

Mining & Construction

A magazine from Epiroc

miningandconstruction.com

The Circular
Economy Issue
02-2022

INSIDE

FACE TO FACE

Battery conversion to elevate Evolution

High expectations for emission-free vehicles at Red Lake

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INNER WORKINGS

Better bearings

Epiroc helped digitize Carrapateena copper-gold mine

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MY WORK

Embracing diversity

Sales Manager Mariem Maiga builds a dynamic team

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[Our Customers]

The next generation

World's first digital mine
built in the Andes

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Circular economy in focus

DEAR CUSTOMERS, The scientific community is in overwhelming agreement that we are heading in the wrong direction on global warming and that more must be done to counteract the trend. Many of you, as well as us at Epiroc, have ambitious goals to reduce emissions and also develop the circular economy, meaning the continual use of resources.

Epiroc's sustainability goals for 2030 include halving our CO₂ emissions both in our own operations and from the use of products sold. In 2021, we received validation from the Science Based Targets initiative (SBTi) that these climate targets are in line with keeping global warming at a maximum of 1.5°C, consistent with the latest climate science and the goal of the Paris Agreement.

A more circular approach not only benefits the environment but also supports your

bottom line. Two examples are mid-life rebuilds of equipment and remanufacturing of your used parts and components. This keeps parts out of the landfill, reduces greenhouse gas emissions, and lowers your costs.

MORE AND MORE of our underground mining machines are sold in battery-electric versions, and here a circular approach is key. Our Batteries as a Service solution lets customers use the batteries while not owning them, ensuring the batteries are properly recycled while providing the user with the most modern technology. We have also started offering conversions of used diesel-operated loaders into battery-electric versions.

Our extensive automation and digitalization programs prolong our products' lifetime, maximizing efficiency in your operations.

Read more in this issue about a very important topic – the circular economy. ✕

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



On my radar

The macro economy

Higher inflation and expectations of lower global economic growth are now a reality. We are keeping a close eye on the developments.

Battery electrification for surface applications

We already are the leader in underground battery-electric machines. Now we are also developing emission-free solutions for surface applications, starting with a trial of a SmartROC T35 E drill rig at a quarry in Sweden.

Happy reading and stay safe!

Helena Hedblom

Epiroc President and CEO



About Epiroc

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

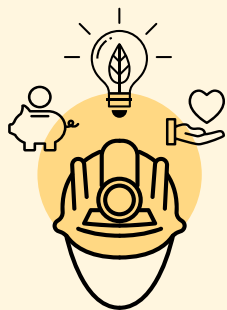
Epiroc Group – get to know us better

Our innovations

Industries we serve

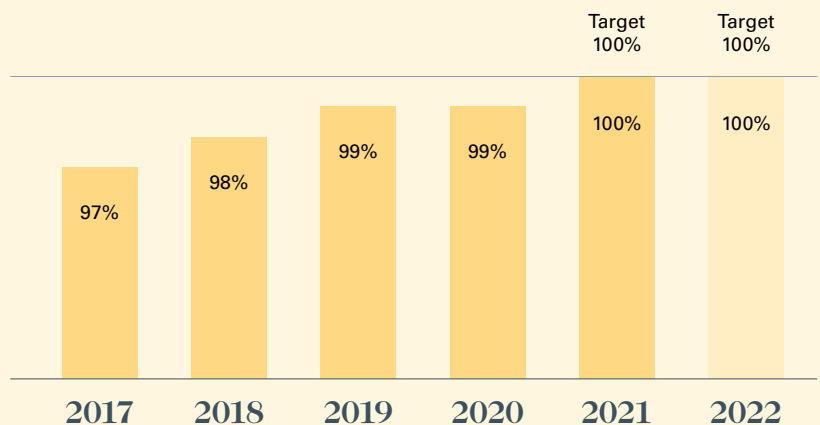
KPI
Targets and performance

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.



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

Significant suppliers confirming compliance with Epiroc Business Partner Code of Conduct



Target for 2021 was 100%, and the result was 100%. We continue to work with our suppliers to maintain a high level.

The Group in numbers



15 500

- More than 15 500 employees.
- Customers in more than 150 countries.
- 145+ years of experience.
- Revenue in 2021: SEK 39.6 billion.

Tools & Attachments

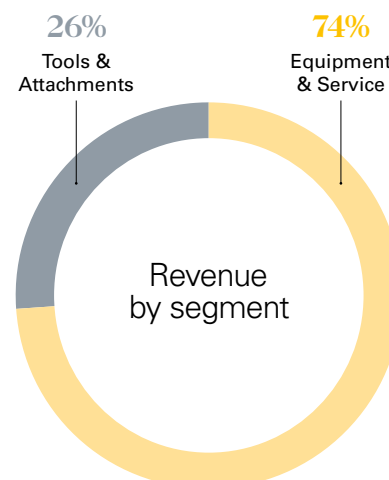
Dedicated to rock-drilling tools and hydraulic attachment tools used for rock excavation, mining, construction, demolition and recycling. Also provides related services

Digital Solutions

Offers solutions that drive customers' digital transformation. Provides a dynamic range of technology-agnostic digital solutions that improve safety, productivity and sustainability

Divisions and reporting segments

Equipment & Service / Tools & Attachments



Surface

Dedicated to rock-drilling equipment for use in surface mining, exploration, construction and quarries, as well as water well applications

Underground

Dedicated to a wide range of underground mining and tunneling equipment

Parts & Services

Dedicated to parts and services aimed at maximizing customers' productivity



[FEATURE]

CIRCULAR ECONOMY

Linear is out; circular is in. The trend toward better management of resources is coming on strong. How circular can we become? **Pages 26–41**

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In a quest to cut carbon emissions, Evolution Mining decided to invest in battery-electric equipment from Epiroc at the Red Lake mine in Ontario, Canada.

22 | INNER WORKINGS New level of awareness

Mine operator OZ Minerals wanted to optimize haulage flows in the Carrapateena mine. Epiroc's Mobilaris Mining Intelligence decision support system has been vital on that journey.

44 | OUR CHALLENGE Guaranteed results

The guessing-game days are over for contractor Implenia, thanks to new Epiroc software. Underground Manager makes it easier to seal tunnels correctly.



ON THE COVER

Quellaveco in southern Peru is one of the largest copper deposits on the planet. It is also the world's first green-field digital mine. Operator Karen Huamantuma and her colleagues control the rigs from the comfort of the integrated operations center.



During March 14–18, 2023, CONEXPO-CON/AGG will take place at the Las Vegas Convention Center in Las Vegas, USA. The event, held every three years, features exhibits of the latest technologies and innovations in equipment, products and services, plus extensive industry-targeted education.
www.conexpoconagg.com

08

OUR CUSTOMERS

Digital forerunners

At Quellaveco in southern Peru, Epiroc is helping Anglo American build the world's first greenfield digital mine.



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

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Web: rubrik.se

Printed by
BrandFactory, Sweden 2022

Website
miningandconstruction.com

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EPIROC IN BRIEF

HISTORIC BATTERY-ELECTRIC FIELD TEST IN SWEDEN

Skanska Industrial Solutions AB is trialling a new rig from Epiroc: the first ever tophammer battery-electric rig in Sweden. The design of the rig is based on the well-proven SmartROC T35 surface drill rig. In combination with invaluable experience gained from the development of Epiroc underground battery rigs, this SmartROC T35 E is designed to enhance the environmental standards of quarries and larger construction sites. Besides low emissions, this rig comes with a range of smart features, options and enhanced automation solutions for high safety, reliability and performance.

“With this achievement, we show that the innovations of Epiroc will play a significant role in the shift to low-carbon operations in quarries and large construction applications,” says **Jose M. Sanchez**, President Epiroc Surface division. “Since our sustainability agenda goes hand in hand with the agendas of our customers, we are very pleased to be collaborating with Skanska Industrial Solutions AB in the trials of this important solution.”

SmartROC T35 E

The SmartROC T35 E rig is equipped with both a battery and an electric cable, which improves flexibility considerably. You can choose to drill with the most suitable alternative for the location and occasion. It also allows for quick and smooth transportation in and between sites.

The tests commenced in early October in one of Skanska Industrial Solution’s quarries in the Stockholm area:

“A milestone has been reached, and a new opportunity has come to reduce our climate impact. I am very happy about the long collaboration between Epiroc and Skanska, and it is exciting to be able to do this project together. Both companies have set bold environmental goals – this project really takes a great step toward Skanska’s goal of be-

ing completely climate neutral by 2045, which is an important part of our promise to build a better society,” says **Johan Eliasson**, Project Manager, Skanska Industrial Solutions AB.

The SmartROC T35 E is fitted with the same type of well-proven batteries and subcomponents as are in the Epiroc underground battery solutions. This streamlines spare parts handling and service for customers with several different operations. ✕



The SmartROC T35 E is being trialled by Skanska in the Stockholm area. The rig is an important step in the shift toward zero-emission drilling in surface mines and quarries all over the world.

Epiroc and BluVein speed up industry shift

ELECTRIFICATION SOLUTIONS from Epiroc support mining customers in their transformation towards using battery electric vehicles. To further strengthen this approach, Epiroc has formed a Memorandum of Understanding with BluVein, a joint venture

between Australian mining innovator Olitek and Swedish electric highways developer Evias. The purpose is to fast-track development of the BluVein dynamic charging solution toward an industrialized and robust solution for the global mining industry.

Epiroc acquires mining electrification infrastructure provider JTMEC

EPIROC HAS ACQUIRED Australian company JTMEC, an electrification infrastructure solutions provider for both underground and surface mines. The company’s offerings include high voltage installation and maintenance work, trans-

former servicing and testing, engineering design, feasibility studies, and training. It also manufactures electrical products, including substations and mine chargers. JTMEC is based in Perth and employs 190 people.



FIGURE



Circular economy models revolve around using existing materials and products as long as possible – in different ways.

How can Epiroc contribute to circularity?

Boltec Auto Bolt Reload redefines safety and productivity

▶ **EPIROC'S NEW** Boltec with Auto Bolt Reload (ABR) is the first-ever underground rock reinforcement drill rig designed so that the bolt type and machine work together in synergy to deliver optimal safety, performance and quality. The main design feature of the Boltec ABR is the fully mechanized bolt reloading system, which automatically feeds bolts from a large carrier magazine to the feed magazine.

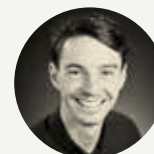
Drilling Tools Optimizer ushers in new digital era

DRILLING TOOLS OPTIMIZER is Epiroc's new digital toolbox packed with benefits for everyone. It provides a new level of knowledge, accuracy and business opportunities, following drilling tools throughout their entire product life cycles from new to end-of-life. Drilling Tools Optimizer enables production-critical decisions in real time, which can save up to ten workdays per month related to data gathering.



Lucia Canedo
Surface division
SHEQ Manager

"Epiroc can contribute to circularity by reducing waste and CO₂ emissions generated throughout our value chain. Our 2030 sustainability goals for the planet – to halve CO₂ emissions in operations, transport, relevant suppliers and from our machines sold – is driving our circularity journey."



Matthew McCarthy
Global Sustainability
Booster

"Ambitious targets for waste diversion drive circularity in our design, sales, sourcing and production phases. Embedding circularity in our processes is challenging, but it will reduce our environmental footprint and support customer circularity goals."



Effort Moyo
Global Product
Manager

"Circularity is a key criteria when we create and package aftermarket products today. We innovate products and services that prolong the product life of our equipment, and we remanufacture, rebuild, reuse and recycle components when necessary and possible."

PROJECT NEWS



HIGHLIGHT

Motivator does not rely on electrical infrastructure, thus enabling continuous and more agile operations.

More agile operations with Motivator

TO INCREASE utilization and overall productivity of environmentally friendly electric driven Epiroc rotary drills, Epiroc has developed a self-contained, wagon-mounted hydraulic powerpack to operate select rig functions in the

absence of electric power. The basic unit will propel the unit via radio remote control from bench to bench, pit to pit or shop without the time and expense of installing electrical infrastructure along the route.

More www.epiroc.com/motivator





[On Location]
Peru

QUELLAVECO MINE

Anglo eyes the future

High in the arid mountains of southern Peru, Anglo American is taking the next step in mining: a giant new copper mine operated largely by robots.





From the comfort of the integrated operations center, Karen Huamantuma monitors the operations of two Epiroc autonomous Pit Viper rigs in the Quellaveco mine.

ON A DUSTY MINE ROAD high in the Andes Mountains, a monstrous truck the size of a house rumbles past with its load of 300 tons of ore. Glancing up through the blinding Andean sunlight, an observer struggles to catch a glimpse of the driver in the cabin. That's because there isn't one. Machines have taken over the mine.

At Quellaveco, Anglo American's latest copper mine, the mining multinational is realizing a vision of what mining will look like in the future.

Built in Moquegua at a cost of approximately USD 5.5 billion, the mine is expected to produce annually around 300 000 metric tons of copper (plus molybdenum) over the next

decade, consolidating Peru's position as the second-largest supplier of the red metal behind neighboring Chile.

One of the largest copper deposits on the planet, the new mine is expected to continue churning out metals for decades to come.

Following a preprogrammed route, twenty-eight driverless trucks patrol the pit, lining up to receive blasted ore or waste from the power shovel and then hauling it to either the primary crusher or the stockpiles. When they meet each other or another vehicle en route, they stop while they work out who has the right of way.

Epiroc is playing its part with six autonomous Pit Viper drill rigs. Standing almost twenty meters high when in po-



Clayton Sanders
Head of Autonomous Drilling,
Anglo American

sition, the vehicles automatically trundle into place to drill a series of blastholes.

Quellaveco is far from the first mine to introduce autonomous vehicles. From Australia to Chile, mining companies are racing to introduce new technologies into their operations, to improve productivity, safety and working conditions for employees. But Quellaveco will be the first greenfield mine project to implement the technology in its initial design.

Safety is one of the major gains of autonomous haulage and drilling. Not only are workers kept out of harm's way, but the machines are programmed to be much more cautious than human operators would be.

“We’ve not had a single incident caused by an autonomous machine. And, in fact, the autonomous machines have prevented what may have been more serious incidents had they been conventionally operated,” says **Clayton Sanders**, Quellaveco’s head of Autonomous Drilling.

Autonomous vehicles have also proved more productive than conventional vehicles, maintaining a regular pace throughout the day. In addition, the Pit Viper rigs have proved more accurate than human operators, drilling all holes within 50 centimeters of the location specified in their pre-programmed drill pattern and to the specified length. Accuracy with conventional rigs can be more like 0.8–1.2 meters.

T HIS PRECISION IS CRUCIAL for ensuring that explosives are properly distributed throughout the rock to obtain the correct fragmentation. This, in turn, facilitates the whole mining process, from how quickly rock can be shoveled and its safe distribution in the trucks to how efficiently it can be pummeled into powder in the crusher.

“This is critically important to the process,” explains Sanders.

But running a digital mine brings new challenges for Anglo American’s mine engineers. To stay in contact with dozens of autonomous vehicles while they move around the pit means ensuring that a sufficient broadband spectrum is available in all parts of the operation at all times. If contact is lost, the vehicle tends to grind to a halt until communication is restored.

As well as the mine’s mind-boggling topography, with mine fronts spread over several stories along a sinuous mountain ravine, a major challenge is the dust. Lifted in plumes by each gust of wind and passing vehicle, the fine powder quickly accumulates in a thick coat on every surface, including the dozens of sensors distributed throughout the mine.

So far, the quickest solution has been to send teams of technicians out

This is Anglo American

- Headquartered in London, Anglo American is one of the world’s largest mining companies, with a market capitalization of around USD 41 billion.
- The company was founded in 1917 with US and British capital to finance gold mines in South Africa.
- Today it employs 90 000 people and produces coal, copper, iron ore and other minerals at 56 sites in 15 countries. Its subsidiary De Beers is the world’s largest producer of diamonds.
- As part of its Sustainable Mining Plan, the company has committed to reducing its greenhouse gas emissions by 30% and improving energy efficiency by 30% by the end of this decade.



Anglo American technicians Miguel Chuctaya and Dante Carhuas check the progress of two Pit Viper rigs at Quellaveco.



Bryce Mancell
Superintendent
of Technology,
Anglo American



Karen Huamantuma
Operator,
Anglo American

with brooms and cloths in an endless fight against the filth to keep the sensors sparkling. But because this runs counter to Quellaveco’s autonomous philosophy, the maintenance team is also working on an automated blower system that would keep the dust off around the clock.

Building a digital mine has also brought new opportunities. Given the different skills required to run autonomous haulage and drilling equipment, Anglo American has recruited many newcomers with no previous experience and trained them from scratch.

“Two-thirds of our workers never worked in mining before, which is very unique. Many did not even have a driver’s license before they joined us,” explained **Bryce Mancell**, Superintendent of Technology.



“We can see data trends before there’s a real issue and take corrective action before problems arise”

Bryce Mancell
Superintendent of Technology, Anglo American

Karen Huamantuma, a recent graduate in Mine Engineering from nearby National University of Moquegua, is one of the new recruits. Her fingers skim over the keyboard as she monitors two Pit Viper rigs drilling several hundred meters away. Above her head, a large screen indicates fuel and water levels for each machine and shows their progress through the sequences of holes they must bore.

“We never studied anything like this. I mean, we didn’t know it existed,” she says. Seated in an ergonomic office chair, she reckons the biggest gain has been the comfort and the convenience.

“We are not exposed to the dirt and dust or at risk from a rockfall or anything like that...this is more comfortable than being at home,” she explains.

Another gain has been the streamlining of decision-making. In a low hut on the edge of the mine sits Quellaveco’s mission control. Here, twenty or so

engineers, like Huamantuma, huddle in front of long curved screens monitoring every aspect of the mine operation, from drilling and hauling to milling and shipping.

WITH ALL THE key players now in one room, identifying challenges and coordinating a response can take just a few minutes rather than half a day’s discussion. For example, if metal recoveries fall in the concentrator mill because of lower copper grades, a quick word from the plant operator to the mine planner is all it takes for the mine to begin extracting richer ore.

“We can see data trends before there’s a real issue and take corrective action before problems arise,” explains Mancell. ✕



The Quellaveco mine

- Anglo American, has called Quellaveco, which it built at a cost of USD 5.5 billion, the world’s first fully digital greenfield mine project making full use of the latest technologies, including automation and renewable energy.
- With reserves estimated at 1.7 billion metric tons, it is one of the world’s most important copper deposits.

Epiroc and Anglo American

THE DEVELOPMENT OF the Quellaveco mine marks the start of Anglo American and Epiroc’s relationship in South America. In 2018, Epiroc won a contract to supply autonomous drill equipment to the mine, with deliveries beginning in March 2020. Despite the difficulties caused by the COVID-19 pandemic, six autonomous Pit Viper 351D drill rigs and three SmartROC D65 drill rigs were delivered and assembled at the mine by March 2022, in time for the start of production.





Epiroc's autonomous Pit Viper rigs drill blastholes much more precisely than conventionally operated drill rigs, ensuring the rock is properly fragmented and facilitating the whole mining operation.

FIVE KEYS TO SUCCESS

<p>1 The right technology</p> <p><i>The autonomous Pit Viper 351 and SmartROC D65 drill rigs from Epiroc fit perfectly with Anglo American's ambition to build the world's first digital mine.</i></p>	<p>2 Tough enough</p> <p><i>Anglo American has praised the robustness of Epiroc's autonomous drilling system, which has meant that more than 90% of the holes at Quellaveco have been drilled autonomously despite challenging conditions.</i></p>	<p>3 Attention to detail</p> <p><i>Thanks to the company's experienced support staff, the drill rigs could be delivered and assembled at the mine site on schedule despite the remote location and the restrictions imposed by the COVID-19 pandemic.</i></p>	<p>4 Training newcomers</p> <p><i>Epiroc has helped Anglo American to train new employees with little or no experience in mining in the new role of rig controllers.</i></p>	<p>5 Working hand in hand</p> <p><i>Since the start of operations, engineers from Anglo American and Epiroc have worked in close collaboration to figure out how to improve the performance of the rigs while production ramps up to capacity.</i></p>
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Working toward building India, drilling into the complex terrain in the Himalayas for one of the country's most prestigious infrastructure projects is no mean feat.



[On Location]
India

Automation on track

While construction work on the Rishikesh-Karnaprayag Railway Line in India is underway, Epiroc machines are creating tunneling wonders for Rail Vikas Nigam Ltd (RVNL).

WORK ON THE 125-kilometer Rishikesh-Karnaprayag Railway Line in the Himalayas is in full swing. The greenfield project is divided into nine packages and has a total tunneling length of 218 kilometers. Complex tunneling works call for machinery such as drilling jumbos, loaders for loading the muck, and grouting equipment. Here, Epiroc's automated and semi-automated machines, not only the Boomer E2 but also the robust Boomer L2 and continuous loader Hägg-loader, are being used in seven packages, increasing efficiency on-site and reducing cycle time. For safety, the boomer sensors halt the machine as soon as they detect someone in front of the machine, eliminating accidents. Also, Epiroc's Unigrout Smart M2 was specially designed to have double silos, including all the parts needed to automate the mixing and recording of the grouting result. **Sumit Jain**, Additional General Manager/Projects, Rishikesh Karnaprayag Project, elaborates.

What has the Boomer E2 done for this project?

"The automated machine captures the parameters while drilling and predicts the upcoming geology. We have access to the rate of penetration, hardness of the rock, and the rotation and feet pressure required to drill through a particular stratum. While we do the advanced probe holes

or face drilling holes, data is captured and we ascertain what lies ahead. We also analyze operator movement."

What has it meant for operational productivity?

"Since the Boomer E2 records the drilling jumbo operations, we identify the real cause, eliminating any kind of disputes. Importantly, with precision drilling, the overbreaks have gone down and the mucking cycle time has been reduced."

How about Epiroc's complete fleet used in the project?

"The Unigrout Smart M2 is the first machine on this project. It gives a data log of the grout volumes, the pressure at which it goes inside the strata, and reduces trial-and-error time. Next, we use the continuous loader. The project has two parallel tunnels – the main and escape tunnels. While the escape tunnel dimensions are smaller, the continuous loader operates in small cross sections, yet maintains a high progress rate of mucking out. We muck out at one-third of the time compared to the hydraulic excavators with short booms that were used earlier."

Define your relationship with Epiroc.

"Epiroc is a one-stop-solution provider that supplies and provides guidance on machinery selection, too. It has multiple inventory centers along the project length, and the delivery lead times are minimal. This results in fewer breakdowns and higher machine productivity." ✕



Sumit Jain
Additional General
Manager/Projects,
Rishikesh Karnaprayag Project

Boomer E2

- **RCS 5 Rig Control System – computerized, award-winning rig control system to ensure precision and productivity.**
- **ROPS and FOPS-certified cabin.**
- **Auto Drilling with ABC Total option.**
- **Automatic navigation using automatic total station navigation.**
- **Automatic rod handling system (Auto RHS E) to efficiently drill grout holes up to 30 meters deep.**
- **Measure While Drilling (MWD).**

More www.epiroc.com/tunneling



LEAD THE CH



[On Location]
Canada

Evolution Mining and Epiroc on electrical journey

»»» As the electrification of mines gains traction, Epiroc and Evolution Mining have collaborated to facilitate the arrival of the first battery-converted Scooptram ST1030 electric loader in Canada.

**KIRSTY
LIDDICOAT**
General Manager
Evolution Mining,
based in Red Lake,
Ontario, Canada

LOADING CHARGE

IN RED LAKE, ONTARIO, Evolution Mining operates one of the highest-grade Archean gold camps in Canada. The operation is in the midst of a transformation, and part of that journey involved a recent order of a battery-converted Epiroc Scooptram ST1030.

Mining & Construction sat down with **Robbie Spekking**, Account Manager at Epiroc, and **Kirsty Liddicoat**, General Manager of Evolution Mining, to discuss their experience with the battery-electric mining equipment.

How did the relationship between Epiroc and Evolution Mining start?

ROBBIE SPEKKING: “Evolution Mining has been dealing with us on rock-drilling tools; we have a 100% market share in that area of their business. Building on that existing relationship, they approached us about battery equipment and decided to go with a battery-converted Scooptram ST1030 underground loader, which is a six-yard underground loader, and the Scooptram ST14 Battery, which is an eight-yard loader. They also went for a Minetruck MT42 Battery.”



ROBBIE SPEKKING

Account Manager
Epiroc Customer
Center, based in
Winnipeg, Manitoba,
Canada



Epiroc's battery-converted Scooptram ST1030 at Evolution Mining's Red Lake, Ontario-based operation is the first of its kind in Canada and has clocked over 1 000 operating hours.

What challenges is Evolution Mining facing in Red Lake that battery equipment might help resolve?

KIRSTY LIDDICOAT: “We wanted to change the way we mine, so we can be more efficient and productive while continuously improving our health and safety by reducing diesel emissions underground. We see our battery-electric fleet as being a key part of this goal. As we move into new mining areas, we’re setting our operations up differently from the past, to be more large-scale and productive. For us, battery-electric is the future; we know we need to reduce our carbon footprint, and Evolution Mining has a goal of net carbon zero by 2050 and a 30% reduction by 2030. Also, the deeper you get the more expensive it is to supply ventilation, so battery for us is a big win in that space.”

How has the collaboration been between your companies?

KL: “For the current machine on site, there has been significant collaboration. It’s the first battery loader, so it’s really been more of a partnership than a supplier/customer arrangement.”

RS: “We also provided a training program, which has helped with getting the battery-converted Scooptram loader to where it is now.”

Has Epiroc provided any specific advice to help facilitate the transition?

RS: “Being that it’s the first machine on site, it’s a bit of a learning curve for Epiroc, as well. Any time there is inter-

action between Evolution Mining personnel and Epiroc, we bring that to the table, and we’re planning to make certain changes on the machines going forward – changes that are going to benefit both parties as they receive the upcoming machines.”

KL: “Hence, why it is more of a partnership.”

What kind of contact did Epiroc and Evolution Mining have during the conversion process?

RS: “For the discussion about going from diesel to battery, there wasn’t too much involvement on Evolution’s side, because we actually took a diesel machine and converted it to the battery already, so the only thing used on the existing battery machine was the frame.”

In Focus: Evolution Mining

EVOLUTION MINING IS an Australian gold mining company with five wholly-owned mines: Cowal in New South Wales, Mungari in Western Australia, Mt Rawdon and Ernest Henry in Queensland, and Red Lake in Ontario, Canada. Its focus is to

operate safely and efficiently while developing mines to their full potential.

- Approximately 700 employees
- Operations in Australia and Canada

More www.evolutionmining.com.au

KL: “From our viewpoint, we were looking at the total operating cost of the machine, and there are definite cost benefits on battery electric in terms of the maintenance costs – even the running costs are cheaper. When we did our trade-offs, it came out as the right option for our site to move forward with.”



Kirsty Liddicoat
General Manager,
Evolution Mining

What can you say about the discussions and collaboration so far?

RS: “I think the partnership between Evolution and Epiroc has been tremendous. There’s been a lot of collaboration with the new and upcoming machines, and they’ve been very understanding on any minor bumps in the road throughout the process.”



Robbie Spekking
Account Manager,
Epiroc

KL: “We have had great feedback on the collaboration, and our operators love the machine, so that’s always a positive.”

What are your hopes for the machines being brought in?

KL: “We’re really looking at them to be a key linchpin of our transformation. So, it’s basing our transformation journey on building up to 300 000 ounces plus per year, which comes off the back of these machines, while also reducing our cost profile.”

RS: “Tons moved is what I want to see – and higher availability of machines. Ultimately, more tons moved is more cost efficient for the mine.”

What is the plan for battery equipment moving forward?

KL: “I think the first step is embedding the current fleet. When we made the initial purchase, we had a long-term vision of a change over to electric, and that’s really in line with how we look to that sustainable net-zero future.”

Can the Evolution Mining/Epiroc relationship grow into more of a partnership?

RS: “We always want to continue to grow this relationship. There has never been a point where we’re planning to stop working together, and there’s always room for improvement as technology evolves.”

KL: “I think it will continue to grow as we bring on the new fleet and as we learn and share together. We are really leading the way working with Epiroc on that.”

Is there a possible scenario where Evolution Mining could be more involved in the development of equipment with Epiroc?

KL: “Well, you know, I have a wish list of stuff...”

RS: “There’s always an opportunity for Evolution Mining and Epiroc to work together on new innovations moving forward.”

KL: “I think it is exciting to see the new equipment, and it’s great to talk to the operators. We have some operators who cannot speak highly enough about this equipment and want to show that they’re loving it. That, for me, is the proof we made the right decision in moving to battery electric and in our partnership.” ✕



KEYS TO A SUCCESSFUL PARTNERSHIP

The successful working relationship between Epiroc and Evolution Mining relies on both parties being willing and able to adapt.

Trust and familiarity

✓ When both organizations have been involved in previous successful collaborations, as Epiroc and Evolution Mining have with rock-drilling tools, a more personal relationship develops that allows for confidence in future projects.

Shared goals

✓ Both parties have prioritized reducing their carbon footprint and increasing productivity, so inevitably their approach to mining aligned with the new battery equipment.

Willingness to collaborate

✓ When embracing new technology and innovation, both groups accepted that a learning curve would be part of the arrangement. By working together to navigate through unfamiliar territory, each party benefitted from the learning opportunity.

Careful planning

✓ Each organization has approached the current partnership with the intention of working together on future projects using battery technology and utilizing their shared knowledge for continued success.

AROUND THE WORLD IN BRIEF



SHUTTERSTOCK

Pure gold is one of the few materials that can resist the combined impact of a laser and highly erosive atomic, allowing the simulator to pulse millions of times during each test campaign.

Pure gold pin for space testing

► **A PURE GOLD PIN** (pictured) not much bigger than the tip of a pencil is the “pulsating heart” of the European Space Agency’s (ESA) Low Earth Orbit Facility, LEOX. Part of the Agency’s Materials and Electrical Components Laboratory based at ESA’s ESTEC technical center in the Netherlands, this test facility is vital for developing materials capable of withstanding the highly-erosive individual oxygen atoms prevailing at the top of the atmosphere. All missions that orbit less

than about 1 000 kilometers above the Earth’s surface must be designed to resist atomic oxygen. To realistically simulate the low-Earth orbit environment, the LEOX atomic oxygen facility generates atomic oxygen travelling at 7.8 km/s. This sturdy gold pin, manufactured in a jewelry shop in Italy, is used to inject tiny pulses of oxygen gas molecules into a vacuum chamber, where the molecules are split into atoms using a powerful laser.

Trenchless pipes reduce the carbon footprint

► **RIO TINTO WENT FOR** a non-invasive, more eco-friendly approach when replacing a section of a DN 550 mild steel cement-lined potable water pipe that supplies the remote mining town of Paraburdoo in Western Australia, *Mining Magazine* reports. The trenchless relining technology Primus Line was deemed the perfect fit. By inserting the flexible Aramid-reinforced pipe-in-pipe system into the existing main, the life expectancy of the asset will be extended by at least 50 years.



RÄDLINGER PRIMUS LINE



Fang Liu

Assistant Professor,
Materials Science and
Engineering, University
of Wisconsin

Can dead batteries be resurrected?

You led a study on high-performance lithium batteries. What was the premise?

“Transportation takes up about 16 percent of carbon emissions globally. If we want to achieve carbon neutral transportation, we must focus on electric vehicles. Besides vehicles, airplanes and ships can also be potentially transformed into pure electric form. In this context, batteries become extremely important, and the lithium-metal battery is the best candidate for long-range performance.”

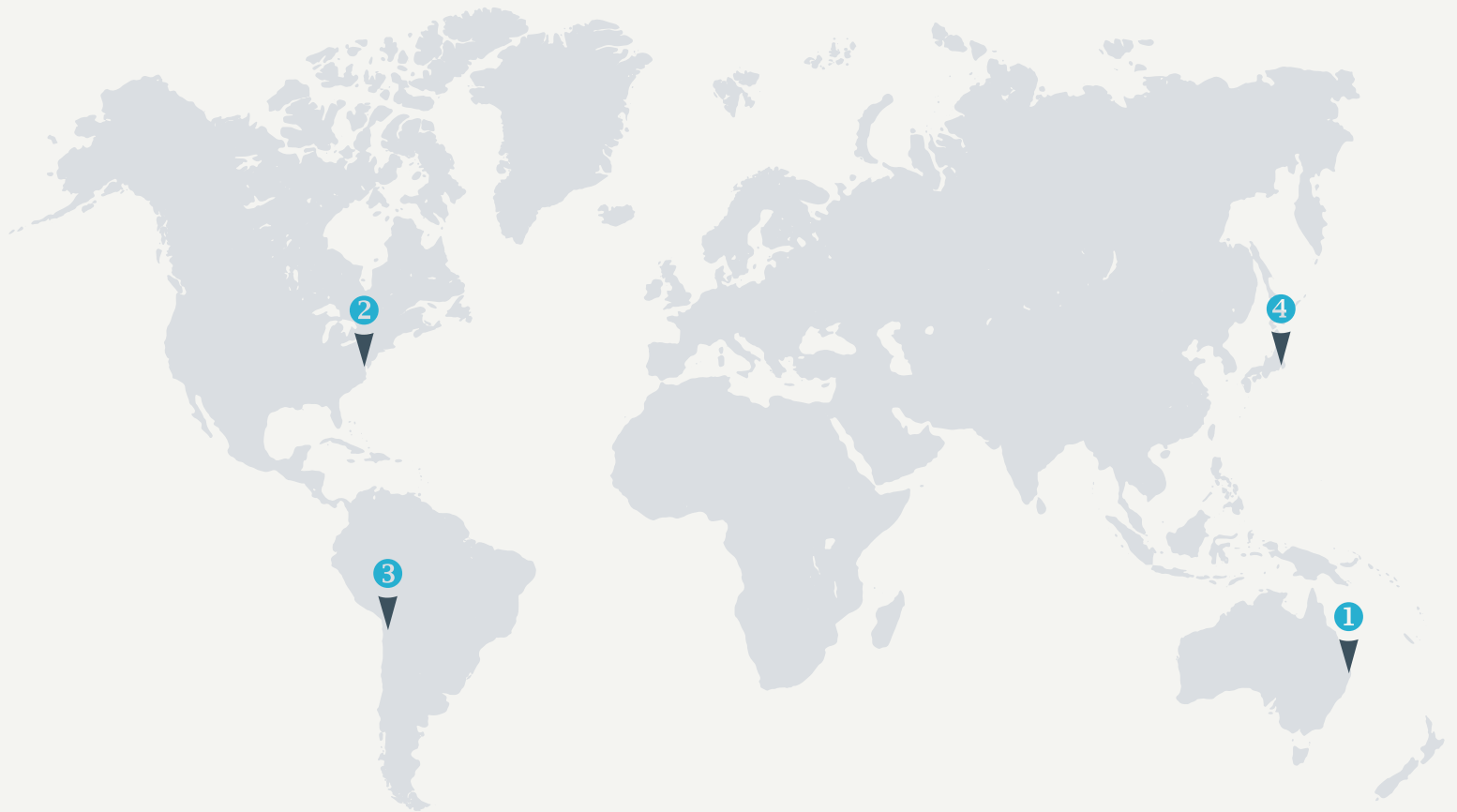
What were your findings?

“In the last 20–30 years, a lot of effort has been made to look into the working mechanism of lithium-metal batteries. In general, the consensus was that the lost capacity can never be recovered. However, in our study we discovered that it’s possible to, in an electrochemical way, recover some of the capacity. This also changes how we understand the working mechanism and the failure mechanism of the batteries and gives us some insight about their design.”

What will this mean for the industry?

“We demonstrated in the manuscript that, by forming a new charging protocol, it’s possible to recover some capacity. Since the rechargeable lithium battery hasn’t been commercialized, this study could be used as a guideline for research but also for further development in the industry.”

More www.bit.do/lithiumbacktolife



Pinpointed

1 Federal Resources minister advocating more women Brisbane, Australia

➡ Madeleine King, Australia's Federal Resources minister, has urged the resources industry to do more to encourage female employment in the sector. King heard from industry about what they are doing to invest in, develop and attract skilled workers so the industry can sustain its crucial role in supporting the Australian economy and used a roundtable in Brisbane to outline some of the workforce challenges facing the sector and hear how the government can support the industry to tackle the issues.

2 US Senate passes act with incentives for critical minerals Washington D.C., USA

➡ The US Senate has passed the Inflation Reduction Act (IRA), which includes incentives to increase production of electric vehicles, renewables, and critical minerals, *Mining Journal* reports. The act extends a \$7 500-per-vehicle consumer tax credit for the purchase of electric vehicles made by firms that include Tesla and General Motors. At least two-fifths of the critical minerals used in the batteries will have to be extracted and processed in the US or with a free trade agreement partner or recycled in North America.

3 Codelco uses AI at aging copper mines Chuquicamata, Chile

➡ Codelco is using artificial intelligence to squeeze out more copper from its aging Chilean mines as suppliers of the metal look to boost efficiency. Battling falling grades, rising costs and growing environmental scrutiny, Codelco introduced a digital data center in 2020 that uses machine learning. The platform is adding about 8 000 metric tons at the century-old Chuquicamata mine, the company states. Now Codelco, the world's biggest copper supplier, will look to introduce AI systems at other operations.

4 Harnessing the power of wind-assisted propulsion Tokyo, Japan

➡ Pan Pacific Copper (PPC), BHP and Norsepower have partnered to reduce greenhouse gas (GHG) emissions from maritime transportation between BHP's mines in Chile and PPC's smelters in Japan. The parties are conducting a technical assessment and plan a retrofit installation of a wind-assisted propulsion system onboard the M/V Koryu,

a combination carrier operated by Nippon Marine. Norsepower's Rotor Sails installation – a “push-button wind propulsion” system that is estimated to be around ten times more efficient than a conventional sail and requires no reefing or crew attention when in operation – is scheduled for completion by the third quarter of 2023.



OPTIMIZING FLOWS

MOBILARIS SOLUTIONS GAMECHANGERS AT CARRAPATEENA

»»» OZ Minerals wanted to improve traffic flows in its mine in Carrapateena, Australia. Having implemented Mobilaris Situational Awareness and Mobilaris Onboard, the company gained a better understanding of where machines and people were physically located underground – and operations became safer.

SINCE COMMENCING PRODUCTION in December 2019, the Carrapateena copper-gold mine has become over the past decade one of the biggest mining projects in South Australia. The ore must be hauled from the production levels to the crusher level via a short decline with limited passing areas, which poses challenges. In order to optimize haulage flows, mine operator OZ Minerals deployed Epiroc's Mobilaris Mining Intelligence decision support system to digitize the mine.

“We saw potential to remove some of the constraints we have underground. You can't see around corners, and you can't see through rock, so understanding where things are – where people and machines are – is

a lot more difficult than in a typical workplace on the surface,” said Superintendent **Daniel Bruce**, OZ Minerals Carrapateena.

OZ Minerals rolled out the first feature in 2019: Mobilaris Situational Awareness, a solution for surface control room operators. Mobilaris Onboard, a solution for underground operators in vehicles, followed in 2021. Thanks to real-time 3D visualization, anybody with access to a tablet or a PC can quickly understand where machines are operating.

“Mobilaris Situational Awareness allows you to see, live, at any point in time, where all the equipment and people are in the mine. It also allows you to navigate to locations, equipment and refuge chambers,” said Bruce.

OZ MINERALS HAD INITIALLY installed Wi-Fi tags on all its vehicles, which provided accuracy to around 150 meters. With Mobilaris Onboard, it



[On Location]
Australia



The Carrapateena copper-gold mine in South Australia faced logistical challenges that were solved thanks to Epiroc's Mobilaris Mining Intelligence decision support system.

can achieve accuracy to 5–10 meters without any extra infrastructure, and all that is needed are basic OBD2 adapters or a Doppler radar. Implementation started with trucks and loaders, and now the entire underground fleet has been equipped. This has significantly improved real-time position information.

“Everyone at the site operations center – dispatchers, mine controllers and haulage control – is now using Mobilaris Situational Awareness. Previously, it could take quite a bit of time to search for a piece of equipment, but it only takes seconds now to see its last location,” said **Amelia Schmidt**, a senior technician in the site operations team.

THE SYSTEM ALSO HELPS OZ Minerals with its fleet management – to determine where trucks are, for instance – thus becoming a tool in the decision-making process.

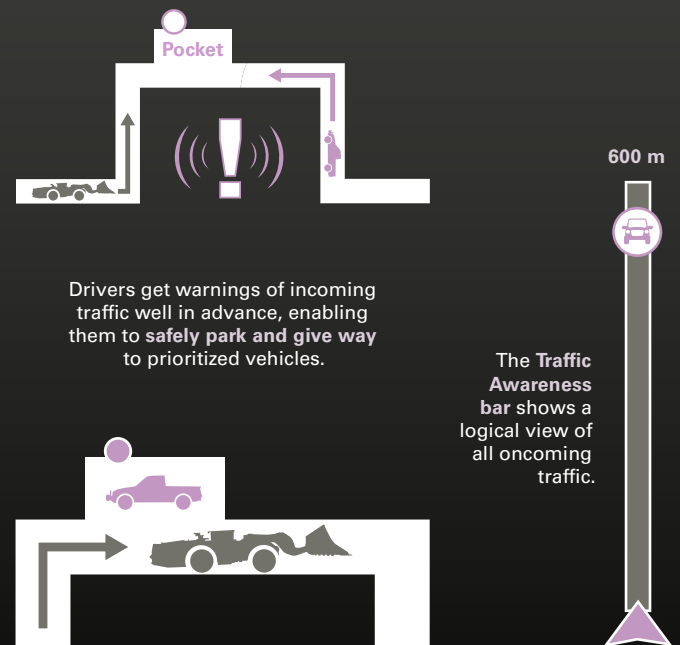
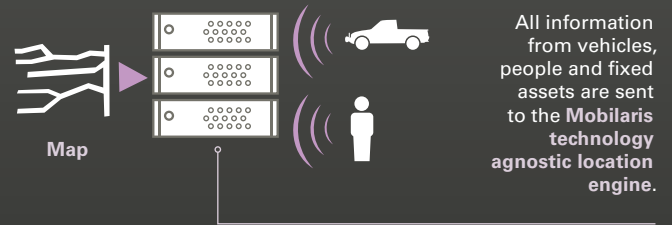
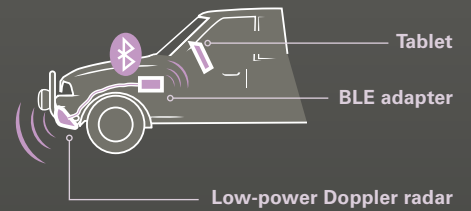


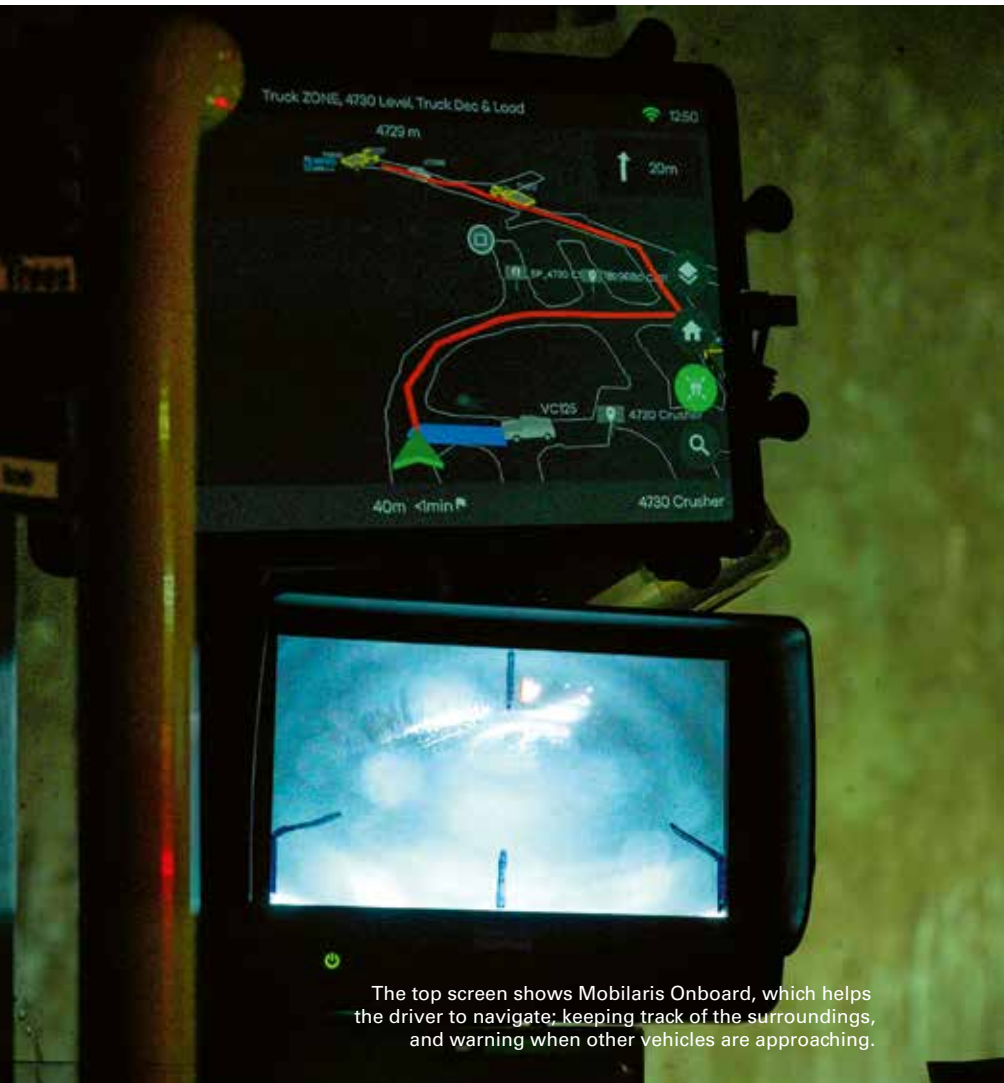
LEARN MORE // MOBILARIS ONBOARD

Mobile “radar” for incoming traffic

WITH MOBILARIS ONBOARD inside a vehicle, the driver can avoid traffic congestion and see the best route to a destination.

Mobilaris Onboard is easily mounted, requiring just some add-on hardware and an Android tablet.





The top screen shows Mobilaris Onboard, which helps the driver to navigate; keeping track of the surroundings, and warning when other vehicles are approaching.

Mobilaris Situational Awareness

1. Control room personnel have total control over the whole mine all the time.
2. Mobilaris Pocketmine gives every miner the same overview as the one shown in the control room.
3. Mobilaris Onboard enables drivers of machines and vehicles (even without previous mine experience) to navigate and drive safely in the mine. Thanks to the Traffic Awareness function, potential oncoming traffic can be detected well in advance.
4. Drivers can plan where to park so unnecessary stops can be avoided.



Daniel Bruce
Superintendent,
OZ Minerals

“For those who are perhaps new to the mine, we’ve been able to insert points of interest on the map, for example where it is best to hold. Cycle times are well managed, despite underground operations becoming a lot busier,” said Schmidt.

OZ Minerals then implemented a second Mobilaris feature: Mobilaris Onboard, a tablet in a vehicle that acts just like a car navigator but without any need for a dedicated tracking infrastructure. This provided everyone underground with a tool that enabled them to easily understand how equipment was positioned around them.

“This is another piece of information that the operator can use to make a decision – and all of these minute decisions add up to a more productive and safer workplace,” said Bruce.

FOR TRUCK CAPTAIN Joel Dodd, everyday work has become easier thanks to Mobilaris Onboard.

“One of the main benefits is that we’re able to travel down and get to our locations a lot better.”

OZ Minerals now has around 200 tablets in vehicles underground – not just in trucks, loaders and face drill rigs, but also in light vehicles – and the feedback has been very positive.

“When people can see more clearly where other people are, it helps them avoid unwanted interaction,” said Bruce. ×



Amelia Schmidt
Senior Technician,
OZ Minerals

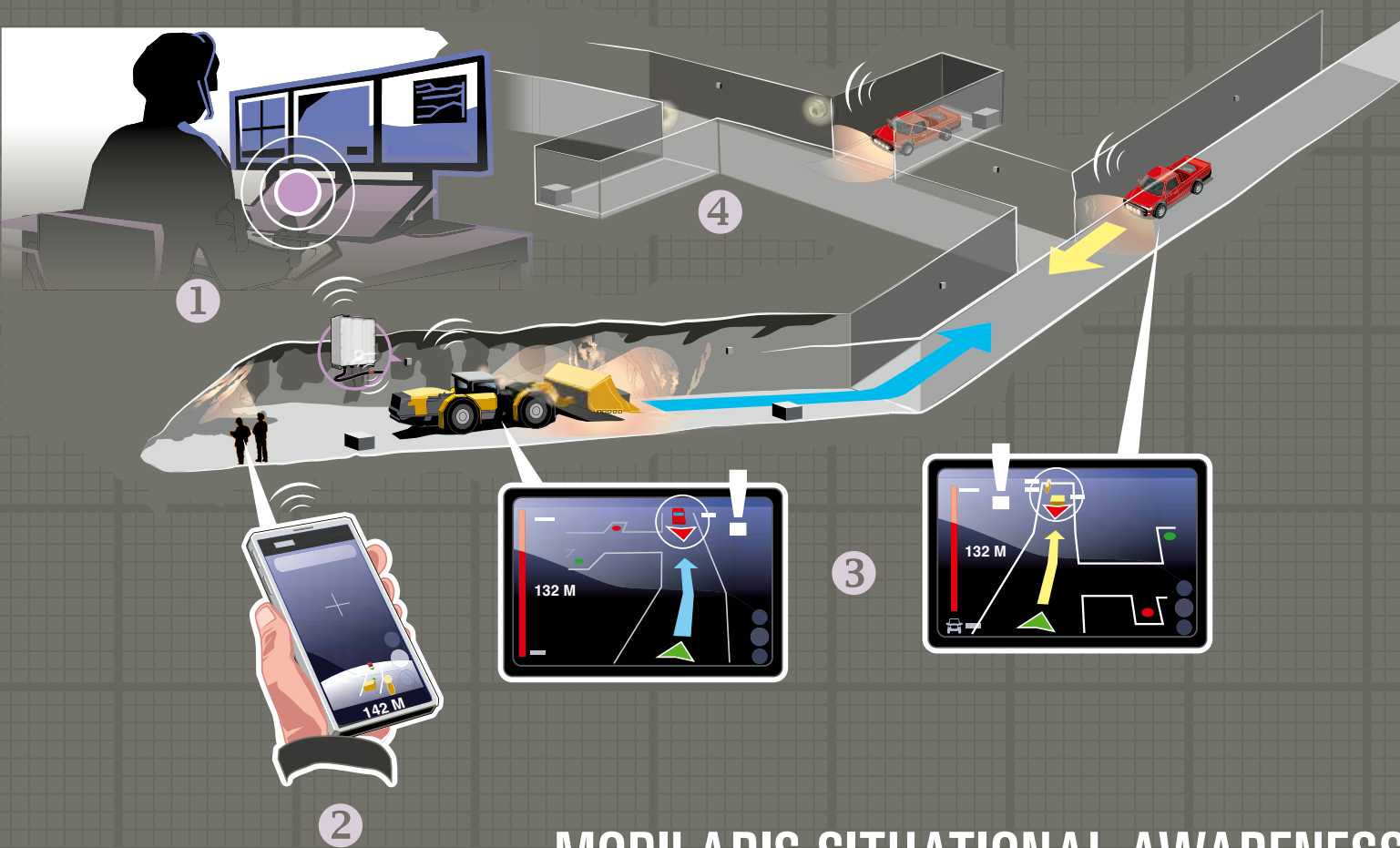


Joel Dodd
Truck Captain,
OZ Minerals

OZ Minerals

OZ Minerals is a mining company based in Adelaide, South Australia. The company was formed by the merger of two Australian non-ferrous metals mining businesses – Oxiana and Zinifex. OZ Minerals operates three mines: Carrapateena (Australia), Prominent Hill (Australia), and Carajás East (Brazil).

More www.ozminerals.com



MOBILARIS SITUATIONAL AWARENESS

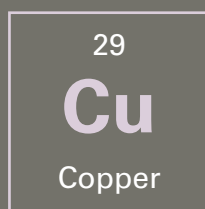
Transparency and awareness

Real-time data and superior 3D visualization make it possible for everyone everywhere to know what is going on underground.

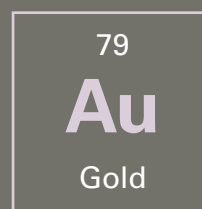
Carrapateena mine

Copper concentrate (containing gold and silver) mine, located 160 kilometers north of the regional center of Port Augusta, in South Australia. The Carrapateena exploration project was acquired by OZ Minerals in 2011. Construction was complete and the first saleable concentrate was produced in 2019. Carrapateena ranks as one of the biggest mining projects in South Australia in the last decade.

Year 2021 in a nutshell



Copper production
125 487 metric tons of copper
(all three mines).



Gold production
237 263 ounces of gold
(all three mines).



Net revenue
AUD 2 096 million
(up 56%).

FEATURE

CIRCULAR ECONOMY



Circular economy is all about the R's: recycling, reuse, restoration and regeneration of resources.

Parts of the concept are old, but the strategic business aspect of it is not. It is only in the past decade that circular thinking has started to take root and "business as usual" is no longer an option.

Digital Solutions

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Stretching resources

Industry, politics and academia have started to tackle resource management in a circular manner.



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Core resurrections

The Epiroc Sudbury Reman plant in Canada keeps cores out of landfills, restoring components to new life.

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PERSPECTIVE
Recovering waste

The TerraCycle corporation has found ingenious ways to make new use of previously discarded materials. Juice pouches become backpacks and cigarette butts become benches, reintroducing them to the economy.

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SURVEY
Voices on circularity

"A truly circular global economy is critical to the longevity of our planet's future," says Li-Cycle VP Elewout Depicker. Read what he and other experts see in the future for circular economy solutions.

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SEVENTHINGS
Creative recycling

Waste not, want not. Every resource imaginable can be used in new and exciting ways. For instance, how about an instrument made from pans and forks? Here are seven examples from around the globe.

SHUTTERSTOCK, BJÖRN ÖBERG, JAMES HODGINS



Going in circles

In the last few years, the concept of the circular economy has surfaced. In its perfect form, we would be sharing, reusing, refurbishing, recycling and repairing resources indefinitely, with zero waste. But how circular is our imperfect world today?

STRICTLY SPEAKING, in planetary terms, there is only one truly renewable resource available to us: sunlight. Everything else is finite.

Examples of resources that are in increasingly short supply are several rare-earth metals, aluminum, helium, phosphorus, soil, fresh water, oil and natural gas. New, untapped supplies of these and other resources on the planet are increasingly unlikely. This makes it all the more important to manage resources in smarter ways, both for the present population and for the untold number of generations to come.

A DECADE AGO, the concept of the circular economy – where we share, repair, reuse, recycle, regenerate and restore resources as much as is humanly possible – became a buzzword that has gradually gained in popularity ever since.

“Circular economy is still in its infancy,” says **Ingela Wickman Bois**, CE Industry Expert at the Centre for Circular Economy established by Exeter University and the Ellen MacArthur Foundation. The Centre conducts research and runs master classes in circular economy for executives from major global and financing corporations.

“The first report on circular economy

issued by the foundation in cooperation with McKinsey, *Towards the Circular Economy*, was published in 2012. The adoption of a circular mindset, however, has been slow up till now,” says Wickman Bois.

Part of the problem, she says, is that a circular economy was long perceived as a strictly environmental concept when, in fact, it belongs more to the realms of economy and innovation.

“Today there is a trend toward finding business rationale for an accelerated transition through value-chain mapping and cross-over industry partnerships or supply-chain collaboration. The industry starts to realize that business-as-usual is no longer viable – and, in fact, a long-term business risk. This insight alone is a game changer,” says Wickman Bois.

THE KEY TO SUCCESS is economic viability and scalability, she continues.

“You’ll need a fit-for-purpose business case within the context of the specific company – there is no “one size fits all.” The good performers evaluate their value



Ingela Wickman Bois
CE Industry Expert
at the Centre for
Circular Economy



Adalbert Jahnz
Spokesperson of
the European
Commission for
the environment

chain from a circular business perspective, strategize scaling opportunities and reach out for industry collaborations within their ecosystem. Philips, Renault and Danone can be considered role models.”

THE ROLE OF governments in a circular market is to lay the groundwork for development of solutions, with incentives, better regulations and higher taxes on virgin resources. In the European Union, for example, a Circular Economy Action Plan was adopted in March 2020.

“The aim is to ensure that resources used are kept in the EU economy for as long as possible, making our economy fit for a green future and strengthening our competitiveness while protecting the environment. The Commission has sustainability in mind in all its senses, working toward an economy decoupled from energy and resource dependencies,” says **Adalbert Jahnz**, spokesperson of the European Commission for the environment.

“The Action Plan identifies seven priority sectors with a high potential for circularity: textiles, buildings, batter-





“It’s theoretically possible to make products 100 percent recyclable, but in practice zero waste might not be feasible”

Michael Saidani
University of Illinois



ies, electronics, food waste, plastics and packaging. The goal is to develop and apply sector-specific sustainability principles to change how we produce, use and recycle these,” says Jahnz.

He adds that the Commission presented a package of proposals in March 2022 that is pending approval by the co-legislators—the European Parliament and the member states.

“One proposal aims to make almost all physical goods on the EU market more friendly to the environment, circular, and energy efficient throughout their lifecycle. Another is new rules to empower consumers. And toward the end of the year, we will be proposing another big package relating to the sustainable repair and re-use of products and the better tackling of waste from packages and microplastics,” says Jahnz.

SO, STRIVING TO become more circular is all well and good. But how do you measure how successful you are? The methods of grading circularity and setting measurable goals have so far been spotty, incomplete and even misleading.

To improve the situation, new methods are under development. **Michael Saidani** is a postdoctoral research associate at the University of Illinois, USA. His research deals with the circular economy and its implementation in industrial practices and seeks to measure, monitor and improve the circularity and sustainability performance of products.

“The past few years, I have developed tools and checklists to be used in the circular business model. I’ve gradually moved to more applied research. Basi-

cally, we take a large amount of circular economy indicators, make life-cycle assessments and put numbers to the circular performance of products,” says Saidani.

“It’s theoretically possible to make products 100 percent recyclable, but in practice, zero waste might not be feasible. For example, it might not be optimal to extend the lifespan too much – at some point it will probably become too energy inefficient compared to new products. Finding the optimal trade-offs and the optimal lifespans, that’s what these tools are for. Eighty percent might be good enough,” says Saidani. ✕



Michael Saidani
Postdoctoral research associate, The University of Illinois, USA

FOCUS AREA

Batteries in the circular economy

THE ELLEN MACARTHUR FOUNDATION, among a multitude of other things, has studied the circularity of batteries. With the rapid increase in electrification of vehicles and the need for energy storage in renewable energy production, lithium-ion batteries have come under particular scrutiny. Potentially usable batteries are more often than not discarded, removing

the component materials from the economy.

But better practices are being heralded. The European Commission’s Circular Economy Action Plan notes that a new regulatory framework for batteries will be proposed, building on the Batteries Directive. One of its key focuses will be to “ensure the recovery of valuable materials.”





In it for the long haul



[On Location]
Canada

»— Epiroc’s tracking system is unique in the business of rebuilt equipment components. For every remanufactured component shipped, a so-called core – a reused component – returns to the Sudbury Reman plant in Canada for repair, creating a circular economy that keeps cores out of the landfill.

BRIAN BERNIER POINTS to a gearbox disassembled on the shop floor of Epiroc’s new global Remanufacturing Center near Sudbury, Canada. Its teeth are gouged and pitted beyond repair. The part is being prepared to be sent for full metal recycling.

That scenario is precisely what Plant Manager Bernier and his team aim to prevent with Epiroc’s Reman Program. The program is unique among Reman component solutions because it employs a custom core tracking and forecasting system that ensures equipment components are replaced before they fail and used cores are returned to the plant for remanufacturing.

“Catastrophic failure creates a lot more waste,” says Bernier as we make our way to his cheery front office, where Epiroc’s signature yellow and gray gleams in the natural light. “And if you’re always shooting from the hip, it’s difficult for us to ensure we’ll have a replacement component for you. If you sign up to the program, though, we’ll use forecasting to figure out how many Reman components you’ll need and when. That way we can guarantee availability.”

Traditionally, about 70% of component failure is unforeseen (the machine hits a mine wall, for

instance). The remaining 30% is “planned” according to the expected life span of a component. Epiroc is reversing this ratio through a combination of initiatives such as matching equipment precisely to the job and operator training.

The latest solution involves tracking cores so that, as they approach obsolescence, a good-as-new Reman component is onsite, ready to be deployed at 70% of the cost of new. The spent core then returns to Sudbury in the same packaging, to be revitalized and reused.

THE BEAUTY OF the Reman Program is that it creates a circular economy by keeping parts out of the landfill for as long as possible and reduces greenhouse gas emissions associated with manufacturing new parts. The zero-waste mindset has changed plant culture.

“We’re not satisfied with even 2% of material, the O-rings and other plastics, that are not recyclable. We’re going to get to 100%,” says Bernier.

To improve the program, Bernier has hired industrial engineer **Klaryza Lehocky** to conduct reliability projects to find ways to increase the lifespan of components so they can run 20–40% longer than the standard 10 000 or 12 000 hours. This involves improving parts that fail frequently or the serviceability of the component.



→
Amanda Cournoyer,
warehouse clerk, carefully
separates components
into recycling bins on site.



Brian Bernier
Plant Manager,
Epiroc

With her engineering background and expertise in continuous improvement, Lehocky contributes not only to innovation of the Reman components, but to tweaking the tracking and forecasting system to include automatic notifications when, say, a core is due or making the interface more user-friendly for customer account managers.

“It all ties into longevity. At the end of the day, Epiroc’s contribution to the circular economy is to get longer life out of a component,” says **André Bertrand**, Business Line Manager Parts & Services at Epiroc Canada, and Global Project Manager for Reman components. “Then, when it comes time for the component to be replaced, to have a process in place to recapture that core.”



Klaryza Lehocky
Industrial Engineer,
Epiroc

EPIROC OPENED THE Sudbury Remanufacturing Center close to three years ago after outgrowing a previous location. The plant, one of two in the world, employs 30 people, including 17 technicians. As befits the base metal mining operations in the area, the plant specializes in underground machines. The other Remanufacturing Center in Tucson, Arizona – which employs 15 people, including the Reman Operations Manager – handles open pit mining equipment.

Reflecting Bernier’s preference for cleanliness and order, the plant walls are neatly stacked with

racks of Reman components and parts, its concrete floors spotless. Every one of the tools the technicians use to disassemble components is in its place. Bernier’s “Achilles heel,” a washing bay that once wasted hours, is gone, replaced by a 22-ft-wide machine that operates like a dishwasher and efficiently cleans incoming components of grease and other debris.

THE CIRCULAR PROGRAM works like this: imagine you have 50 machines in your fleet. The axles in three of your machines are reaching the end of their useful lifespan. You schedule maintenance downtime. If you’re registered with the Reman Program, Epiroc has already shipped a trio of remanufactured axles in a stand specially designed to prevent the leaks and other damage that can occur during transport from the Reman plant to the underground maintenance bay. You remove the aging axles and replace them with the like-new Reman axles. You arrange the spent axles in their molds in the shipping stand and send them back to Sudbury for remanufacturing.

Epiroc guarantees the availability of the Reman components by collaborating with the customer and forging an agreement that for every Reman component purchased, a used core will return to Sudbury.



André Bertrand
Business Line
Manager Parts
& Services, Epiroc

Q&A



**Danila Praporschikov, Global Product Manager
Reman Components, Sweden**

The Reman Program can play a key role in making machine lifecycle costs competitive. The program offers customers a lower-cost option to purchasing new components while maintaining the highest availability and reliability.

Q What is the purpose of Epiroc’s Reman program?

A “The purpose of the program is to provide a solution in compliance with circular economy principles. We use existing materials, so we save raw materials. Even if we have material we cannot reuse – for example, rubber – we recycle it. Reman is a global alternative to new components, to our local service and exchange program, and to our repair and return services. Ultimately, the Reman program reduces

both costs and environmental impacts: our customers pay less and get more.”

Q What challenges have you encountered implementing the program on a global scale?

A “Managing cores and forecasting are key elements of the program. Customers need to replace the core before it fails and send it back to us within a reasonable time-frame. If we don’t have the core, we cannot refresh our inventory. It’s more complex than just selling parts or building a

new machine. When you repair a component, you have to do the repair first and *then* install the component. At the same time, forecasting which components will be needed, and when, involves a lot of details and communication, as well as a long-term commitment from the customer to ensure Reman components will be available to meet the needs of each mine.”

Q How do you see the Reman program evolving over the next decade?

A “We believe the Reman program will grow because it is more efficient and effective than the alternatives. Instead of sending the component to the workshop and waiting until it’s repaired, you can have a finished good right off the shelf. Demand will grow not only because of the tangible benefit of cost savings but also because our customers are adopting the circular economy and plan to use fewer raw materials going forward. Through the Reman Program, we want to deliver superior value to our customers and become the global provider of remanufactured components everywhere they are needed.”

More www.epiroc.com/reman





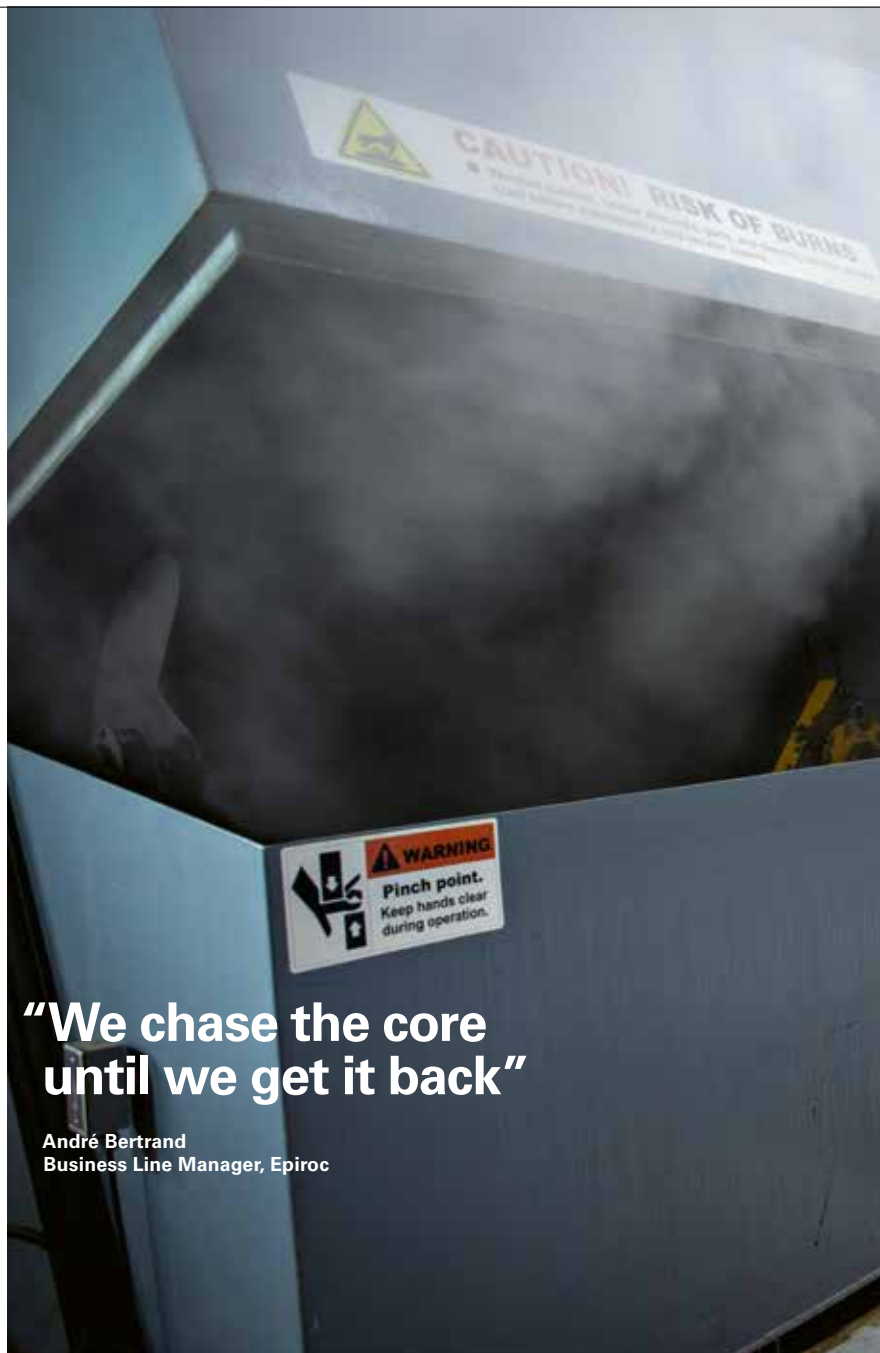
A freshly washed component in an industrial-sized wash tank ready to move on to the next step of the remanufacturing process.

“We chase the core until we get it back,” explains Bertrand. “That’s a big industry change – most suppliers charge for the core up front. If the customer sends it back, that’s OK; if the customer doesn’t, that’s OK too. They have no formal process for chasing the core like we do.”

THE COMPONENT REMANUFACTURING and exchange process was spearheaded by the late **David Palomaki**, former plant manager. In 1998 one of his customer’s differentials failed. The customer didn’t have time to send the component out for repair so Palomaki suggested he provide a used differential that could be installed in exchange for the damaged piece.

He started looking around local “boneyards” to find cores and purchase them by weight. Back then, there was plenty of supply because most spent cores were thrown out or even stashed in mined-out stopes. But with no guarantee the scrapped core could be fixed and with the potential for inventory build-up, the venture was risky. Still, Palomaki was able to sell the idea to customers, and now about 90% of them have registered with the Reman Program.

What’s new is Epiroc’s ability to forecast their component needs. Cores come from Epiroc’s “NASA” business region, including Canada, Chile, Mexico and the United States. When a core arrives at the plant, it is washed, sandblasted and disassembled to reveal the degree of wear and tear. Epiroc’s in-house partner Bristol Machine Works refurbishes internal parts that can be recycled (i.e., spindles and hubs) and then returns them to



“We chase the core until we get it back”

André Bertrand
Business Line Manager, Epiroc



David Palomaki
Former Plant
Manager, Epiroc



Tom Hayden
Test Center Trainer,
Epiroc

Epiroc, where they are tested for quality before being used in the next remanufactured component.

Epiroc has programmed the testing machine to check for leaks and telltale noises along with standard hydraulics. **Tom Hayden**, another long-term Epiroc employee, has stepped into the role of Test Center Trainer to teach apprentices how to set up and run the intricate tests. Components that fail, representing a very small amount of the total, go back through Epiroc’s quality control process.

With thousands of components spread out in machines around the globe, forecasting and core tracking can be challenging. **Olli Matikainen** in Operations Support has set up a system on the customized in-house platform to do both tracking and communication. The system tracks when the component was sold to which customer and then communicates with each stakeholder to make sure the core is returned within four weeks. The database includes a list of machines and the



Joe Benoit
Maintenance Manager,
Hudbay Minerals,
Lalor Mine, Canada

Why did you go for Reman?

Roughly how many machines do you have operating, and how many are in your fleet?

“We have 110 to 130 pieces of equipment operating at any given time. Our total fleet is around 185 pieces.”

How has the Reman program changed the way you maintain your fleet?

“We used to send a piece of equipment for a complete rebuild at, say, 16000 hours for a Scooptram, so it didn’t make sense to change the components inside the scoop that were due to fail based on, maybe, 12000 hours. A lot of the time we were pushing those components to make it to 16000 hours, which had a negative effect on our reliability. Now, because we do the rebuild onsite, we can change the components earlier and capitalize on keeping them working inside the tram until we get their useful life out of them.”

How do Hudbay’s goals for the environment and mine sustainability align with the circular economy and the Reman Program offering?

“By affording us the flexibility to shape the scope of work to meet our specific requirements. Our underground technicians also get vital hands-on training in the use of the equipment models operating at Lalor, and that allows more streamlined and efficient troubleshooting and repair in the future.” ✕

More www.hudbayminerals.com

components within them. Another column records the customer’s intention for each component: will they outsource next time, buy a remanufactured part or buy new?

“We can compile that data to figure out how many transmissions, axles, etcetera, we need to have ready for the next year,” Matikainen says.



Olli Matikainen
Operations Support,
Epiroc

THERE ARE ALREADY PLANS in place to expand the Reman Program to other regions around the world based on the success of the Sudbury plant. The program fits neatly under the commitments Epiroc has made to sustainability by 2030.

“Our goal is not only to remanufacture the component but to get that component’s life from 8000 hours to 12000 hours,” says Bertrand. “If you’re using three transmissions per model per year, and you can get that down to two transmissions per model per year, that means burning less fossil fuel in the manufacturing plant.” ✕

☑ Christian Tarras Ericsson
📷 Shutterstock

From worms to global recycling programs

Redefining recycling

BACK IN 2002, TERRACYCLE founders Tom Szaky and Jon Beyer were students at Princeton University. They started manufacturing liquid fertilizer, feeding organic waste from the university dining halls to worms. The worm excrement was then mixed with air and warm water into compost tea, which was bottled and sold to customers.

Because Szaky and Beyer could not afford packaging, they utilized used plastic drinking bottles and spray bottle tops rejected from other companies, marketing the liquid fertilizer as “Waste in Waste.” A few years down the line, this idea of collecting and re-using material took on a life of its own, eventually forming the core business of TerraCycle.

Early ideas included a waste collection program for the Honest Tea brand. Szaky designed sample recycled products made from the discarded juice pouches, like pencil pouches and tote bags. TerraCycle also acquired 20 million baled juice pouches stored in Canada, including a large number of Capri-Sun pouches. After gaining permission from Kraft, TerraCycle designed products such as backpacks made from the Capri-Sun pouches.

IN 2009, to improve finances, TerraCycle moved away from manufacturing to licensing products. One example is the collection and recycling of cigarette butts, from which the cellulose

acetate is eventually transformed into shipping pallets, benches and ashtrays, while the residual tobacco and paper is composted. Another example is a shampoo bottle for Procter & Gamble, made from plastic recovered from beaches, rivers and waterways.

The number of products created by TerraCycle and licensed to manufacturers today number more than 200 and includes playground equipment, plastic lumber and pavers, bike racks and park benches. Global recycling programs, in collaboration with sponsoring companies, enable individuals or groups to collect specified waste materials in exchange for donations to selected causes or schools. ✕



In Focus: TerraCycle

TERRACYCLE HAS offices in 21 countries around the world. The main headquarters is located in Trenton, New Jersey, in a formerly abandoned warehouse. The walls of the building are repainted periodically by local graffiti artists, not least during annual “Graffiti Jams” arranged by the company.

The company has also founded the non-profit TerraCycle Global Foundation, which collaborates with local communities in regions of the world suffering from heavily polluted waterways. The aim is to reduce the flow of plastic waste from rivers and canals before it can reach the ocean.

More www.terracecycle.com

SURVEY CIRCULAR ECONOMY

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

☑ Gustaf Höök

01

What's the potential going forward
for the circular economy?

02

What challenges have to be met?



Avi Blau

Director, Afeka Institute
of Circular Engineering and
Economy, Israel



Josefina Sallén

Coach, Circular Transition,
RISE Research Institutes
of Sweden



Elewout Depicker

Vice President, Commercial
and Corporate Development,
EMEA of Li-Cycle

01 "THE CIRCULAR economy needs to be integrated in the engineering community so that products, services and systems are designed with those principles in mind. If indeed value chains find it possible to plan together, then the circular economy offers a valid and technically feasible model for how to design the economic system to be less resource intensive and less polluting. As the circular economy cannot provide a 100% solution (not even close), it will need to address and encompass other change vectors such as degrowth, consumer awareness, political change, and techno-optimization."

02 "THE BIGGEST challenge is getting systems that used to operate individually to think and work together. An additional challenge is the current focus on recycling, which in fact is more often than not downcycling. Lastly, there is a huge capacity gap, as circular economy is not currently taught in the vast majority of technical institutions."

01 "GIVEN THAT THE current business model is based on make, sell, dispose – and that the economy can grow only if sales increase – we have very little focus on longevity or usage of products. Since we have viewed resources/material as abundant, this has created a system where we create value but don't preserve it, meaning that we have not spent effort, time or money on value preservation and clever resource use. So, the potential is huge since it is an area where we have only just started to focus our efforts."

02 "EACH BUSINESS has its own challenges, and it is not easy to change a business model or an entire ecosystem. So, the complexity is probably the biggest challenge – that and the financial aspects, since many investors still prefer a smaller profit today as opposed to a much larger profit in four years' time. Also, the fact that the old business model has been very profitable. Why change something when you earn money today?"

01 "A TRULY CIRCULAR global economy is critical to the longevity of our planet's future. It goes beyond recycling and the lithium-ion battery supply chain, providing both positive economic benefits and considerable environmental advantages across a variety of industries. It's essential that we build localized circular economies across different markets to ensure that supply chains are not dependent on sourcing from countries overseas."

02 "TWO KEY CHALLENGES, namely critical material supplies and effective waste management solutions. Manufacturers need to secure a sustainable supply of critical materials to build solar panels, batteries and more. Additionally, we need safe, effective waste management solutions, particularly with lithium-ion batteries. It's imperative that we have enough material to support mass production and ensure industries are truly sustainable, with proper waste management procedures in place."

More www.bit.do/circulareconomyfacts

End-of-life does not necessarily entail end of usefulness. Here are seven examples of ingenious ways to infuse new viability into decrepit materials.

01

Toner powder
→ Asphalt binder

Australian company **Close the Loop** has developed a number of sustainable recycling solutions. For example, TonerPlas transforms soft plastics and printer toner powder into an additive used to make high performance asphalt roads that last longer and require less maintenance.

07

Scrap material
→ Musical instruments

The Recycled Orchestra from Asunción, Paraguay, is a youth orchestra and uses instruments made from scrap materials collected from the local Cateura landfill. One instrument, the "*Stradivarius de Cateura*," is a violin made from an old pan, a fork and other recycled objects.

06

Wastewater
→ Biogas

US company **Cambrian Innovation** has developed a water treatment reactor that cleans wastewater while converting a large part of the waste content to high-quality biogas with around 80 percent methane fraction. A typical installation generates up to net 200 kW of power.

05

Waste cotton
→ Sneakers

French shoe company **Veja's** sneakers are filled to the brim with recycled materials. Waste cotton and jute combined with recycled textiles, polyester and plastic bottles collected from the streets of São Paulo comprise the materials used to manufacture the shoes.

02

Solid waste
→ Biofuel

Canadian company **Enerkem** has developed a solution for breaking down shredded municipal waste to separate and extract, for example, carbon monoxide and hydrogen. These molecules are then used to manufacture hydrocarbons like liquid ethanol fuel and other chemicals.

03

Tires
→ Construction material

Lehigh Technologies transforms rubber from worn-out tires, among other things, into micronized rubber powders (MRP). These sustainable and versatile MRPs can be used in a wide variety of applications, for example construction, plastics, asphalt and coatings.

04

Trash
→ Clothes

The work of US-born, Australian-based artist **Marina DeBris** focuses on reusing beach trash to raise awareness for ocean and beach pollution. She has made several pieces of trashfashion (fashion from trash), for example using 300 face masks she found on beaches in 2021.

Next issue
[Feature]

What role will the mining and construction industry play in years to come – and what kind of demands does that put on a company like Epiroc? Read more about *future* challenges in next issue's Feature.

MY WORK: SALES MANAGER

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

✍️ Frida Valentin
📷 Merveille Nukunu

“Our customers keep me going”

»→ Renewable energy was the goal for **Mariem Maiga** after earning a degree in Electrical Engineering. Instead, she ended up in the mining industry, just like her father. Today, she is Regional Sales Manager in Bamako, Mali.

“I was born in Zouerate, the heart of mining country in Mauritania, where my father worked as a drill & blast manager. So you could say that I was comfortable in this industry. However, after earning my two master's degrees, first in physics and then electrical engineering, I aimed for a job with focus on renewable energy. But when starting my career journey, it was also natural for me to apply at Atlas Copco. My first education prepared me to be a lab rat, but now I have the privilege of working with people and business development while still navigating in a very technical environment. I love it!

FOR A FEW YEARS, I lived in the USA working as a product marketing engineer with our production center in Garland, Texas. That is where I first got to learn about agile and change management. After we had our first son, it was time to move back to Mali. Luckily, I got this exciting role with the opportunity to develop the sales structure in the region. The goal is to have a high performing sales



MARIEM MAIGA

Age: 36
Job: Regional Sales Manager, Bamako, Mali
Joined the company: 2012
Best part of the job: “The customer feedback, which gives me such a rewarding feeling.”

organization with clear accountability toward our customers. I enjoy starting from a blank canvas and setting up a team while making strategic plans. My goal is to build something sustainable, and it feels like I'm helping to shape history here at Epiroc West Africa.

THE BIGGEST CHALLENGE is that everyone on the team has different experiences and backgrounds, but it is also our biggest strength. To succeed, we simply need to find a common way of working. I focus on listening to and understanding my team, and seeing how people grow and develop is one of the best things about my job. Our customers are what keeps me going; I enjoy finding the best solution to support them.

With two boys, aged two and five, I'm also busy in my spare time. Quality time with family and friends is something I prioritize. My oldest son, Idrees, and I build scale models, planes, trucks, and trains. It takes a long time to build them, but only a few seconds for him to destroy them.” ✕



Mariem Maiga was born in the heart of mining country in Mauritania. After a few years in the USA, she is now back in Mali to develop Epiroc's sales structure in the region.

Quality seal

» The work of sealing tunnels has so far mostly been based on guesswork and hope. Thanks to new software from Epiroc, construction contractor Implenia now has full control over its projects and can also guarantee the result.

Thanks to the Underground Manager software, the operator can, among other things, perform digital documentation instead of taking handwritten notes.

1

THE CHALLENGE

THE STOCKHOLM METRO is currently being expanded, and 17 new stations and an underground service hall for trains will be opened over the next ten years. For the contractor Implenia, the work is not just about getting through rock and under lakes. It is equally important to seal both fractures that were present in the rock from the beginning, and the drill holes that were created during the course of the work. Otherwise, large quantities of water will leak into the tunnel, which may lead to lower levels of the surrounding groundwater.

“Sealing rock has traditionally been an intuitive task. When an operator saw a hole, they filled it with cement and nor-



Johan Broström
Software Developer,
Epiroc

mally documented the work with handwritten notes. The problem with this method is that no one knows with certainty that the correct hole was filled,” says

Software Developer **Johan Broström**, Epiroc Digital Solutions.

The fact that the work has been based more on feel than facts has also resulted in a number of conflicts between contractors and clients when the end result has not been as expected. Without precise documentation, it has also been difficult to determine who made a mistake.

2

THE SOLUTION

TO GET BETTER control of this work, Epiroc developed the Underground Manager software. It helps the operator seal the rock correctly while creating complete documentation of the work performed.

“In practice, the rock drill that goes first automatically analyzes the rock and registers its own work. The information is then sent digitally to the grouting machine that will follow,” says Broström.

He continues:

“The operator thus gains precise knowledge of the cracks in the rock and where the drill holes that must be filled are located. The system also notifies the operator of the volume of a hole and the cement to be used to get the best results.”

By tying together the drill rig used for tunneling with the grouting equipment, the contractor also gains full

control over how long the work will take – a solution that has not yet been available on the market. For the customer, this means that the work can be adapted to actual conditions, which makes the project more predictable while at the same time making better use of resources.

“Because each drill hole has a unique identity, it becomes possible to evaluate the work in detail, both during and afterwards,” says Broström.

THIS MEANS THAT problems can easily be identified and handled, and also discussions – about how the work has been carried out and whether the right amount of cement has been used – that were previously common have been minimized. This makes the work more predictable at the same time as the water leakage into the tunnel is reduced.



3

THE RESULT

SINCE LAST SUMMER, Implenia has been using Epiroc’s Underground Manager software for the tunnel construction in Stockholm. The system facilitates day-to-day work and also means that the handwritten notes, which were previously used to document the work, have been replaced by digital documentation. In this way, Implenia can assure the quality of the entire project, which gives both them and the client greater security.

THE OPERATOR’S constant control over the condition of the rock introduces for the first time conditions to enable high-quality work and opportunities to later show why the job has been performed in a specific way.

“This complete solution is unique in the industry, not least because our customers can now offer a function, a watertight tunnel, instead of just buying the equipment that powers the rock in the past,” says Broström. ✕

More www.epiroc.com/grouting



← Energy consumption at Epiroc's Garland production facility has gone down from about 1.3 million kilowatt hours to roughly 397 000, thanks to LED lights.



ENERGY REDUCTION AND HIGHER SAFETY

LED lighting a bright spot in Garland

»»» Reduction of energy consumption is an important goal in Epiroc's sustainability work, in line with Agenda 2030. LED lighting at the Garland production facility is a step on the way.

SUSTAINABILITY IS A KEY ISSUE for the Epiroc Group. All markets are working hard to contribute to the global sustainability goals of the Paris Agreement and the UN 2030 Agenda for Sustainable Development. In November 2021, the Garland production facility started a huge project that turned out to be an immediate success.

"We were looking for ways to reduce our energy consumption. With our

previous lights, we consumed about 1.3 million kilowatt hours. After the installation of LED lights, we only come up to roughly 397 000. That's what I call an improvement," says **Wayne Apke**, Facilities & Environmental Manager at Garland production facility.

Since the lights also are equipped with programmable motion sensors, Epiroc was able to reduce the energy consumption even further. This allows for the light to dim, reducing the power con-

sumption after a set amount of time. "If the lights see no movement for a longer period, they will shut off. Once movement is sensed, they will come back on or brighten back up," explains Apke.

ALL 675 LIGHTS were installed in February, and in June Apke and his team saw the project finished. Getting the LED lights in the facility was the biggest challenge. "But the electricians were quick, scheduled, and competent, so everything worked out fine. It's a team effort to bring a project of this size to completion. Collaboration with other departments and informing employees was essential."

For the workers in production, the new lights were also a pleasant surprise, since the better lighting has improved the working environment.

"Today, they can do their job more safely and efficiently. A brighter workspace has also increased the morale at the facility; everyone is glad we made this change. The new lights are a win-win project for the planet and our employees."

The LED lights are expected to result in cost savings of around USD 95 000 per year, thanks to the reduced

🌟 FOUR SUCCESS FACTORS WITH LED LIGHTING

<p>1 Energy reduction</p> <p><i>With the installation of LED lights, the Garland production facility has reduced its energy consumption by 70 percent. The fact that the lights have motion sensors plays an important role.</i></p>	<p>2 Cost savings</p> <p><i>The cost savings thanks to reduced energy consumption is around USD 110 000 per year, including savings on maintenance costs. This is significant when it comes to reducing the cost of the daily operations.</i></p>	<p>3 Better working environment</p> <p><i>For the production team, brighter lighting has made the working environment better and more effective. Although no one had complained before, there was a clear difference after the installation of LED.</i></p>	<p>4 Improved safety</p> <p><i>A safe working environment is an important part of the sustainability goals. With better lighting, safety at the Garland production facility has improved, as has efficiency.</i></p>
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↓
 The LED lights do not just save money but have also improved the working environment. Better lighting has improved safety and increased morale at the facility for the employees, here Warehouse Lead Branden Blain.



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



The Reman Center in Sudbury, Canada, is a good example of how Epiroc strives to prolong product life and, in so doing, reduces its environmental footprint.

HIGH RECYCLABILITY IS KEY

➤→ The global Sustainable Development Goals (SDG) formulated by the UN guide our sustainability work. We take a closer look at how Epiroc approaches Goal 12.

energy consumption. Moreover, Apke foresees USD 15 000 in savings on maintenance costs per year. “Reduced energy consumption was the main objective, but of course the financial gains are a plus, as well as the safer and better working environment for our employees.”



Wayne Apke
 Facilities & Environmental Manager,
 Garland, USA

The Garland production facility, and Epiroc in general, continues to look for solutions that will halve the CO₂ emissions from the operations, transportation and use of the products. Developing battery technology is one important investment in 2022.

“We have replaced the gas steamers with electric units, and we are also investigating the possibility to install heat pumps rather than natural gas-fired heaters,” says Apke, finishing: “Finding ways to decrease our diesel fuel consumption during our testing process is also a future project here at Garland, as well as changing the lights outside to LED tubes. LED lighting technology is so much better today.” ✕

WORLDWIDE CONSUMPTION and production – a driving force of the global economy – depend on the use of the natural environment and resources in a way that continues to have destructive impacts on the planet.

“Epiroc strives to optimize the usage of natural resources,” says **Christina O. Larsson**, Epiroc Group Environment and Chemicals Manager. “Eighty percent of a given product’s environmental footprint is determined in the design phase, so this phase is important to ensure that products are designed for high durability and easy disassembly, to facilitate that products and materials can be retained with high resource value. In other words, it ought to be possible to remanufacture Epiroc components as well as rebuild machines, so that service life is prolonged and that there’s high recyclability at end-of-life.”

A case in point, and a strong statement of intent, is the Reman Program,



Christina O. Larsson
 Environment and Chemicals Manager,
 Epiroc

in which components are upgraded in state-of-the-art purpose-built facilities to include the latest OEM-engineered improvements.

“It ensures the highest degree of product quality

and longevity for customers, while also supporting sustainability goals. We are also avoiding usage of hazardous substances in our products, so the materials can be recycled and reused,” says Larsson.

Another Epiroc strategy to reduce the environmental footprint is to further enable digitalization, allowing equipment to be remotely monitored. This, in turn, makes it easier to determine when a product needs a certain kind of servicing. ✕

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

BLAST FROM THE PAST

YEAR 1990

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

✍ Gustaf Höök
📷 Shutterstock

Portfolio: Konkan railway

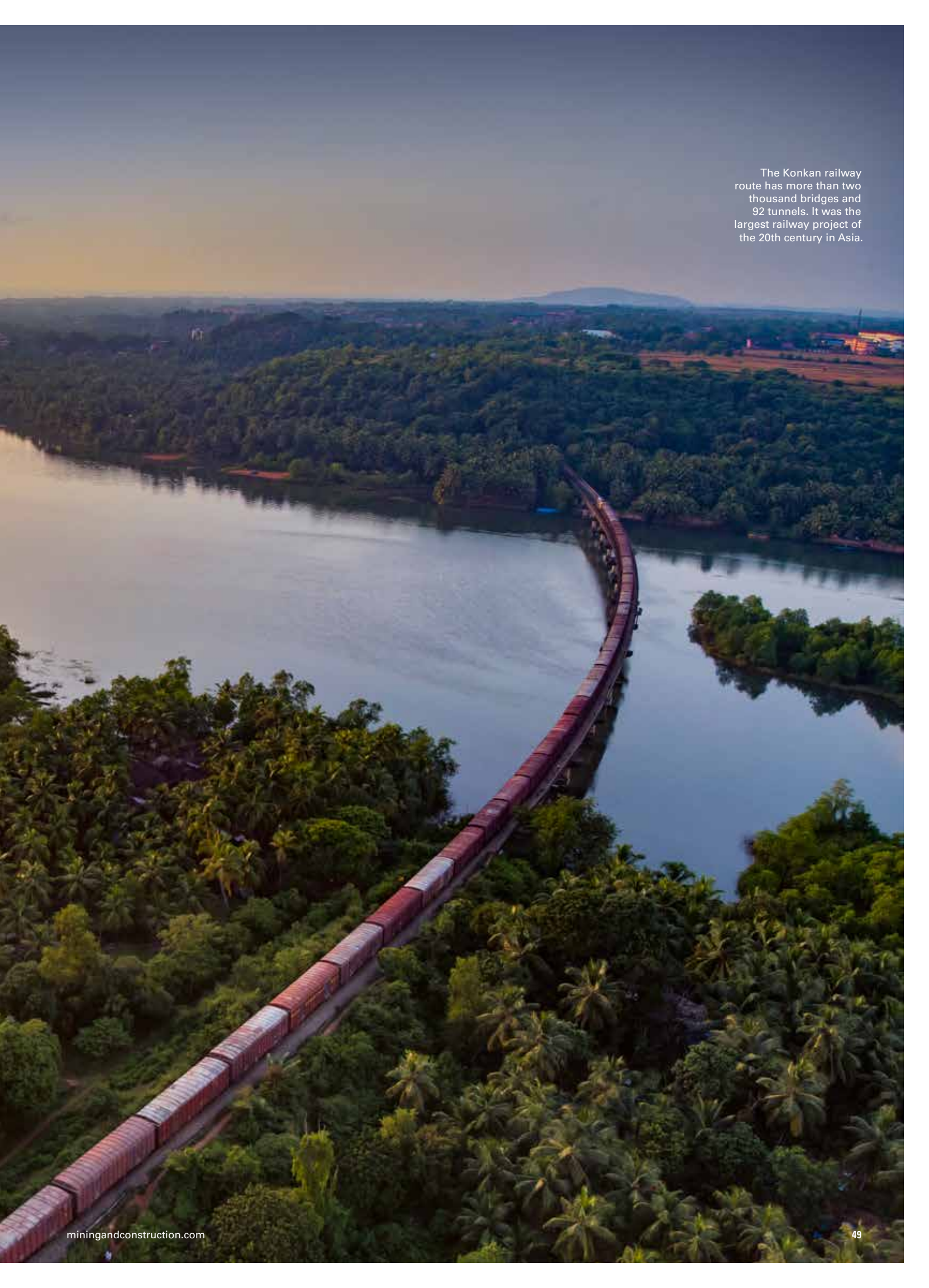
For many years, the Konkan coast in western India did not have a railway link between Mumbai and Mangaluru, leading to slow industrial growth for the states of Maharashtra, Goa and Karnataka. However, in the early 90s, spectacular measures were taken to change that, when the Konkan railway was built. The challenging nature of the coastal region – the route runs through the foothills of the Western Ghats mountain range and crosses innumerable rivers, creeks and streams – presented a challenge, and modern rock-drilling technology meant that several tunnels could be constructed.

“Tunneling was definitely the critical area. We needed quality equipment to complete the job on time – so we chose Atlas Copco,” said Ambi Krishnaswamy Somanathan, Technical Director of the project, at the time.

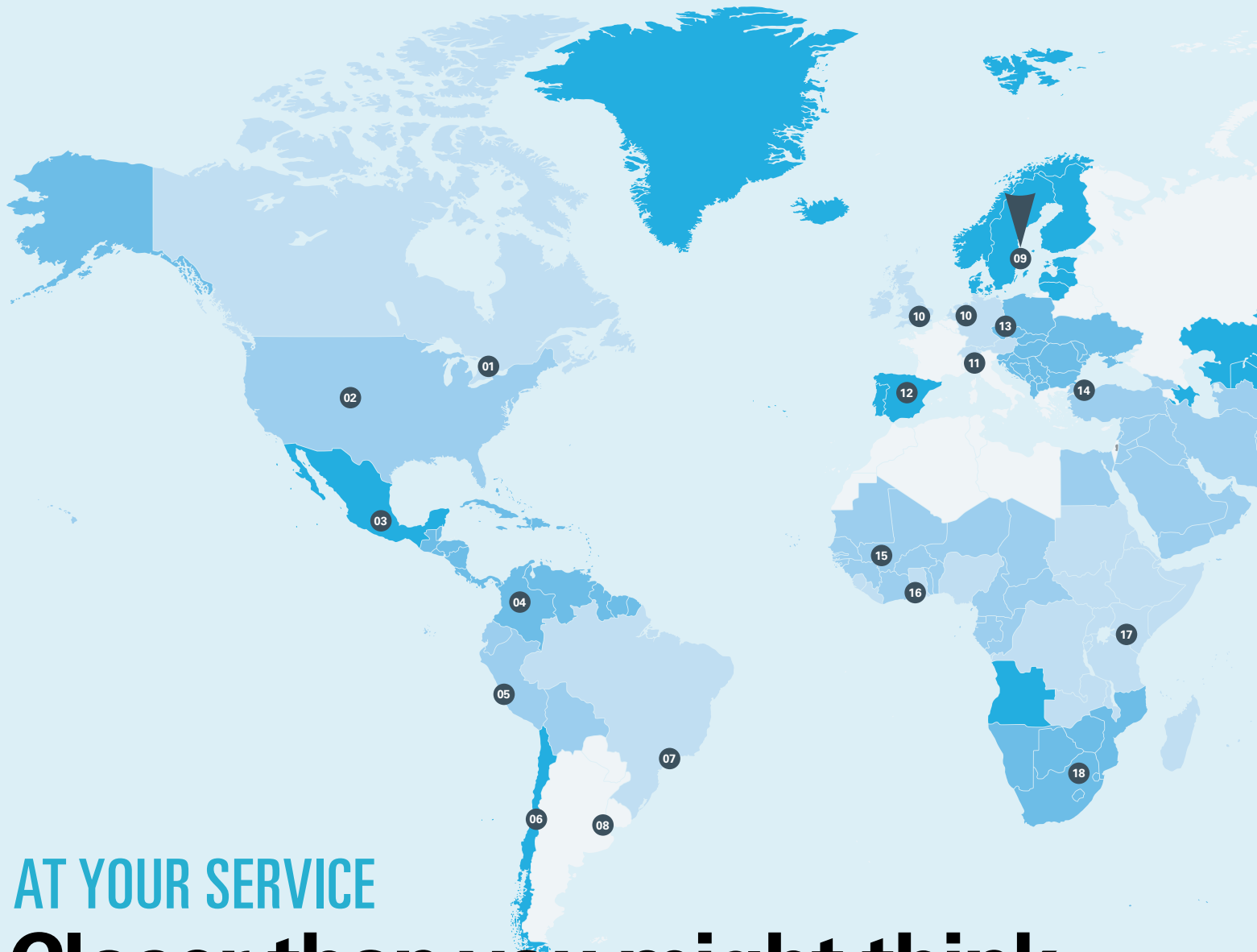
Seven Boomer 352 drill rigs and two H135 units worked at eight tunneling sites along the line, along with nine Hägglund loaders excavating. The equipment managed to handle the difficult granite/basalt rock formation and played a vital role in the success of the project.

The first passenger train between Mangalore and Udupi ran on March 20, 1993, and the passenger service on the full route, between Mumbai and Mangaluru, began in May 1998.

More www.konkanrailway.com

An aerial photograph capturing a long freight train as it traverses a bridge over a wide river. The train, composed of numerous red and white cargo containers, stretches from the bottom left towards the center of the frame. The bridge is a long, narrow structure supported by many small piers. The surrounding landscape is lush and green, with dense tropical vegetation, including many palm trees, lining the riverbanks. In the background, a range of low mountains is visible under a clear, bright sky. The lighting suggests it might be late afternoon or early morning, with a soft glow on the horizon.

The Konkan railway route has more than two thousand bridges and 92 tunnels. It was the largest railway project of the 20th century in Asia.



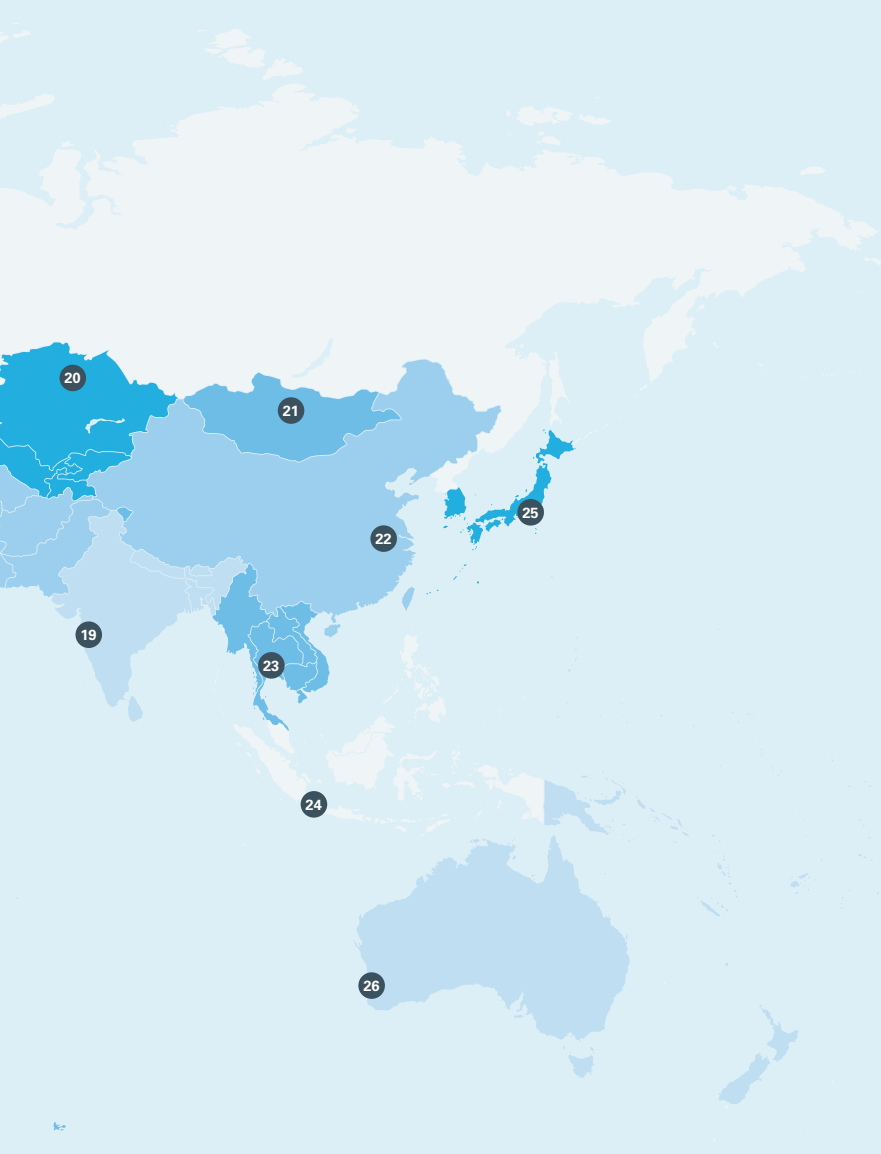
AT YOUR SERVICE

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 26 Customer Centers

supporting and collaborating with customers in more than 150 countries. 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	07 Brazil São Paulo	12 Iberia Madrid	17 Eastern Africa Nairobi
02 USA Denver	08 Argentina Buenos Aires	13 Central Europe Prague	18 Southern Africa Johannesburg
03 Mexico Mexico City	09 Nordics & Baltics Stockholm	14 Turkey & Middle East Istanbul	19 India Pune
04 CVCA Bogota	10 Europe West Essen/Hemel Hempstead	15 Mali & Burkina Faso Bamako	20 Central Asia Nur-Sultan
05 Andes Lima	11 Southern Europe & Northern Africa Milan	16 Ghana Obuasi	21 Mongolia Ulaanbaatar
06 Chile Santiago			



22 Greater China
Nanjing

23 Southeast Asia
(North)
Bangkok

24 Southeast Asia
(South)
Jakarta

25 South Korea
& Japan
Tokyo

26 Australia
Perth

Find Epiroc
in your country:

www.epiroc.com



[In focus]
Stockholm, Sweden

Hello there! What's happening in the Nordics?

IN AUGUST 2022, Epiroc launched its new unit in Stockholm – Epiroc Nordics and the Baltics. In a few months, customers in Sweden, Norway, Finland, Estonia, Latvia, Denmark, and Iceland will meet a decentralized company built for the future. General Manager **Andrzej Mielko** is in charge of establishing the new organization.



Andrzej Mielko
General Manager,
Epiroc Nordics
and the Baltics,
Sweden

Why is Epiroc launching a new unit, and what is your vision?

“There are many synergies among the countries that we can take advantage of to provide better solutions. With a cross-country organization, we will work together and leverage the strengths in every field of competence, the people, the leadership and the business. Our vision is to build one Epiroc that has a strong local presence and regional support, so we are close to our customers.”

How will this change most affect your customers?

“Our customers will have access to one key account person at Epiroc, which makes the decision process a lot faster. This will also be applied to the implementation of new technology, since we can share successful stories between countries. Customers will see speed and more competence.”

How will they see the shift in technology?

“We are putting a lot of effort into electrification and automated solutions. We must spearhead the trends, not just follow them. We are running a field test project and establishing ownership in future technology products for the business. We aspire to realize next-generation developments within fleet data management, digital platforms, and mining process optimization. I love technology, so I really look forward to contributing to this journey.” ×

New member of the SmartROC family

»»» The SmartROC T25 R radio-controlled drill rig brings together a number of valuable functions in one machine. **Marcus Leü**, Global Product Manager Surface division, has been involved in the development of the forthcoming solution for surface radio-control drilling.



Marcus Leü
Global Product
Manager Surface
division, Epiroc

Which four core values distinguish SmartROC T25 R?

“The rig has good terrainability features, which results in faster operations and increased safety. It also has an exceptional coverage area; longer reach and fewer trammings make drilling more efficient. Application versatility is another major advantage, since the flexible boom system makes the machine suitable for several different work areas. In addition, the platform is built with RCS (Rig Control System) for lower fuel consumption and better drilling performance.”

What customer challenges does the SmartROC T25 R solve?

“We know what the market is asking for in this segment. That’s why we’ve developed a rig that

uncompromisingly combines these sought-after features. It will be the first in its field to become part of the SmartROC family. The smart RCS control system future-proofs digital functions and reduces the rig’s climate impact through fuel savings. The machine is extremely user-friendly and powerful in relation to its size and has the highest level of automation in its segment.”

What were the challenges during development?

“The biggest challenge was to create a machine that doesn’t compromise on key features. Combining good terrainability with a large coverage area is difficult since you often get a front-heavy and side-sensitive machine. That’s why we have worked a lot with the stowage of the rig. By thinking about the location of the components, we managed to bring down the center of gravity without compromising on functionality.” ✕

More www.epiroc.com/construction

SmartROC T25 R in brief:

- Good terrainability with low center of gravity and increased track width.
- Larger coverage area for increased turning radius and longer range.
- High application versatility with flexible boom system, rubber crawler tracks, three feed lengths, and air and water flushing.
- Optimized fuel consumption and better drilling performance with the SmartROC control system.
- International release 2023.

