

# Mining & Construction

A magazine from Epiroc

miningandconstruction.com

The Automation  
Issue 01–2018

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**OUR CUSTOMERS**

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## A new world

Safer and more productive – automated mining is the way forward

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# “Automation is the future”

**YOU ARE THE REASON** that Epiroc was born. Building a completely new brand focused solely on mining, construction and infrastructure enables a better fit and focus for our operations and your business. We work hard on constant improvement and making what's good even better. Going through this great change at Epiroc is ultimately for one reason – providing better solutions for you, our customer.

**WHAT HAS NOT CHANGED** is our core; our passion for innovation and automation, and for finding the best solutions together with you. Alongside the birth of Epiroc, our business has kept moving forward. Our constant striving to evolve continues to lead to new innovations and new ways to bring automated solutions to our partners around the globe.

We believe that automation and interoperability are the future of our industries. And at Epiroc, the future is already here. These are not just great ideas – they are reality. In this issue of Mining & Construction you can read about how Epiroc automation solutions are making a difference in the field. It all starts with an innovative idea, then making it work for your business while taking your productivity to great new heights. It's a case of ideas put into action – and the solutions make your life easier, safer and more productive.

Being part of the growth of new technology is exciting. Seeing what automation and interoperability enables and how it improves businesses – in more than one way – is truly inspiring.

**AT EPIROC**, we are excited to see what the future holds within this field, and we are looking forward to making this journey together with you.

### On my radar

**New look for equipment**  
Supplying equipment is always a top priority and now we can put Epiroc branding on products leaving the factory.

**Continuous improvement**  
How can we become a better partner and organization today and tomorrow?

**#Epiroc**  
Seeing your images of Epiroc equipment in action on Instagram is very inspiring.

Enjoy!

**Helena Hedblom**

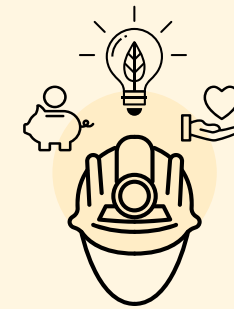
Senior Executive Vice President,  
Mining and Infrastructure

# Epiroc Group – get to know us better

Our innovations

Epiroc's heritage dates back to 1873. Epiroc has been formed out of Atlas Copco's mining and construction business, and builds on proven expertise, quality and performance.

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.

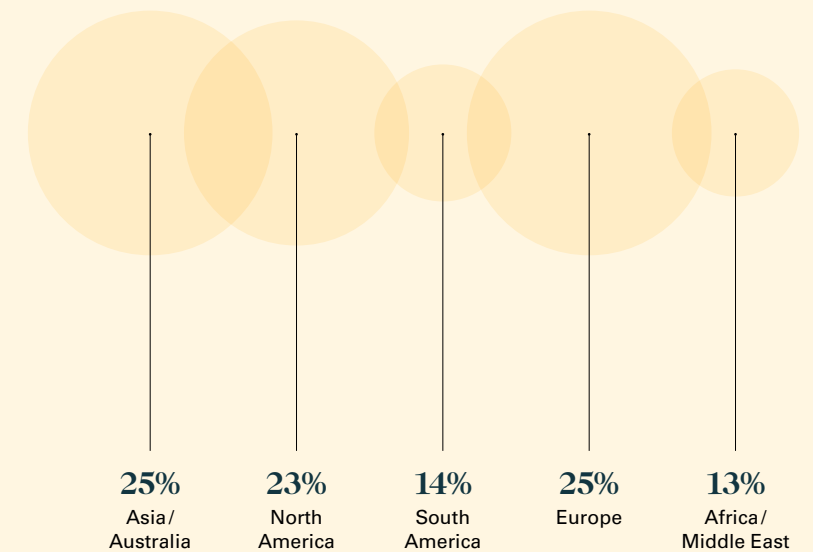


Industries we serve



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

Revenues by region



### The Group in numbers



13 000

- More than 13 000 employees
- Customers in more than 150 countries
- 145 years of experience
- Revenues: SEK 31.4 billion

### Rock Drilling Tools

Dedicated to rock drilling tools worldwide

### Hydraulic Attachment Tools

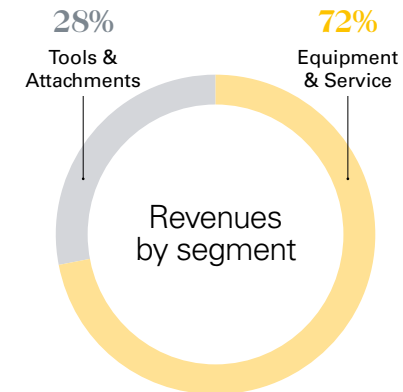
Dedicated to hydraulic attachment tools for carriers

### Rocktec

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

### Divisions and reporting segments

Equipment & Service / Tools & Attachments



### Drilling Solutions

Dedicated to a wide range of rotary drilling equipment

### Mining and Rock Excavation Service

Dedicated to parts and services aimed at maximizing customers' productivity

### Surface and Exploration Drilling

Dedicated to rock and exploration drilling equipment

### Underground Rock Excavation

Dedicated to a wide range of tunneling and mining equipment

26-41 | FEATURE  
**AUTOMATION**

Robots are the future. Not as overlords – despite the disparaging imagery in books and movies. Instead, they will help us to a better life. The quest for automation in mining is making good progress.



SHUTTERSTOCK

08 | OUR CUSTOMERS  
**Automation pioneers**

Barrick Gold Corporation has been running an automation program in the Hemlo gold mine in Ontario, Canada, since 2007. The most recent addition is autonomous tramming and teleremote operation.

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**Precision drilling**

The Diamec Smart 6 rig has made a big difference for Australian diamond drilling specialist Webdrill. Jared Webb (Webdrill) and Dave Brooker (Epiroc) elaborate on a fruitful partnership.

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**Smooth loading**

Loading efficiently in tight spaces can be tricky. The Häggloader is designed to solve this problem – helping operations enormously as Betonmashhæhre Anlegg builds two underground hydropower plants in northern Norway.



**ON THE COVER**

The future of mining is here – and it will be safer and more productive. Thanks to automation, people will be less exposed to hazards, machinery can be utilized during shift changes and environmental impact can be reduced. No matter what automation level you choose, there are significant gains to be made.

Electra Mining Africa will take place in Johannesburg, South Africa, from September 10–14, 2018. The trade show is held every second year and attracts over 850 local and international exhibitors from across the mining, industrial, electrical and power industry sectors. [electramining.co.za](http://electramining.co.za)



MIKAEL GÖTHAGE

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FOLLOW-UP  
**“It’s an absolutely brilliant rig”**

Swimpex Granite has been using a SpeedROC 2F drill rig since November. For operator Per-Anders Olausson, it was love at first sight.



ERNESTO BENAVIDES



SHUTTERSTOCK



SERGIO GARCIA

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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.



WOLFGANG E. HOHN

Epiroc is a new brand, carrying 145 years worth of Atlas Copco experience.

Our core values – innovation, commitment and collaboration – are deeply rooted within the organization and serve as a competitive advantage in an ever-changing environment,” says Sofie Gielen, Epiroc Branding and Communications Manager.

**EPIROC’S CORE VALUES** are words that reflect the spirit of the company and at the same time mark the way forward.

“We are creative, bold and open-minded, with the imagination to develop new ideas and the initiative to bring them to the market. That’s being innovative,” says Sofie Gielen. “Commitment has to do with meeting and exceeding expectations by staying connected to customers, technology and the environment. Collaboration refers to Epiroc’s firm belief that a close relationship with colleagues, customers, partners and other stakeholders will help us deliver intelligent solutions that empower them to achieve their goals.”

**CREATING A NEW** brand for a company is a balancing act. Coming from a renowned brand like Atlas Copco, it takes courage to create something new.

“The foundation remains the same, but the face is new and we now have the added focus. I also think there’s an advantage in having to re-think your company. It prepares us better for the future and brings out fresh energy. I think that characterizes our organization – we are not afraid to try new paths to find the best one. These are very exciting times,” concludes Sofie Gielen. ✕

## Our core values take us forward

The new brand Epiroc has grown from bold idea into firm reality in less than a year. Yellow Epiroc signs now light up buildings all over the world, we have a place on the world wide web, we have new brochures and the whole product range will have a new look.

**ONE IMPORTANT PART** of creating a new brand is the company’s core values.

Even though Epiroc is a new brand, it has been born out of Atlas Copco – which has 145 years of experience. The mission of the rebranding project has been to interpret the spirit of Epiroc and create a look and feel that mirrors this.

“The aim is to take the best and make it even better, with the same people and a bold new drive to support the success of our partners and customers.”

### Teleremote drilling demo sends global message

**IN JUNE OF LAST YEAR**, a transcontinental demonstration involving a cabless **Pit Viper 275 CA** in Garland, Texas, proved the potency of autonomous operation. The machine was controlled more than 8 100 kilometers away by par-

ticipants in Stockholm, Sweden – the longest distance known. The feat demonstrated how **Pit Viper Teleremote and Autonomous** – a capability already at use in mines around the world – can be used from any location in the world.

[More bit.do/autonomousdrillingfacts](http://bit.do/autonomousdrillingfacts)

### BBE 57 rock drill still customer’s choice in Algeria

**SARL SAPAM**, an aggregate quarry company in Algeria, has been using the **Epiroc BBE 57** rock drill since the Seventies – with great results. When a replacement was needed, the idea was to go for a current model. However, it turned out that Epiroc in Sweden still had a BBE 57, a

model that’s now discontinued, sitting in the warehouse – still in perfect condition.

With Epiroc guaranteeing that it would work just as it would have 10 years ago, Sarl Sapam was more than happy to keep using the same tried and trusted equipment and accepted the BBE 57 as replacement.



### Automated rigs to optimize productivity in Mount Morgan mine

**ON OCTOBER 19**, a Boomer S2 drill rig was loaded onto an aircraft carrier in Örebro, Sweden. The destination was Perth, Australia, and the drill rig will be used in Mount Morgan mine, owned by Dacian Gold. The company ordered a total of four Epiroc rigs: two Boomer S2 face drill rigs and two Simba S7C production drill rigs. Equipped with smart automation features, these drill rigs are designed to optimize overbrake/underbrake and to handle drilling plans. Both rig types also feature the new superior COP MD20 rock drill.

#### DRILLING



### Master driller reaches magic number

**IN SEPTEMBER 2017**, Wolfgang Keck passed the 1 000 000 meter mark as a driller at TH Mining in Southwestern Germany. He has mainly operated DTH drill rigs, producing raw material in limestone and aggregate quarries. The secret to his success? “It’s the long experience – and the Epiroc rigs. They work very well in each geology,” says Keck.

*Epiroc’s core values are innovation, commitment and collaboration.*

## Which core value is the most important to you?



**Jenny Heimersson**  
General Manager  
Construction Tools PC AB,  
Sweden

“Collaboration is necessary if we are to succeed in our other two values. It doesn’t matter that we have brilliant innovations if we don’t work together to bring them to market. Good collaboration will ensure greater commitment. I try to run my organization through collaboration and with respect for the individual, their ability and knowledge.”



**Paula Boné E.**  
Business Line Manager  
Underground Rock  
Excavation, Chile

“The most significant value relating to my work is collaboration. I think it’s important to take time for discussions and to listen to other people’s ideas before making decisions, as that’s the way to come up with the best solution. Also, working together is a great way to learn during the process. I strive to have good communication in my team in order to get inspiration during conversations.”



**Hedley Birnie**  
Business Line Manager  
Surface and Exploration  
Drilling, South Africa

“If we are committed to our customers it will involve innovation, collaboration and far more than just our core values. When we are committed to our customers, we are up to speed with their demands, the issues that they are facing and with technology. It’s commitment that leads the process forward.”

#### PROJECT NEWS



### Protection system improves breaker performance

**AutoControl and StartSelect** have been popular features on Epiroc hydraulic breakers for some years. Now the functions are ingeniously combined in Epiroc’s Intelligent Protection System (IPS), which ensures that the hydraulic breaker always starts in AutoStart mode. The IPS makes for simpler, faster breaking with less wear and more uptime.

#### NO MANUAL SWITCHING

When the contact pressure between chisel and material increases and AutoControl switches from a short piston stroke to a long piston stroke, IPS switches automatically to AutoStop mode.

[More bit.do/ipsfacts](http://bit.do/ipsfacts)



[On Location]  
Canada

# All clear in the automation zone

## BARRICK'S HEMLO MINE GOES DEEPER WITH TELEREMOTE AND AUTOMATION

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





The dumping and scooping functions of the Scooptram ST14 are controlled from an office-based teleremote control station on the surface. Trimming is completely autonomous once the rig has "learned" the route.

Operator **Wayne Locht** switches the Scooptram ST14 to remote control mode in the automation zone 1.4 kilometers below.

with a five-year plan after a year-long search for a solution offering the lowest cost, quickest implementation and solid product support.

"We studied all available technology. We had conferences with manufacturers and visited their facilities. We toured operations where their equipment was at work," says **Patrick Marshall**, Manager Automation Projects.

"We believe the Epiroc package featured the product support we wanted, had the best integration capability for our multivendor operation, had the right pricing model and, in general, was the best fit for our needs."

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

**F**OR HEMLO, SAFETY is the greatest benefit of the high-tech Scooptram ST14. Combining autonomous tramping with teleremote operation also increases productivity.

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

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

**ONE SOLUTION UNDER** discussion is creating additional ore passes to give one crushing operation time to clear ore between dumps. The Scooptram loader can easily learn multiple routes and alternate between them. Other systems Hemlo looked at took up to a full shift for the route-learning process.



**O**PERATOR **WAYNE LOCHT** trams his Scooptram ST14 loader to the automation zone, passing white Wi-Fi boxes mounted on the access walls. He stops short of the first "light curtain", a laser-actuated barrier marking the zone's boundary. Crossing a light curtain will trip a shutdown of the level and alarm those at the surface.

Equipment at Hemlo is tagged to display its location in the mine with Mobilaris real-time tracking software. The same Mobilaris technology is planned for miners' hard hats by the end of 2018. Exiting the cab, Locht says: "We still personally walk the area to make sure no one is in the zone." Reassured the zone is clear, he takes an elec-

**Hemlo Mine in 2016**

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

tronic "key" from a safety box near the light curtain.

"This key gives the rig permission to enter. It connects the rig to the automation area so that the safety system knows that the rig is in the area." He inserts the key into a socket beneath his operator's seat. The red status light on the pole turns to flashing yellow. Locht may proceed to the second light curtain.

Parking the rig between the first laser barrier and the next, Locht sets the

brake and flips a switch on the operator console from manual to remote control. He leaves the cabin a final time, removing the key from below the seat. Plugging it back into the safety box, it rearms the first light barrier and mutes the second. The level-status light turns green.

Locht radios the operator waiting at the control room operator station on the surface 1.4 kilometers above. The rig is now in his hands and Locht catches a 40-minute ride to the surface.

**AUTONOMOUS TRAMMING AND** teleremote operation are the most recent addition to an automation program at Barrick Gold Corporation's Hemlo open-stopping operation near Marathon, Ontario, that began with an autonomous truck circuit in 2007. It is accelerating its automation program



**Patrick Marshall**  
Manager Automation Projects, Barrick Gold Corporation



**Jon Laird**  
Mine Superintendent, Barrick Gold Corporation

**Graham Hanson**, Innovation and Technology Manager, who heads up teleremote operations at Hemlo, says, "This rig, you just run the route to learn it and it's ready to go."

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

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

However, it isn't all about numbers. Introducing advanced technology raises concerns about job security. Hemlo



**Graham Hanson**  
Mine Superintendent, Barrick Gold Corporation



**Trevor Kelly**  
Technical Excellence Director, Barrick Gold Corporation

## “The Scooptram is so efficient it threatens to outpace crushing operations at the ore pass. ... Overproduction is a good problem to have.”

John Laird, Mine Superintendent, Hemlo Gold Mine

has actually added personnel to build and maintain its Wi-Fi infrastructure. And automation has opened paths for other employees to more fully realize their potential with expanded skillsets, achieving at higher levels in an improved working environment.

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

There is an electronics cabinet beside a table with an array of computer monitors behind a single control pad. Locht crosses to the desk to see how things have gone for the operator who has monitored the Scooptram ST14 since Locht left it in the automation zone. Then he's off to the locker room just down the hall to get out of his underground gear. He returns minutes later showered and in his street clothes,

takes his seat in the padded office chair and rolls up closer to study live footage from the Scooptram. It's pulling up to the ore pass with a full bucket. Mucking is not yet an automated feature, so Locht takes the joysticks in hand.

Until the rig is re-fuelled, after approximately 16 hours, no human being will visit the rig or enter the automation zone. Teleremote operators will monitor its routine, taking control only during loading and dumping operations.

Barrick's next step is finishing the wireless infrastructure throughout the Hemlo mine, expanding the automation zones, and getting more loaders. A single operator will run more than one machine from a control station, and the mine will have more than one station. Operators at any station will be able to control any of the automated Scooptram loaders, anywhere in the mine.

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



### Hemlo Mine story

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

### Epiroc and Hemlo

Hemlo Gold Mine Inc. is wholly owned by Barrick Gold Corporation, the world's largest gold mining company with proven and probable gold reserves of \$85.9 million. Hemlo not only chose Epiroc for its recent autonomous,

teleremote initiative underground, but has included Epiroc rigs in its surface fleet for many years. The Hemlo pit-mining fleet includes a DM45 and two Pit Viper 235 rotary drilling rigs, and a SmartROC D65 down-the-hole drilling rig.



### 5 KEYS TO SUCCESS

<p><b>1</b> Mobilaris real-time location tracking</p> <p><i>Mine-wide use of Mobilaris Mining Intelligence not only gives Hemlo real-time equipment tracking, but the precise location of each person underground – a vital advantage in case of an emergency.</i></p>	<p><b>2</b> Designed with operators in mind</p> <p><i>Operators report high satisfaction with the ergonomics, power, comfort and features of the Scooptram ST14 loader. Transitioning to teleremote and autonomous operation is quick and easy to learn.</i></p>	<p><b>3</b> Capacity and speed boost productivity</p> <p><i>The Scooptram ST14 loader with 14-tonne bucket capacity gives fast, fully loaded tramming speeds rated up to 29.5 km/h on level ground and up to 4.8 km/h up a 25 percent grade.</i></p>	<p><b>4</b> Safer, more comfortable environment</p> <p><i>Automated load-haul-dump operation reduces ventilation and climate control requirements for deep mining operations and moves operators to a safer, more comfortable environment than is possible with line-of-sight radio remote control.</i></p>	<p><b>5</b> Multi-use Wi-Fi</p> <p><i>Wireless infrastructure for autonomous operation also enables live access to performance data and provides mine-wide network access for location tracking and communication capabilities like mid-interval reporting.</i></p>
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Gneiss is one of the oldest accessible rock types in the earth's crust. Bararp gneiss is a multicolored migmatitic rock in red and gray, and is found only in this quarry.



### SpeedROC 2F

- Main application area: Marble, granite and limestone in the dimension stone industry
- Main benefits:
  - + Fast drilling and positioning
  - + 360° carrier rotation and extensive boom reach
  - + Outstanding terrainability
  - + Low fuel consumption
- Drilling method: Tophammer
- Rock drills (two parallel): 2 x DF500X
- Hole diameter: 33 millimeters
- Maximum hole depth: 9 meters

# The blockbuster drill rig



[On Location] Sweden

» He sets a drilling program using the remote control. The machine then takes over and takes care of the rest. For operator Per-Anders Olausson, the SpeedROC 2F drill rig means a whole new – and better – way of working.

**O**n the west coast of Sweden, a type of gneiss that is unique in the world is quarried. It was named after the farm next door: Bårarp, which has been Anglicized as Bararp. This is where **Per-Anders "P-A" Olausson** works as a drill rig operator at Swimpex Granite. After 26 years he has got to know the soul of this rock.

"It's the only rock in the world to have this coloring and patterning. Not only that, but the pattern varies depending on how I choose to drill. In western Europe they prefer a wavy pattern with more red in it, while the big eastern market likes a striped pattern," says P-A Olausson.

**HIS JOB IS** to drill out blocks, often a good five cubic meters in size and weighing 17 metric tons, which will then become gravestones, cladding, steps or countertops.

"I have to take into consideration pattern, colors and any defects, cracks and other quality faults when I plan the positioning of the drilling holes. The drill bit has a diameter of 33 millimeters and there are just 10 centimeters between holes, so the rig can't go off course."

Swimpex Granite has had a SpeedROC 2F drill rig from Epiroc since November 2017.

"We had a demo rig for a week, but I liked it so much the management decided to buy it. We had an instructor here from Italy for a week, and the support since then has also been really good and helps me with any questions. I've probably run the rig for at least 600 hours since we got it, and I've been extremely happy with it so far," says P-A Olausson.

He compares it to the rig he used previously, reeling off point after point on his fingers.

"This one's faster, more fit for purpose, has more settings, higher capacity, lower fuel consumption and is much more automated. I set where and how deep it is to drill, and then it takes care of itself. It's an absolutely brilliant rig. I'd never have believed it could be this good."

**ON A GOOD DAY**, in good conditions, it takes P-A Olausson around two hours to drill out a block.

"I maybe drill 1 000 meters a day. After 140 meters the drill bit is worn out and has to be replaced with a new one."

The old rig was based on the same principles, but nothing was automated.

"So it was a full-time job just keeping up with it. OK so I still have to change drill bits, but you have to do that on any rig you have. I'd never go back to the old way of working – that would be unimaginable." ✕



Per-Anders Olausson, Drill Rig Operator, Swimpex Granite

More [bit.do/speedrocfacts](http://bit.do/speedrocfacts)





**DAVE BROOKER**

Product Manager, Exploration Equipment at Epiroc. Based in Townsville, Queensland, Australia.



# DRILLING DREAM TEAM



[On Location] Australia

»→ The Webdrill and Epiroc success story is inspiring exploration efforts in Australia. Epiroc's adept drilling machinery has enhanced Webdrill's reputation as a leading drilling specialist.

**A**ustralia's newest underground diamond drilling specialist, Webdrill, was founded by industry expert **Jared Webb** in 2014. The company is contracting at the Nicolson's Gold Mine in North Western Australia, making first-class underground diamond drilling machinery a priority for the operations. Prior to making the investments, Webdrill conducted thorough research before settling on Epiroc as its exclusive supplier. Webdrill's first purchase was the Diamec Smart 6 rig with the integrated Rod Handling System (RHS). The machinery makes the underground drilling less laborious and improves safety.

Mining & Construction brought together Webdrill's Jared Webb and Epiroc's **Dave Brooker** for a discussion on their budding partnership.



**JARED WEBB**

Managing Director at Webdrill Australia. Based in Perth, Western Australia, Australia.



**“It’s fast and easy to use.”**

Jared Webb,  
Managing Director,  
Webdrill

The RHS rod handler device largely takes the place of a human driller in replacing drilling pipes. A two-hand activation controller ensures safe operation of the RHS rod handler.

**Why was Epiroc chosen as exclusive supplier?**

**JARED WEBB:** “During my time in the drilling industry I have been involved in the evolution of the range of rigs common to the industry today, and underground diamond drilling rigs are very different from the larger machines you might see drilling on the surface. Visiting the Epiroc factory in Sweden, as well as seeing a Diamec Smart 6 rig in operation at Boliden’s Kristineberg mine, I was impressed with the setup and operation of the rigs – including the RHS. The decision was made there and then. I knew what I wanted in a rig, and I was convinced that Epiroc could supply me with what I needed.”

**DAVE BROOKER:** “Webdrill had specific requirements. Safety, productivity and technology were key focuses, and we were pleased to cooperate. The Diamec Smart 6 rig that Jared mentioned also has very powerful self-diagnostics, making it extremely easy to troubleshoot – which results in more up-time and less downtime for his operations.”

**What are the key benefits of the RHS, the integrated Rod Handling System?**

**DB:** “The RHS device significantly reduces the manual workload of the driller’s offside when replacing drill pipes. The key benefits of the system are button activation, offside safety and the fact that it can handle the entire weight of a full core barrel and inner tube. It operates on a constant cycle time, reducing the risk of repetitive strain injuries, and the rig can drill unattended.”

**JW:** “Dave’s points are spot on. The RHS automation has reduced manual handling of rods for the driller and the offside. It isn’t as fast as manual rod running, but the elimination of repetitive strain injuries is worth it from a safety point of view. It’s fast and easy to use – not to mention the unattended drilling function and programmability of the rig.”

**Would you say this type of machinery is innovative for the mining industry?**

**DB:** “A lot of contractors still use non-computer-controlled rigs, so it’s not completely common. At Epiroc Australia we have a team that is dedicated to the support of the RCS control systems, and that local expertise has been beneficial in the introduction and ongoing support of the machines and RHS rod handler. The system is a result of great collaboration between the local Epiroc team here in Australia and the global R&D department in Sweden.”

**JW:** “The industry has really progressed, and Epiroc has remained among the industry leaders in this area. It still surprises me how much of the operation can be left to computers, and the benefits this has for working conditions and safety. For example, we have a laser barrier that goes across the drill cuddy and when unattended drilling is under way, if anyone walks through the laser the rig shuts down.”

**In Focus:**  
Webdrill

Webdrill is a new Australian-based diamond drilling company specializing in underground diamond drilling for exploration and grade control. The company focuses on consistently delivering high-quality core samples and value to the customer, with safety at the forefront of all operations. Webdrill is currently contracting at the Nicolsons Gold Mine, owned by Pantoro Ltd and located in

the Kimberley region of Western Australia. This is part of the Pantoro Halls Creek Project, with gold extraction being the main objective.

- **Founded in 2014**
- **Fifteen team and site employees**
- **Nicolsons Gold Mine contract established in 2016**

More [webdrillau.com.au](http://webdrillau.com.au)

**Does the remoteness of the Nicolsons Gold Mine pose any challenges for your partnership?**

**JW:** “Not at all. We mainly communicate by phone and email with the Epiroc teams in Townsville or Perth. They are very knowledgeable and even take our calls after hours, which is rare. And when there have been issues, they have been resolved quickly.”

**DB:** “For smaller on-site issues, the RCS screen will show a fault message that can be sent to our service guys, that is then rectified immediately. The rig’s self-monitoring has proved to save a lot of on-site servicing, and the Webdrill personnel have become very proficient with the RCS. Epiroc also has branches and centers close to all of the mining centers, so we are very well placed to quickly support our customers.”



Dave Brooker  
Product Manager,  
Epiroc Australia



Jared Webb  
Managing Director,  
Webdrill

**How would you describe your experience of the working relationship?**

**JW:** “It has been a learning curve for me, around the new drill technology and how the equipment operates. Overall it has been a positive experience. The Epiroc team allows me to have a custom-built rig to suit most mine types and ground conditions in the world. Having the ability to pick from a range of drills is an added bonus for Webdrill.”

**DB:** “The two-way communication has been excellent. Jared provides a lot of feedback, and as a supplier we need feedback from people that are operating the equipment. He will come in to the office occasionally to review the machines and possibly ask for some level of customization. We have a local engineering team at our Perth facility, and we customized the drills to meet his specific requirements. It’s been a win-win.”

**What does the future look like for Webdrill and Epiroc Australia?**

**JW:** “Webdrill plans to grow our fleet of Epiroc machinery in the coming years, so I would like to think we will have a long and prosperous relationship with Epiroc. They have done the right thing by me and I know they are continuing to develop new designs and improvements in Sweden, which is why they obviously appreciate my feedback and we are in constant communication.”

**DB:** “I would say technology is a focus for both of us. We are both interested in modern technology, safety and automation. Webdrill has established their position in the marketplace and Epiroc are continuing to work on more features to be added to the RCS system. The future is looking bright for both parties.”



**KEYS TO A SUCCESSFUL PARTNERSHIP**

Building and sustaining a strong supplier-customer relationship can be challenging. Here are some suggestions for how to maintain an effective partnership, according to Jared Webb and Dave Brooker.

**Common goals**

✓ Both parties share a commitment to innovation, as represented by the RHS rod handler. Epiroc’s research department remains in close contact with operators, enabling both parties to regularly exchange ideas and suggest improvements.

**Two-way communication**

✓ A willingness for the supplier to involve and consider customer opinions is utmost. Epiroc and Webdrill are in regular contact regarding feedback and customization.

**Trust and integrity**

✓ Both parties appreciate a level of mutual trust. Webdrill trusts Epiroc to deliver the customization requested in order to give Webdrill a competitive edge. Webdrill also gives regular constructive feedback to the Epiroc team based on their field operational experience with the machines.

**Post-sales cooperation**

✓ Prompt responses to consumable requests, as well as regular material deliveries to the drill site, are part of a considered service program devised by Epiroc.

More [bit.do/diamecsmart6](http://bit.do/diamecsmart6)

Want to keep track of what's happening in the mining and construction business? Visit [miningandconstruction.com](http://miningandconstruction.com) for links to industry news and other interesting reading.



In 2017, global spending on the search for nonferrous metals rose for the first time in five years. Gold was the top target in all regions around the world.

SHUTTERSTOCK



**Darryn Quayle**

Executive Vice President and Mining Specialist, Proudfoot, London, UK

## Why is social responsibility good business practice?

**In your opinion, mining companies need to focus more on social sustainability. What's changing?**

"The most important part of any mining operation is to get local communities involved from the start. If you asked a mining executive a few years ago in, for example, Latin America what the three key points for success were, they would've said energy, water and ore grade. If you ask the same question today, they'd say local communities, local communities and local communities."

### Why is that?

"It simply makes good business sense. People in communities want to participate in developments affecting their land. They are well informed and socially mobile on Twitter, Instagram and Facebook. It's part of a wider process involving developing communications and a focus on trust in relationships. Companies have to build something lasting and positive. Both communities and shareholders expect this."

### Can you give us an example?

"For example, BHP runs an effective anti-malaria program in Mozambique, assisting the local community. Not only is it a good thing to do, it's also resulted in less absenteeism in the workforce, and immensely increased productivity. The best ROI is to start a relationship at the geoscience phase, and make sure that the local community is on board from the start."

More [sustainabledevelopment.un.org/topics/mining](http://sustainabledevelopment.un.org/topics/mining)



## Pinpointed

### 01 BC task force to strengthen mining sector British Columbia, Canada

The province of British Columbia, Canada, has created a task force in an effort to strengthen the mining industry and create jobs long-term. The task force report, which is due in November 2018, will encompass in-depth analyses of economics and skill mapping, along with recommendations for development and financial incentive programs. "One of our goals... is to find ways to ensure mines in BC remain viable when commodity prices fluctuate, so that people can keep working and communities can thrive," said BC Energy, Mines and Petroleum Resources minister Michelle Mungall.

### 02 Colombian Mining Class of '18 Colombia

The first class of 53 students has graduated from Servicio Nacional de Aprendizaje (SENA) in Colombia, a result of Continental Gold's underground mine training initiative in partnership with the government. A total of 19 graduates are female – the first such Colombian-certified underground mining technicians. Continental Gold has already hired 37 of the graduates for the flagship Buriticá gold project, scheduled for commercial production by mid-2020. Further joint training programs are under way, with another class graduating in the fourth quarter of this year.

### 03 New Australian lithium production plant Western Australia, Australia

Tawana Resources and Alliance Mineral Assets have commenced spodumene (lithium) production at the Bald Hill lithium and tantalum mine, the first Australian mine to do so since 2016. The lithium production is made possible by a newly constructed dense media separation (DMS) circuit. "It is a great effort by everybody involved to take Bald Hill from maiden lithium resource to production in nine months, including only seven months of construction from the ground up," said Tawana's Managing Director Mark Calderwood.

### 04 China proposes a 'Polar Silk Road' Arctic region

In its first official Arctic policy white paper in January, China said it would encourage enterprises to build infrastructure and conduct commercial trial voyages – paving the way for Arctic shipping routes that would form a 'Polar Silk Road'. China has become increasingly active in the polar region and has been an observer member of the Arctic Council since 2013.

The white paper also said China is eyeing development of oil, gas, mineral resources and other non-fossil energies, fishing and tourism in the region. It said it would do so "jointly with Arctic States, while respecting traditions and cultures of the Arctic residents including the indigenous peoples and conserving natural environment".



SHUTTERSTOCK

## Exploration spending is growing

**THE MARCH 2018** World Exploration Trends report, commissioned by the PDAC International Convention and authored by S&P Global Market Intelligence, offers some noteworthy insights. For the first time in five years, global spending on the search for nonferrous metals rose – to an estimated US\$8.4 billion in 2017 compared with US\$7.3 billion the year before.

2017 was a good year for the global mining industry, with increased investments despite concerns over North Korea. Metal prices

have also benefitted from the improved global economy.

**CANADA, AUSTRALIA AND THE U.S.** continue to be the top spenders in exploration, with gold being the popular top target in all regions around the world. Exploration targeting base metal assets also rebounded in the second half of the year. Cobalt and lithium have fast become increasingly popular with junior companies, spurred by the growing demand for rechargeable batteries.

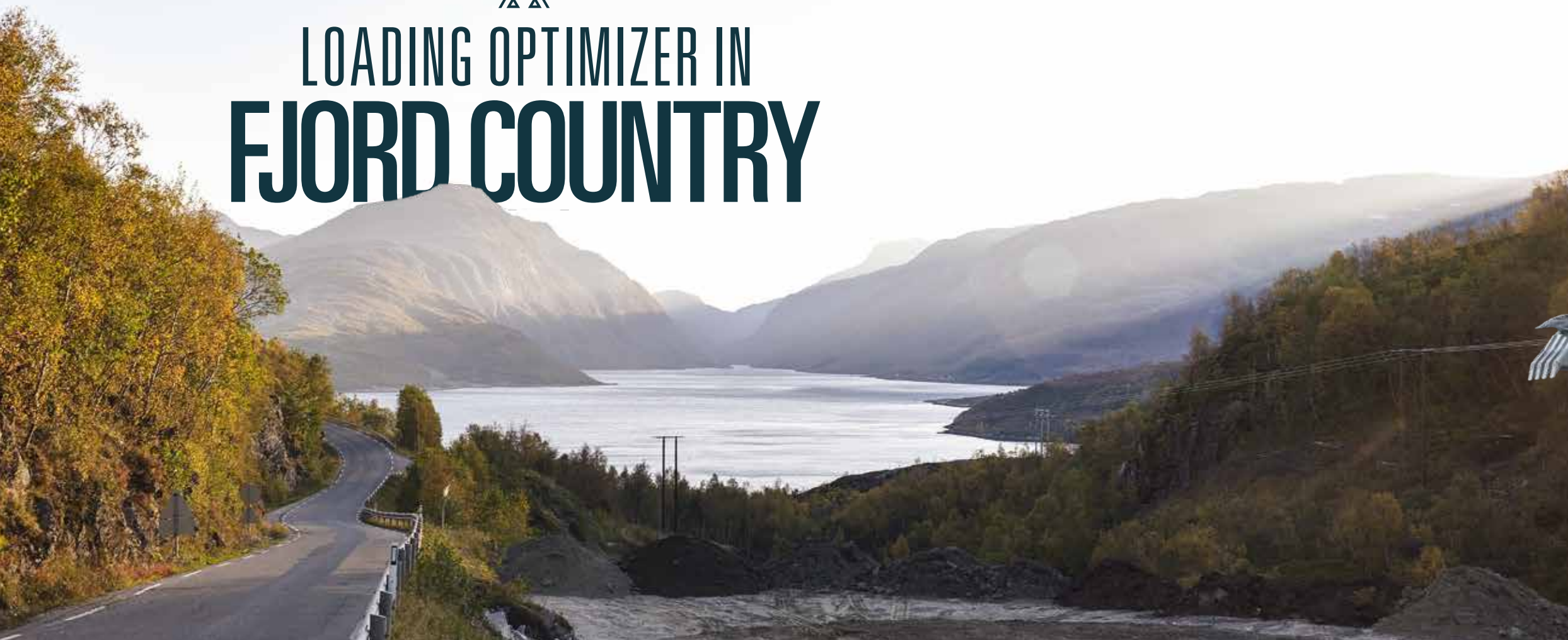
## Rocketmine to deploy high-altitude drones in Mexico

**ROCKETMINE, A SOUTH AFRICAN** subsidiary of the Delta Drone Group, is expanding with new contracts in Ghana and across the Atlantic in Latin America. Rocketmine will cover at least six sites with drone surveys for Mexican mining company Minera Autlán. The high altitude of these sites is challenging, but Rocketmine has stated that it is breaking records with regards to flight altitude and the project will allow them to demonstrate advanced capabilities and operational adaptability.



ROCKETMINE

# LOADING OPTIMIZER IN FJORD COUNTRY



**S**



» Building two hydropower plants in northern Norway, BetonmastHæhre Anlegg faces specific challenges – and is overcoming them with the help of the Häggloader. The environment, the project budget and the operators are all winners.

**SINCE FALL 2015** an enormous project has been under way on both sides of the Gjervalen Fjord on the west coast of Norway, just south of the Arctic Circle. Power company Smisto Kraft is having two hydro-power plants built into the rock: Smibelg and Storåvatn, which together will produce 210 gigawatt hours of electricity per year.

Responsibility for delivering a turnkey project, encompassing everything except the power electronics, lies with BetonmastHæhre Anlegg. In addition to the actual power stations, among other things the company is building five water reser-

voirs, four brook intakes and a pumping station – as well as 27 kilometers of tunnels, mainly for water.

**SINCE THE TUNNELS** are only 20 square meters in size, there is no room to turn around loaders at the tunnel fronts. Here BetonmastHæhre is using the continuous loader Häggloader 10HR-B, which was designed precisely for tight spaces and which, unlike conventional loaders, is stationary during loading. The blasted material is scraped up onto a conveyor and then discharged down onto a dumper.

“It’s a very smooth way to load,” says **Rune Lien**, Project Manager at BetonmastHæhre. “The alternative would be to drive to and fro with loaders, which would take much longer and cause more wear to both the road surface and the machinery. And since the Häggloader is a continuous loader,



**Rune Lien**  
Project Manager,  
BetonmastHæhre  
Anlegg

it’s easy to fill the dumpers optimally.”

The Häggloader is mainly electric-powered, with diesel required only for lengthy tramming. This reduces climate impact and lowers noise levels, as well as reducing ventilation costs.

“The Häggloader requires a ventilation capacity of 16–17 cubic meters a second,” says Rune Lien. “Had we used a diesel loader instead, it would have needed to be at least 40 cubic meters a second. Something like that would have required larger tunnels – and since we’re doing so much tunneling, the costs would be considerably higher. And all for nothing, because there would be no benefit in terms of what’s finally delivered.”

**ON CERTAIN SECTIONS** in the rock there are steep gradients of up to 15 percent. A wheel loader would find it difficult to work in such conditions – but for the Häggloader, which does not move and scrapes down the material onto the conveyor, it’s another matter.

“The machine is incredibly good on a gradient, and it’s also multifunctional. I use the boom

## LEARN MORE // HÄGGLOADER A loader for every need

**THE HÄGGLOADER IS** available in various designs and sizes to suit different needs. All models are available with two different boom applications: dual digging arms for high productivity and backhoe for superior flexibility.



### Backhoe

The backhoe system provides greater flexibility and greater coverage. Among other things, the multifunctional boom can perform digging and scaling, and is therefore often chosen in civil construction.

3.5 m<sup>3</sup>

**Häggloader 10HR**  
loading capacity:  
3.5-4 m<sup>3</sup>/minute



### Dual digging arms

The dual digging arms can be moved individually, providing high productivity and loading capacity. The system is preferred in production and is very well suited for mine development, room and pillar, cut and fill and stoping.

5 m<sup>3</sup>

**Häggloader 10HR**  
loading capacity:  
5 m<sup>3</sup>/minute

More [loadingoptimizer.com](http://loadingoptimizer.com)



The Häggloader has been a key to success at the Smibelg and Storåvatn sites, where BetonmastHæhre is building two hydropower plants.



**Ole Jørgen Johansen**  
Operator,  
BetonmastHæhre  
Anlegg

not just for loading, but also to scrape the walls and roof of the tunnel. And moving the machine sideways at the tunnel front is easy because it's equipped with front and rear steering," says operator **Ole Jørgen Johansen**, who has been working with the Häggloader for four years.

He continues:

"It's also nice not to be moving about when you're loading. Driving a wheel loader to and fro can be quite bumpy, but this is much gentler on the back. We've even been given air seats, which makes the working environment even better."

**BETONMASTHÆHRE IS TO** complete the project at the end of 2019, and to date the work has gone according to plan. Combining a wheel loader – as used at the loading bays placed at 200 meter intervals in the rock – with the Häggloader has proved to be a winning concept.

"We've tried other solutions in previous projects, but no loader has delivered like the Häggloader," sums up Rune Lien. ✕

### 1. Large opening

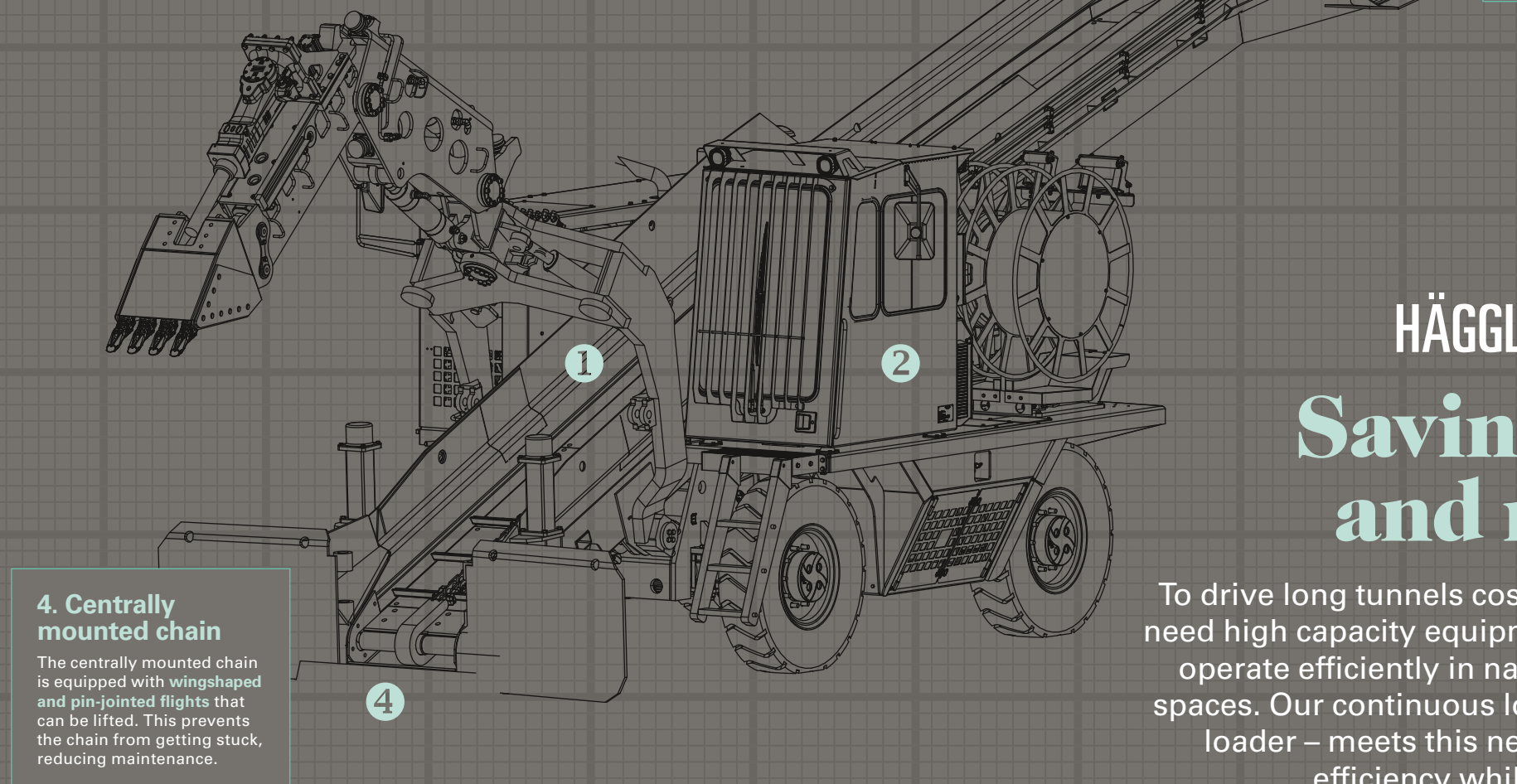
The open type conveyor in combination with a wide digging arm bridge allows large rocks (up to 1.2 meters in height, much larger compared to similar machines) to pass through. Thanks to this, the Häggloader will continue production without interruption even when handling rock with large fragmentation.

### 2. Safe and ergonomic cabin

The cabin is FOPS approved and has an ergonomically designed driver's seat with joysticks mounted in the armrests. It is equipped with air conditioning, a heater, protection bars, LCD display for performance data, and two rear-mounted cameras for maximum visibility.

### 3. Adjustable conveyor

The conveyor is available in different lengths and is individually adjustable in height at both the front and rear hinges. Having a machine with two hinges increases flexibility and makes it easy to match with all types of haulage equipment.



### 4. Centrally mounted chain

The centrally mounted chain is equipped with wingshaped and pin-jointed flights that can be lifted. This prevents the chain from getting stuck, reducing maintenance.

## HÄGGLOADER 10HR

# Saving time and money

To drive long tunnels cost-effectively, you need high capacity equipment designed to operate efficiently in narrow or confined spaces. Our continuous loader – the Häggloader – meets this need by increasing efficiency while lowering costs.

## BetonmastHæhre

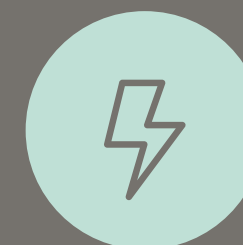
**FOUNDED IN 1974**, Hæhre Entreprenør has since become a major operator in civil engineering in Norway, and along with its subsidiaries Hæhre Mek. Verksted, Hæhre Maskinutleie, Hæhre Gulvstøp, Hæhre Auto and Zenith Survey offers a wide range of products and services. The company has offices in Vikersund, Billingstad and Bergen and carries out work throughout the country.

In 2017 it merged with Betonmast. The BetonmastHæhre Group has 2850 employees and in 2017 sales amounted to around NOK 10 billion.

## Smibelg and Storåvatn power plants

**THE TWO POWER** plants are being built 150 meters and 200 meters respectively into the rock. Construction work began in May 2015 and will be completed in December 2019. The waterways consist of 27 kilometers of tunnel, five reservoirs, four brook intakes and a pumping station.

The Smibelg and Storåvatn facility can be accessed by boat or helicopter.



Total annual production and rated output: 210 GWh/68 MW



Number of households whose electricity consumption is covered by Smibelg and Storåvatn: 10 500 (5 750 + 4 750)



Total cost of the project: NOK 1.4 billion

# [FEATURE] AUTOMATION



## CONTENTS

It is a grand vision: completely autonomous mines, comfortably supervised from safe distances by humans. A lot is happening in mining automation these days, and the buzz is steadily increasing. But where are we heading? And how far are we from the vision?



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#### The pursuit of autonomy

Automated solutions are the future of the mining industry – though the road ahead is long. And somewhat bumpy.



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#### Crewless ships ahoy!

The shipping industry, like so many others, is forging ahead into the unknown waters of automation. This year the first potentially unmanned ship will be launched in Norway.

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What benefits are to be expected from automation, and what problems need to be overcome along the way? We asked an engineer, a vice president and a researcher.

41

### SEVENTHINGS

#### Automation through the ages

The first automated machine was a mercury thermostat built by a Dutch inventor in 1620. Since then – in most cases for better, occasionally for worse – robots have proliferated in society.



# Entering the age of autonomy

A steadily increasing number of tasks are being automated, in virtually all strata of society. Over the next few years we will see automated solutions for businesses as diverse as transport, retail, security, healthcare, food services, ... and mining.

**T**he age of automation is here. A plethora of tasks is being automated; even tasks that just a few decades ago would have been inconceivable to put in the hands of robots and artificial intelligence. To pick just one recent example, artificial intelligence drastically outperformed – in speed as well as accuracy – a team of lawyers in scanning a set of non-disclosure agreements for legal errors. Automation, experts agree, is the inexorable future. The questions are: why is the mining industry on the automation conveyor belt, how far along is it, and how will it be affected?

The reasoning behind automating mining is, put simply, safety and productivity. The mining industry has seen mostly declining figures since 2013. Operational Equipment Efficiency (OEE) has been stuck at around 20 to 25 percent – compare that to the value of 80 to 90 percent in the automotive industry. There’s also a need to increase Asset Utilization (AU), according to **Jonas Albertson**, President Rocktec division at Epiroc. He says:

“Neither machines nor mining sites are being used with a high enough degree of efficiency. Automation is a way to increase safety, predictability and productivity.”

**THE PATH TO AUTOMATED** solutions in the mining industry will involve several increasingly complex steps, the first being adding automated functionality to machines. This is where most mining companies are today. The second step involves getting machines to cooperate and work together, markedly increasing efficiency while removing employees from hazardous zones. Further

steps involve increased automation and integration of systems, even though they might be from different manufacturers. The final step – the automation “vision” – is largely self-sufficient round-the-clock operation of mines, with human presence many miles away.

“A good way to start would be with positioning, and then to begin optimizing the traffic flow. The key to successfully implementing automation is to optimize processes and make them work tighter together. For example, optimizing drilling processes to get better fragmentation after the blast, so as to facilitate loading,” says Jonas Albertson.

**I**ncreased safety, as previously mentioned, is also one of the major driving forces for automation in the industry. Automated solutions allow personnel to work outside of hazardous areas, or even far away from the actual sites. There are already examples of machinery being successfully operated from control rooms many miles away.

“There is still some way to go before the industry can apply fully integrated system solutions though. Mine sites differ from, for example, manufacturing plants in that they are not controlled environments – and also that they keep expanding. It will take time to design and apply the necessary infrastructure to support fully automated solutions,” says Albertson.

Building the necessary infrastructure for automation at new sites is a lesser problem, considering; this can be taken into account at the onset of the planning stage. As Albertson states, converting existing sites to incorporate automated solutions poses a much greater challenge.



**Jonas Albertson**  
President Rocktec division, Epiroc



**Tony Scheres**  
Manager Technical Services & Business Development, Hudbay

**Tony Scheres**, Manager of Technical Services and Business Development at Lalor mine, Hudbay in Manitoba, Canada, has hands-on experience trialing innovative technology at an existing mine. He has been at the Snow Lake site since 2010, and has been putting new equipment through the hoops ever since.

“I think we were the first in the world to test the Scooptram ST18 automated loaders, for example, and we’ve been running automated Scooptram loaders for more than a year now. At Lalor mine we do a lot of trialing and testing of equipment and products to improve operation.”

**HE SEES LOTS OF** major benefits from automation, not least in safety.

“Automation allows us to remove people from the underground work environment hazards of dust and other contamination. During automation the equipment operates at designed optimal levels with less wear and tear. Automated equipment continues to operate between shift changes and is not affected by blast clearance when the mine is being ventilated and employees are at the surface. The efficiency of automation has the potential to reduce operating costs and mine lower-grade ore, extending the life of our mines.”



**AUTONOMY ↑**

**“The functions should be accessible and easy to use correctly. The point is to help people do better work.”**

**Ulla Korsman-Kopra**  
Global Business Manager Automation and Information Management Systems, Epiroc



Converting to automation is not without its problems, however. “For safety reasons, the operation of automated equipment must be separated from other working areas of the mine where we have underground miners actively working. We’re not set up for transferring the ore automatically to a haul truck at the moment, for example. If we switch to autonomous trucks they will have to move through areas where we have active crews working, and we need to solve that. Another downside, we’ve discovered, is not having miners in the draw-points of the stopes. Miners are still better at spotting potential hazards in the stopes, and we’ve lost a couple of loaders when oversize pieces came down on top of them.”

According to **Ulla Korsman-Kopra**, Global Business Manager Automation and Information Management Systems at Epiroc Underground Rock Excavation division, the first step in converting an existing site is to do a thorough audit. “You have to see what is at all possible. You need to get a full picture of aspects such as the layout, restrictions, barriers, safety systems, dumping points, traffic flow and personnel. The existing Wi-Fi network may certainly have to be enhanced – every automation solution is dependent on having a reliable communication network,” says Korsman-Kopra.



**Ulla Korsman-Kopra**  
Global Business Manager Automation and Information Management Systems, Epiroc

to understand and use. If they’re too complex, a lot of the functionality will remain unused because nobody understands it. The functions should be accessible and easy to use correctly. The point is to help people do better work.”

**WHEN BUILDING AUTOMATED** solutions, she also stresses the importance of designing good user interfaces. “It’s vital to build solutions that are easy

**IN ORDER TO REACH** that goal, she advocates using best practice solutions from other industries – be it aviation, bionics or space.

“We have to be open to new kinds of solutions; technologies that nobody has thought of applying to the mining industry before,” says Korsman-Kopra. ✕

IN THE AIR

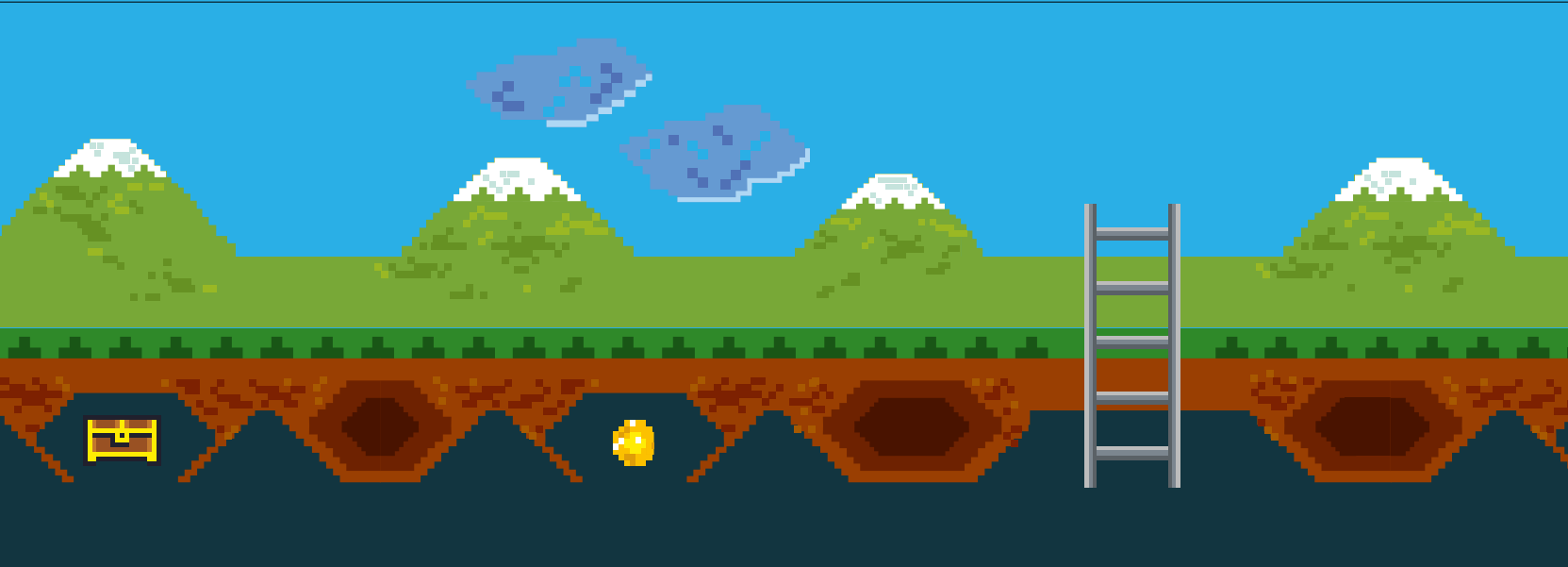
**Our wireless tomorrow**

**THE NEXT GENERATION** of wireless standards, the upcoming **5G** for mobile and **802.11ax** and **802.11ad** for Wi-Fi, will pave the way for better communication both above and below the ground. Early tests of candidates for the 5G standard suggest it boasts speeds that are at least a magnitude higher than 4G, while also dramatically lowering latency times – very important not least when used with

remote control, where split-second reactions can make all the difference. The 802.11ax standard promises access points that can talk to multiple devices simultaneously, not sequentially like today, while the 802.11ad standard will be a very short-range system with very high throughput capabilities, which could be an option for demand-intensive implementations.



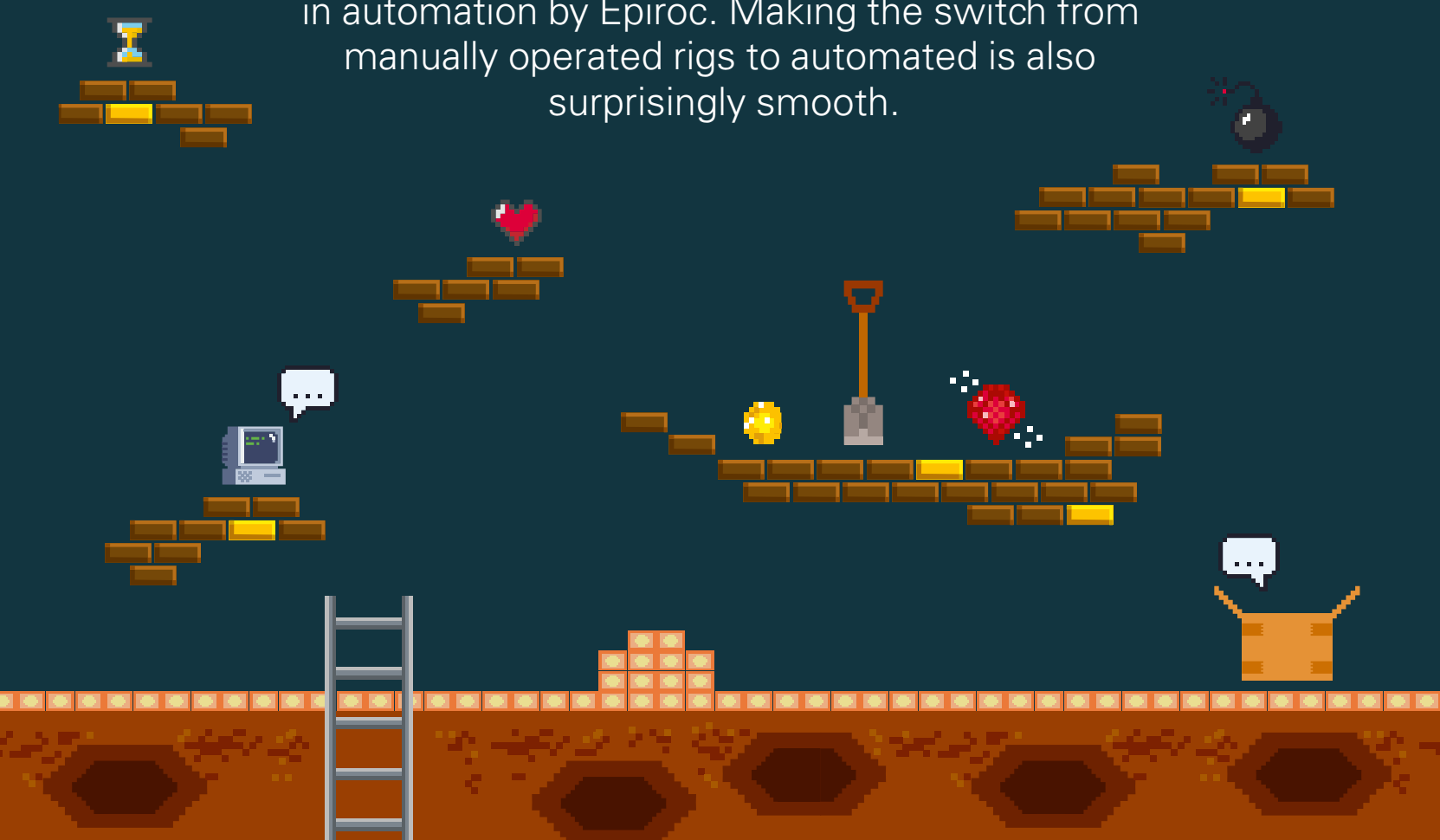




LEVEL UP

# MINING FOR EFFICIENCY

»»» The world's mining industry is becoming safer and more efficient, thanks to developments in automation by Epiroc. Making the switch from manually operated rigs to automated is also surprisingly smooth.



**“This is a smarter way to do the job in so many ways. I see this changing everything for the better.”**

**Steve Germain**  
Product Specialist, Epiroc Canada



[On Location]  
USA

**HANDS ON JOYSTICKS** have controlled drilling rigs for years. But today, a huge smile appears on the face of the operator. It's the first time **Steve Germain**, Product Specialist from Canada, is controlling a rig with no noise, fumes, dust, or vibration. He calmly sips coffee in a quiet, air-conditioned, state-of-the-art classroom, and the rig is outside the windows 80 meters away.

“Who would want to go back to sitting on a noisy rig? This is a smarter way to do the job in so many ways. I see this changing everything for the better,” says Germain.

He and eight other Epiroc employees are learning about the next revolution in mining. Their classroom is modern but casual, with huge flat screen TVs, shelves stocked with binders of documentation, a refrigerator filled with refreshments, and people rapidly scribbling notes from subject matter experts. The attendees come from the U.S., Chile, Russia, Morocco, Canada, Sweden, and Ukraine. No two accents are the same,

but they're all speaking the same language – automation.

The classroom is a part of the Epiroc Surface Automation Center in Garland, Texas, and they are gathered here for Boot Camp. Several are held every year for Product Managers and Product Specialists. State-of-the-art automation equipment requires thorough training for all Epiroc stakeholders involved, so the attendees are immersed in every phase of the process using the same equipment they will use on the job.

**EPIROC IS PLACING** a huge focus on automated solutions to meet the challenges facing today's mining industry. For example, new safety restrictions protect workers but could affect productivity. Operators are driven to meet quotas, which wears out costly consumables like bits and rods. The costs of transporting workers to remote locations are rising, and skilled workers are becoming more and more difficult to find.



**Steve Germain**  
Product Specialist,  
Epiroc Canada



**Herman Krause**  
Automation Implementation Manager,  
Drilling Solutions division

According to **Herman Krause**, Automation Implementation Manager, Drilling Solutions division, “Our customers today want safety, efficiency, increased productivity, cost reductions, and improved quality of life for workers. Automation is solving all these problems. We’re setting the pace for technological advancements, and it’s our goal to offer customers the best possible solutions and products. This is why we established the Surface Automation Center and hold Boot Camps at our training center – we’re equipping people to lead the future of mining.”

Automation is a key ingredient in meeting the challenges facing the industry.

“For safety concerns, we take the operator out of the hazardous environment containing noise, dust, and heat. Productivity increases, and possible machine abuse decreases. When a bit gets stuck it’s human nature to push through a difficult area, but in automation a more controlled approach is taken by backing out of the hole and/or changing the drilling inputs. Automated machinery is all about repeatability. No holdups, no hiccups. We improve the entire value chain,” says Krause.

Epiroc is pioneering automated safety innovations such as Obstacle Detection (OD), which detects and takes action on objects so the rig doesn’t damage itself or other machines. Personnel Detection (PD) signals the system to stop if a per-

son gets too close. As Herman Krause points out: “OD and PD are critical for keeping machinery and personnel safe.”

**NEAR THE TRAINING CENTER**, customized automation kits are being prepared for rigs and customers around the world. Each remote order involves an office kit with equipment for controlling and awareness of the fleet, and machine kit(s) for the rig itself. The field kits are built to be turnkey. All components are tested, then packed so each part is removed in the order needed for installation to minimize downtime.

Members of the Field Automation Service Team (FAST) assist with installation and testing, and commission the rig back into operation. The team members train onsite Epiroc technicians and operators, and correlate system integration with a Site Champion to assist for a given time period.

**TODAY’S BOOT CAMP** attendees are surprised to see how the joysticks on the compact control pad replicate those on a manually controlled rig, which simplifies retraining. The operator watches the drill on a personal console screen and can supervise up to nine drills at once.

Steve Germain sees the advantages of automation in underground mining. “After an underground blast we wait four hours for the air to



## Q&A

**Herman Krause**  
Automation Implementation Manager,  
Drilling Solutions division



*The shift towards automation in the mining industry goes hand in hand with Agile methodology replacing Waterfall methodology. This means a big change in everyday ways of working for the customers.*

**Q** Do the changes have to be done all at once?

**A** “No, Epiroc makes it easy by offering four stages – or baby steps. Each step offers higher levels of efficiency for the drilling. The steps can also be customized for the perfect design solution to fit any type of mining operation or climate.”

**Q** What’s the first step in the transition?

**A** “First, we would install **Auto Level** and **Auto Drill**. This simple upgrade to any rig increases efficiency of the drill cycle by the repeatability of our Auto Level and Auto Drill system.”

**Q** What’s the second step?

**A** “Next, we install **GPS**. This upgrade enables the rig to consistently follow an exact drill pattern of burden and spacing, to precisely place the holes and eliminate errors. In fact, it places them where they are needed within the diameter of our bit. When the holes are perfectly placed it offers downstream efficiency advantages such as level benches and fragmentation. A geo-fence could also be loaded onto the pattern, which would keep all our Pit Vipers safely contained.”

**Q** And the third upgrade?

**A** “Installing **Tele-Remote Operation**. This upgrade includes all of the above plus remote control either from our line-of-sight trailer option or our operating station option in an office for a safe, climate-controlled environment which could also be somewhere on the other side of the world. This enables one operator to run several drills at a time for greatly enhanced productivity.”

**Q** What’s the final step in the automation process?

**A** “A **fully autonomous Pit Viper**. By going fully autonomous, a rig can be programmed and sequenced to complete a drill pattern autonomously from anywhere in the world to drill 24 hours a day to complete a given task. This greatly reduces drilling costs, safety risks, and operational free will. The ultimate drilling machine is an automated Pit Viper.”

**More** [bit.do/autonomouspitvipfacts](http://bit.do/autonomouspitvipfacts)



The Boot Camp attendees enjoy a few minutes outside the classroom, just a few steps from the fully-automated drilling rig in the background.

## In Focus: The Surface Automation Center

The Surface Automation Center is a fast-growing part of the Epiroc Drilling Solutions division, providing cutting-edge automation solutions for all types of drilling challenges anywhere in the world.

- Knowledge and solutions are shared with other divisions in the Epiroc Group
- Boot Camp training sessions with a specially equipped classroom and full-scale automated drilling rig are held several times a year, focused on specific roles
- The growing Surface Automation Center will have skill sets providing all facets of a robotics organization, including development and field support; some are in Garland, Texas, and others in the field, at supported locations throughout the world



**Anna Rønning**  
Underground  
Project Manager,  
Underground Rock  
Excavation division

clear of toxic gases before an onsite driller starts the next hole. That's four hours wasted. But with tele-remote we can start the next hole immediately. With four extra hours of drilling we get 30 buckets per hour at 500 tons an hour. That's 2 000 extra tons a day per rig. The automation upgrades pay for themselves after two days."

**Anna Rønning**, Underground Project Manager in Underground Rock Excavation division, marvels at how similar the efficiency improvements are between underground and surface mining. She also realizes the enhanced quality of life. "Automation is the future for the business. It's a much cleaner, healthier, and safer work environment."

**AS THE MINING INDUSTRY** faces the challenges of improving safety and efficiency, it is evolving from the business model of traditional Waterfall methodology to Agile methodology made possible by automation. For decades, development methods have relied on variations of the Waterfall sequential workflow process based on moving from task A to B to C without variation. But it doesn't adapt to a product's evolving needs, so it's difficult and costly to change the scope if needed. The advantage of Agile methodology is that it breaks down the workflow into smaller stages so that adaptations can be made along the way as a project progresses, allowing problems or opportunities to be addressed and solved much faster.

Herman Krause sees automation as the perfect partner for the Agile approach.

"The problem with Waterfall is that it stands in the way of efficiency. Rapid change is not possible. But with Agile, a small focused team of people are constantly talking and working with each other. Development time for new solutions is broken down into shorter periods (bursts), and customers can be very involved. We are not a huge bureaucracy tied up in red tape, but rather make changes to our technology faster to make the product better."

**ANOTHER PROBLEM FACING** the mining industry is that workers have to be transported to remote locations, and they're away from home a long time. **Tyler Berens**, Automation Product Line Manager in the Drilling Solutions division, describes many lifestyle improvements automation brings to mine workers. "Instead of commuting over bumpy roads, flying in bad weather, or staying gone a week at a time, operators go home to their families every night. They're happier, and it saves on transportation, food, and remote housing."

Tyler Berens also explains how the performance of an automated rig compares to a manual rig.



Attendees from various parts of the world learn the advantages of operating a drilling rig from the safety and comfort of a remote location.

"An onsite operator might drill some holes faster than an automated rig, but over a long shift the performance advantages of automation are obvious. There are no lunch breaks, no bathroom breaks, and no loss of concentration that causes accidents. Plus, automation delivers increased consistency from hole to hole with fewer redrills."

One of the companies that has benefitted is BHP Billiton, a global mining company that has been running a trial of Epiroc's autonomous technology on Pit Viper 271 rigs at Australia's Yandi mine for three years.

"The machines have operated autonomously for more than 3.5 million meters. Their fleet of autonomous rigs has initially been controlled on site at BHP Billiton's mines in Pilbara, but they are switching to remote operation from



**Tyler Berens**  
Automation Product  
Line Manager,  
Drilling Solutions  
division

Perth – over a thousand kilometers away. Because of the successful results, the company is continuing to roll out automation to more sites," says Berens.

**HERMAN KRAUSE SEES** many challenges ahead for automation. "People are used to doing things the same old way, and this will require changes in people and processes." But he goes on to sum up the advantages for customers quite simply. "We are selling a good quality, precise, fast hole in the correct place in the ground at the lowest possible cost per meter, and we offer a solution to do that."

With big picture gains in efficiency, profitability, safety, and working conditions, Tyler Berens looks to the future and makes a bold prediction: "Epiroc is changing the way mining gets done." ✕



**Owen Parsons**  
Mining Technology Specialist,  
Goldcorp Inc.

## How is automation improving your business?

**What kind of automation equipment/services is Goldcorp buying from Epiroc?**

"In line with our strategies of reducing operational costs and improving production, we see autonomous drilling as a good fit for that. A large portion of technological implementation is on the change management side. Epiroc has been a key supporter of us in terms of installation, commissioning, and training our people in order to understand these new technologies."

**Where and how is it used?**

"It's being used in Penasquito, one of the largest gold mines in Mexico. It's our flagship operation in Mexico, and one of the major value drivers for the company. We're able to put the operators in a situation where they're in a control room instead of in an area with higher risks such as ground stability and other mobile equipment in the area. So we're able to reduce the risk to the operator. It also comes down to reducing our operational costs and improving upon our production. So with automation we have the ability to do more with those same machines that we have – thereby maximizing the value of our assets."

**What more can be said about the benefits to the company?**

"With our switch to autonomous drilling, we're able to improve upon the rate of production, the accuracy of the holes, and the fragmentation, leading to downstream improvements in our processes as well as improving upon our safety." ✕

More [bit.do/pitviperspenasquito](http://bit.do/pitviperspenasquito)

# PERSPECTIVE KONGSBERG/YARA BIRKELAND

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  
📍 Kongsberg Maritime



Yara Birkeland is owned by Norwegian chemical company Yara International. It is being built by Marin Teknikk, with navigation systems from Kongsberg Maritime.

[Feature] Automation

# “I see very few drawbacks with autonomous ships”

**THE MARITIME SHIPPING** industry, like the mining industry, is gradually pushing towards autonomy. It's a step-by-step process, explains **Ørnulf Jan Rødseth**, senior researcher at Sintef Ocean in Trondheim, Norway:

“Autonomy is a broad concept; it includes everything from advanced autopilots and expert systems to remote control operations and fully autonomous unmanned ships.”

**RØDSETH SPECULATES THAT** crewless ships – his own area of research – will become a reality in the next few years for select tasks, mostly short sea freight routes between designated ports. An example is Yara Birkeland, the world's first fully electric container feeder ship, which will be launched in Norway in 2018.

It will initially sail with a crew, but will switch to remote control from a shore center in 2019. In 2020 Yara Birkeland will become completely autonomous, moving 40 000 containers per year for distances up to 30 nautical miles between three ports.

In time, all tasks – including loading, navigating, and unloading – will be automated.

“There are many advantages to autonomy. By removing the crew from hazardous offshore work the number of injuries decreases drastically. No crew also means no crew quarters, less heating and no lifeboats, and that makes smaller, simpler ships viable,” says Rødseth, continuing:

“To be frank, I see very few drawbacks with this development. There might be a few new types of accidents, including some that maybe could have been avoided by having a crew on board, but the overall gains in safety, services and reduced environmental impact more than outweigh that.”

**IN OTHER WORDS,** autonomous short sea freight ships are just around the corner. Passenger traffic, as well as intra- and intercontinental shipping, will take longer to implement (see sidebar). Research initiatives into unmanned intercontinental ships are under way – not least in the Pacific region, for example China, Japan and Australia. ✕

## In Focus The route to autonomy

**Maritime shipping** is heavily regulated by law and accords. As presently written, for example, the rules require commercial ships to have a person in charge – a “captain”. Until the rules catch up with developing technology and industry demands, the first step to autonomy is having ships remotely controlled by operators from a shore control center.

Technical hurdles still to be overcome include settling on a fuel capable of handling intercontinental distances; traditional heavy fuel oil engines require too much manual maintenance. A prime candidate is liquefied natural gas.

More [imo.org](https://imo.org)

# SURVEY GAINS AND HURDLES

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

☑ Christian Tarras Ericsson

01

What benefits does automation bring to the mining industry?

02

Which obstacles have to be overcome in order to fully utilize automation technology?



**Mats Strömsten**

Research Engineer, LKAB, Kiruna, Sweden



**Hans Wahlquist**

VP Business Development and Strategic Product Management, Mobilis MCE, Luleå, Sweden



**Christian Niestroj**

M.Sc., Research Assistant, AMT, Aachen, Germany

**01** **"THIS IS NOTHING NEW** – we've been working with automated solutions for a long time to increase efficiency and productivity. Automation can compensate for increased depth and we have a lot of automated solutions for hauling ore, for example. It's more time-efficient, letting us operate more hours. It also makes for a better working environment, minimizing personnel exposure to hazardous areas and allowing more operations to be run from control rooms nearer the surface."

**02** **"PEOPLE ARE FLEXIBLE** problem solvers, and robots today aren't. Hands and eyes are hard to replace, and a mine is a dynamic environment – a lot of unexpected things happen. We have to break down complex processes into a number of simplified, smaller parts to enable automated solutions. We lose some efficiency by having to set up cordoned areas separating autonomous machines from people. Also, machines still break down and we're still dependent on people to fix them."

**01** **"THERE ARE MASSIVE** benefits that will potentially increase efficiency, for example by facilitating short interval planning, through optimization of machine utilization, and the ability to visualize what's happening in the underground mine in real-time 3D with machines, vehicles, equipment and people. Also, ventilation on demand will dramatically reduce energy consumption. In the case of emergency evacuations, we can save lives by cutting the time for evacuation, knowing where people are at all times and knowing if they are in need of assistance."

**02** **"I'D SAY INSUFFICIENT** communications infrastructure. Without that, our world-class system solutions are like a cool sports car without a road. Some mining companies want the sports car, but lack the roads – they excel at the mining process, but are way behind in digitalization. But there's a large paradigm shift under way. More and more companies realize that automated solutions are a necessity for survival."

**01** **"MORE COMFORTABLE** workplaces and a higher level of safety for people. Since automated machinery requires specialized knowledge, I personally hope it will lead to better wages. On top of this, automation brings with it better planning and less dependence on people's gut instinct, making for improved efficiency. Automated solutions are potentially cheaper to operate, faster, more efficient and selective, and produce better quality."

**02** **"WE HAVE TO STOP** staring at buzzwords like the Internet of Things and Mining 4.0, and focus on two things: what does each mining operation really need, and which of the available solutions does it make sense to use? Also, it will take time to change the mindset of the people in the industry. Regarding tech, today's solutions don't cover all aspects of the operations in a mine. First and foremost, we need better positioning systems. And finally, OEMs need to work together – we need universal solutions and open standards."

More [bit.do/automationfacts](http://bit.do/automationfacts)

**The story of automation**  
"Anything you can do, I can do better," sang Annie Oakley. Some would say that robots, too, are rapidly approaching that point.

01

**Thermostats**

☑ One of the first examples of a feedback-controlled automated system was a mercury thermostat constructed around 1620 by Dutch scientist Cornelis Drebbel, used to keep a constant temperature in a chicken incubator.

02

**Bombes**

☑ Bombes were electromechanical devices used by the Allies during World War II to crack the supposedly unbreakable German Enigma encryption. The machines reduced the time taken to decipher messages from years to mere hours.

03

**Autopilots**

☑ Modern autopilots can do more than just fly airplanes levelly. In fact, most stages of a flight – including landing – can be handled just as well by machines as by people. The only exceptions are the taxiing and takeoff phases.

04

**Baristas**

☑ The Briggo company has launched a robotic barista aimed at college campuses, airports and malls. The robot mimics real life baristas in how the milk is steamed, how the coffee is ground and tamped, and how shots are pulled.

05

**Chatbots**

☑ Automated conversation agents have yet to consistently pass the Turing test for artificial intelligence. The best, though – like Mitsuku and Cleverbot – are getting better every day, learning from real human conversations.

06

**Tradebots**

☑ In 2014, more than 75 percent of the trades on U.S. exchanges were initiated by automated trading systems. The bots have taken over the stock market and will continue to dominate in the foreseeable future.

07

**Cleaning robots**

☑ While lawnmower robots have surpassed their human masters in keeping the grass neat, robotic vacuum cleaners are still at the level of someone using a dustpan and brush. Good to know that machines aren't yet our overlords.



Next issue  
[Feature]

Want to delve deeper into zero-emission technology for underground mining? Make sure not to miss next issue's Feature.

# MY WORK: SERVICE EXPERT

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.

☑ Christian Tarras Ericsson  
📷 Ernesto Benavides

## "I like showing the customers all I know about the machines"

»—> **Raúl Almonacid** has worked his way up from being a service technician in Andean mines to the level of Service Expert. Now he travels to sites in Peru to start up mining and tunneling equipment, and supports other South American countries.

"I started as an outsourced service technician, working for three years in a mine 4 800 meters above sea level, then one year in another mine. I wanted a more challenging job, preferably based in Lima, and now I'm a Service Expert. I have learnt English and travelled to several countries on assignments.

My main job is to go on site to start up new equipment for underground mining and tunneling construction: rock bolting rigs, loaders, mine trucks and long hole drilling rigs. I also do warranty analyses and provide training, both internally in our Customer Center and externally to end customers.

**TO PREPARE FOR** a start-up, I first make sure that the machine is ready by performing a pre-start-up in our workshop. The machine is then delivered as per the customer's wishes. I contact the customer to plan the training program, then I travel to the site. The first order of business is meeting with the customer, to go over



**RAÚL ALMONACID**

**Age:** 34  
**Job:** Service Expert  
(Mining and Rock Excavation Service division, Lima, Peru)  
**Joined Atlas Copco:** 2008

**Best part of the job:**  
"I get to travel and meet different customers – I really like that"

the commissioning plan and to set up the training program for operators and maintenance crew. Sometimes we need to adjust the plan to fit the customer's schedule. Then I make sure that the machine is okay after delivery. After that, training and operations start. At the end of it, I do a second equipment check to make sure it performs optimally. I write a detailed report, which the customer will sign. Not until then is the delivery considered complete. I often stay on as a technical contact for further support.

**AT THE START** of my career I used to travel with a partner, but now I take on the assignments by myself. My strength is that I'm good at preparing before meeting the customers. I have a deep knowledge and understanding of how the equipment works, and I think the customers feel that. I like working with them, and showing them all I know about our equipment. I'm happy in my job." x

Service Expert **Raúl Almonacid** goes on site to start up new equipment. He also carries out warranty analyses and provides training, both internally and externally.





[On Location]  
Poland

The SmartROC T40 drill rig and the Hole Navigation System reduced total operating costs by more than 30 percent. The photo shows one of the SmartROC T45 rigs that MAXAM purchased after the drilling tests.



NO EXCESS = SUCCESS

It's a blast!

➔ **MAXAM** drills a million meters of blast holes per year in Poland and wanted to reduce its total operating costs. The SmartROC T40 drill rig with Hole Navigation System more than fulfilled the company's wishes.

1

## THE CHALLENGE

**M**AXAM IS THE world leader in the production of explosives and the largest company in the market for drilling and blasting services in Poland. Its fleet is distributed across Poland and provides services to granite, dolomite, sandstone, basalt and melaphyre aggregate quarries, as well as limestone quarries for the production of cement and other components for construction chemicals production.



**Marcin Plachta**  
Business Manager  
Surface Drilling,  
Epiroc Poland

**DRILLING APPROXIMATELY** a million meters of blast holes per year in Poland, using mainly Epiroc drill rigs, MAXAM was looking to reduce its total operating costs.

"The main challenge was to find a way for MAXAM to avoid excess drilling, to improve the quality of the holes and to reduce the number of boulders

after blasting. Traditionally, the majority of blast holes in Poland were designed using the traditional method, without consideration of the wall profile or the possibility of verifying the quality of completed holes immediately after drilling. The Boretrak system was in use, but due to the time-consuming nature of hole sampling and the risk of blocking, its use was very limited," says Marcin Plachta, Business Manager Surface Drilling at Epiroc Poland.

**MAXAM WAS ALSO** aiming to decrease the seismic vibrations attributable to blasting.

"Minimizing seismic vibrations is always desirable, particularly when operating close to populated areas, so that was a distinct goal for MAXAM," says Marcin Plachta.

2

## THE SOLUTION

**I**N 2016, Epiroc Poland presented the latest available topammer drill solutions to MAXAM. The next step was to let the customer carry out drilling tests with a SmartROC T40 drill rig equipped with a COP 2560+ rock drill, HNS (Hole Navigation System), Certiq and remote control. Testing took place in a granite quarry in Rogoźnica operated by Colas Poland.

"**WE TRAINED THE** operators and then they tested the rig under our supervision. Our customer was very pleased that they could perform extended tests at one of the company's sites. MAXAM had heard about HNS, but hadn't experienced the benefits. The system made it possible to perfectly

maintain the depth level of all drilled holes and to avoid uncontrolled excess drilling," says Marcin Plachta.

**AFTER COMPLETING** the entire grid, the operator can save the data and transfer it to ROC Manager software. ROC Manager is used to plan the drill grid and compare it with data received after drilling.

Marcin Plachta says: "Using HNS, the customer could create the drill plan on the computer and upload it to the rig, so that the operator could follow it on a screen in the cabin. Thanks to the system, the start points and end points of the holes were a lot more accurate and it was easier for the customer to analyze data after blasting."



3

## THE RESULT

**A**FTER TWO MONTHS' worth of testing, MAXAM could make a reliable assessment of the costs of drilling and also get an idea of the actual wear on drilling tools. To begin with, elimination of excess drilling meant that total drilling decreased by 70 meters per 1 000 drilled meters.

"These rigs drill 60 000–70 000 meters per year, so the decrease measures up to a lot of money over time. Fuel consumption dropped by 50 percent, as did seismic vibrations. The penetration rate increased by 10 percent, the hole quality improved and there was no need for horizontal drilling. The total operating cost was reduced by more than 30 percent, so the results exceeded the customer's expectations," says Marcin Plachta.

**LATER IN 2016,** MAXAM purchased three SmartROC drill rigs with HNS, as well as three FlexiROC D50 rigs. Epiroc's technology initiated further modernization at MAXAM, such as the purchase of state-of-the-art 3D scanners. It opened up a new stage in the improvement of drilling and blasting works and gave the opportunity to carry out more precise projects with improved quality. More recently, MAXAM purchased another SmartROC with HNS and recommended the rig to MAXAM Germany and Spain, resulting in the sale of an additional three SmartROC rigs with HNS.

More [bit.do/hnsfacts](http://bit.do/hnsfacts)

Epiroc takes a life cycle approach to innovation and focuses on resource efficiency, thereby reducing the environmental footprint across the value chain.



Epiroc maintains an old tradition

# In safe hands

➤➔ Safety and sustainability are an integrated part of Epiroc’s strategy to achieve its vision of becoming the customers’ first choice. This accords well with Epiroc’s values and beliefs, and opens up new business opportunities.

**S**ound values are becoming increasingly important for companies and organizations. For Epiroc, building the business strategy on a sound foundation is a given.

“Our focus on safety and sustainability is inherently connected to the productivity and success of our customers. They urge us to develop cutting-edge products in this respect – so being sustainable opens up new markets and business opportunities. Energy efficiency is just one example. By developing battery-driven machines for underground use, we truly help our mining customers. They lower their costs and improve the working environment. At the same time, greenhouse gas emissions are zero,” says **Mattias Olsson**, Senior Vice President, Corporate Communications.

Four key topics have been identified in the area of safety and sustainability, for which key performance indicators have been set and are continuously followed up. The topics relate to safety and well-being, developing people and leaders, responsible and efficient use of resources, and living by the highest ethical standards.

**STARTING WITH THE FIRST**, Epiroc’s Code of Conduct covers the well-being of employees and a safe and healthy working environment in Epiroc’s operations.

“Safety is important for our customers, as the Group is engaged in industries where work-related accidents are a reality. The ambition is to continuously reduce the number of accidents and have zero fatalities,” says Mattias Olsson.



**Mattias Olsson**  
Senior Vice President, Corporate Communications

## 🌱 SAFETY AND SUSTAINABILITY: OUR FOUR KEY TOPICS

<p><b>1</b> Improving safety and well-being</p> <p><i>We strive to improve customer safety by providing equipment designed with the safety of the user in mind. Epiroc’s Code of Conduct covers the well-being of employees as well as a safe and healthy working environment in our operations.</i></p>	<p><b>2</b> Developing people and leaders</p> <p><i>We are committed to promoting equal opportunities in our hiring and promotion processes. A wide range of efforts to attract a diversified workforce is in place globally and our ambition is to increase the percentage of female employees in the organization.</i></p>	<p><b>3</b> Responsible and efficient use of resources</p> <p><i>We believe in reducing our environmental footprint across the value chain by taking a life cycle approach to innovation and focusing on resource efficiency. We aim to improve sustainability performance in areas such as energy consumption and the use of renewable energy.</i></p>	<p><b>4</b> Living by the highest ethical standards</p> <p><i>We are a good and reliable corporate citizen, complying with the laws and regulations of the countries in which we operate as a minimum and observing the spirit of these. This also encompasses a strong commitment to respecting human rights and taking a clear stance against corruption.</i></p>
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A fundamental belief at Epiroc is that diversity inspires innovation and gives insights that help to create a better understanding of customer needs.

“We wish to attract a diverse workforce and our ambition is to increase the percentage of female employees within Epiroc.”

Epiroc believes in reducing its environmental footprint across the value chain by taking a life cycle approach to innovation and focusing on resource efficiency.

“As far as sustainable performance goes, the largest footprint for Epiroc is energy consumption from the use of our products. Our product development projects therefore have targets for reducing the energy consumption of the equipment and, in addition, large investments are being made in developing battery-powered equipment.”

**EPIROC IS A GOOD** and reliable corporate citizen. Being a trustworthy company also encompasses a strong commitment to respecting human rights and taking a clear stance against corruption.

“This also applies to our business partners: suppliers, subcontractors, agents and distributors.”

Mattias Olsson concludes: “Epiroc shares its history with Atlas Copco, which has been a pioneer in integrating sustainability into its business. We will continue on that path in the future, as a standalone company. We have our own Code of Conduct, we contribute to the UN Sustainable Development Goals and we are a signatory to UN Global Compact. We are committed in this area.” ✕

Read more [epirocgroup.com/en/sustainability](http://epirocgroup.com/en/sustainability)



EPIROC MEXICANA

The rainwater tanks used for Water for All in Ticoma were decorated by people from the community together with Epiroc employees (in this case Alejandro Hernández, Business Line Manager Epiroc Mexicana).

# Giving the gift of water



[On Location] Mexico

**D**RINKABLE WATER IS scarce in Ticoma. Located at high altitude in the Mexican state of Veracruz, the village has around 200 families with no access to running water at home. At times, mothers and children have to walk several kilometers to get water – or get water off the ground and boil it. However, thanks to Atlas Copco’s and Epiroc’s Water for All initiative, times are changing.



**Tita Alvarez**  
Communications Manager, Epiroc Mexicana

“We wanted to launch a local Water for All project, and held talks with different NGOs,” says **Tita Alvarez**, Communications Manager at Epiroc Mexicana. “We decided to partner with World Vision Mexico, an organization dedicated to working with children to overcome poverty. In August 2016, thanks to contributions from employees, a Water for All project became reality in Ticoma.”

**THE REGION RECEIVES** a lot of rain from April through June, but the villagers lack equipment to make use of it. Thus, big rainwater tanks are being installed in order to collect and store water, as well as a system to maintain and distribute the water. The villagers were invited to help assemble the tanks and they were also given training in how to store, purify and use the water.

“It felt natural to engage the locals, since they’re the ones who will use and enjoy the water collection systems,” says Tita Alvarez. “They’ve been very enthusiastic from the start and experiencing their reactions has been fantastic. Thanks to the rainwater tanks, the opportunities to prepare food, drink potable water and even have a shower are much greater. The families are very excited and it’s easy to see why.”

At the time of writing, 54 homes have been equipped with rainwater tanks.

“It’s taking a bit longer than expected, but the goal is for all families to have their own tank,” concludes Tita Alvarez. ✕

More [water4all.net](http://water4all.net)



# BLAST FROM THE PAST YEAR 1985

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 glimpse in the rearview mirror.

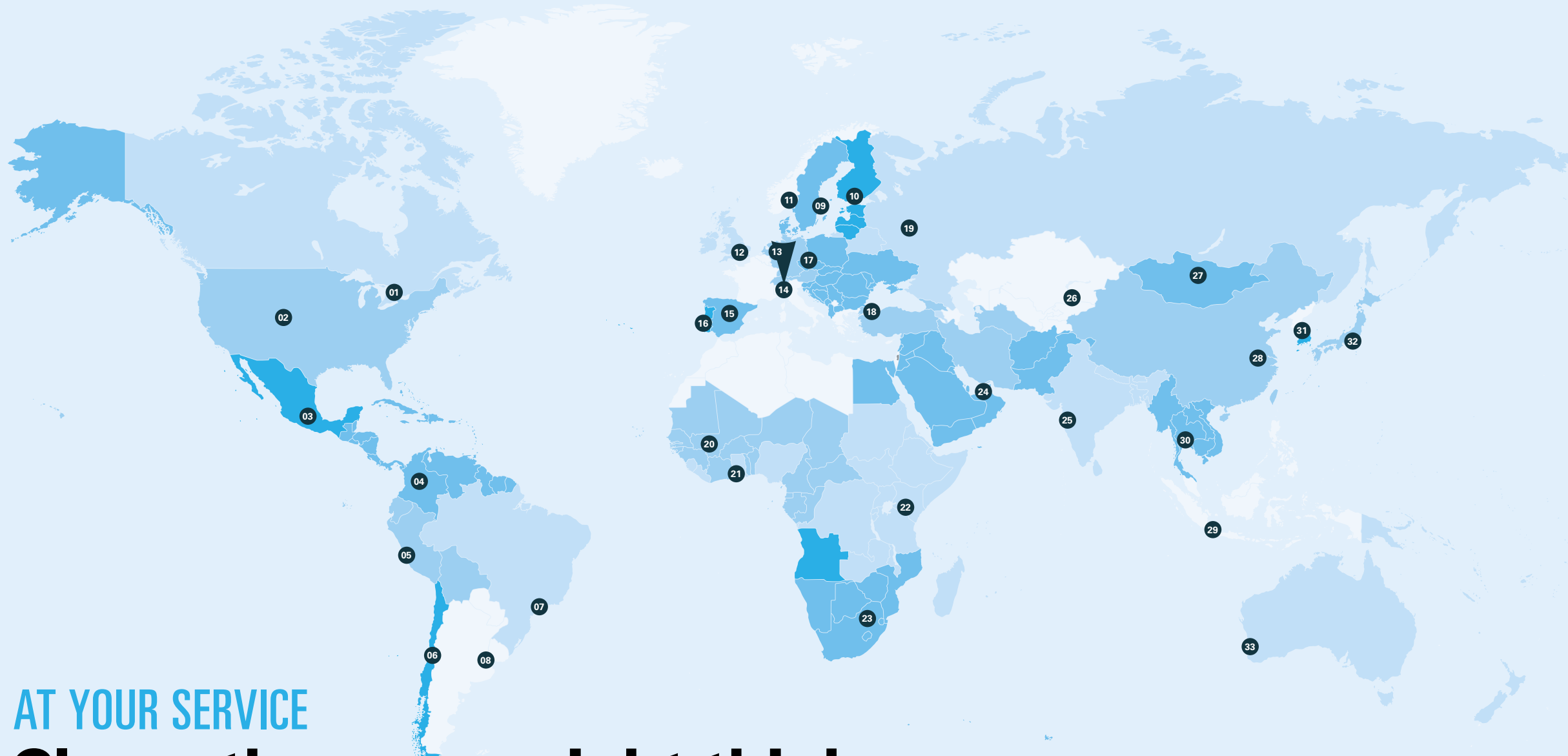
☑ Christian Tarras Ericsson  
📷 Shutterstock

## Portfolio Mose barriers

Tides, pollution and the constant battering of waves from motor boats are taking their toll on the slowly sinking city of Venice. An effort to save the World Heritage Site was launched in 1985. One of the projects is Mose: a series of breakwaters, underwater gates and dykes that will protect the lagoon from

destructive high tides. Much of the stone needed for construction was harvested from a local quarry, Cava di Sarone. With the introduction of a new Epiroc drill rig, the quarry was able to produce a significantly higher yield in fewer man-hours – reducing drilling days from six to four per week.

More [mosevenezia.eu](http://mosevenezia.eu)



## 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 33 regions. In each one, there are one or more Service Centers.

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

01 Canada  
Toronto

02 USA  
Denver

03 Mexico  
Mexico City

04 CVCA  
Bogota

05 Andean  
Lima

06 Chile  
Santiago

07 Brazil  
São Paulo

08 Argentina  
Buenos Aires

09 Sweden  
Stockholm

10 Finland  
Helsinki

11 Norway  
Oslo

12 UK & Ireland  
Hemel Hempstead

13 Europe 1  
Essen

14 Southern Europe  
& Northern Africa  
Milan

15 Spain  
Madrid

16 Portugal  
Lisbon

17 Central Europe  
Prague

18 Turkey  
Istanbul

19 Russia  
Moscow

20 Mali &  
Burkina Faso  
Bamako

21 Ghana  
Obuasi

22 Eastern Africa  
Nairobi

23 Southern Africa  
Johannesburg

24 Middle East  
Dubai

25 India  
Pune

26 Central Asia  
Almaty

27 Mongolia  
Ulaanbaatar

28 Gr. China  
Nanjing

29 Southeast Asia  
(South)  
Jakarta

30 Southeast Asia  
(North)  
Bangkok

31 Korea  
Seoul

32 Japan  
Yokohama

33 Australia  
Perth



[ In focus ]  
**Milan, Italy**

## Hello there!

### What's happening in Milan?



**Edoardo Angelucci**  
Regional General  
Manager, Southern  
Europe and Northern  
Africa

SINCE THE SUMMER of 2017, the map of newly formed Epiroc Customer Centers has been taking shape. In particular, this goes for parts of Southern Europe and Northern Africa, including the following countries: France/Belgium, Italy, Greece, Israel, Cyprus, Malta, Morocco,

Algeria, Libya and Tunisia. All of these countries will be centrally managed from Italy, with local support in each of the countries in the region. **Edoardo Angelucci**, Regional General Manager for Southern Europe and Northern Africa, explains the reasons for the change.

“Due to legal requirements we have set up Epiroc company functions and premises where these were previously supported by Atlas Copco. The aim is to have a good footprint in the territory within every operational area.”

#### What organizational changes are being made?

“We are providing general management here in Italy. Locally, we have the functions to support the business and customer collaboration – like sales, service and logistics – but also functions for business development and controlling. We are working on putting together a good group of people with great experience and skills. People from different cultures working together towards the same goal will create a better customer experience in every country of the region.”

#### What difference will this make for the customer?

“It will enable us to have greater customer focus and proximity, with a dedicated product portfolio for the mining and infrastructure industry. We will be working more closely with our customers in order to increase their productivity and their satisfaction with our products and services.”

Find Epiroc  
in your country:

[epiroc.com](http://epiroc.com)

Load Assist is a function that enables the operator to properly fill the bucket with ease.



# Load Assist

## Filling buckets and needs

»»» Underground loading can be tricky and time-consuming for the operator. With Load Assist, Epiroc offers a solution to the problem – as software developer **Håkan Almqvist** explains.



*You're part of the team that developed Load Assist. What need were you looking to fill?*

“Loading rock in underground mines can be very difficult and for safety reasons, the operator sometimes has to use a remote system. That poses certain challenges as the operator never ‘feels’ the machine and rarely sees more than the back of it. Thus, loading can get quite inefficient. Our goal was to develop an assist function that enables the operator to properly fill the bucket with ease.”



**Håkan Almqvist**  
Software Developer,  
Rocktec division

*What challenges did you face?*

“Load Assist is enabled by the sensors that already exist on Epiroc loaders equipped with RCS, Rig Control System. The operator uses two joysticks; one that controls the

gas, brake and steering functions, and one that controls the boom and bucket. What we did was advance the software so that the boom and bucket can be put in automatic mode, which makes for more efficient loading. The main challenge for us was to make Load Assist reliable. The solution has to function at all times, even under poor conditions and in different circumstances. We also made sure that it's easy to operate.”

*What's the next step for Load Assist?*

“Additional field tests will be carried out in late 2018. We're keen to evaluate how the function improves customers' operations. I'd like to think that we've achieved something significant.” ✕

### Load Assist

- A software-based function that will be available for most Epiroc loaders equipped with RCS
- Increases productivity in situations where it is difficult to load, such as remote control
- Available from the cab, via radio-remote or tele-remote
- Equipped with a dead man's handle for increased safety

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