

SOLID

GROUND

#2 2020

A MAGAZINE FROM
SANDVIK MINING AND ROCK TECHNOLOGY

Spain:

**Dependable fleet
drives expansion**

LH514BE:

**Loading
untethered**

Sustainability:

**Parts of the
whole plan**

South Africa: Mafube Colliery

Dawn of a new way

SANDVIK

Dear reader,

THE WORLD IS still in the grip of the coronavirus (COVID-19) pandemic, in which countries are at different stages of outbreak and recovery. It has been an unprecedented situation for all of us, one in which individuals, governments and organizations have had to take action to protect against the impact – not just in terms of health and safety, but also on the global economy.

As an organization, Sandvik was swift to take action not only to protect our employees – always our top priority – but also to ensure that we could continue to serve you, our customer, recognizing that we are as one when facing the challenges that the pandemic has placed upon us.

DURING THIS SITUATION, we know that more than ever you have been looking to Sandvik to help you meet your requirements – something that is, of course, always our primary objective. Throughout it all we have focused, and continue to focus, on doing everything that we can to make that possible, even in those parts of the world that have been most heavily impacted. I am proud of the way that our people have responded to the situation, working closely with our customers and suppliers to ensure that we can all come through this troubling and turbulent period with as little harm to people and operations as possible.

We do not know how long this coronavirus will present a major threat, but even while we have been dealing with it, Sandvik has continued to look to the future and our industry’s new dawn, in which automation, electrification, digitalization and sustainability have increasingly important parts to play. You can read about the progress we are making in this magazine.

NONE OF US could have predicted the impact of the pandemic, but one thing we can predict is that Sandvik will be here to help you achieve a healthier work environment, together with increased efficiency and productivity.

Keep safe, keep well. ■



HENRIK AGER
PRESIDENT, SANDVIK MINING
AND ROCK TECHNOLOGY

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ALL IN THE FAMILY

From trainee truck operator to shift boss and training manager, **Arlene Johnston** parlayed her love of mining into a career underground at QME Ltd, distinguishing her as the first female miner in Ireland. She took time to share with *Solid Ground* the challenges and opportunities she faces on a daily basis.

Q: WHAT IS QME's CORE BUSINESS?

A: QME Mining is a family-run business with nearly 40 years' experience and has become a world leader in the area of supplying services, products and expertise globally to the mining and quarrying industry. We are the largest mining contractor in Ireland, and in recent years we have extended onto a global platform. We create innovative mining solutions for all aspects of mining and provide a full range of services, which include providing surface and underground mining equipment, labour, materials, information and planning.

Q: WHAT DOES A TYPICAL DAY AT YOUR JOB ENTAIL?

A: My main duties are to collaborate with senior management to design new and innovative training programmes so as to ensure our people not only become exceptional in their field but have a career pathway so they can progress through the company. A typical day for me is to travel underground to carry out task observations with mining and other personnel, as direct contact with the miners enables me to improve training techniques and apply them through practical training sessions.

Q: WHEN DID YOU GET INVOLVED IN MINING?

A: I come from a family who have been engaged in construction work and have been in business for more than 35 years. I started out operating mobile plant and equipment in the construction industry at a young age, working alongside my father and gaining knowledge in the planning,



FREDRIK T.JERNSTRÖM

ARLENE JOHNSTON

Age: 33
Home: From a small village in Dromintee, County Armagh, Northern Ireland
Title: Training manager
Family: Youngest of five, with three brothers and one sister

pricing and project management of jobs. In 2009 I took a career break and headed overseas to Australia, where I worked in the mining industry. It was while working in Australia that I found my love for mining. In 2012 I returned to Ireland and have been with QME Mining ever since. I joined their contract mining sector, and with their support and my excitement I became the first female miner in Ireland. Fast forward to 2020 – I have completed the full mining cycle from trainee truck operator to shift boss and trainer. Recently I've been given the opportunity to head up the QME Mining training department. This role has brought many new challenges and exciting opportunities.

Q: WHAT IS THE BIGGEST CHALLENGE YOU FACE AT YOUR JOB?

A: To achieve the kind of expansion in production that was required, we faced challenges to find modern mining equipment that would keep up with the demand. In the area of hard rock mining this is where we felt Sandvik would really deliver the most technically advanced equipment to produce the

efficiency and productivity that we needed.

Q: HOW WOULD YOU DESCRIBE YOUR RELATIONSHIP WITH SANDVIK?

A: Sandvik has been much more than our conventional supplier. They are incredibly reliable with great communication skills, and due to our demand they are quick to supply us with trucks, loaders, drill rigs and rock bolters. Once supplied they didn't stop there. Their service crew provided us with any necessary technical and on-the-job training when and where necessary.

Q: WHAT DO YOU ENJOY MOST ABOUT YOUR JOB?

A: There are so many aspects to the job that I love, but one that sticks out is training miners on the Sandvik DS411-C rock bolter. Its uncomplicated use and edge mean high productivity for our company. It's clean and comfortable and has advanced mapping features, which speeds up bolt installation and takes pressure off our operators. ■

The Expert

Senior Programme Officer Verónica Martínez at the Innovation for Cleaner, Safer Vehicles is on a mission to drive sustainable change across the mining industry.



LAUNCHED BY THE International Council on Mining and Metals (ICMM) in 2018, the Innovation for Cleaner, Safer Vehicles (ICSV) programme was inaugurated to address three of the most critical safety, health and environment performance issues on its mission towards zero harm while contributing to the decarbonization of the mining industry. Senior programme officer Verónica Martínez discussed its goals, unique collaborations and future with *Solid Ground*.

Q: WHAT IS YOUR ROLE AT THE ICSV AND WHAT DOES THE PROGRAMME HOPE TO ACCOMPLISH?

A: I lead two of the three workstreams of the ICSV programme and I also lead the climate change working group at ICMM. ICSV addresses the following challenges: introducing greenhouse gas (GHG) emission-free surface mining vehicles by 2040; minimizing the operational impact of diesel exhaust by 2025; and making collision avoidance

technology available to all mining companies by 2025. Essentially this is a change leadership programme, focused on technology development and how existing mines might adapt their operations and how future mines are designed to embrace these technologies.

Q: WHAT ARE THE MOTIVATIONS BEHIND EACH WORKSTREAM?

A: If we look at each workstream individually, large mining equipment can currently make up as much as 80 percent of the Scope 1 emissions at a mine site. Access to ore is getting more difficult in mature operations – deposits are becoming deeper and grades are declining – requiring more trucks and longer hauling distances for mining equipment, which will be reflected in an increase of CO₂ if we continue business as usual.

With regard to diesel particulate matter (DPM), the WHO has classified DPM as a carcinogen, and exposure to elevated DPM emissions, particularly in underground mining

operations, has been linked to negative health effects. The issue is raising the awareness in mining companies, promoting existing technology to minimize DPM emissions and then getting them implemented across the industry.

And finally, for the vehicle interaction workstream, transport and mobile equipment accidents accounted for 30 percent of fatalities at ICMM member mines in 2018, the highest cause of fatalities at our member operations. Safe working conditions are a fundamental human right, and ICMM members are committed to strengthening health and safety performance.

Q: HOW FEASIBLE IS IT FOR COMPETITORS TO COLLABORATE TO IMPLEMENT THE INDUSTRY-WIDE CHANGES YOU PROPOSE? ISN'T THIS UNCOMMON?

A: Member collaboration to strengthen the social and environmental performance of the mining and metals industry is a core part of ICMM's mission, but the ICSV programme is the first time that we are working with external stakeholders in a formal collaborative initiative, with a shared governance of mining companies and OEMs. ICSV is a unique, CEO-led model of collaboration that sends strong market signals to mining equipment suppliers that a large portion of the mining and metals industry is committed to embracing new technology. This builds the widespread confidence needed to accelerate investment in innovation in these three key areas.

All of ICMM's collaboration operates under anti-competition and antitrust rules. Our role is to convene the parties, motivate action and promote solutions. It does not work on specific solutions, as the programme recognizes that there will be more than one depending on each mine site's opportunities and constraints. Our role is to encourage – not stifle – innovation.

Q: WHAT'S ON THE HORIZON FOR ICSV?

A: This year, we're working to get an aggregated industry view of where we are in regard to the ambition, by using the innovation road maps we have collectively built within the programme. Mining companies will be in a better position to understand the challenges and start adopting technologies or partner with other members and OEMs to develop them.

We are testing an ICSV Knowledge Hub, and we expect that it will become a reference in the industry as a source of technical and practical information for all those companies that want to improve their sustainability performance. ■



Mafube is among the few coal mines in South Africa to move its waste with rollover dozing, which makes drilling accuracy an essential part of the operation.

OVERBURDEN OVERACHIEVER

MPUMALANGA PROVINCE, SOUTH AFRICA.

A new automation-ready blasthole drill rig is helping a South African coal operation make quick work of its overburden to unlock a new resource and extend its life of mine.

TEXT: ERIC GOURLEY PHOTO: ADAM LACH

When Mafube identified the need to invest in a dedicated overburden rig, the company chose the Sandvik DR412i rotary blasthole drill.



MAFUBE MEANS “DAWNING of the new day” in Sesotho, and the aptly named Mafube colliery in South Africa’s Witbank coalfield has indeed entered a new era.

The 50-50 joint venture between Anglo American and Exxaro Resources commenced operation in 2007, producing high-quality thermal export coal and a lower-grade product for a nearby power station.

Mafube had depleted its Springboklaagte reserve by the end of 2018 and initiated a project to bring the nearby Nooitgedacht resource into production, thereby extending mine life to at least 2032. Following the procurement of equipment and the installation of a seven-kilometre overland conveyor to move new ROM product to the washing plant at Springboklaagte for processing, the Nooitgedacht pit began producing mid-2018.

Mafube produced 5.3 million tonnes of coal in 2019 and is targeting an increase to 5.8 million tonnes during 2020.

While many similar operations use draglines for overburden stripping, Mafube is among the few coal mines in the country to move its waste with rollover dozing. Overburden is bulldozed back into the first

cut from the next cut, enabling the continuous rehabbing of mined-out areas while a modest truck and shovel fleet excavates the exposed coal.

MAFUBE MINING MANAGER Kennedy Botsheleng says drilling accuracy is essential for the operation.

“All mining activities after drilling rely on accuracy of the drilled pattern,” he says. “If you don’t get the drilling right, you’re likely going to have a bad blast and then you don’t have a good cast. We move about 30 percent of the overburden material with cast blasting, and doze 70 percent of the remaining material to truck and shovel bench or doze to coal, depending on the depth of the coal. So drilling is very key to our operation.”

When Mafube transitioned from Springboklaagte to Nooitgedacht, it brought over two ageing Sandvik D25KS drill rigs from the original resource. Together, these rigs have amassed more than 70,000 engine hours since they were commissioned at the start of the operation in 2007.

“Those rigs have definitely done their part over the years and they are still performing

reliably,” Botsheleng says. “We didn’t scrap them when they reached their expected life, and we are still getting good metres sweating those assets.”

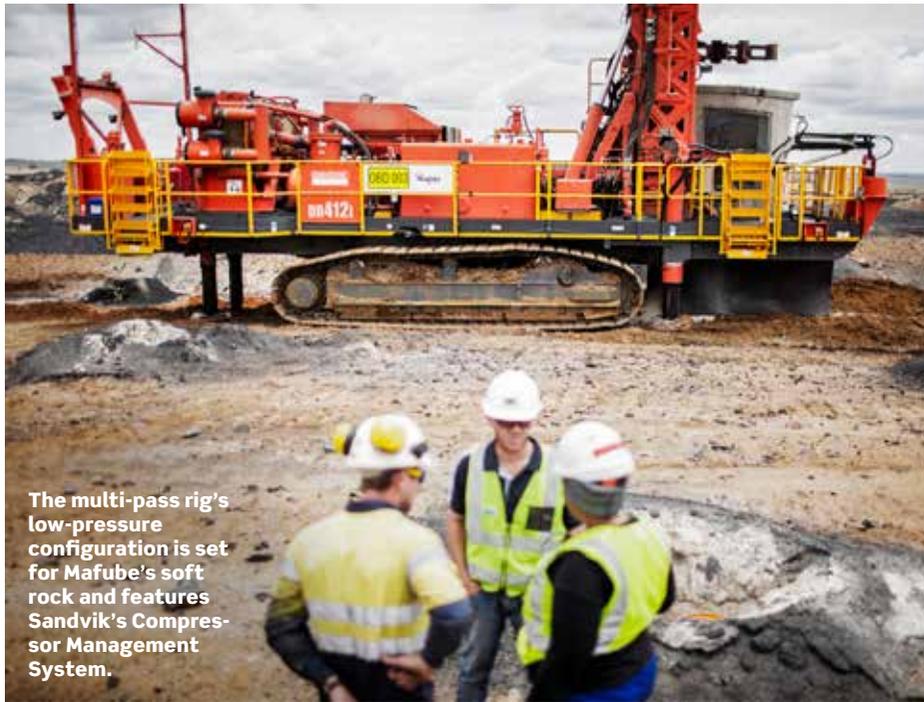
Mafube identified the need to invest in a dedicated overburden rig for Nooitgedacht. Frikkie Fourie, the drill and blast specialist for Anglo American’s coal business, says an automation-ready solution was paramount.

“When we went out to the market, one of the key drivers was to see how far the OEMs had come and how ready they are when it comes to automation,” Fourie says.

SANDVIK DR412i ROTARY blasthole drill soon emerged as the ideal solution, with Sandvik’s automation offering integrated into the rig.

“What was great is that the DR412i machine came already with the majority of the automated processes on it,” Fourie says. “With the majority of the other suppliers, it was additional add-ons to the machine. And that’s one of the reasons why we went for the machine is to have it automated ready.”

Several other strengths allured mine management.



The multi-pass rig's low-pressure configuration is set for Mafube's soft rock and features Sandvik's Compressor Management System.



Frikkie Fourie, drill and blast specialist, Anglo American.

"We looked at drill rate, fuel consumption, life cycle cost, simplicity of design, ease of maintenance and historical backup support," Botsheleng says. "The automation, GPS positioning, operator assist functionality and auto-levelling made it right for our operation."

Fourie says Mafube invested in a larger, more advanced drill than it immediately needed in order to "future-proof" the operation.

"We went for an over-specified machine in part to save on the usage, meaning less wear and tear on the compressor, the engine and some of the components," he says. "And as the life of the mine progresses, we're also going deeper. So we're already set up. It's more than we need for the next two or three years, but going into the future, we're all squared away."

SANDVIK DR412i WAS commissioned in August 2018, and the supplier worked closely with Mafube to address and overcome some early hurdles.

"Like with any new thing that you buy, there's always some challenges," Fourie says. "We got it resolved. With a lot of work between the two different stakeholders, we got a very good result out of it. The machine is performing really, really well at this point in time. Very reliable. Great work between the two companies."

Limited wireless network connectivity in the pit exacerbated some of the initial technical issues.

SANDVIK DR412i

Designed for dependable drilling in both soft and hard rock, the automation-ready Sandvik DR412i blasthole drill rig delivers high rotary power and feed force. Capable of drilling holes with a diameter of 216-311 millimetres (8.5-12.25 inches) down to a maximum multi-pass depth of 75 metres (246 feet), Sandvik DR412i can be fitted for both down-the-hole and rotary drilling and delivers greater penetration at lower operating costs. Its drill-to-depth feature enhances efficiency and productivity.

"We had hiccups in the beginning but now it's exceeding set targets," Botsheleng says. "We battled for four months with the drill, but now it's breaking records."

MAFUBE RELIES ON its Sandvik DR412i to drill 251-millimetre (9.9-inch) holes as deep as 24 metres.

"We use one-touch levelling, one-touch drilling," Fourie says. "The guys who are utilizing it are giving us very good, continuous results. Mean time between failure is really big hours, we're talking now days. We're happy where we have it."

The multi-pass rig's low pressure configuration is set for Mafube's soft rock and features Sandvik's Compressor Management System, designed to reduce diesel

consumption by as much as 30 percent while extending maintenance intervals and engine and compressor life.

"It's fuel-efficient," Botsheleng says. "Of all of the machines that we bought for the mine extension, this machine is sitting almost at the bottom in terms of fuel consumption. We thought it was going to use more diesel."

Sandvik DR412i features a GPS-based 3D navigation system that provides hole accuracy within five centimetres, for both location and depth.

"It's exciting for our operators because the machine is comfortable; they just press a few buttons and don't need to wait for surveyors to stake cups on the bench," Botsheleng says. "So the 3D GPS is working very well for us."

SANDVIK DRILLER'S OFFICE software enables Mafube to wirelessly transfer drill plans to Sandvik DR412i and further improves accuracy, hole quality and fragmentation.

"The planner sends the plan to the drill from his office, which is very lekker for him," Botsheleng says. "Some days he even sends it from home. Accuracy is about 98 percent. Our surveyors can now be utilized more efficiently."

Operators like Thulane Mlongeni enjoy Sandvik's next-generation cab, which features enhanced ergonomic controls and improved visibility.

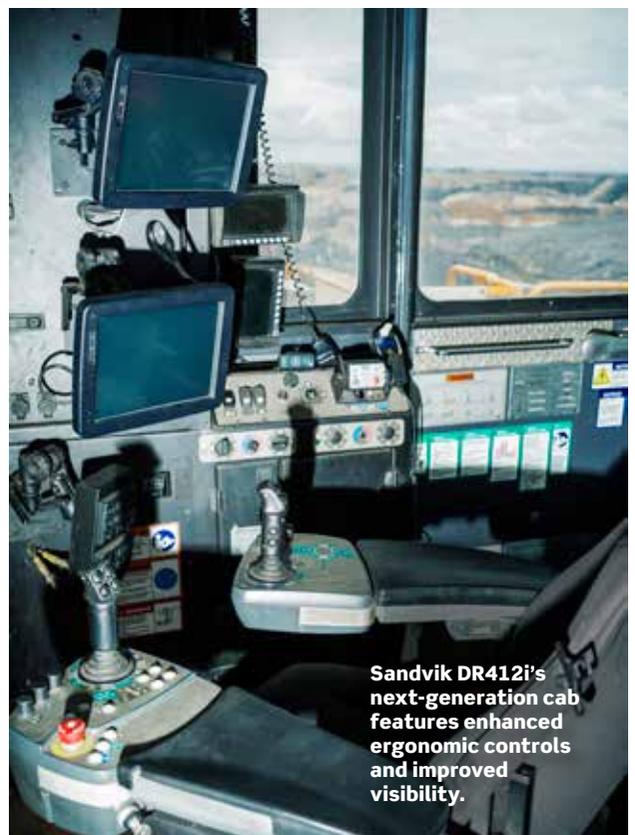
"It's a comfortable drill to operate and it's



It's more than we need for the next two or three years, but going into the future, we're all squared away



Mafube operator Jabulile Zwane.



Sandvik DR412i's next-generation cab features enhanced ergonomic controls and improved visibility.



Mafube operators appreciate the auto-drilling and auto-levelling features of Sandvik DR412i.

also very good hydraulics, so everything is on the screen,” says Mlongeni, a driller since 2007 when he started on Sandvik D25KS. “I like drilling on auto with this new rig. There are fewer controls. On the D25, you have to hold a lever until the hole is finished.”

JABULILE ZWANE ALSO appreciates the ease of operation.

“The auto-drilling and auto-levelling, I like that,” she says. “It’s very quick. You can make metres just like that in an hour.”

Improved access to the mast area, including walkway handrails, allows for safer maintenance access and inspections without working at height hazards.

“This is definitely a major benefit and will be a standard requirement for the future,” Botsheleng says. “It makes it very easy to

MAFUBE COAL

Located about 180 kilometres east of Johannesburg and 25 kilometres east of the town of Middelburg, Mafube Coal is a 50-50 joint venture between Anglo American and Exxaro Resources. The operation produced around 5.3 million tonnes of coal in 2019, and reserves are estimated to last until at least 2032. Mafube Coal has around 350 permanent employees and 550 contractors.

service the machine and improves safety as well.”

Operating costs have been “way below budget” according to Botsheleng, and the drill routinely finishes its benches ahead of schedule.

“The maintainability is excellent and maintenance costs are highly competitive,” Botsheleng says. “Utilization is higher than previous drills we’ve operated.”

The new rig surpassed 5,000 engine hours in January 2020 and continues to impress mine management.

“The records are there,” Botsheleng says. “The drill has drilled 1,000 metres a day. The machine was parked for two weeks because it has completed its area that’s been allocated. So the machine is doing very, very well. I mean, a thousand metres a day? You’d be stupid not to buy the drill.” ■

SUSTAINABILITY



IRRIGATION INSPIRATION

MPUMALANGA PROVINCE, SOUTH AFRICA. A milestone project using mine-impacted water to irrigate crops has revealed potential to increase food production, empower local communities and improve sustainability for the mining and agricultural sectors. ▶

TEXT: ERIC GOURLEY PHOTO: ADAM LACH



Mines can help protect precious water sources while enabling agricultural producers to achieve food security

► **MINING SUSTAINABLY IS** personal for Kennedy Botsheleng.

Restoring the land to as close to its original state as possible when he's done mining coal is as important to Botsheleng as extracting it.

"My father was a farmer, so as I was growing up I used to go to the farm every weekend," says Botsheleng, the mining manager at Mafube colliery.

He farms in his spare time and plans to farm full-time once he retires from mining. "So I must make sure that where I mine, I leave ground that can be used for farming," Botsheleng says. "And then what about the future generation after me? After we have taken out the coal, they must be able to continue farming. In 2050 there won't be enough food for the whole world, so we must make sure now that we leave a proper land in terms of agriculture."

MAFUBE, A 50-50 joint venture between Anglo American and Exxaro Resources, is one of the only coal mines in South Africa that moves its waste with rollover dozing. Overburden is bulldozed back into the first cut from the next cut, enabling the continuous rehabbing of mined-out areas.

"A major reason we do rollover dozing is that we're able to rehab areas as we mine," Botsheleng says. "We leave plowable ground, land where cattle can eventually graze."

The mine is located about 180 kilometres east of Johannesburg in South Africa's Mpumalanga province,

which comprises nearly 6.5 percent of South Africa's total land area and accounts for roughly 80 percent of the country's coal.

THE PROVINCE IS also one of South Africa's most productive agricultural areas, and the sector employs more people than any other in the rural province. Around two-thirds of Mpumalanga's land is used for agriculture, including natural grazing land and farming. The drier Highveld region, home to the province's rich coal reserves, also produces more than half of South Africa's soya beans and yields field crops including maize, wheat and other grains. Citrus, fruit, vegetables, nuts and sugarcane abound in the subtropical Lowveld region.

The coexistence of coal mining and farming in South Africa – two water-intensive processes in a water-scarce country – may sound like a paradox, but an ongoing irrigation project prompted by a prolonged drought is revealing widespread benefits for both industries.

AGRICULTURAL IRRIGATION WITH mine-impacted water could help Mafube and other mines address a major challenge: sustainably managing large volumes of water during and after closure. Mine water that can't be treated and discharged has historically posed a headache for mine operators when reserves are depleted.

The South African government chose Mafube as the first trial site in a public-private initiative to determine the feasibility and sustainability of

using mine-impacted water to irrigate crops.

"This is a very important project for the future of both the mining and agricultural industries," Botsheleng says.

South Africa's Department of Water and Sanitation, the Water Research Commission and the country's Mine Water Coordinating Body – a neutral sustainable mine closure collaborative platform launched in 2018 – partnered with mining companies Anglo American, Exxaro Resources and South32 and a local farmer in the project.

MAFUBE EMPLOYEES HELPED establish the infrastructure, including a 30-hectare trial site on virgin soil and another on rehabbed mining land. Salt-tolerant summer and winter crops have been planted rotationally and irrigated with neutral-pH saline water from the pit that doesn't require any treatment. Although mine water can't be released after becoming contaminated through contact with minerals, its use on crops transforms what was once considered an environmental liability into a useful resource that not only helps conserve drinking water but could also reduce reliance on seasonal rain and severely stressed local water catchments, enabling farmers to plant crops all year round. This is essential as the Highveld region only has rainfall during the summer months.

"Mines can help protect precious water sources while enabling agricultural producers to achieve food security," Botsheleng says.



Mafube mining manager Kennedy Botsheleng is committed to returning mined land to a fertile state.

The five-year project is expected to stretch into 2021, but the results so far have more than affirmed earlier research about the suitability of mine water for agricultural use. The initial maize yields irrigated with mine water at Mafube were 80 percent larger than a typical crop.

“Improved crop sizes create more food for communities, employment and increase local farming and profits,” Botsheleng says.

THE PROJECT HAS revealed potential to utilize rehabbed mining land for commercial farming, addressing both water scarcity and food security.

“This project will help shift a misbelief that mines leave land as it is

when they’re done and don’t offer any long-term benefits,” Botsheleng says.

The irrigation initiative forms a building block in Anglo American’s Green Engine project, which examines mine closure and how the company can help create sustainable employment opportunities in post-mining communities.

THE COMPANY ALSO aims to recycle or reuse water to meet 75 percent of its global water requirements under its Sustainable Mining Plan, which is aligned with the UN’s 2015 Sustainable Development Goals for improving global sustainability outcomes by 2030.

If irrigation with suitable quality

mine water continues to prove sustainable, South Africa plans to ultimately develop national guidelines for potential large-scale adoption.

Botsheleng believes the initiative at Mafube will impact the region long after the mine’s coal reserves are depleted, estimated to be sometime next decade.

“This project will serve as a breakthrough for the mining industry,” Botsheleng says. “When you can reduce your long-term water liability, empower local communities and open doors for more and better farming activity, it’s a win-win situation for all stakeholders. People could benefit from mines long after their closure.” ■

ROCKING SUPPORT DRILLING

As the company's first battery-powered rock bolter, Sandvik DS412iE extends the zero emissions concept to the underground rock bolter class and opens up a wide range of possibilities for mines driven to boost their productivity and safety with data-based analytics.

TEXT: TURKKA KULMALA PHOTO: SANDVIK

IN ITS CORE mission of delivering productive, secure and versatile rock support solutions, Sandvik Mining and Rock Technology rock bolters have a clear track record. Still, these tools' automation and data acquisition capabilities have not been as advanced as their production and development drill rig counterparts. Scheduled for launch during 2021, the new Sandvik DS412iE rock bolter will complement the intelligent family of next-generation battery-powered underground drill rigs.

"It is basically an upgrade on our existing, well-liked rock bolter in this size class, Sandvik DS411," says Anssi Kouhia, product manager, rock support drills. "We have received positive feedback about that model. We made an accomplished model even better with more advanced automation capabilities,

improved data acquisition and upgraded ergonomics."

Along with its direct predecessor, the new intelligent bolter also has much in common with the larger Sandvik DS512i in the 5 x 5-metre drift size. One example is their similar versatility in terms of bolting systems: Sandvik DS512i and Sandvik DS412iE can handle a wide range of bolt types and lengths, including a combination of automatic cement mixer and automatic resin injection on the same bolter.

THE NEW SANDVIK DS412iE will effectively complete Sandvik Mining and Rock Technology's rock support drill range for the 4 x 4-metre class, updating its entire product range to the latest i-standard of connectivity and automation capabilities. Additionally, Sandvik DS412iE will be the sup-

plier's first battery-powered rock bolter. In other words, the zero underground emissions approach will now include all stages of the underground mining process: rock support drilling as well as development and production drilling and loading and hauling. The ability to virtually eliminate underground particulate matter, NO_x, CO₂ and heat emissions, is first and foremost a major health and safety benefit, but it also offers cost savings by reducing mine ventilation power requirements.

THE NEW RIG responds to major industry trends that customers have identified in feedback sessions. In addition to reducing underground emissions and improving working conditions, the safety and environmental improvements also make economic





Sandvik DS412iE's new boom control system and advanced boom manipulator mode help operators function more efficiently.



Sandvik DS412iE battery-powered rock bolter complements the intelligent family of next-generation underground drill rigs.



The bolter's access detection system automatically scans its surroundings and alerts the operator if a person enters the work area.

DS412iE ADVANTAGES

- Battery powered: eliminates emissions of particulate matter and reduces heat as well as fuel logistics in underground environments
- Silver- and Gold-level automation packages: full compatibility with digital My Sandvik fleet management and OptiMine suite for mine automation and analytics
- Intelligent Sandvik Underground Rock Excavation software (iSure): unprecedented capabilities to design, execute and document bolting patterns
- Boosted productivity: upgraded drill control and other improvements increase productivity by up to 25 percent
- Increased safety: zero engine emissions, significant noise reduction, improved ergonomics and visibility

sense by reducing costs and time lost to injuries. The advanced automation capabilities will increase the speed and safety of the bolting cycles as well as

open up a range of possibilities for process optimization. This will translate into more reliable rock supporting and safer working environments.

Similar to one-hole automation that has been a standard feature in Sandvik mining and tunnelling jumbos, the one-bolt automation feature of Sandvik DS412iE now extends this capability to rock bolters. The rig can carry out a single bolting cycle unassisted, so that in optimal conditions the operator only needs to manually relocate the boom from one bolt location to another.

SANDVIK DS412iE WILL come with two automation levels: the standard Silver package from the outset and in the near future the optional extended Gold level. The main difference between the two packages is in the remote monitoring and operating capabilities, and in the measurement-while-drilling functionality. The automation packages seamlessly mesh with iSure software. Available as a standard tool for designing drift drilling plans and blasting plans, iSure

now increasingly extends to bolting operations and comes in three levels: iSure Basic and iSure Plus for the standard Silver automation package, and iSure Premium for the optional Gold level automation. The advanced automation solutions can offer a significant productivity and quality boost.

“With iSure, you can design a bolting pattern in the office, transfer it to the rig over Wi-Fi or on a USB flash drive, carry out the bolting according to the pattern, and on top of that, you can retrieve a report that compares the plan and the realized bolting pattern,” Kouhia says.

IN PARTICULAR, ISURE compatibility enables more extensive data acquisition and reporting. In addition to the bolting pattern, the retrieved data will also include various parameters that characterize the quality of the bolting process, such as grouting concrete consumption and bolt tightening torques. This can serve to document the bolting process in much greater detail than it did previously, which



Sandvik DS412iE includes excellent safety and ergonomic features.

enables more accurate quality control of the rock supporting measures. The verifiable track record of the rock support measures taken provides systematic safety documentation, and should a failure still occur, the bolting process reports can help to determine the cause of it, down to the level of an individual bolt: when it was installed, how it was installed and whether it complied with set specifications.

Full compatibility with the My Sandvik fleet management portal and the OptiMine suite of digital mine automation and analytics solutions further enhances the connectivity of Sandvik DS412iE, providing all-round data-based control for rock support operations.

WHILE THE MAIN areas of focus for Sandvik DS412iE surround automation, connectivity and data acquisition capabilities, productivity has by no means been neglected. The new boom control system, advanced boom manipulator mode and optimized bolting head movements help the operator to achieve a smooth and

efficient process by keeping the bolting head automatically aligned with the correct bolt fan positions and angles.

In terms of sheer mechanical power, much of the new bolter's high productivity derives from the new control system of the Sandvik RD314 rock drill, which substantially increases the output and penetration rate. Overall, the productivity upgrade is roughly 25 percent from previous models.

AS ALWAYS WITH Sandvik equipment, Sandvik DS412iE includes myriad safety and ergonomic features. The bolter is designed to be compliant with the EN16228 standard for drilling and foundation equipment, which is harmonized with the requirements of the European Machinery Directive. One of the EN16228 requirements is an access detection system (ADS). In Sandvik DS412iE, the ADS automatically scans the surroundings of the bolter and alerts the operator should a person enter the work area, which effectively reduces potential accidents. The safety improvements also include

TECH SPECS

SANDVIK DS412iE

Operating dimensions: Length 12.74 m, height 3.05 m and width 2.975 m

Bolt length: 1.8 –4.0 m

Rock drill: Sandvik RD314, 14 kW

Hole diameter: 33–45 mm

Control system: SICA

Electric engine power: 155 kW

Battery type and capacity: 98.8 kWh, Sodium Nickel Chloride (SoNick) technology

Carrier: Wheel mounted, frame steering

a fully covered steel strand reel.

Sandvik DS412iE continues the class's legacy of secure and effective cabin design: the 55 percent improvement in visibility, better effective vibration control and significant noise reduction add up to a safer and more comfortable workplace for the operator.

Future launches will also include a diesel-powered version, Sandvik DS412i, which will be compliant with the latest engine emission specifications. ■

REOPENED AND RAMPING UP

MINAS DE RÍOTINTO, HUELVA PROVINCE, SPAIN.
As Atalaya Mining's Proyecto Riotinto continues an expansion that will see annual production triple to 15 million tonnes, drilling contractor INSERSA depends on a fleet of reliable surface rigs to keep up with demand. ▶

TEXT: ERIC GOURLEY PHOTO: ADAM LACH



Atalaya Mining is tripling annual production to 15 million tonnes at the Proyecto Riotinto copper mine in south-western Spain.



INSERSA operates six Pantera DP1500i drill rigs at Proyecto Riotinto, which drill a monthly average of around 55,000 metres.

THE RIOTINTO MINES in south-western Spain are among the world's oldest. The area in northern Andalusia is part of the 350-million-year-old, 250-kilometre-long Iberian pyrite belt, stretching from western Portugal to Seville, Spain, and has served as a major source of European copper in both ancient and modern times.

Five thousand years ago, indigenous peoples mined copper from outcroppings and shallow depths. Tartessians likely mined copper and silver here during the Bronze Age (2,500 to 1,000 BC). The Romans later conquered the area and mined more than 20 million tonnes of raw material over 200 years using more advanced techniques and tools. There's still evidence of ancient Roman mineworks in areas of Rio Tinto's open pits.

TODAY, MODERN TECHNOLOGY makes fracturing rock significantly easier for INSERSA, the contractor responsible for all drilling and blasting at Atalaya Mining's Proyecto Riotinto.

The copper mine, located 65 kilometres north-west of Seville, was decommissioned in 2001 due to low metal prices. Atalaya brought the mine back into operation in 2015 following two years of rehabilitation.

INSERSA

Established in 1988 as a drilling company, INSERSA (Ingeniería de Suelos y Explotación de Recursos S.A.) has diversified its business over the years. Today the company has drilling, mining, tunnelling, building construction and civil engineering projects across Spain. The company's aggregates subsidiary Sodira also operates 16 quarries. INSERSA's mining projects include Riotinto, Aguas Teñidas, Magdalena and Sotiel in the province of Huelva and Cobre Las Crossings in the province of Seville, in addition to two exploration projects in other locations in the Andalusian territory. INSERSA has more than 800 employees and had a 2018 turnover of 150 million euros.

The current open-pit mine commenced commercial production in February 2016 at an initial annual processing rate of 5 million tonnes. Atalaya completed construction of an expansion project in June 2019 to nearly double processing capacity to the current 9.5 million tonnes.

THE COMPANY IS now undertaking a project to further boost annual processing capacity to 15 million tonnes, an expansion that will increase demands on INSERSA.

"It is a very important challenge for INSERSA to contribute to growing a mine of this size, safely and sustainably," says Manuel Martín, head of INSERSA's works group. "Bringing the mine back to life after

15 years, our focus is increasing extraction volumes and reducing operating costs, thus producing a quality concentrate."

Fernando Díaz Riopa, Atalaya's mine manager at Proyecto Riotinto, says the company has relied on Sandvik surface drill rigs since it began preparations to reopen the operation in 2015.

"Good drilling and blasting ultimately improves yields in the processing plant," Riopa says. "We continue placing our trust in Sandvik for surface drilling, as it provides good results. At Atalaya we are happy with INSERSA and with the equipment from Sandvik."

INSERSA has partnered with Sandvik for more than a decade. The contractor's mobile

**Pantera DP1500i is
perfectly matched
to our drilling
application**



**INSERSA production
manager Laureano
Pazos Pérez.**

ATALAYA MINING

European copper miner Atalaya Mining produces copper concentrates and silver by-product at its wholly owned Proyecto Riotinto site in south-western Spain. The mine holds 197 million tonnes of ore containing 822,000 tonnes of copper. Atalaya Mining also has a phased, earn-in agreement to acquire up to 80 percent ownership of Proyecto Touro, a brownfield copper project in north-western Spain which is at the permitting stage.





The Pantera DP1500i rigs on site consistently meet INSERSA's top KPIs, including drill metres per hour and diesel consumption.

fleet features more than 30 pieces of Sandvik equipment.

“INSERSA and Sandvik have a relationship of collaboration and trust,” Martín says. “Sandvik delivers high-quality equipment and strong aftermarket service.”

INSERSA production manager Laureano Pazos Pérez says it was natural for INSERSA to reach out to Sandvik during its means assessment for Proyecto Riotinto.

“Once monthly drilling rates, bench heights and drilling diameters were determined, we initiated a search based on these parameters for reliable equipment with short delivery times and aftermarket support,” Pérez says. “Sandvik’s advice and consultancy were key to our choice.”

Sandvik proposed Pantera DP1500i as the ideal drill rig for the operation due to its reliability, ease of maintenance and low fuel consumption.

“Pantera DP1500i is perfectly matched to our drilling application,” Pérez says. “It is reliable, robust, easy to handle and simple to maintain. The drilling is very efficient and we reach our production goals easily.”

INSERSA operates six Pantera DP1500i drill rigs, as well as a Sandvik DP900 for secondary breaking. The six Pantera rigs,

coupled with Sandvik GT60 rock tools, drill a monthly average of around 55,000 metres. That number is expected to increase as the mine further ramps up production.

“The features of Pantera DP1500i that made it perfect for our operation are its highly proven robustness, simple mechanics and reliability,” Pérez says. “One of the most important options of Pantera DP1500i is its modern GPS positioning system for increased efficiency and operator safety.”

Riopa says the TIM3D drill navigation system increases operator confidence.

“They no longer need to perform tasks like measuring the holes for depth, as they can now do it with the machine,” he says. “It improves the blasting, the floors, the benches, which are very important for us to get right.”

THE PANTERA DP1500i drills at Proyecto Riotinto were initially purchased for 6-inch holes, but the drilling diameter was reduced to 4.5 inches in an effort to improve granulometry.

“We typically drill smaller diameters now due to the hardness of the ore, but these drills can handle greater diameters with ease,” Martín says. “They have low maintenance costs and are very safe machines which the

PANTERA DP1500i

Pantera DP1500i is a crawler-based surface top hammer drill rig, for 89- to 152-millimetre (3.5- to 6-inch) hole sizes. Ideal for production or pre-split drilling in open pit mines or large quarries, the intelligent rig features an advanced drilling control system with easy-to-use user interface and a robust rock drill with high penetration rates, all combined with excellent fuel efficiency. Additionally, the rig can be equipped with GPS navigation (TIM3D) for improved drilling accuracy.

operators can trust. Over the years, Sandvik has offered the solutions best suited to meet INSERSA’s needs.”

The Pantera DP1500i rigs at Proyecto Riotinto have consistently met INSERSA’s vital KPIs, including drill metres per hour and diesel consumption.

“The drills’ availability and reliability are high and the performance exceeds our expectations,” Martín says. “Pantera DP1500i allows us to achieve our production targets with ease.” ■



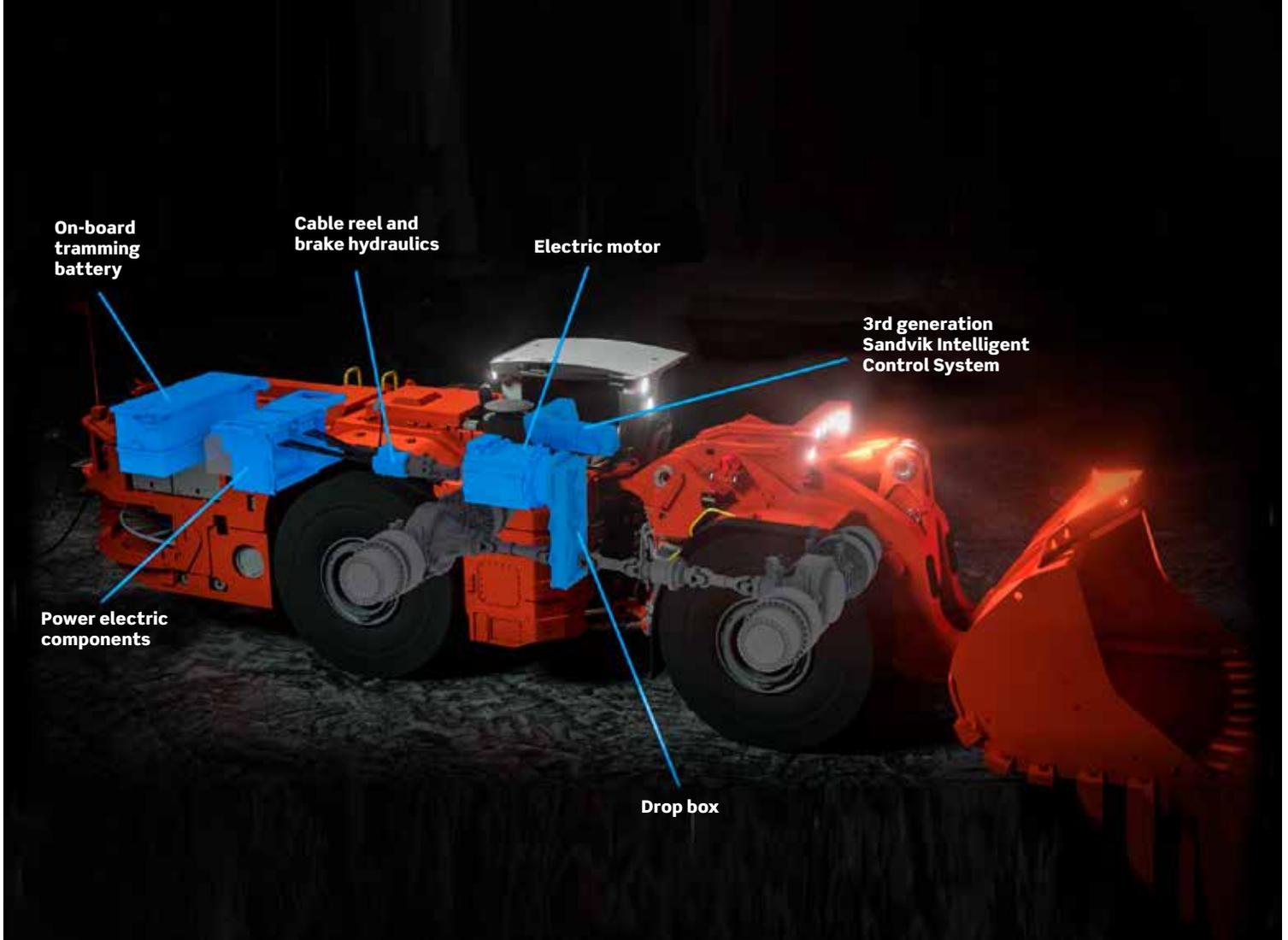
Untethered productivity

The zero emissions concept increasingly attracts mine operators for obvious reasons: reducing underground emission levels and operating costs are attractive rewards. Electrically powered load and haul (eLHD) equipment is a major enabler for this mission.

TEXT: **TURKKA KULMALA** PHOTO: **SANDVIK**



SANDVIK LH514BE eLHD



THE KEY ADVANTAGE of a cable electric powered loader or haul truck is its ability to operate uninterrupted with zero underground exhaust emissions: the particulate matter, CO₂ and NOx emissions from the exhaust gases are completely eliminated, and heat emissions can also be reduced. Thanks to this, eLHD solutions can potentially also help reduce mine ventilation costs.

Since 1981, Sandvik Mining and Rock Technology has offered market-leading electric mining solutions. Sandvik LH514E, a loader for the 4.5 x 4.5-metre (15 x 15-foot) tunnel size with a 14-tonne payload, represents the established tethered electric loader technology and is the market leader of its class.

While proven and praised by operators, tethered-electric loaders come with some practical limitations that are impossible to entirely eliminate. One distinct challenge is during relocation, when the loader must be disconnected from its power box and the power supply cable must be hauled to the next one by using an external power source.

BATTERY TECHNOLOGY HELPS operators overcome the relocation challenge. Thanks to an on-board tramming battery, the power cable can simply be reeled in and disconnected before relocations and the loader can drive to the next heading under battery power. On ramp operations, the same on-board tramming battery gives the

electric loader a power boost enough to raise the tramming speeds to a level comparable to conventional diesel-powered loaders as well as modern battery loaders.

Electrification of loading and hauling equipment enables the elimination of underground exhaust emissions and improves the sustainability of a mining operation while also reducing ventilation and fuel costs. Shortcomings in the operational flexibility, however, have hampered the utilization of these possibilities. Until now.

THE NEW SANDVIK LH514BE, soon to enter field testing, will offer groundbreaking technology to bring the benefits of electric loaders to

We have already built more than 600 electric loaders and we are the market leader in this segment

operations where they have not previously been practical.

“We have delivered more than 600 electric loaders to the market, including the first fully automated electric loaders using AutoMine,” says Wayne Scrivens, vice president load and haul at Sandvik Mining and Rock Technology. “Now the electric driveline in Sandvik LH514BE will enable faster acceleration and high speed with improved controllability to reduce cycle times and increase productivity.”

The target applications of Sandvik LH514BE typically include mines that need to relocate loaders between several production areas without resorting to extra transportation equipment or personnel required for the operation. With a battery-electric loader, the loading capacity can be independently relocated without restrictions.

THE SPEED DIFFERENCE between conventional electric loaders and the new battery-electric solution is clearly demonstrated in uphill tramming speeds, which can be as modest as 3 kilometres per hour (1.9 miles per hour) on a 17 percent gradient for a conventional electric loader. The addition of the on-board tramming

battery boosts Sandvik LH514BE up to 9 kilometres per hour (5.6 miles per hour) on a similar 17 percent gradient. The higher operational speed also makes Sandvik LH514BE a viable option for mine development tasks, where the low ramp speed of conventional electric loaders used to be particularly problematic.

THE BATTERY-ELECTRIC LOADER

also has a regenerating brake system that makes use of the potential energy and tops up the battery when it trams downhill. Overall, charging the on-board tramming battery while operating and braking enables high availability.

The battery-electric Sandvik LH514BE exemplifies how battery technology is expanding the capabilities of eLHD equipment to new territories, to larger vehicles and more demanding applications with higher power requirements. It brings the benefits of electrically powered mining processes to all types of mines.

Sandvik LH514BE is one result of Sandvik’s constant efforts to advance battery technology to support the mining industry.

While Sandvik LH514BE will add an entirely new product in the

Sandvik portfolio once it has successfully completed trials, it shares extensive commonality with Sandvik LH514E, the company’s tethered-electric loader. Based on a compatible frame structure suitable for an on-board tramming battery installation, a retrofit kit will be offered for converting existing Sandvik LH514E loaders into battery-electric units. ■

LH514BE ADVANTAGES

- More flexible possibilities for zero emission underground load and haul operations
- Increased operational flexibility thanks to on-board tramming battery
- More powerful uphill tramming capacity on battery boosted operation
- Charging on-board tramming battery while operating and braking enables high availability
- Retrofit possible on existing tethered-electric Sandvik LH514E loaders

SUSTAINABILITY



SANDVIK'S CLIMATE TARGETS FOR 2030

Customers <ul style="list-style-type: none">• CO₂ improvement part of all product development projects• Value proposition to customers shall always include verified CO₂ reduction potential	Operations <ul style="list-style-type: none">• Halve the CO₂ footprint from own production• Halve the CO₂ footprint for transportation of people and products	Suppliers <ul style="list-style-type: none">• Require halving of CO₂ footprint from key suppliers
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SUSTAINABILITY CHARGES AHEAD

Radically reduced energy consumption, a lower carbon footprint and efficient operations: the sustainability gains from innovations in battery-based mining equipment are simply electrifying.

Text: **JONAS REHNBERG AND ERIC GOURLEY** Photos: **SANDVIK** Illustration: **NIKLAS THULIN**

SANDVIK'S SUSTAINABILITY AND CLIMATE GOALS for 2030 include targets to help reduce carbon emissions at customer operations. In addition to developing surface and underground drills with Tier 4 and Stage V engines and underground trucks and loaders with low-emissions engine options, the company also engineers electric equipment models and an extensive line of battery-electric vehicles (BEVs).

“Will electrification spark the next wave of mining innovation?” is the title of a recent report from consultancy firm EY. Brian Huff, vice president of technology at Sandvik Business Unit Artisan, says the wave has already reached the shore. Huff sees electrification more as a natural evolution of technology rather than a revolution, with the potential to reap a range of sustainability and cost benefits.

“We’re moving past the ‘why’ stage and approaching the ‘how,’” Huff says. “Most mining companies have analyzed the business case of electrification and seen the value. We just need to explain that an electric mine is not that different from a traditional mine, nor is it difficult to electrify. Battery-powered trucks and loaders are used the same

way, and no new underground infrastructure is needed.”

Newmont’s Borden Lake operation in Ontario, Canada, became the world’s first all-electric underground mine when it achieved commercial production in late 2019. A combination of tethered electric and quick-charge battery-powered equipment comprises the entire mining fleet.

DURING DECLINE CONSTRUCTION in 2017, Newmont (then Goldecorp) anticipated that eliminating diesel underground and fully electrifying Borden Lake would result in a 70 percent reduction in greenhouse gases and annual savings of 2 million litres of diesel fuel and 1 million litres of propane. The company also expected to save 35,000 megawatt hours of electricity yearly, due in large part to drastically reduced ventilation needs.

John Mullally, Newmont’s senior director sustainability and external relations, considers a shift to cleaner, more sustainable mining practices essential, and BEVs a key enabler.

“We believe Borden will be a great pilot to prove that there are tremendous financial and environmental benefits from the adoption of cleaner technology,” Mullally says. “It’s

really exciting to be a part of. Once other companies see that the business case works, we hope to see large-scale adoption at a meaningful rate across the industry.”

On top of the sustainability improvements, another major benefit of electrification is the amount of money that can be saved on initial capital and operating expenses, including construction of ventilation shafts and the cost of operating ventilation systems.

In terms of capital expenditures, ventilation systems don’t come cheap. “The per-foot cost of digging a ventilation shaft can typically be USD 5,000, or USD 30 million for an 1,800-metre ventilation shaft, plus the time spent,” Huff says. Some mines operating electric equipment have been able to eliminate a return air raise and reduce the diameter of intake raises.

Ventilation also comes with operating costs. As much as 40 percent of an underground mine’s energy outlay is spent on powering ventilation systems to remove heat and airborne by-products from tunnels, according to EY. In comparison, an electric mine requires roughly half as much ventilation, which can reduce energy demand by up to 90 percent.



BATTERY-ELECTRIC VEHICLES FROM SANDVIK

In 2019, Sandvik acquired Artisan Vehicle Systems, whose battery-electric underground vehicles use lithium iron phosphate (LiFePO4) battery chemistry. Sandvik's Business Unit Artisan offering includes a 50-tonne truck (the Z50), a 10-tonne loader (the

A10) and a 4-tonne loader (the A4). The recently introduced Sandvik LH518B, the industry's first 18-tonne battery loader, combines Artisan's battery know-how and Sandvik's decades of underground mining equipment experience.

As mining companies are forced to dig increasingly deeper in search of new findings and extensions of existing ores, the cost of constructing ventilation shafts grows. "The deeper you go, the better the business case for electrification gets," he says. "When you access a new stope you don't need as much auxiliary ventilation as you would with a diesel-run unit. Plus, a BEV only generates some 12 percent of the heat generated by diesel-driven equipment."

The reduced ventilation of an electrified mine also saves on heating and cooling costs, as the air transported from outside might be too cold or too hot, depending on the season, to produce the required ambience.

"All these things compound to provide a real financial advantage," Huff says. "The capex costs for building ventilation shafts are substantial enough to pay for the entire equipment fleet needed to operate the mine."

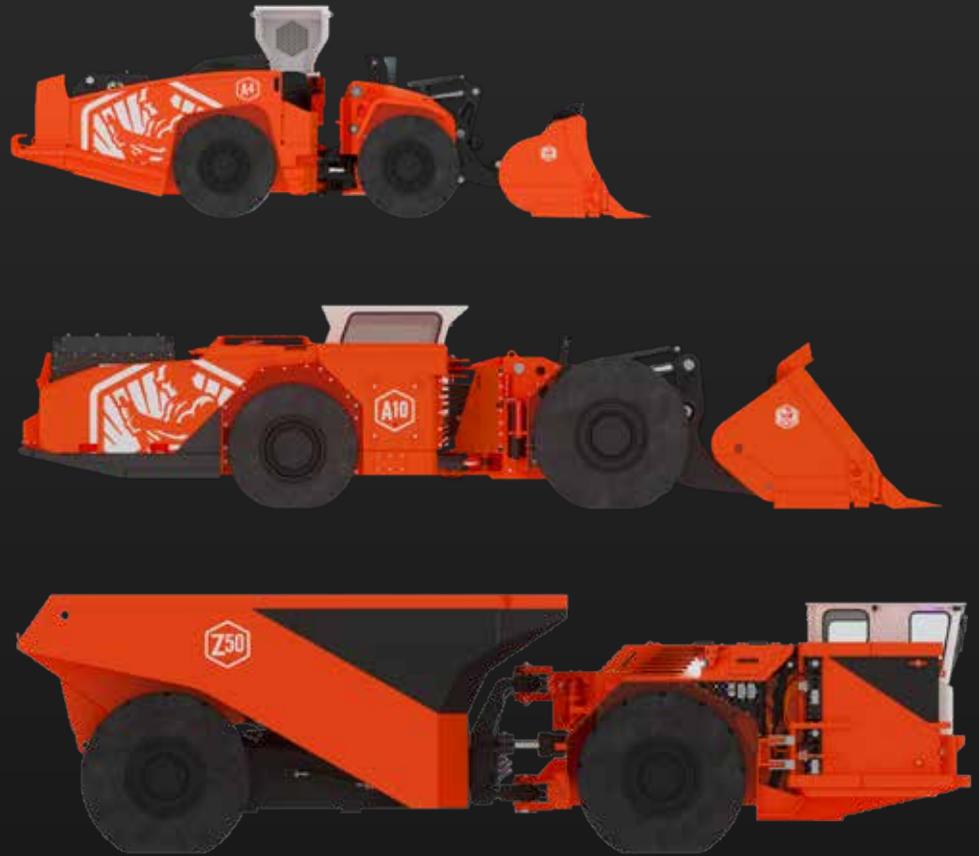
ELECTRIFYING OPERATIONS HELPS mining companies contribute to a more sustainable industry from many perspectives. The cost of energy represents up to one-third of a mining company's total cost base, making it a keenly managed component of operations, and the EY report notes that "demand for carbon reduction in the sector is inevitable, and electrification is one way to achieve it."

In addition, the energy used to charge the batteries may come from renewable energy sources. With Sandvik's BEVs, the battery is being charged every time the vehicle trams downhill, and the recharged energy is used to carry the next load.

Adding to a lower total cost of ownership, Huff says, is that a BEV has fewer moving parts than a fossil-fueled unit. "There is no need for a mid-life engine or transmission replacement," he says.

The latest Sandvik BEV models are fitted with an additional battery pack, and the vehicle swaps batteries automatically when needed.

"We designed the machine to swap its own batteries in just six minutes," Huff says. "The machine has a secondary battery pack that is a third the size of a Tesla battery and is charged by the main pack once it's loaded. After charging for one hour, the main pack typically lasts two to three hours and is swapped about four times a shift for a total time of 24 minutes."



Small changes create enormous advantages

This time is comparable to a diesel unit's refueling requirements, which typically take 30 minutes each shift, including the time to drive to the fuel bay. "We offer battery as a service, meaning we provide charged and available batteries as well as preventive maintenance and service," Huff says. "This service converts capex into opex and minimizes maintenance work."

According to the EY report, reaping the full value of electrification requires a rethink of mine design that considers a technology road map. Huff agrees that there is more leverage to be had for a greenfield mine that decides to go all-in electric from day one.

"Then you have the ability to design around the potential for electrified equipment and benefit from the fact that you don't need large ventilation shafts," he says.

Still, so-called brownfield operations also stand to gain from electrification, he says. "Most existing mines are expanding, digging deeper to continue exploration of the ore currently being extracted and to find new ore bodies and explore adjacent ones. With BEVs, ventilation capacity is less of a problem."

Electrification holds the potential of boosting the mining industry's sustainability score. As Huff puts it, "Small changes create enormous advantages." ■



The Sandvik Rebuild and Upgrade programmes help increase usage rates while reducing scrap rates.

Parts of the whole plan

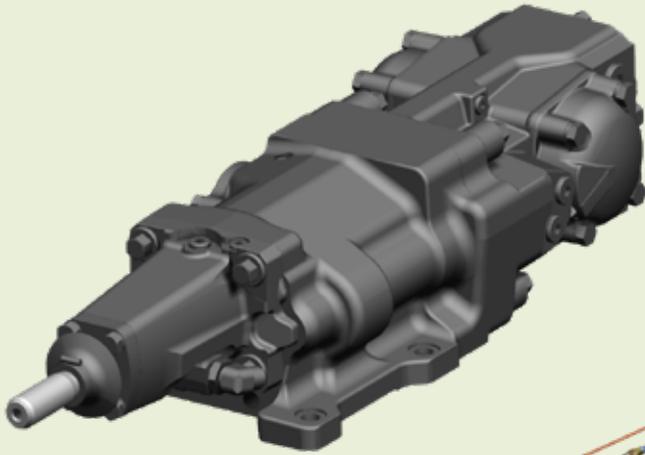
Implementing a sustainable business model involves a complete commitment from any operation that wants to work continuously towards a common goal. Sandvik Mining and Rock Technology has dedicated its efforts to this goal by integrating its sustainability targets into everyday business practices. But there is one division that inherently makes itself and its customers more sustainable: Parts and Services.

TEXT: JEAN-PAUL SMALL PHOTOS: SANDVIK ILLUSTRATION: BORGS.NU

LOOK AT ANY company in the modern marketplace and you'll find most of them disclosing their carbon emissions or setting lofty reduction targets. In fact, the number of Fortune 500 companies with ambitious carbon targets has quadrupled in the past four years, according to research from climate solutions specialists Natural Capital Partners. And while this is a promising start to a new normal, where organizations consistently attempt to operate more sustainably, it is also essential that these companies provide customers with solutions that help their operations become more sustainable – and productive – as well.

“At Sandvik Mining and Rock Technology, we’re championing the belief that sustainability goes hand in hand with productivity,” President Henrik Ager says. The very embodiment of this statement is the company’s Parts and Services division. From the inherent circularity of the Sandvik Rebuild programme to the reduced emissions, improved safety and extended life cycle offered by digital services, the division provides customers with products and solutions that drive their businesses towards a more sustainable model.

One of Sandvik Mining and Rock Technology’s sustainability targets for 2030 is to become more than 90 percent circular, halving waste from its production. One way the



Sandvik Mining and Rock Technology offers repair or replace programmes for key components, such as Sandvik rock drills.

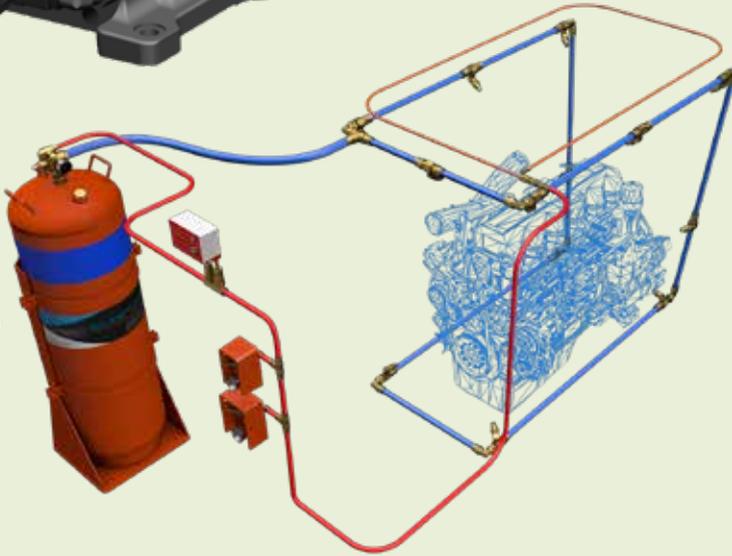
company helps its customers accomplish similar results is through its Rebuild and Upgrade programmes, which extend the equipment's life cycle by refurbishing the entire unit at optimal intervals.

"We want our customers to be able to get the highest rate of usage out of their assets," says Erik Lundén, president of Sandvik Mining and Rock Technology Parts and Services division. "Our Rebuild and Upgrade programmes do this by helping them avoid unnecessary capex investments through an optimized maintenance strategy which lowers the total cost of ownership. This has the benefit of minimizing material and scrap rates as well as downtime, extending operational life and reducing running cost."

During the refurbishment customers can also opt to upgrade components to help the equipment operate more sustainably, from the latest engine emission technologies to increased safety features. These changes can drive sustainability efforts, such as reducing fuel use, emissions and ventilation power requirements.

SIMILAR TO THE Rebuild, other options available to customers looking to improve their sustainability profile are the Sandvik Component Repair, Replace and Exchange Solutions.

The Eclipse Sustain system is the world's first fluorine-free fire suppression for mobile equipment.



My Sandvik Digital Service Solutions provides clear insights into how to reduce fuel consumption and emissions.

“Our component offerings, which break down into Component Exchange, Component Repair and Return, and Fixed Price Repair and Return, minimize environmental impact by reusing components,” Lundén says. “This regenerates the life of the component and avoids the creation of scrap. Additionally, repairs don’t have to be carried out on site, which limits the interactions of workers with high-risk load equipment scheduled for repairs.”

For Component Repair and Return, a Sandvik engineer inspects and repairs the original components; with Component Exchange, the component is remanufactured according to stringent standards and equipped using the latest product improvements.

DIGITALIZATION HAS SHOWN to be a vital tool for mining and construction companies seeking to modernize their operations while driving towards a more sustainable model. My Sandvik Digital Service Solutions transfer data into easy-to-use knowledge about fleet performance, maximizing productivity, operational efficiency and safety. Connected machines offer close to real-time data all year round and offer insights into how to get the most out of the equipment.

“From a sustainability standpoint, digital services provide clear insights into fuel consumption and excessive idling time, which can drastically reduce emissions underground,” Lundén says. “Equipment alerts on speeding, brake violations and freewheeling in neutral, for example, can also improve safety for operators and other staff in the mine.”

ANOTHER AFTERMARKET OFFERING that is a crucial component to safety management is the Eclipse Sustain fire suppression system. Eclipse Sustain is the world’s first 100 percent fluorine-free fire suppression for mobile equipment. Fluorine-based foams can persist as a hazardous substance in the ground for thousands of years after use. With Eclipse Sustain, it can be simply rinsed off with no detrimental effect to the surrounding environment.

Finally, the way parts are shipped to customers can have a significant effect on a company’s carbon footprint. Sandvik Mining and Rock Technology considers logistics as an influential way to make its processes more sustainable. “If you ship a drill bit on a boat, it will generate around 100 times less CO₂ than if you fly it to the customer on an airplane,” Ager says.

“That approach reduces our generated CO₂ by 10,000 tonnes, which in comparison with the total emissions for the division is significant.” ■

BEFORE



AFTER



During refurbishment, customers can opt to upgrade components to help their equipment operate more sustainably.

Sustainable parts and services

- Critical savings using digital services: Up to 5 percent emission reduction applying My Sandvik Productivity and up to 10 percent emission reduction with long-term remote monitoring service as well as substantial component life increase.
- On loading and hauling equipment, for example, a major intervention at the optimum rebuild interval between 12,000 and 16,000 engine hours can extend the reliable life of the equipment to longer than 30,000 hours – at a fraction of the price of a new unit.
- Upgrading loaders or trucks to the latest Tier 4 engine standards, complying with local legislation. Some examples of available possibilities:
 - Sandvik LH514, Sandvik LH517 Detroit to Volvo TAD13 Tier 4i
 - Sandvik LH621 Volvo engine upgrade from Tier4i to Tier 4 Final
 - Sandvik TH663 Cummins to Volvo TAD1643VE-B
 - Sandvik TH550 Detroit to Volvo
 - Sandvik TH540 Volvo Tier 2 to Tier 4 Final
- 15 times NOx emission reduction (g/kWh) comparing Stage II to Stage IV

More than restored

One of the essential aspects of the planning stage of mining activities is how the land will be rehabilitated once the ore has been extracted. Increasingly, mine reclamation and restoration plans are required for a mining permit to even be granted. Creating useful landscapes that meet a variety of goals, ranging from the restoration of productive ecosystems to the creation of

industrial and municipal resources, is the key aim of mine reclamation projects and is essential to burgeoning sustainability initiatives.

From Mongolia to Great Britain and the US, mining reclamation methods have dramatically improved recently due to ingenious and novel technologies and solutions that are going far beyond just restoration. Some of

the biggest advances in mine closures have been made in geomorphic software, technology which allows mine sites to be returned to a natural and cohesive form. Public parks, forests, farmlands and even golf courses are popping up where once there were mines, like the wooded area pictured here at a reclaimed strip mine in Appalachia, USA. ■





Enhanced equipment, supreme support

Whether drilling or crushing or loading and hauling, we have the tools and expertise to help you boost your bottom line. Our dynamic spectrum of tools, equipment and services is designed to maximize your productivity, safety and efficiency, above or below the ground.

ENVIRONMENT, HEALTH AND SAFETY (EHS)

Fundamental focus.

Our objective is to eliminate harm to people and the environment. EHS is a fundamental consideration in all Sandvik operations, especially product development. Our ambition is to provide the safest, most sustainable products and services, designed to minimize environmental impact and reduce health and safety risks. Our efforts are driven by continuous improvement and an understanding of your business needs.



GENUINE PARTS AND SERVICES

Proudly keeping you on track.

Our parts and services aftermarket solutions enable your equipment to function at peak condition, helping you to achieve the most demanding production targets without compromising safety. Our commitment to genuine Sandvik parts extends beyond after-sales support. It covers research and development, skills training for in-house teams, investment in production technology and more, creating an infrastructure that adds value to your business.



SURFACE DRILLING

Power and precision.

Sandvik surface drilling equipment is renowned for durability, reliability and productivity. For decades, our surface top hammer, surface down-the-hole and dimensional stone drilling rigs have delivered low total cost of ownership in quarrying, opencast mining and construction applications. We specialize in engineering surface drilling equipment that marries power and precision while improving operator safety and productivity.



UNDERGROUND DRILLING

Know the drill. Sandvik underground drills are designed for productivity in mining and tunnelling applications. Our high-performance drills range from robust, simple rigs to automated units. Every rock drill and drill rig we engineer is designed with safety, reliability and productivity in mind. Adjustable automation levels, on-board tools, drilling data collection and analysis along with our digital offerings allow for optimized accuracy and the lowest possible cost per advanced metre.



CONTINUOUS MINING AND TUNNELLING

Always advancing.

Sandvik continuous mining and tunnelling equipment reflects the unique advantages of total in-house control over the equipment and cutting tools alike. Optimized cutting technology and machine design for soft and hard rock applications result in high productivity, long service life and low total costs.



LOADING AND HAULING

Safer. Stronger. Smarter.

Sandvik underground loaders and trucks are engineered to be safer, stronger and smarter in the toughest of applications. These rugged and compact yet intelligent products offer high capacity, today's connectivity, ease of maintenance and low cost of ownership.



CRUSHING AND SCREENING

Maximum size reduction.

Sandvik crushing and screening solutions are engineered for productivity in mines, quarries and civil engineering projects. We offer advanced solutions for any size-reduction challenge, stationary or mobile. We can upgrade existing plants, deliver complete solutions and effect turnkey installations. We also supply individual crushers and screens, as well as key components and consumables. Whether you're crushing tonnes of hard rock or producing several-sized aggregates with our mobile screens, our solutions deliver the robustness and versatility you need.



BREAKING

Hit harder. Hit smarter.

Sandvik breakers and demolition tools deliver what you need when you need it, whether you're looking for breaker booms for your crushing applications or hydraulic breakers for your demolition projects. With the remote monitoring device RD3 and MyFleet telematics, you can remotely monitor your hydraulic hammer's operating hours, service intervals and location, ensuring a more efficient and profitable process with higher uptime.



MINE AUTOMATION

Complete control.

Sandvik is a world leader in automation. AutoMine covers all aspects of automation, from remote and autonomous operation of a single piece of equipment, to multi-machine control and full-fleet automation using automatic mission and traffic control capabilities. OptiMine is the most comprehensive solution for optimizing underground hard rock mining production and processes. It integrates all assets and people – including Sandvik and non-Sandvik equipment – delivering descriptive and predictive insights to improve operations.



ROCK TOOLS AND SERVICES

You'll never work alone.

Sandvik has a complete range of rock tools and services for the mining and construction industries. We control the entire production chain – from raw material and powder production to finished drill bits. Our products and services, ranging from on-site support to digital solutions, are developed based on decades of research, experience and customer collaboration, helping you operate efficiently, productively and sustainably.





LEOPARD™ DI650i TIME FOR A NEW LEADER

Our Leopard™ DI650i down-the-hole surface drill rig delivers long-term productivity and superior stability with robust and reliable main components – seamlessly integrated with scalable automation and state-of-the-art technical solutions.

Explore the new Leopard™ DI650i:
[ROCKTECHNOLOGY.SANDVIK/DI650i](https://rocktechnology.sandvik.com/di650i)

