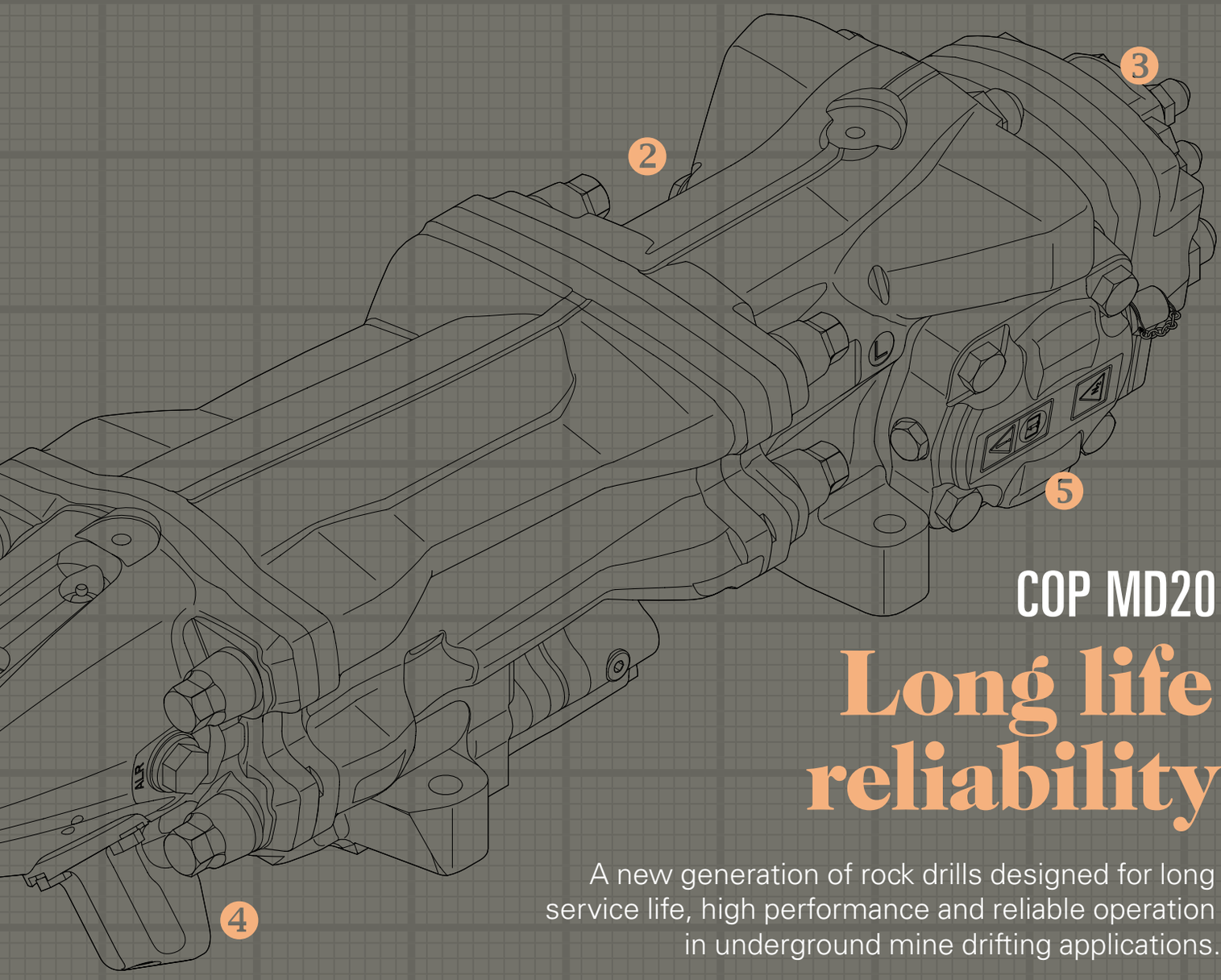
1. One part number conversion kit to fit existing 2000 and 6000 series feeds available.
2. Sealed off mating surfaces.
3. All hydraulic hoses connected in the rear part of the rock drill.
4. Few rigid housing parts.
5. Dual dampening system.



Etik Bakir Co.

Eti Bakir is Turkey's largest copper and metallurgical mining operation, and it intends to meet up to nine percent of national demand in the next few years and 15 percent of national demand in combination with the Murgul plant (also owned by Cengiz Holdings). Eti Bakir Co. comprises six different mining facilities across Turkey.

More www.etibakir.com.tr



COP MD20

Long life reliability

A new generation of rock drills designed for long service life, high performance and reliable operation in underground mine drifting applications.

Küre Plant

Cengiz Holding took over the plant in 2004. Following the acquisition, exploration below existing tunnels showed new reserves of copper ore and pyrite. In 2014, drilling operations for new ore reached 1 000 meters deep inside the Küre Plant. Today, the sophisticated underground system descends to over 960 meters, including some concrete-lined tunnels 40 kilometers in length.

The Küre plant in numbers

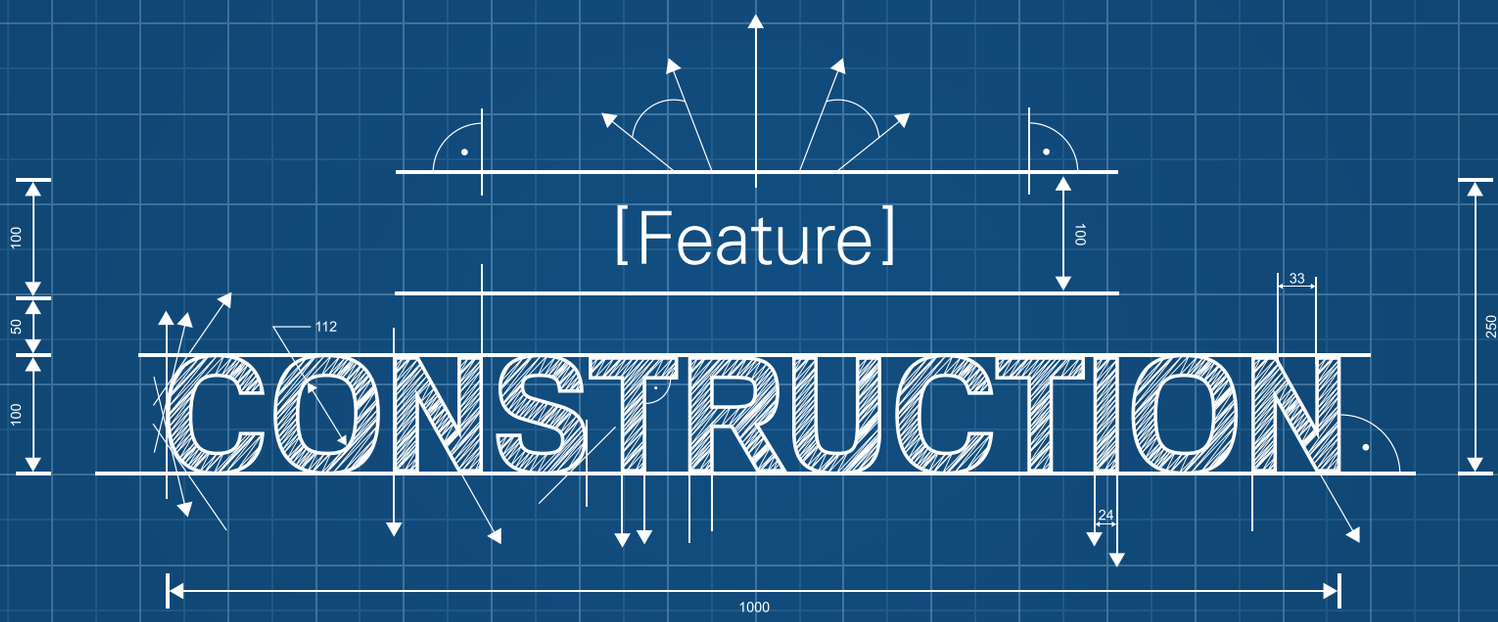
29
Cu
Copper

Tons of copper
Annual production of 1 490 000 metric tons of raw copper ore.

Deepest in Turkey
Turkey's deepest mine at 960 meters.

4 000

Big workforce
4 000 employees in total at eight different mines.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CONSTRUCTION
100
50
100
100
112
33
250
24
1000

520

Construction is changing the face of the planet – and the conditions in which we live and work. It is also a key factor in building a world geared towards sustainability. In the last few years, we have gained a deeper understanding of what it will take to make construction techniques and materials more sustainable.

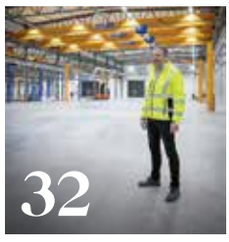
CONTENTS

450

ORIENTATION

The concrete conundrum

To meet the future, both building practices and construction materials like concrete have to evolve.



ON SITE

A smarter production site

Epiroc's revamped and expanded Eyra factory will be more sustainable and provide better deliveries.

38

PERSPECTIVE

Connecting oceans

One of the most challenging projects in the history of construction, the Panama Canal, would not have been possible without developments in technology – or in healthcare. Yet it still cost countless lives.

40

SURVEY

EU's plan for climate neutrality

Europe's aging building stock suffers from a low rate of energy renovation, which is insufficient to meet Europe's climate and energy goals. The European Commission is addressing this with new legislation.

41

SEVEN THINGS

Testaments to imagination

From the deepest seabeds to the loftiest heights, ingenious construction projects can be found all over the planet – and beyond. Here are a few that we consider modern Wonders of the World.

BJÖRN OBERG, ANDREAS HYLTHÉN

Building a better tomorrow

Christian Tarras Ericsson Björn Öberg Shutterstock

Construction is humanity's main tool for shaping the world – for better and for worse. As essential as construction is, it also comes with a price tag in the form of a carbon footprint. How will construction have to adapt in a world of climate change?

CONSTRUCTION HAS EVOLVED alongside humanity; starting with humble habitations like shelters and huts, progressing to paved roads and winding aqueducts, spreading under our feet along tunnels and subways, to touch the clouds with skyscrapers half a mile high.

Construction provides housing, factories and places of commerce, as well as roads, railways and airports. Bridges spanning gorges and bays, and tunnels connecting cities and countries. Potentially, construction can help us to reduce our carbon emissions if used in smart ways. At the same time, it comes with a carbon footprint of its own.

"Emissions continue to grow, and we're seeing the effects of it here in Vancouver. Heat waves, floods and forest fires are increasing. Recently extreme weather destroyed our seawall, which will cost millions of dollars to repair. The city has an obligation to step up," says **Doug Smith**, Director of Sustainability for the City of Vancouver, Canada.

VANCOUVER HAS BEEN tackling the climate change issue since the early 1990s. In November 2020, the city approved a plan to halve carbon emissions by 2030. The plan aims, for example, to continue to grow public transport, bicycling and walking, as well as reduce energy use and steer towards renewable energy and greener solutions in building projects. By 2050, the city plans to have at least net zero emissions.

"Greener forms of concrete, and using less of it, can reduce the carbon footprint. We're also looking at alternative building materials like cross-laminated timber. We're building protected bike lanes and dedicated bus lanes, and our Skytrain system has been very effective when it comes to getting people out of their cars," says Doug Smith.

Doug Smith
Director of Sustainability, City of Vancouver

Karen Scrivener
Head of the Laboratory of Construction Materials, EPFL

Usually, the local building codes in Canada are controlled by the provinces. Vancouver, having control of its own code via the Vancouver Charter, is in a unique position. This enables the city to push emission reductions harder and faster than the province and federal government – in the hope that they and other cities will follow suit.

"For example, we are changing the zoning to remove the requisite for on-site parking in new residential buildings if they are near transit, which will considerably reduce the need for concrete and result in fewer cars. We have also begun demanding embodied carbon calculations for all rezoning permits, which provides us the data needed to start regulating reductions in embodied carbon," says Doug Smith. He concludes:

"Greener solutions are better for society and less expensive in the long run. In fact, we're kicking ourselves – why didn't we do this a long time ago? We will have a city that's better better for walking, uses less energy, has better air and happier and healthier people."

THE KEY TO making construction sustainable in the future is reducing the concrete carbon footprint, which comes mostly from the cement binder production process. Cement production is responsible for eight percent of the total global carbon emissions today. Perhaps surprisingly, concrete has a relatively low carbon footprint per weight unit – in comparison, brick has ten times the embodied carbon. The problem comes from the huge volume used.

"Concrete has overwhelming dominance, with more than 30 billion tons used each year. To replace just one quarter of the concrete with timber, you would need new forests with an area of 1.5 times that of India. So that's

"There are no miracle construction materials waiting for us out there"

Karen Scrivener
Head of the Laboratory of Construction Materials at EPFL

simply not a viable option," says **Karen Scrivener**, head of the Laboratory of Construction Materials at EPFL in Switzerland.

The reason for concrete's success is manifold: it uses limestone for the cement, which is available in abundance almost everywhere; it is cheap, flexible and easy to use; and it is long-lasting and resistant to external influences. As a construction material, it is hard to beat.

"There are no miracle construction materials waiting for us out there, which some people like to claim. At best, the claims are over-exaggerated, at worst, blatantly false. What we can do is replace part of the cement in concrete with other binders. Slag and fly ash are commonly used, but they are by-products of heavy industry and come with their own problems," says Karen Scrivener.

THE GAME CHANGER, she says, is calcined clay. Combined with ground limestone to produce a material called LC3, it can easily replace 50 percent or more of the cement in concrete with no drawbacks. If implemented everywhere, it would reduce carbon emissions from concrete by more than 400 million metric tons per year.

"Calcined clay is readily available globally, and feasibility studies we've made show that the concrete will actually be cheaper to produce. At the moment, there are already two plants producing LC3 and another 10 to 20 coming in the next few years."

In combination with other efforts to use concrete more efficiently and in smarter ways, it could be possible to reduce the carbon footprint from concrete by around 80 percent.

"So, to get to net zero emissions we will need to implement carbon capture, as well. But offsetting 20 percent is more realistic than 100 percent," says Karen Scrivener.

In other words, the evolution of construction continues. Hopefully, in time to change the world for the better.

HOW TO FIT EVERYONE IN?

The Vancouver zoning challenge

DOWNTOWN VANCOUVER is one of the most densely populated areas in North America, second only to Manhattan, while the rest of the city in large part consists of developments with single-family homes supported by remote commercial centers. This creates both equity and sustainability issues.

Changes in zoning and the building code have aimed to create pockets of more self-sufficient "villages" and increase residential density by converting homes to duplexes and allowing for so-called laneway houses – smaller houses built on backlots.

"Laneway housing created a whole new industry. Suddenly, 60 000 lots opened up. There's a constant shortage of housing and consistent demand," says Bryn Davidson, co-founder of Lanefab, a company that builds passive houses.

[On Location]
Sweden

A factory for the future

Epiroc's new, old plant in Örebro, Sweden, will more than double in surface area and concentrate production in one place. Sustainability, safety, and logistics have been high on the agenda.

Christian Tarras Ericsson Andreas Hylthén

"We have strived for a good overall solution. Adhering to the budget, meeting targets, satisfying legal requirements and regulations, but also making sure that this is a boost for everyone who works here"

Anders E. Karlsson
Project Manager, Production Engineering and Operation Development, Epiroc

WHEN EPIROC'S FACILITY in Eyra, Örebro, Sweden, is completed, the production of exploration equipment and surface drilling equipment will be brought together under one roof. The state-of-the-art facility, with several innovative solutions, houses both the production areas and offices.

"The goal has always been to consolidate production with Örebro as a hub to gather expertise and meet future requirements. The first step was to move the production of exploration products from Märsta to temporary premises in Kvarntorp. Then we expanded the factory here in Norra Bro, on the outskirts of Örebro, to gather everything under one roof," says **Thomas Hallmén**, General Manager.

Flexibility and efficiency have been keywords for planning and designing the new premises. This is partly so as to adapt production to meet customer demands more quickly and more easily, and partly to be able to better monitor market fluctuations. Of course, sustainability, energy efficiency, and safety and well-being have also been on the agenda.

"We've kept costs within the framework, and the results have been better than I imagined. We are now filling the shell and adapting it to our needs, and it will be exciting to see how it turns out," says Thomas Hallmén.

FROM THE NEW PLAZA and reception in the entrance, the path leads past the new dining room via airy but sturdy oak stairs to the office floors. The dining room is designed to give the feel of a bistro, the kitchen has been expanded and improved, and you can also buy coffee and cake here.

"The entrance is very bright, green and welcoming. We wanted the material choices to immediately give us a sense of what we're doing here: the surface business," says **Anders E. Karlsson**.

He is the project manager for the expansion, which has been internally called "brownfield", as it involves rebuilding and expanding the existing plant – unlike the more virgin greenfield projects.

"I've been involved since 2014, when we moved operations from Märsta to Kvarntorp. The brownfield assignment has had three parts. First, complete the move here to Norra Bro. Second, enable the production of new products. And third, be able to get rid of the temporary office barracks we had to accommodate the white-collar staff here. The latter is also about increasing our attractiveness.

The production area will more than double in size. Also, the new section has more daylight, better lighting and lighter materials.

Thomas Hallmén
General Manager, Surface division, Epiroc

Anders E. Karlsson
Project Manager, Production Engineering and Operation Development, Epiroc

Competence is in high demand," says Anders E. Karlsson.

The new offices cover 2 000 square meters, with both work rooms and open, flexible office solutions. Textile mats and curtains dampen disruptive noise, and there are also smaller rooms for phone calls and undisturbed work. The conference rooms are well-equipped for both live and digital meetings. The building is energy-efficient with, for example, presence-controlled LED lighting and heat recovery in the ventilation.

Anders E. Karlsson leads the way out into the production area, which will more than double in size. There are noticeable differences between the old part and the new part – not least when it comes to light. The new section has more daylight, better lighting and lighter materials. But improvements have also been made in the old production halls, the oldest parts of which date back to the 1940s.

"We've formed working groups together with the employees for both the office and production, and they've come up with requests that we've tried to take into account. And we have strived for a good overall solution. Adhering to the budget, meeting targets, satisfying legal requirements and regulations, but also making sure that this is a boost for everyone who works here," says Anders E. Karlsson.

A LOT OF EMPHASIS has been placed on improving logistics and material flows. **Daniella Polbring**, Flow Leader, Material Handling, appreciates this.

"Previously, we had warehouses in several places – here in the factory, in Kvarntorp and also externally. This entailed a lot of unnecessary handling and transfers. Now we're consolidating everything here, with larger areas for goods receiving, better control of traffic, and more material passages and unloading positions," she says.

A new, taller warehouse with high-lift trucks will store almost everything except bulky goods. QR codes will be used in the warehouse instead of entering information manually, which will reduce the risk of mistakes.

"For smaller goods, we will have an eight metre-high automated storage and retrieval system. We register what we need, and then it comes out automatically. This is something completely new for us, and we see great possibilities in adapting it to

Q&A

Alexandra Nordvall
Facility Manager, Epiroc Rock Drills AB, Örebro, Sweden

In connection with the brownfield project, Epiroc acquired the property from the former owner, a real-estate company. One of the goals was to be able to influence property development, not least in terms of energy efficiency.

Q What are the advantages of owning the property?
A "When we took over, we were able to sit in the driver's seat and set the course ourselves, thus having a greater impact on the development. We can now draw up long-term plans and think more about sustainability, for example by insulating better, introducing new ventilation and measuring and following up on energy consumption. The previous owners were less involved."

Q What are the objectives for managing the property?
A "We will create the conditions for our core business, and provide support with both resources and expertise. Naturally, we want the property to be as well-adapted as possible for future operations, with high operational reliability, good ventilation, good lighting, modern technology and good working conditions. We must be able to carry out safe production, and the property must support this."

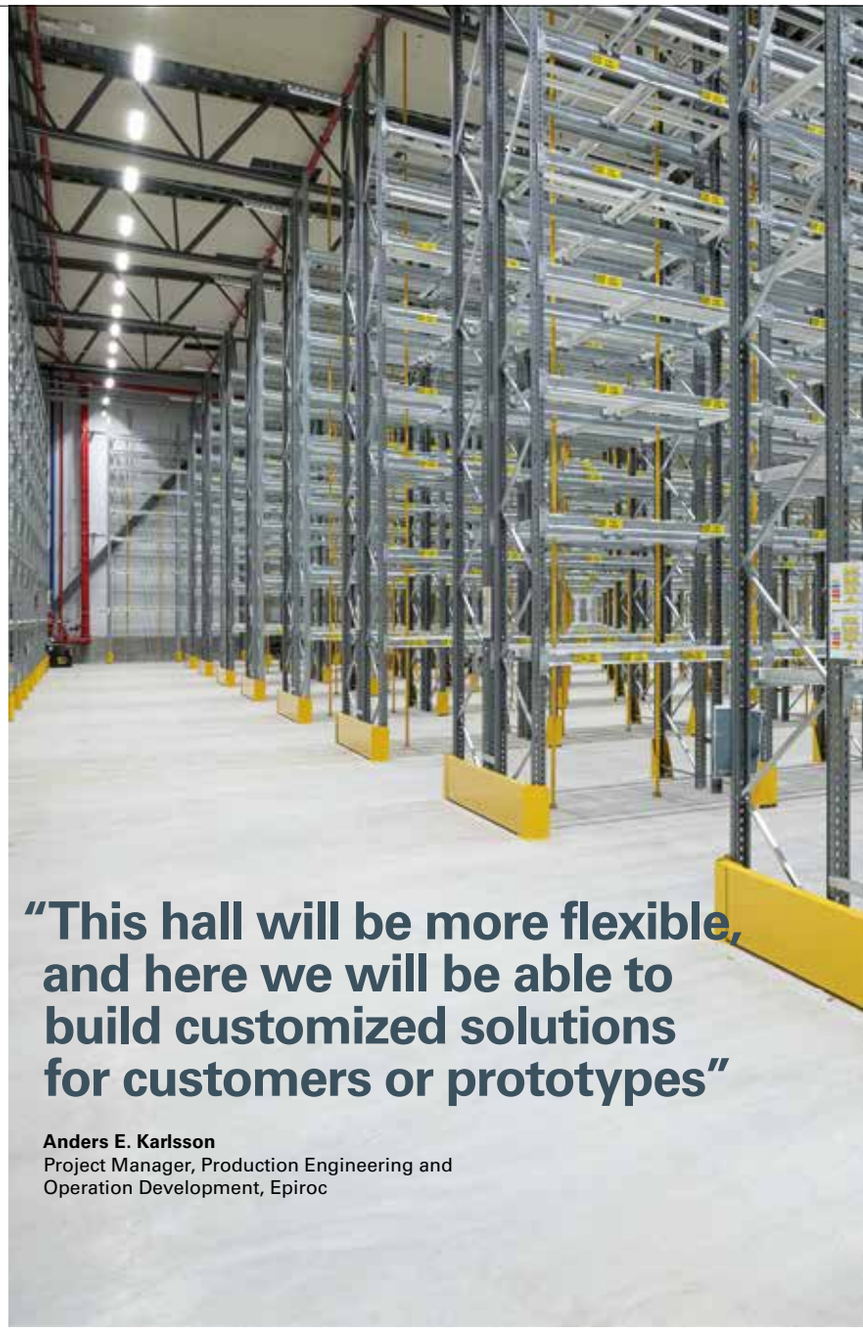
Q You plan on obtaining environmental certification for parts of the property. Can you tell me more about that?
A "The new office has Silver level certification according to the Miljöbyggnad classification system. The environmental classification process factors in a broad spectrum of values, including energy use, heat, air quality, wet rooms, building materials and the use of chemicals. The aim is for our employees to feel as good as possible. We'll also be looking at certifying the production halls afterwards, but some technical components are still needed in some areas."

Q Are you satisfied with the results?
A "It's a fantastic team that's been working on this, with a lot of commitment. I am very satisfied. For example, I think the slate facade turned out great. Looking at it gives a pleasant feeling."

“The goal has always been to consolidate production with Örebro as a hub to gather expertise and meet future requirements”

Thomas Hallmén
General Manager, Surface division, Epiroc

The new lobby is light, warm and welcoming, using natural materials.



"This hall will be more flexible, and here we will be able to build customized solutions for customers or prototypes"

Anders E. Karlsson
Project Manager, Production Engineering and Operation Development, Epiroc

our needs. We will also have automated trucks for certain transports from the warehouse. It's fantastic to be involved in such a big change, you don't get the chance to do that so often," says Daniella Polbring.

IT IS THE DAY before moving in. The floor is almost empty in the aisle that will house the new D line, which builds the drill rigs SmartROC and FlexiROC T35/T40. Gantry cranes running overhead can lift up to five metric tons. The easy-running tracks for the manually operated hoist are not yet in place.

"It will be a modern production facility that will result in a better-optimized flow. The new premises will be adapted for us, and we're really happy about that," says **Ulf Gyllander**, Global Product Manager.

The SmartROC T35/T40 belongs to the small quarry segment. These are flexible rigs with many applications. Today's generation is smart machines with satellite navigation and a large measure of automation, and product development is ongoing.

"We have just released a new GUI, better access points and lighting. We continuously strive to reduce impact from noise and lower fuel consumption, as well as systems for better binding of drilling dust," says Ulf Gyllander.

He is very much looking forward to switching over to the new line.

"We will be able to build faster and easier, which will lead to less logistics and better deliveries."

Next to the new production area are separate halls for testing and filling completed rigs with fuel, oil and hydraulic fluid. From the halls, the finished rigs can be moved directly outdoors for further testing or delivery.

Daniella Polbring
Flow Leader, Material Handling, Epiroc

Ulf Gyllander
Global Product Manager, Epiroc

The last aisle in the newly built section will accommodate the Exploration area. Here the ceiling height is even higher, the floor reinforced, and the overhead cranes stronger.

"This hall will be more flexible, and here we will be able to build customized solutions for customers as well as prototypes. We will also be able to subcontract rigs for our sister division Underground if needed. Previously, we had to do such things at an individual station or in the ordinary flow, which caused disruptions," says Anders E. Karlsson.

THE CONSTRUCTION PROCESS itself has also inevitably caused disruptions. But a lot of work has been put into minimizing them, and the goal has been to maintain the same output.

"We have been very successful so far and have been able to produce at the same pace," says **Oscar Ydreborg**, Flow Leader, Final Assembly.

Some innovative solutions have been required when, for example, access to warehouses has been impeded by construction.

"But here at the Surface division we are extremely solution-oriented. We will also benefit from this during the move now. It will certainly be a bit of a struggle during the transition phase, but we are incredibly excited about this and are really only seeing improvements. It's good to have everything under one roof," says Oscar Ydreborg.

"If the need for further expansion should arise in the future, the facility is well-prepared," says Anders E. Karlsson.

"It's possible to add more aisles for production and there's also an overcapacity in, for example, the switchgears."

He is noticeably proud of the results.

"It's been a huge investment. But the fact that we have been given the mandate to do this is proof that they believe in this business."

Oscar Ydreborg
Flow Leader,
Final Assembly,
Epiroc

Victor Åkesson
Drill master and co-owner,
Stens Bergborrning

Why do you choose Epiroc drill rigs?

When did you start operating with Epiroc equipment?

"Our first drill rig was an Atlas 748 HC, purchased in 1998. Since then there have been six new rigs, and more will follow. We feel very confident with these machines; we also use other brands, but they don't feel as reliable at all."

What distinguishes Eprioc's products?

"On the one hand, I find it easier to get help from Epiroc than from other suppliers. But above all, the environmental aspect is an important parameter. Epiroc machines are very fuel-efficient, while they also have Adblue, a good SCR system, particle filter and emission control. In addition, the machines have an outstanding noise reduction system that makes an incredible difference for the working environment, both in the city center and when working in the forest."

How would you like to see the collaboration will develop?

"We want to operate fossil-free, so I'm really looking forward to an electric drill rig. I want the first one! It's surprisingly rare for these machines to malfunction, but of course something will break down at some point. After all, the machines are subjected to a lot of stress. We can usually service the machines on our own, but I hope that Epiroc will invest even more in its skilled technicians. Their service is very important to us."

More www.stensbergborrning.se

PERSPECTIVE
THE PANAMA CANAL

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

Mission made possible

The wonder canal

THE PANAMA CANAL IS, by a wide margin, not the longest canal in the world. But it may very well be one of the most challenging construction projects ever undertaken.

The dream of connecting the Atlantic and Pacific Oceans across the Isthmus of Panama has roots as far back as the 1500s, when Spain started to survey rivers for a possible passage. But it wasn't until 1880 that a French team broke ground under the guidance of Ferdinand de Lesseps, the mastermind behind the Suez Canal. After investing immense amounts of funding into the project and making little progress, the French government finally cancelled it in 1888 and sued key individuals, including famed engineer Gustave Eiffel.

The task, simply put, seemed impossible. The terrain was mountainous and covered in jungle, plagued by incessant rains that caused heavy landslides, and there were no effective means for combating the spread of yellow fever and malaria among the workers. Over those eight years, around 22 000 men died from disease and accidents.

IN 1903, the United States signed a treaty granting them the rights to build and indefinitely administer the Panama Canal Zone, and the following year purchased the French equipment, excavations and railroad. The US built and improved housing, sanitation, service and infrastructure for the workers, as well as implementing a range of measures to minimize the spread of deadly diseases.

The lead engineer, John Frank Stevens, settled on a solution using a lock system to raise and lower ships from a large man-made reservoir known as Gatun Lake, 26 meters above sea level. This required the excavation of more than 130 million cubic meters of material using 102 large railroad-mounted steam shovels, fighting floods from the new lake.

After the loss of another 5 600 workers, construction was finally completed in 1914, with breakwaters, dams, channels and locks in place on both the Atlantic and the Pacific sides. ×

In Focus:
The Panama Canal today

THE US RETAINED control of the canal until 1977, when Panama was granted free control if they guaranteed permanent neutrality of the canal. The treaty led to Panama taking full control in 1999. The length of the canal is 82 kilometers, and the average time of passage is about 11.5 hours. There are three lanes of locks, with three locks up and three locks down per lane, that can convey vessels with a maximum length of 366 meters, a beam of 49 meters and draft of 15 meters. Around 14 000 ships make the transit each year, generating tolls and other fees of about USD 2.6 billion. Gatun Lake has become a source of fresh water and recreation.

More www.pancanal.com/en

SURVEY
SUSTAINABLE CONSTRUCTION

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 biggest challenges for sustainable construction?

02 How should those challenges be met?

Philippe Moseley
Policy Officer, Sustainable Industrial Policy and Construction, European Commission, Belgium

01 **"EUROPE'S AGING** building stock suffers from a low rate of energy renovation that is insufficient to meet Europe's climate and energy goals. Accelerating the rate of deep renovation will require a high volume of materials and skilled workers. Buildings consume around 40% of the EU's energy. Construction activity accounts for around half of Europe's extracted resources and over a third of the EU's total waste generated per year."

02 **"THE EUROPEAN COMMISSION** has tabled a comprehensive package of legislation to achieve climate neutrality by 2050. The strategy to unleash a Renovation Wave, doubling the annual rate of renovation, also addresses improved resource efficiency and circularity. The Commission has recently published *Scenarios for a Transition Pathway* towards a resilient, greener and more digital construction ecosystem. This will ensure that the industry is ready to face these challenges."

Holly Smith
Sub Agent, Skanska, UK

01 **"IT'S IMPORTANT TO** acknowledge the link between efficiency, digitalization and sustainability, which is sometimes overlooked. It's something we can all do to advance our journey towards a more sustainable construction industry. A lot of the technology is already available, but we are not using it to its full potential. Historically, improving health and safety had tangible benefits to the individual – that one could be safe to go home and see one's family – whereas with sustainability it's not as obvious, but it's actually about securing the planet for future generations."

02 **"IT DOES REQUIRE** a bit more of a cultural revolution. For instance, the UK construction industry is not overly diverse; most people have sort of the same background, with an engineering-based education. I think we need more diversity of thought; people with different backgrounds, gender and ethnicity, who can bring different ideas to the table."

R. Douglas Hooton
Industrial Research Chair, University of Toronto, Canada

01 **"ONE MAJOR CHALLENGE** results from the large number of players typically involved in construction. While owners may want more sustainable construction, selecting the appropriate technologies and materials and getting builders to implement them requires input and agreement along the whole value chain. I work in the cement and concrete segment of construction, and for life-safety, building codes must be met that use approved design and materials standards. This can provide barriers to novel materials and approaches, and making changes to codes and standards is typically a very slow process."

02 **"EDUCATION AND TRAINING** of regulators from both the government agencies and the private domain is key to overcoming some of the barriers. The cement, admixture, and concrete companies have been leading in the development of new concretes that are not only more sustainable, but also have special properties."

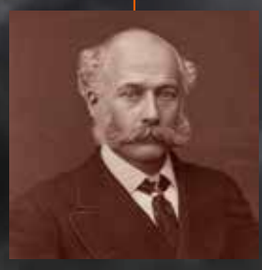
More www.bit.do/sustainableconstruction

As long as humanity has used tools, it has built things. Here are seven modern wonders of the world, though probably not the ones you usually think of.

01

London Sewage System

Following the "Great Stink" in 1858, Sir Joseph Bazalgette led the construction of 720 kilometers of main sewers that conveyed the contents of 21 000 kilometers of smaller local sewers. The tunnels required 318 million bricks and 670 000 cubic meters of concrete and are still in good shape.



02

Sphinx Observatory

At 3571 meters above mean sea level, the Sphinx Observatory is one of the highest in the world. The mountaintop has been tunneled to fit an elevator to the Jungfraujoch railway station 117 meters below. The open viewing deck is accessible to the public.

03

The Doomsday Vault

The Svalbard Global Seed Vault is located 120 meters inside a sandstone mountain on Spitsbergen island. The vault provides long-term storage of duplicates of seeds conserved in gene banks around the world, securing them against loss due to war, for example.

04

Large Hadron Collider

At 27 kilometers in circumference and buried 175 meters beneath the France-Switzerland border, the LHC is a marvel that combines massive construction and delicate, precise engineering. The collider can accelerate particles up to 99.999999 percent of the speed of light.

05

The Marmaray Tunnel

As impressive as tunneling between two countries is, it does not beat linking two *continents*. The Marmaray Tunnel in Turkey runs 13.5 kilometers under the Bosporous strait, through the world's deepest immersed tube tunnel, providing a railway connection between Asia and Europe.

06

Suzhou 3D Printed Wall

Suzhou, in the Jiangsu region in China, is home to the first 3D printed river revetment wall in the world, constructed in modules and over 500 meters long. The "ink" used is a mixture of steel, sand, cement, fiberglass, hardening agents and recycled materials.

07

The International Space Station

The first module of the ISS was launched in 1998, and the station has been continuously occupied for more than 21 years. The latest major pressurized module, Nauka, was fitted in 2021. Today, the station occupies an area of 73 by 109 meters and weighs almost 445 metric tons.

Next issue [Feature] Making use of physical resources is a key to a sustainable future, by sharing, repairing and recycling materials and products. Read more about circular economy in next issue's Feature.

MY WORK: BUSINESS MANAGER

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
Andreas Hylthén

"I want to give people confidence"

⟶ To experience something different has always appealed to **Shaiful Ali**. Having left his native Singapore for Australia, he's now relocated to Sweden to become Underground Business Manager for… Africa. One thing remains constant, though: his will to engage and keep an open mind.

"From a young age, my mindset has always been 'nothing is impossible,' so it felt natural to study to become an engineer. I started out in Singapore, my homeland, and left for Australia to finish my degree. I wanted to get out of my comfort zone, but quickly fell in love with the country. There I also met my future wife, who is Swedish, and Australia became home to us.

Immediately after university, I joined Atlas Copco, and I have been here (now Epiroc) ever since. I started out as an engineer and then moved on to become Product Manager Underground Drills, and later Business Line Manager. In 2020, I became the Underground Business Manager for the Australia region, and now I am undertaking that same role in a new part of the world: region Africa. My new base is Örebro, Sweden, and I share my time between Sweden and the three Customer Centers in my region: Southern Africa, West Africa, and East & Central Africa. It's good sometimes to be sitting close to one of our production factories, where decisions often have to be made quickly. That being said, Africa is huge, so collaboration is vital. One thing I have learned is that the customer is always the best teacher. They will guide both you and Epiroc.

SHAIFUL ALI
Age: 42
Job: Underground Business Manager Africa, based in Örebro
Joined the company: 2010
Best part of the job: "It's not always just a job. It's fun, rewarding and builds character"

Regarding my experience in Epiroc (and Atlas Copco before that), I've always been allowed to make mistakes in my roles. When it has happened, I've been taught to explore why and how the mistake happened, and how to do things better next time. That's something I've taken to my teams, as well. I want to give people confidence, and make them feel that they are always part of the decision. Never expect recognition. That will come based on what you do and how you do it.

IN MY SPARE TIME, I love to keep busy. I play Nintendo Switch with the kids – we have two girls, nine and five years old – and I read quite a bit, preferably crime novels. I also play soccer and collect toys and comic books, mainly DC Comics. Oh, and I play music. I used to jam with my friends when I was younger, but now I'm noodling on the guitar. I like to express myself." ×

After 11 years in Australia, Shaiful Ali relocated to Örebro, Sweden to become Underground Business Manager Africa. Being close to the division team while keeping a good rapport with the three Customer Centers and our market in Africa will be key to success.

INTEGRATION SUCCESS

The Rosh Pinah mine in Namibia wanted to improve its production tons and grade quality. Thanks to MineRP's Integrated Operating Schedule, their ambitious goals have been met.

[On Location]
Namibia

Gustaf Höök Dan Audet

The successful partnership between MineRP and Trevali has contributed to turning things around for Trevali at the Rosh Pinah mine.

1

THE CHALLENGE

THE ROSH PINAH underground zinc-lead mine, located in southwestern Namibia, has been in continuous operation since 1969. Operated by Trevali (TSX-T), there was a need for the mine to increase both the quality and the quantity of the ore delivered to the plant. Despite having excellent mine plans, they found it hard to accurately forecast production. This was down to difficulties in merging interdepartmental short-term plans, performing conflict resolution, orchestrating pre-shift tasking, and controlling the impact of unplanned work in-shift.

Jurgens Visser
Mining Executive, MineRP

To address those issues, Trevali partnered with MineRP, an Epiroc-owned software company – headquartered in Centurion, South Africa – specializing in increasing mine productivity through digitally-enabled enterprise interoperability, integrated planning, execution and analytics.

"There were three basic challenges: to integrate all data into one platform where everybody can make use of it, to reduce the dilution of the ore by having a good quality blast every day, and to better understand the mine's constraints and bottlenecks so that planning and task assignment could be improved," says **Jurgens Visser**, Mining Executive at MineRP.

2

THE SOLUTION

WHEN TRYING TO meet the challenges, MineRP had full access to Rosh Pinah's data. The main task was to create an Integrated Operating Scheduling (IOS) system, a MineRP platform-based solution designed to improve planning and execution. Another important component was to develop a Short-Term Dilution Management solution, in order to stabilize the quality of the plant feed. It was combined with continuous volumetric monitoring.

"The biggest costs for a mine are people and machines, so you cannot afford to lose production hours due to them standing idle," says Jurgens Visser. "The most important thing for us was to improve the short-term planning through the IOS. The mine used to have separate production schedules and maintenance schedules, and these schedules often conflicted with each other. Our approach was to help Rosh Pinah deconflict the scheduling between production and maintenance, so there is no constraint on the tonnage capacity due to these conflicts."

THE MINERP PLATFORM was used to bring on board not only mine planning and design elements, but all of the planning that affects the mine. The IOS that was created reflects all planned work, not just the production activities.

"Success is a combination of proper scheduling and proper task management. This addresses conflicts in the schedule, as well as conflicts caused by emerging work. For example, if something goes wrong during a shift, that information is brought into the schedule so that the next shift is minimally impacted."

3

THE RESULT

WITH THE IOS in place, the Rosh Pinah mine can now perform enterprise-wide planning, and by doing so, they are able to carry out the work that was planned.

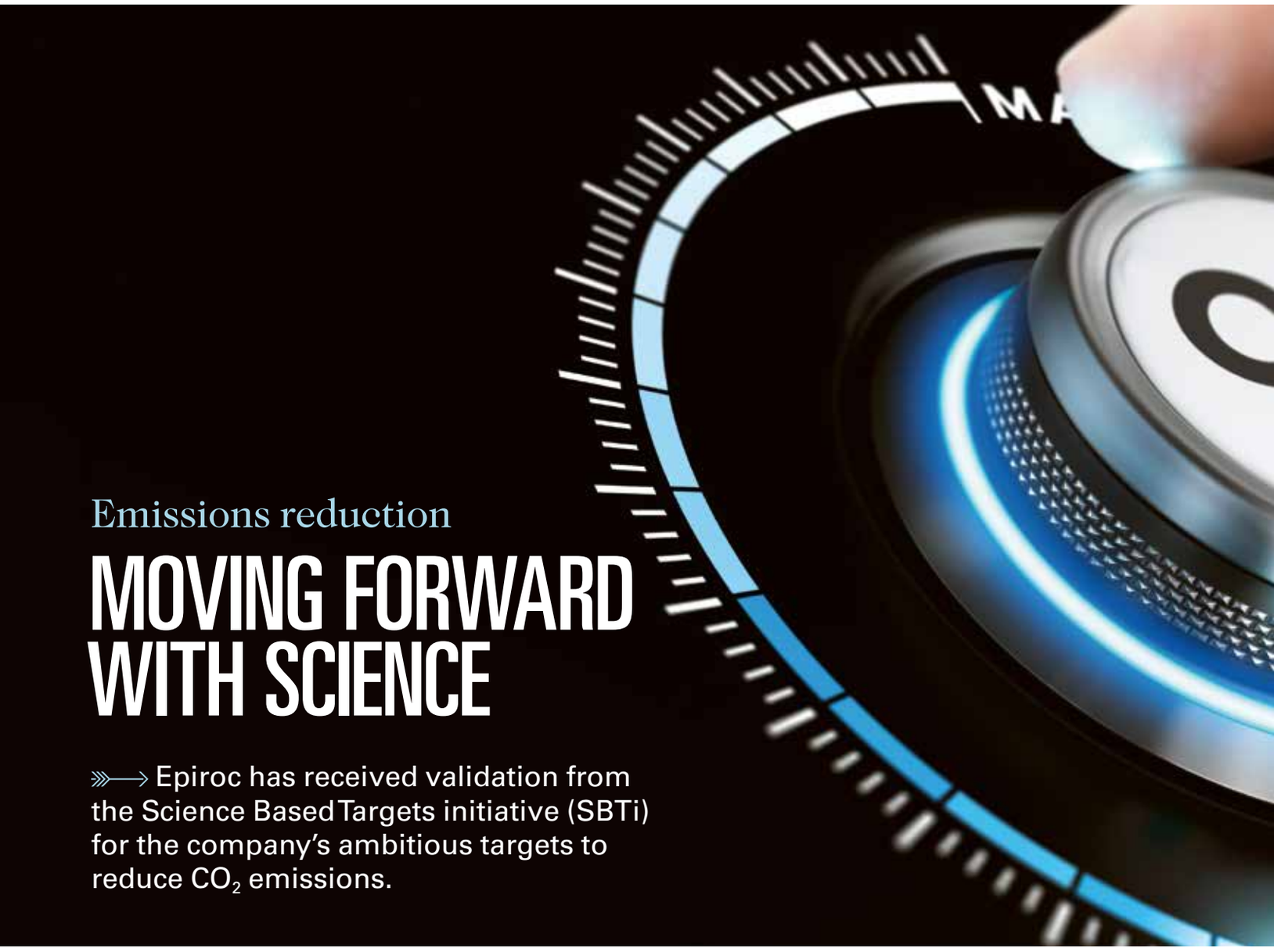
"We always say that a mine should plan the work and work the plan," says Jurgens Visser. "What often happens is that they plan the work, and work the mine, so to speak. They get underground and do whatever they are able to do, since there are so many interruptions and unexpected conditions to deal with. Thanks to the integrated schedule Rosh Pinah was able to minimize these unplanned interruptions and actually work the plan."

The improvement started when it was noted that the development detail was on budget. Also, there was much better control of the grade according to the plan. Dilution is still a bit of a challenge, but improvements have been made.

"The daily tons have also improved. During the third quarter of 2021, Rosh Pinah exceeded the daily target almost every day. All in all, better quality tons are coming through the system, the development has improved, and the grade is on target based on the budget."

More www.minerp.com

Gustaf Höök Shutterstock



Emissions reduction

MOVING FORWARD WITH SCIENCE

Epiroc has received validation from the Science Based Targets initiative (SBTi) for the company's ambitious targets to reduce CO_2 emissions.

IN 2020, the Epiroc Group established long-term sustainability goals that support the Paris Agreement and the UN 2030 Agenda for Sustainable Development. One of the major objectives is to lower CO_2 emissions, not only from operations and transportation but also customers' use of Epiroc equipment.

Approaching the task with the utmost commitment, Epiroc joined the Science Based Targets initiative (SBTi). The SBTi has now validated Epiroc's climate targets as being in line with keeping global warming at a maximum of 1.5° C.

"The SBTi aligns with our 2030 goals, and to have the initiative validate Epiroc's climate targets as being in line the Paris Agreement is very important. As part of the initiative, we will report on our efforts and results, and that will be a valuable driver," says VP Corporate Responsibility **Camilla Goldbeck-Löwe**.

Camilla Goldbeck-Löwe
VP Corporate Responsibility, Epiroc

Science-based targets show companies how much and how quickly they need to reduce their greenhouse gas (GHG) emissions to prevent the worst effects of climate change. The SBTi, among other things, defines and promotes best practice in emissions reductions and net-zero targets in line with climate science. It states that, "Business has a vital role to play in driving down greenhouse gas emissions and building the resilient, zero-emissions economy we urgently need. This action must be grounded in science. We need a race to the top, led by pioneering companies. This will empower peers, suppliers and customers to follow suit and drive governments to take bolder action."

In line with SBTi requirements, Epiroc commits to reduce its absolute Scope 1 and Scope 2 CO_2 emissions – from sources that are owned or controlled by the company and indirect greenhouse gas emissions from consumption of purchased electricity, heat or steam – by 50 percent by 2030 with 2019 as the base year. The goal is the same for absolute Scope 3 CO_2 emissions, meaning emissions from the use of sold products.

"COMPARED TO MANY other companies, the Scope 3 goal is very ambitious, not least since we have less control over it. About 83 percent of our total CO_2 emissions is coming from customers' use of our products, and if we really want to have an impact, this is an area we must focus on. We will have

to work hard to achieve it, but we are determined to succeed," says Goldbeck-Löwe, adding:

"It's all about the effort: Epiroc and customers together. Customers are facing tougher demands, and we want to help them on their respective sustainability journeys."

BATTERY ELECTRIFICATION, enabling zero emissions from equipment, is key to reaching the 2030 goals, as is automation and digitalization. Epiroc has come a long way already, and the goal is to have a completely electrified portfolio for underground mining by 2025. For surface operations, the same will apply by 2030.

"We see sustainability as a long-term growth driver. This ambition will set the tone for our approach for years to come, and we want to drive the future in intelligent mining and infrastructure," says Goldbeck-Löwe. ×

Gustaf Höök Epiroc

Epiroc has selected eight relevant UN Sustainable Development Goals, connecting them to the company's own goals. In each issue, we highlight one of them.

Epiroc's HM 1500 F hydro magnet cleans jobsites from steel, for example from rebar of concrete structures, turning waste into profit – and helping construction companies be more sustainable.

"WE ARE OPEN IN SHARING OUR AMBITIONS"

The global Sustainable Development Goals (SDG) formulated by the UN also guide our sustainability work. We take a closer look at how Epiroc approaches Goal 9.

BUILD RESILIENT INFRASTRUCTURE, promote sustainable industrialization and foster innovation. That's the wording of SDG goal 9, one that Epiroc supports wholeheartedly.

"Sustainability is embedded in everything Epiroc does. We aim to enable and lead our stakeholders and society into further sustainable developments by minimizing any negative sustainability impacts, such as climatic effect," says **Goran Popovski**, President Tools & Attachment division.

Epiroc's efforts in digitalization, automation and electrification push the efficiency boundaries in the mining and construction business. To stay innovative, engaging with many stakeholders is key.

"We are open in sharing our ambitions, and we collaborate with customers, stakeholders and various institutions in pushing sustainability as a new norm. Being involved in initiatives such as Sustainable Underground Mining and NEXGEN SIMS is vital to Epiroc. We want to create value and development, and also make our business more attractive to young people," says Goran Popovski.

Goran Popovski
President Tools & Attachment, Epiroc

The division he heads plays a key role with regard to SDG 9, in that it provides the market with products, services and know-how that greatly support a more circular economy.

"Attachments such as hydraulic breakers, non-impact attachments and tools for cutting make recycling a lot easier, reducing the need for new materials." ×

More www.epirocgroup.com/un-sustainable-goals

BLAST FROM THE PAST
YEAR 1990

Innovative products and a wide array of customers: Epiroc is a new 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 rear view mirror.

Gustaf Höök
Jungfraubahnen

In Focus:
Jungfraujoch

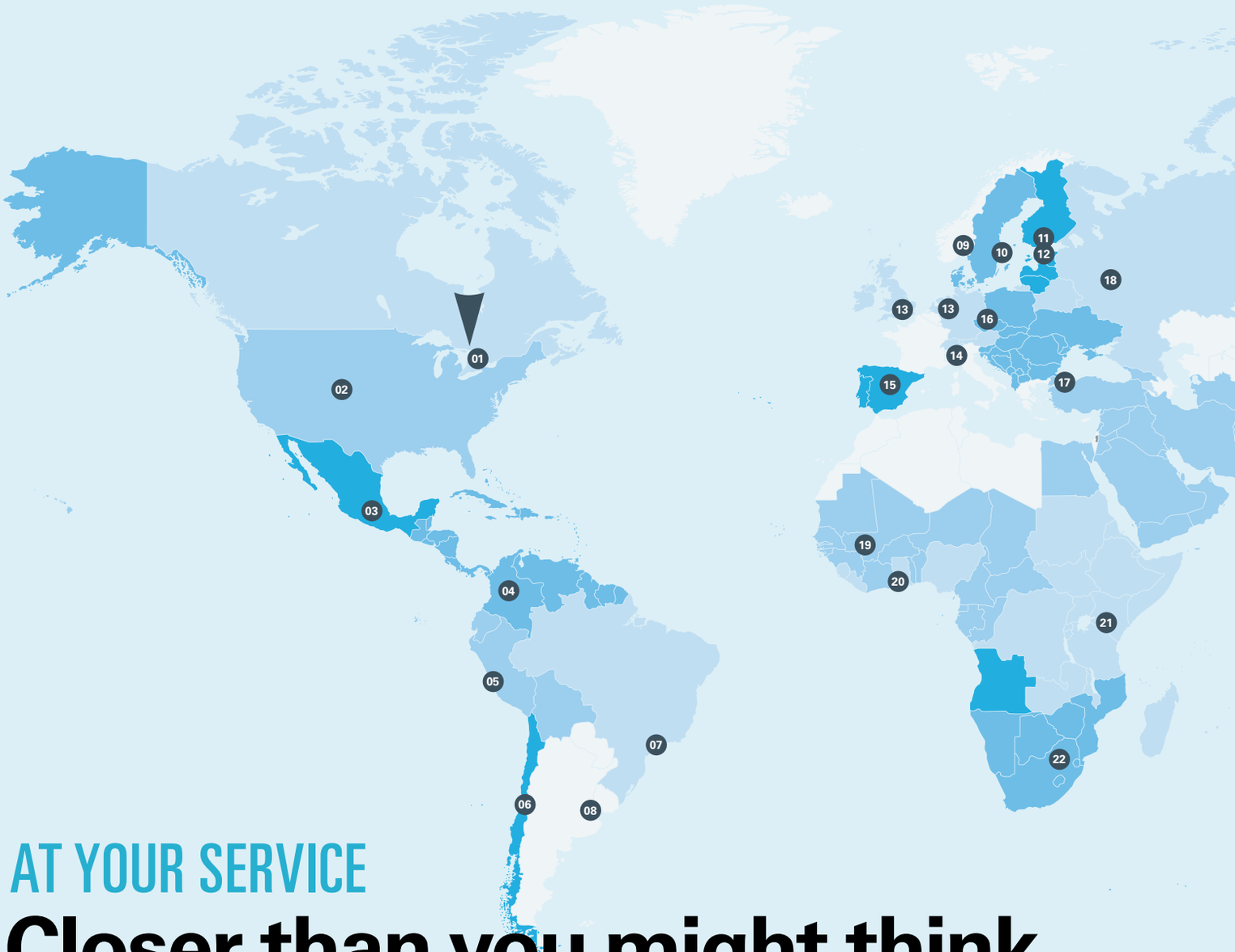
The mountainous region of Jungfrau-Aletsch in south-western Switzerland – site of the northern wall of Jungfrau and Eiger, and the smallest glaciated area in western Eurasia – is a sight to behold. To do so, one needs to ride the *Jungfraubahnen* (the Jungfrau Railway), terminating at Jungfraujoch. At 3 454 meters above sea level, the train station is Europe's highest.

In the early '90s, it was modernized in order to cope with increasing traffic. The station hall was extended, and new access tunnels and a lift shaft were constructed. An Atlas Copco H126-32 Boomer face drill rig was chosen to drill the holes for both blasting and Swellex anchor bolts (for safety precautions). The thin air, reducing working performances by as much as 30 percent, made it a project with unique challenges for both men and machines. However, the Boomer rig passed the test with flying colors, handling the rock (granite and calcareous slate) and the tight spaces, as well as the altitude. In the words of the drilling foreman from Frutiger AG, part of the contracting consortium: *"I'm very pleased with the Atlas Copco jumbo … On such a mountainous site, we would certainly have had difficulty with any other equipment."*

More www.jungfrau.ch

The Jungfraujoch train station is located 1 117 meters below the Sphinx Observatory, which is one of the highest in the world. The observatory offers spectacular views of the Swiss Alps. It is located in the Jungfrau-Aletsch area, the first World Natural Heritage site in the Alps.

Gustaf Höök 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 31 countries and 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 Andes
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

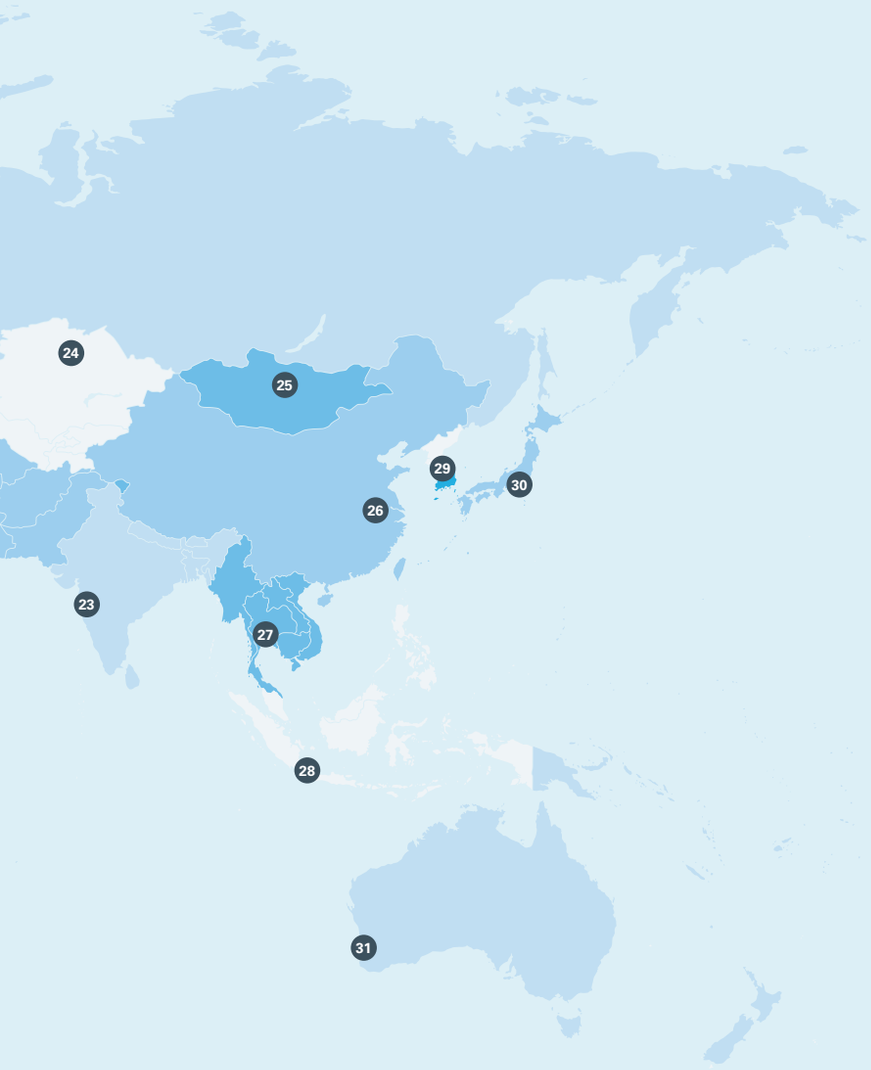
19 Mali & Burkina Faso
Bamako

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?

Andre Bertrand
Global Project Manager for Reman Components, Canada

IN SEPTEMBER 2021, Epiroc launched the Reman Program as an alternative to new components, local service exchange programs, and repair and return service. Two Reman Centers are in operation; one in Tucson, Arizona (USA), and one "new" center in Sudbury, Ontario (Canada). **Andre Bertrand**, Global Project Manager for Reman Components, based in Mississauga, elaborates.

In a nutshell, how does the Reman Program work?

"The target was to up the level of service already provided by local Customer Centers. We wanted to make it a global program, with a distinct focus on collaboration. Customers honor us with their business – returning used components – and we'll guarantee availability. We remanufacture used components to the highest standards and sell them for a discounted price; 30–40 percent less, compared to new components. A customer that joins the program will see automatic savings and benefits."

There's a focus on recycling too, right?

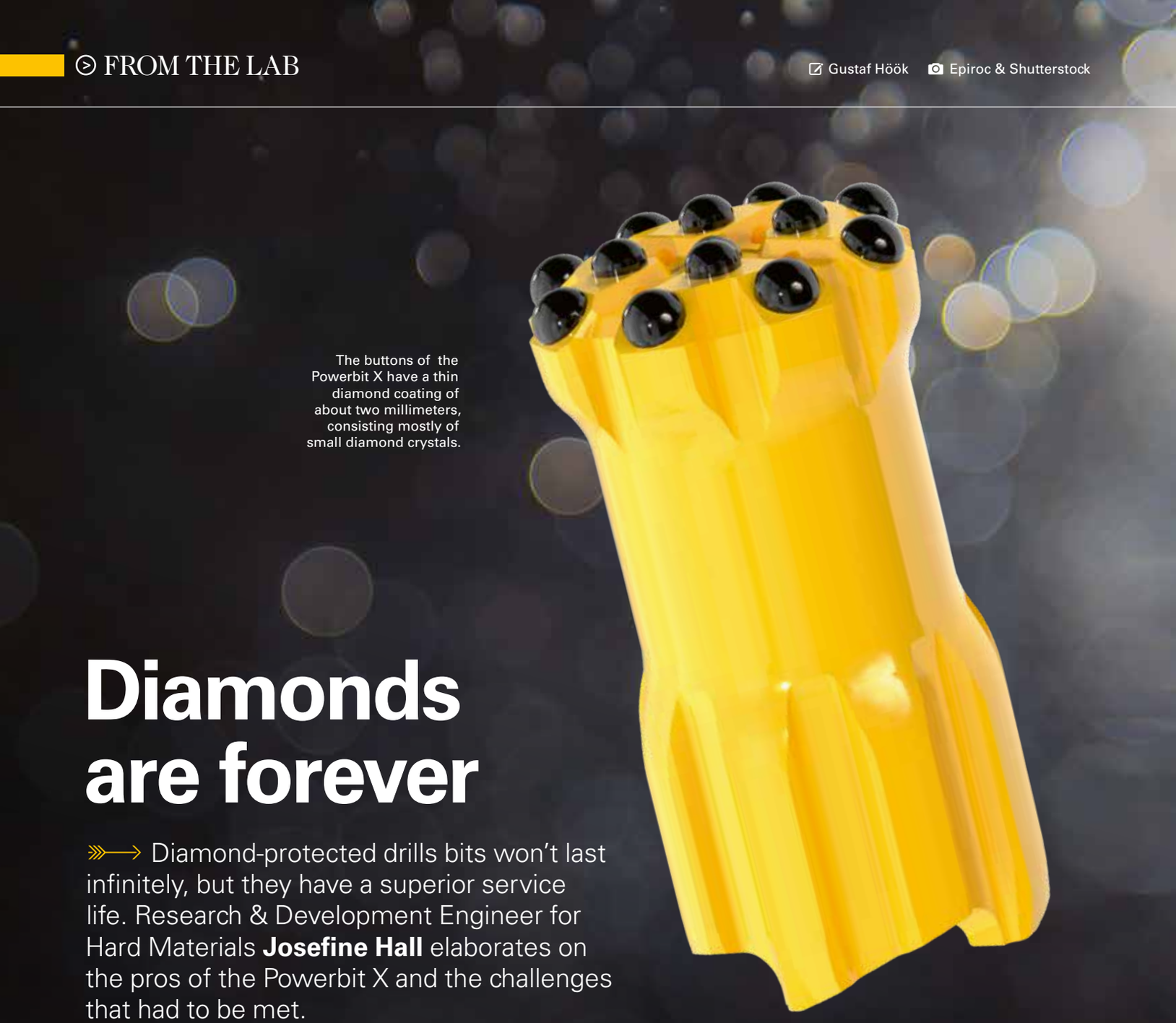
"Indeed. All components are taken apart, and almost all the materials are recycled. Less than two percent goes to waste, so with the program, we definitely take a full-circle view."

Tell us more about the facilities in Sudbury.

"This is the Reman Center for the Underground division, and we have 60 000 square feet [5 570 square meters] at our disposal. It's equipped with all the tools needed to maximize a component's lifecycle potential. Being based in Sudbury also helps. It's a true mining town, with a great sense of community." ×

More www.epiroc.com/reman

Gustaf Höök Epiroc & Shutterstock



The buttons of the Powerbit X have a thin diamond coating of about two millimeters, consisting mostly of small diamond crystals.

Diamonds are forever

Diamond-protected drills bits won't last infinitely, but they have a superior service life. Research & Development Engineer for Hard Materials **Josefine Hall** elaborates on the pros of the Powerbit X and the challenges that had to be met.

How does the product make it easier for Epiroc customers?

"The Powerbit X has diamond-protected buttons, which allow you to drill for much longer before the drill bit needs changing. Fewer replacements mean greater safety and better productivity. Another major benefit is reduced climate impact; less material and energy is consumed per drilled meter, and transportation is reduced."

How is Powerbit X different from Powerbit, Epiroc's comparable product?

"The buttons themselves are identical in shape, but have a thin diamond coating of about two millimeters. The coating consists mostly of small diamond crystals. In order to sinter them into a hard wear-resistant coating, tungsten carbide and cobalt are added, facilitating the binding of the diamond crystals. Treatment occurs at high pressure and high temperatures: 5–6 gigapascals at approximately 1 500 °C. Because the pin surface is much harder and more wear-resistant, Powerbit X has a significantly longer service life"

Josefine Hall
Research & Development Engineer for Hard Materials, Epiroc

What were the major challenges of development?

"For my part, it was first a question of understanding this complicated material, what defines a good diamond coating and why the buttons wore down in different ways. Creating an optimal drill string has required good interaction and continuous exchange of knowhow between teams. And Epiroc will continue to invest a great deal in this area."

Powerbit X in brief

- The bit is protected by a diamond coating consisting of a sintered mass of randomly oriented, inter-grown diamond particles in the presence of cobalt as a catalyst.
- The sintering process is achieved at high pressure and high temperatures.
- Drastically reduces the amount of drill bit changes.
- Bits available for face drilling as well as production drilling, released Q2 2022.

More www.epiroc.com/powerbit-x