

SOLID GROUND

A MAGAZINE FROM SANDVIK MINING

#1.2015



✦ Go deep inside the belly of a coking coal mine.

POLAND: BORYNIA-ZOFIÓWKA-JASTRZĘBIE

COAL CONTROL

Productivity in the heart of Poland's coal region

Sandvik CH860 & CH865:
Crushing it!

Big Picture:
Mining in space

Norway:
Iron from the frozen tundra

SANDVIK

Dear reader,

OUR CUSTOMERS ARE at the heart of everything we do within Sandvik Mining. We are taking action to get closer to you to make sure we have a real understanding of your needs and wants. We have a fantastic product and service offering and strive to provide you, wherever you are in the world, with a seamless Sandvik Mining relationship.

DURING THESE CHALLENGING times for our mining industry, we are committed to working alongside you in the essential drive for increased productivity, process cost savings and enhanced energy efficiency. We also want to make sure that you are equipped and ready to make the most of every opportunity moving forward – for where there are opportunities, there’s undoubtedly growth.

WE ALSO HAVE one eye very much on the future, which isn’t always light years away. The future is what we work with day in, day out here at Sandvik Mining, as our extensive R&D resources focus on bringing you new, advanced solutions such as the Sandvik CH860 and Sandvik CH865 cone crushers.

ALWAYS AT THE forefront of our mind is the environment, health and safety. An excellent example is Sandvik Eclipse, the world’s first fluorine-free fire suppression foam. Not only a safer solution for those handling it, it’s also less harmful to the environment. Roughly the same price as other foam systems, it costs companies less in clean-up operations due to its lower environmental impact.

OUR FOCUS, pure and simple, is on achieving a high level of excellence in everything we do. That is what you can expect of us, both now and moving forward.



Scot C. Smith

SCOT SMITH
PRESIDENT SANDVIK MINING

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Helping mothers and their children

▶ The Rotary club of Ulaanbaatar Peace Avenue and Sandvik Mongolia LLC have joined forces to help mothers and newborn babies in the region. The project, called "Jargalan" (Happiness), provides maternal and newborn clothing to the most remote hospitals in the country, including some in Zavkhan, Govisumber, Ömnögovi and Orkhon Uul provinces. Sandvik Mongolia has supported the Jargalan project through the use of its facility for equipment storage and a training room.

Honours for honourable men

▶ Sandvik Mining employees Udo Fischer, Torbjörn Hartzell and Jan Åkerman were recently inducted into the International Mining Technology Hall of Fame in the Underground Development category. The trio were recognised for the productive rock tools they have developed over the years for both percussive drilling and cutting applications.

However, it is with great sadness that we learnt that Udo Fischer, a much-respected colleague, has since died.

THE QUOTE

"We believe in integrating sustainability in our business."

- Christina Båge-Friborg, head of sustainable business, on Sandvik being included in the 2015 Sustainability Yearbook for the sixth year in a row. The Yearbook recognises the world's most sustainable companies.

A better web experience

▶ The new Sandvik Mining website, launched in January 2015, boasts advantages in terms of working with content, search functions and general usability.

Whereas the previous Sandvik Mining website only worked with Internet Explorer on a desktop computer, the new site is responsive and functions on a range of devices, including desktops, cell phones, smart phones and tablets (Android and iOS devices).

The new site is more user-friendly and each Sandvik Mining product and service has its own page, highlighting features and benefits. There's also a link to minestories.com with published



www.mining.sandvik.com

articles about Sandvik products and to the EHS 'Make it Count' site. Additionally, visitors can find information on the EHS features of Sandvik product lines.

The site is linked to the Sandvik Customer Relationship Management (CRM) system. When visitors to the website submit an inquiry form, the information is automatically entered into the CRM system.



The 'Most Innovative Product' in Poland

+ **Innovation at its best: the Sandvik MR341 wins in Poland for its advanced design and cutting-edge features.**

▶ A group of mining and business authorities in Poland have honoured the Sandvik MR341 roadheader with the distinction of the country's "Most Innovative Product." The award was presented to Sandvik Mining during the 2nd International Silesia Innovatica Congress 2014. The biennial conference drew many attendees representing coal producers, scientific institutions, technological universities and mining equipment manufacturers.

Sandvik MR341, successor to the

well-proven Sandvik MR340 roadheader, is designed for the European coal industry. Launched February 2014 in Zeltweg, Austria, Sandvik MR341 includes numerous safety features, such as a radio remote control for all machine functions and a larger working platform for installing roof support.

"This award affirms our core commitments in product development, which are always safety and productivity," says Bruno Reumuel, product line manager, UG Coal & Minerals at Sandvik Mining.

Sandvik Mining relocates headquarters

▶ Sandvik Mining recently moved its Amsterdam headquarters to a new location, which provides improved office space efficiency.

The new building, known as 'The Edge', acquired recognition in 2014 as the World's Most Sustainable Office Building based on its BREEAM score of 98.36 percent. The building is considered to be 'energy neutral', offering many innovative ways to save on energy costs as well as providing an optimal working environment.

The solar panels that cover the building's south façade and an aquifer thermal energy

storage system (located approximately 130 metres below ground level) generate enough energy to heat and cool the entire building. An intelligent LED powered lighting system enables the monitoring of light, movement and temperature throughout the building. This means that when the building is empty, or almost empty, energy sources such as light and temperature can be moderated and managed accordingly.

The building also has a water management programme, whereby rainwater is collected for reuse in the site's toilets and for watering the gardens.



PHOTOS: RONALD TILLEMANN

Going deep to improve drill safety

▶ Sandvik Mining collaborated with Barrick Gold equipment operators to evaluate a prototype of the Sandvik DR461i rotary drill rig at Barrick's Cortez mine in Nevada, US. Sandvik Mining engineers and Barrick operators looked at the drill's safety features and recommended enhancements before the product launched globally in February 2015. The results of this process, formally known as EMESRT Design Evaluation for EME Procurement (EDEEP), were presented in November 2014 at the Global Health & Safety Excellence for Mining Forum in Las Vegas.

"The EDEEP process allows Sandvik engineers to see through the eyes of our customers and may help us to identify potential risks that are related to operator safety," says product safety manager Darlene Dutcher.

As part of the EDEEP programme, Barrick personnel conducted a risk assessment of tasks required of the Sandvik DR461i rig. They ran the drill in day-to-day operations, and as each step of the drilling process was completed they identified potential hazards from their perspective.

Sandvik and Downer join forces

▶ Sandvik Mining has partnered with Downer EDI Ltd to offer high-level field service solutions for mining systems and materials handling projects around Australia.

The memorandum of agreement will enable Downer to carry out any maintenance work on Sandvik Mining equipment operating on its customer sites, ensuring the equipment is safely up and running in the shortest possible time to meet customers' production targets.

Downer will now be able to carry out full servicing, repairs and maintenance on Sandvik mining systems projects.

1.2

Lost Time Injury Frequency Rate (LTIFR) for Sandvik Mining in 2014, an important indicator of the company's commitment to safety.



New state-of-the-art facility in Zambia

▶ In an effort to support mining in Central Africa, Sandvik Mining is building a state-of-the-art facility in Kitwe, Zambia. The new premises, which will include an office block, workshop, stores complex and sundry support facilities, are currently under construction and will help international mining organisations set up operations seamlessly within the region. Particular attention has been paid to environmental issues during its construction, and the systems installed are designed to reduce the impact of emissions in the area.

Q & A

A MANAGER OF THE PEOPLE

AS AN UNABASHED people person, Managing Director of Northparkes Mines Stefanie Loader prides herself on putting her colleagues in a position to succeed.

Q WHY DID YOU CHOOSE TO ENTER THE MINING INDUSTRY?

I had applied for a place in medicine at university, as was expected of me since I was good at math and science. I worked out that chemists spend a lot of time inside and geologists spend a lot of time outside, so I convinced the scholarship providers to add geology to their list of suitable sciences, and I never looked back.

Q WHAT ARE YOUR RESPONSIBILITIES AS MANAGING DIRECTOR?

My role is all about supporting people to be successful. I see it as my responsibility to provide an organization and resources that support it so that everyone goes home every day safe, healthy and with a sense of satisfaction about what they have contributed to our business.

Q WHAT ARE SOME OF THE BIGGER CHALLENGES YOU FACE?

The biggest challenge that I think about every day is how we will achieve ‘Zero Harm’. I know that Zero Harm Operations, as we call the approach here at Northparkes, supports success for everyone – our neighbours, our environment and our equipment. I search every day inside and outside our industry for new ways to mix up what I believe are the right base ingredients in the Zero Harm ‘cake’.

Q WHAT ARE THE MOST INTERESTING ASPECTS OF YOUR JOB?

People, people, people and people. I get my energy and enthusiasm every day from the people of Northparkes. Listening to and learning from people and then taking every opportunity to inspire and motivate them are the most interesting and rewarding parts of my job.



MINCO PHOTOGRAPHY

ABOUT THE MINE

Northparkes is a copper and gold mine located 27 kilometres north-west of Parkes in the Central West of New South Wales, Australia. The mine has an operational capacity to process six million tonnes of ore per year, containing roughly 60,000 tonnes of copper and 50,000 ounces of gold.

Q DESCRIBE YOUR WORKING RELATIONSHIP WITH SANDVIK MINING.

Northparkes and Sandvik have been in partnership since the first Sandvik loaders arrived in the first underground block cave mine in 1997. Today we have a fleet of automated Sandvik loaders that are operated from the surface using the Sandvik AutoMine system. Sandvik runs one of the best underground workshops in the world at Northparkes to service our loaders. Every tour group we bring in comments on the housekeeping and organization of the Sandvik workshop.

STEFANIE LOADER

TITLE: Managing Director, CMOC Northparkes Mines
COMPANY: CMOC – China Molybdenum Co., Ltd.
AGE: 42
LIVES: New South Wales, Australia
FAMILY: Husband Brendan, two children, Philip (8) and Sofia (5)



KEEP CALM AND CARRY ON MINING

Professional services firm Deloitte published its *Tracking the trends* 2015 report. Here's a synopsis of what they see for this year.

1. BACK TO BASICS:

To increase efficiency and productivity, mining companies need to reevaluate their operational processes and embrace new cultural norms.

2. INNOVATION IS THE NEW KEY TO SURVIVAL:

In order to apply innovative methods directly into the way they work, mining companies need to start by embedding innovation into corporate DNA; thinking big, testing small and scaling fast; leveraging emerging technologies; becoming part of an innovation ecosystem; and preparing for new operational realities.

3. THE NEW ENERGY PARADIGM:

Mining companies need to consider a new approach to energy use, including incorporating unconven-

tional fossil fuels and obtaining stakeholder buy-in to develop renewable energy facilities.

4. DWINDLING PROJECT PIPELINES:

To prevent potential future supply constraints, mining companies need to find a better balance between meeting short-term investor and analyst expectations and maintaining project pipelines by creating strategic partnerships and shifting from global to local production.

5. FINANCING'S GREAT DISAPPEARING ACT:

Junior mining companies may need to woo foreign investors, pool their resources, explore alternative financing options and position themselves for private equity to unearth alternative financing solutions.

6. SURVIVAL OF THE JUNIORS:

To mitigate the issue of shifting ownership patterns, juniors should get their assets in order and consider options, from partnership and joint ventures to sale and consolidation.

7. SEEKING NEW SKILL SETS:

Companies embracing the innovation imperative need to commit to diversity, explore new talent management systems, recruit talent in high demand better and invest in more targeted training.

8. RIDING THE WAVES OF GEOPOLITICAL UNCERTAINTY:

Response strategies for negotiating geopolitical uncertainty include lobbying for greater policy clarity, leveraging mining associations to influence government policy, becoming more risk intelligent and planning for myriad scenarios.

9. RISING STAKEHOLDER ENGAGEMENT STAKES:

Companies need to learn to communicate in new ways, work with mining associations to negotiate with local communities, improve their corporate giving practices and consult with community stakeholders to plan mine closures.

10. ENGAGING WITH GOVERNMENT:

Some strategies to counter regulatory uncertainty include working to build better government relationships, becoming more vocal in industry associations and through social media, measuring social impact, and helping to set the policy agenda.

Finland most attractive

▶ Finland ranked as the number one jurisdiction for mining investment around the world in 2014. Compiled by the Fraser Institute, the list uses geologic attractiveness and government policies that encourage exploration to determine where the most favourable regions for mining investment are located.

WORLDWIDE RANKINGS (TOP 10):

1. FINLAND
2. SASKATCHEWAN
3. NEVADA
4. MANITOBA
5. WESTERN AUSTRALIA
6. QUEBEC
7. WYOMING
8. NEWFOUNDLAND AND LABRADOR
9. YUKON
10. ALASKA



Bucking the trend

▶ Some of the world's largest mining companies that have been hurt by falling commodities prices have vowed not to cut production, saying the stronger US dollar is softening the effect of depreciating markets.

Mining houses around the world are benefiting from the stronger greenback because they receive dollars for the gold, copper and iron ore they dig up, but pay for labour and many other costs using local currencies.

THE QUOTE

“This is not something that is being considered.”

- Chile's Minister of Mining, Aurora Williams, in an interview with The Wall Street Journal, seeking to reassure mining companies that the country's government has no intention of forcing miners to operate using a desalinated water supply.

Hitting Pay Dirt

▶ The board game Pay Dirt brings you into the hard-nosed and competitive world of modern-day gold mining in the wilds of Alaska. In the game, players take the roles of enterprising mining companies looking to refine the most efficient process for gold discovery. Hire the top employees, buy the best equipment and manage through the hardships that will inevitably come to hit pay dirt and win.

Players put their teams of workers in the field using equipment, selling gold or buying what they need. Participate in the gold refinement process, from buying a claim through to washing away the dirt to discover how much gold you've discovered, and you'll feel as if you're truly mining gold in the Alaskan wilderness.



4.9 BILLION

The number of vehicles, industrial equipment and other connected devices using Radio Frequency Identification sensors, Wi-Fi networks and fiber-optic cables that will be in use in mines worldwide in 2015.



Deep-sea deposits in Japan

+ For nations like Japan, deep-sea mining is a way to secure mineral supplies for the future.

▶ The Japanese government is looking to mine the rich seafloor deposits bordering its country by commercializing the endeavour by the 2020s. Japan has relied on imports to meet demand for mineral resources like copper, lead, gold and silver since many domestic mines were shut down at the end of the 1970s.

An exploratory research robot,

owned by Japan Oil, Gas and Metals National Corporation (JOGMEC), retrieved six samples of ore with copper concentrations 15 to 30 times higher than those typically mined in South America. JOGMEC has discovered two seafloor deposits near the main Okinawa island since 2013 in addition to the one off Kumejima. It said all three finds have high potential.



PHOTO: REPOWER DESIGN

Water works

▶ The University of Arizona has developed a new solution to manage the evaporation of water from mining tailings ponds and reservoirs, while generating additional energy reserves through solar panels.

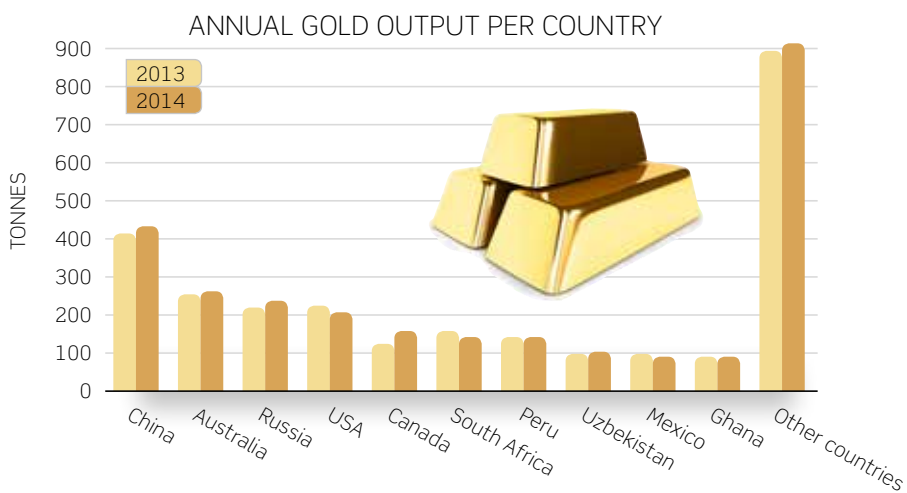
Developed by Moe Momayez from the university's Department of Mining and Geological Engineering and Nathan Barba, managing partner at RePower Design, the Hexocover consists of

individual hexagonal plastic panels that can be arranged to fit individual water surface dimensions. These form a cover over the water to slow the evaporation process and can be fitted with solar cells to simultaneously generate electricity. The panels are fitted with a propulsion system and GPS to allow remote configuration and for the cover to move easily during refilling.

Hexocover addresses a variety of salient water issues in mining such as the scarcity of water for operations and the high cost of replacement resources of energy at mining operations in remote locations.

The golden ones

▶ According to United States Geological Survey (USGS) provisional data, the top 10 gold-producing countries mined out 1,920 out of the 2,860 tonnes produced globally in 2014. Among those top 10, five countries — China, Australia, Russia, Canada and Uzbekistan — increased their gold output. The global amount of gold produced in 2014 was 2.1% higher than 2013 totals.



The Expert

MINING HAS TRADITIONALLY been a male-dominated industry. And while steps have been taken in recent years to integrate women into mining, women are still vastly underrepresented in the industry. Women in Mining UK is a non-profit organization dedicated to promoting the employment, retention and professional development of women in the mining and minerals sector. CEO Amanda van Dyke spoke to *Solid Ground* about the organization's goals and what the future holds for women in mining.

Q: What are WIM's primary goals?

A: There are fewer women in the mining sector than any other industry sector in the world. Our network aims to help individual members get together and exchange ideas and information, which helps to raise the profile of women in the mining sector, both locally and globally. We believe that together we can accomplish more than we can individually.

Q: What do you see as the solution to the lack of women in the mining sector?

A: The solution is to change the bias of both men and women, and the perception of the nature of mining globally, in order to attract and retain a diverse workforce. And changing perceptions takes time and effort.

Q: What primary challenges do women in mining currently face?

A: The true challenge is getting the business case across, letting both the industry and women know that diversity is a serious contributor to better mining companies, and that they are welcome and needed in the industry. The research we have done, as well as research by companies and organizations around the world, heavily supports the fact that women contribute greatly to the bottom line. Employing women has proved to increase efficiency significantly, and it also solidifies mining companies' social licence to operate.



Amanda van Dyke, CEO, WIM UK

COLD COMPETENCE

Text: DAVID NIKEL Photo: ERIK ARDELIUS

■ **KIRKENES, NORWAY.** Surrounded by the barren yet beautiful Arctic landscape, the Sydvaranger iron ore mine in northeastern Norway is a key driver of the local economy.

EAST OF MOST OF Finland and sharing a longitude with Saint Petersburg, Kirkenes surprises many by its location. You can drive to Russia in just 10 minutes, where you jump forward in time by two hours. The Finnmark region surrounding Kirkenes was completely destroyed by the end of the Second World War, and reminders linger everywhere. During the operation of the Sydvaranger iron ore mine, located just a few kilometres south of Kirkenes, helmets, equipment and even a complete bomb shelter have been discovered.

Temperatures hover below freezing for months on end and can plunge as low as minus 30 degrees Celsius. From late November through January the sun doesn't rise, so the region dwells in

almost total darkness, the only light provided by the floodlights of the mine and the frequent displays of aurora borealis, the famous northern lights. On the flip side, permanent summer daylight may sound appealing, but it can play havoc with your body clock and sleep patterns.

“We do struggle with visibility during winter storms, when snow and wind combine,” says Ulf Dæhlin, mine manager at Sydvaranger Gruve AS. “Although the climate is very cold, it’s rare that we stop production. Heavy snowfall can be a problem, but it’s normally too cold to snow.”

The history of the Sydvaranger mine dates back to 1910, when iron ore concentrate was first produced in the area. After 15 years of closure, Sydvaranger Gruve recommenced production of iron ore concentrate in 2009 using conventional open pit methods, with drill and blast followed by load and haul to extract the ore and

There's plenty of high-quality ore under Finnmark, but extracting it profitably is challenging.





While the climate in Kirkenes is very cold, sometimes reaching minus 30 degrees Celsius, production rarely stops.

▶ waste. As part of the refurbishment, Sandvik Mining was selected to supply crushers, feeders and a complete new set of conveyor components to the old conveyor system at the crushing station.

IN MARCH 2014, the owners elected to employ a Rock on Ground (ROG) services contract to better control costs. Lead contractor Orica Norway takes responsibility for the entire drilling and blasting process, including all designs, survey work, timing plans and blasting itself. Orica teamed up with local contractor Oscar Sundquist, who in turn sources the drilling equipment

from Sandvik. World-leading research and technology from Orica combined with the 70-year experience of local mountain operations from Oscar Sundquist provide the optimum balance of skills, vital to the success of not only the mine but the local economy. Unlike many remote mining operations, 80 percent of the mine's 500 workers live locally, and only specific expertise is flown in.

The project covers blasted rock volumes of 140 million tonnes over six years. The material is crushed and transported by an exclusive eight-kilometre rail link to the concentrator plant and ice-free port in Kirkenes. In the last financial year, the operation produced approximately two million dry metric tonnes of high-quality iron ore concentrate, while the quality has improved to 68 percent iron content and 4.8 percent silica.

There's plenty of high-quality ore under Finnmark, but extracting it profitably is a challenge due to climate, transportation and logistics, among other factors. To ensure a profitable operation for all, Sydvaranger Gruve, Orica, Oscar Sundquist and Sandvik work together as partners. The decision to purchase eight surface drills was a significant one for a mine of this size, so it's no surprise that all parties had strong

80

percent of the mine's 500 workers live locally, and only specific expertise is flown in.

opinions during the testing process. Finding a machine that could cope with the Arctic environment and a company that would become a partner in the project were the priorities.

SANDVIK EUROPEAN SERVICE

Manager Joakim Strandberg visits the mine regularly.

"The drills can manage the 140-millimetre holes that were required by the mine, and we have the tools, manufacturing, parts and service all within a reasonable distance," he says. "We worked closely with Oscar Sundquist to decide on the best approach to support the contract, including grinding services. We have one technician on site doing the grinding of the drilling tools and a supervisor handling the on-site training and support for the Oscar Sundquist technicians."

Emil Dæhlin, project manager at Oscar Sundquist, is one of the mine's many local employees. He grew up in the Kirkenes area and now has responsibility for the drilling operations and managing communication between the contracting partners. He explains why they chose Sandvik and its DP1500i drills.

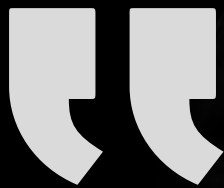
"We had our field test here in November 2012 using the Sandvik DP1500i," he says. "We tested it for a



Tim Hunt is project manager at lead contractor Orica Norway.



Sandvik technicians and trainers are on site at the mine supporting Oscar Sundquist employees.



The drills can manage the 140-millimetre holes that were required by the mine



Sydvaranger mine

• The Sydvaranger mine is located in northern Norway, about eight kilometres south of Kirkenes, close to the Russian border. The total mine area covers 35 square kilometres and comprises 23 largely separate iron-ore deposits.

Sydvaranger Gruve AS was established in 2007 to rehabilitate the mining, railroad and manufacturing plants and start production of high-grade iron ore concentrate. The company employs 400 people and is wholly owned by the Australian company Northern Iron Ltd.



The Sandvik DP1500i drill rig and GT60+ rods produce perfectly straight holes without the need for additional guides.

SANDVIK SOLUTION ◆◆◆◆◆◆◆◆◆◆

- Oscar Sundquist purchased eight Sandvik DP1500i crawler-based surface top hammer drills. The new-generation intelligent rigs come equipped with an advanced user interface featuring GPS and step-by-step troubleshooting instructions.

Sandvik also supplies technical staff to the site, working in partnership with both Orica Norway and AS Oscar Sundquist to ensure the operators are fully trained and the drills remain operational in tough conditions.

At Sydvaranger, top hammer drilling uses less fuel with better penetration than down-the-hole drilling.

We had our field test here in November 2012 using the Sandvik DP1500i



The extremely hard rock at the mine requires blasting to fracture the material.



SANDVIK FLEET AT SYDVARANGER

- Eight Sandvik DP1500i drills
- Seven Sandvik SP1423 feeders
- Three Sandvik CH870 cone crushers
- Two Sandvik LF1530 screens
- One Sandvik DX780 drill

▶ month and it performed well. There are more than 500 DP1500i drills in operation around the world today, so we were confident in the capability and strengths. Other options hadn't been tested in such conditions. Given the proven quality of their equipment and focus for service, Sandvik was the obvious long-term choice."

Oscar Sundquist chose the top hammer technology over alternatives such as down-the-hole (DTH) or rotary drilling due to the relatively small pits at Sydvaranger. Again, Sandvik offered the ideal solution.

"We have hard rock and bench heights of only 40 metres," Dæhlin explains. "Top hammer drilling uses much less fuel with better penetration, and the maintenance costs are lower than using DTH. We began using steering rods, but it quickly became apparent these weren't necessary. The combination of the DP1500i rig and Sandvik GT60+ rods gives us perfectly straight holes without the need for

additional guides. With such tough rock to break through, that's quite an achievement."

Lars-Even Pettersen works as a DP1500i operator, drilling precise holes at 10-degree angles before the charge team loads the explosives. He also has responsibility for routine maintenance work.

"Sandvik DP1500i is stable and easy to handle and manoeuvre, but it's the new GPS system that makes the biggest difference," Pettersen says. "It's a big improvement over the DP1500. The bigger cabin means I can have someone alongside me learning the process, while the powerful heater keeps us warm. Working in wintertime is challenging with the cold but also the total darkness, so we depend on the LED lights and cameras to see where we are working."

A NEW PROJECT highlights the close relationship Sandvik has not only with the customer but with each party on site. The teams are currently working

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The expected life of the mine is at least 20 years.

together to develop an improved drill bit that will last longer in the tough Arctic rock.

"It's a very abrasive material so we need to find drill bits that last as long as possible," Dæhlin says. "We are collaborating to develop something suitable to help the economics of the operation and benefit everyone in the long run."

The outlook for Sydvaranger is optimistic, despite tough market conditions. The expected life of the mine is at least 20 years, and the owners are currently investigating possibilities of expansion. The economics are everything, and Sandvik equipment plays its part by enabling cheaper and quicker drilling than would otherwise be possible. ■



See a video about the Sydvaranger mine at www.minestories.com

BORN AGAIN



■ How can mining companies remain cost-conscious while meeting normal fleet maintenance requirements? By getting a new lease on life for their worn-out equipment through comprehensive rebuild services.

Text: **TURKKA KULMALA** Illustrations: **BORGS.NU**



SANDVIK REBUILD BENEFITS

- Extended equipment life at a fraction of new equipment cost
- Lead time (11 to 12 weeks) shorter than for new equipment
- Equipment inspection by qualified OEM expert, assuring highest quality
- Refurbishment or replacement of main components with exclusively OEM original parts
- Systems and safety upgrades
- Improved equipment performance and reliability
- Modifications possible for equipment use in new environments
- Carried out by local Sandvik experts, supported by global standards
- OEM warranty and support



A ONE-MAN TRENCHING

business and a multinational mining

company are in many ways worlds apart. But today's fierce marketplace and cost-cutting pressures force fleet managers of any size to weigh their investment decisions carefully.

Historically, an exhausted piece of equipment has simply been replaced by a new one, but in current market conditions this is becoming increasingly difficult. Considering that awaiting delivery of a new machine can take significantly longer than rebuilding one, a refurbished old unit often saves both time and money, while also reducing an operation's environmental footprint.

But can rebuilt equipment match the quality of a new piece? Will it perform as well as new? And what about the warranty?

Naturally there are preconditions. The original machine must be durable and of high quality. The basic design must facilitate repairs and upgrades. New, improved components must be available to make upgrades sensible. Finally, there must be a service provider capable of reliably carrying out the repairs and upgrades as specified.

As the OEM, Sandvik is in control of all these preconditions, and rebuild processes are systematically fine-tuned to improve efficiency and quality, as recently demonstrated by the company's operations in Australia and Mexico.

11

Approximate lead time, in weeks, for rebuilds, which is shorter than for new equipment.

HOWEVER, EVEN THE best systems and processes cannot produce high quality without qualified and dedicated people. Sandvik rebuild personnel always take their customer commitment very seriously. In this they are supported by stringent environmental, health and safety (EHS) standards, which are always a top priority for Sandvik, and another assurance of outstanding overall quality.

Mine operators today demand more out of their capital equipment, so by giving new life to used machines, Sandvik displays global leadership by adding value to its equipment for customers and in promoting sustainable development.



Rebuilds deliver many benefits, including systems and safety upgrades.



Rebuilding an old unit extends its life at a fraction of new equipment cost.

CASE AUSTRALIA

A RECENT REBUILD project at the Sandvik Customer Service Centre in Kalgoorlie involved a Sandvik DD420 development drill, which had served in a Western Australian nickel mine for seven years. Respecified for a silver mine in Queensland, the unit is now expected to serve another seven years.

The drill was completely stripped down to its base chassis and individual components. After thorough crack tests and inspections to detect any fatigue, the specified parts and components were replaced by new or rebuilt versions.

The result is a completely overhauled and updated unit in compliance with today's standards. The rebuilt rig is covered by Sandvik Australia's 12-month/1,500-hour warranty, and

feedback on the quality of the rebuild and also on the performance of the rebuilt drill has been very positive.

SANDVIK HAS INVESTED heavily in the quality and productivity of its Australian rebuild facilities. There can be some variation in the equipment configuration depending on the legislative requirements of the location where it is used, and Australia has particularly strict regulations that Sandvik follows to the letter. Specialized productivity centres are set up to optimize the rebuild processes and work flows using Lean processes and strategies. All technicians receive continuous training to maintain and increase their knowledge, capability and skills. ■

Mines can rely on doubling the average service life of their equipment

CASE MEXICO

MEXICO IS A strong market for Sandvik, which serves a large fleet of underground hard rock mining units. Sandvik Mexico has its main rebuild facility in Guadalajara, in western Mexico, and a new shop will be opening in Zacatecas city in Central Mexico. Rebuilds of mining jumbos, loaders and trucks have increased since 2009, and for the past two years, reductions in capital spending budgets have also helped drive rebuilds.

Many customers have appreciated faster service and significantly better quality in their Sandvik rebuilds compared with their in-house repair shops.

“At the moment we have 25 units awaiting rebuild, and the shop is running at full capacity,” says Patricio Apablaza, vice president of sales at Sandvik Mining Mexico.

The rebuild service also supports new equipment sales because of the confidence it creates: Mines can rely on doubling the average service life of their equipment.

SANDVIK MEXICO AIMS to cut lead times and improve quality even further through increased focus on process improvements. To achieve this, a Kaizen/Lean initiative was held in Guadalajara in November 2014 with participants from the neighbouring Americas Sales Areas and the Global Service Team. The Guadalajara workshop was also certified as a Dana-Spicer Repair Center in July 2014.

We have 25 units awaiting rebuild, and the shop is running at full capacity

Mine operators are looking not only for reliable, productive equipment but also for great service and closer partnership with suppliers, and Apablaza says the rebuilds are a great tool for achieving this. “This is where we must respond to the change in the market,” he says. ■

Over the past two years, reductions in capital spending budgets have helped drive rebuilds.



Local Sandvik experts can modify equipment for use in new enviros.



Text: JEAN-PAUL SMALL Photo: ADAM LACH

UP FROM THE DARKNESS

■ **JASTRZĘBIE-ZDRÓJ, POLAND.** There are no dragons here. No dwarfs or ogres either, but from the dark depths of the Borynia-Zofiówka-Jastrzębie coal mine in Poland, 21,700 tonnes of coking coal are expertly and efficiently extracted every day.



JASTRZĘBIE-ZDRÓJ SITS at the heart of coking coal mining in Poland, about 60 kilometres southwest of

Katowice. Huge deposits were found in the area's picturesque green hills during the 1960s, and over the course of 12 years five mines were set up. Coking coal is used predominantly to make coke, an essential component for producing steel from iron ore.

As its name implies, Borynia-Zofiówka-Jastrzębie is actually three coking coal mines (Borynia, Zofiówka and Jas-Mos) that were combined into one in January 2013. The mine is operated by state-owned Jastrzębska Spółka Węglowa S.A. (JSW SA) and was strategically integrated to make bet-

ter use of the coking coal deposit and production assets, incorporate the best design solutions, implement the best organizational practices into everyday work and optimize employment resources. Borynia-Zofiówka-Jastrzębie currently employs 10,560 people and has an average daily net extraction of around 21,700 tonnes of coking coal.

The sprawling Borynia-Zofiówka-Jastrzębie site, covering 66 square kilometres, is home to a processing facility, administrative offices, storage and such shipping infrastructure as mining elevators, rails, trains and trucks. The mine itself is a vast interconnected network of tunnels and caverns, some of which are 1,200 metres deep.





**With the new
Sandvik TriSpec tools,
the efficiency of the
process was raised by
some 50 to 80
percent**



**Developmental mining
manager at Borynia-
Zofiówka-Jastrzębie,
Zbigniew Czarnecki, plans
and manages the prepara-
tory work at the mine.**



TriSpec tools

• TriSpec tools are equipped with a carbide ring placed slightly below the tip to prevent body wear and maximize carbide tip use. Each tool is available with either an insert or cap carbide tip. TriSpec tools are the top of the line in high body-wash conditions.



Cavernous tunnels snake through the belly of the Borynia-Zofiówka-Jastrzębie mine.



▶ It takes about 25 minutes to get from the surface to the belly of the mine. First the miners equip themselves with a variety of safety equipment, from lights, helmets, masks, goggles and boots to the life-saving breathing apparatuses that are vital in the event of a methane leak or underground fire. Then they take a two-minute ride on a high-speed elevator 600 metres down into the earth. After that a small, four-car train that runs throughout the mine's labyrinth of tracks and corridors transports them further downward for about 10 minutes until they reach paths that are accessible only on foot.

It's at this point that the heat, which has been steadily rising during the descent, reaches temperatures around 30 degrees Celsius. It is also very dark. At some points, the only light available to the descending miners emanates from the lamps on their helmets, which gives their approach an otherworldly feel, as if they were exploring an unknown planet or the bottom of the sea. This feeling is compounded by the utter silence (all sound is insulated and dampened by the rock face) and the puffs of dust each footstep produces. This beige powder is the product of rock dust brought in to trap the flammable coal dust. Still, the

miners are in good spirits. Despite working in dark, confined spaces, their sweaty, swarthy faces smile readily, and they address one another with a tip of the hard hat or a handshake and a hearty "Szczęść Boże" ("God bless").

After a 15-minute walk downward, the sounds of the drills and conveyor belts that carry the coke coal rise, their din indicating the location of the day's activities that involve developmental work on the rock wall.

"I lead a group of about 350 people," says Zbigniew Czarnecki, developmental mining manager at Borynia-Zofiówka-Jastrzębie. "I plan and manage the preparatory work at the mine, which involves cutting through the sandstone to expose the coal. We excavate a lot of coke coal here, which is later cleaned and treated at our processing plant."

CZARNECKI'S TEAM EMPLOYS

Sandvik MR340 and Sandvik AM75 roadheaders to build galleries along the coal bed for future extraction. It is hard work; each shift of miners cuts around 80 centimetres in a cycle before steel-arch supports need to be erected to protect against a cave-in. Where the rock is too hard for the roadheader, the

15

tonnes of coking coal are sent to the surface every 30 seconds during peak production.

team uses a drill and explosives, which limit the amount of hard manual labour required.

"We have a face with a lot of hard rock to work through," says Pawel Stepowy, a muscular roadheader operator with a decade of underground mining experience. "The rock is both up and down in the excavation's cross section. A big advantage with this roadheader, other than its toughness, is the visualization it offers. It really helps with excavating the rock when dust limits visibility. And then there are the resilient cutting tools it uses to strip away the sandstone."

One of the most important considerations at Borynia-Zofiówka-Jastrzębie is productivity. The robustness of the rock ▶

SANDVIK SOLUTION ◆◆◆◆◆◆◆◆◆◆

• Along with Sandvik AM75 and Sandvik MR340 roadheaders, the Borynia-Zofiówka-Jastrzębie mine also operates a loader from Sandvik. But it's the Sandvik TriSpec cutting tools that keep this mine humming at an efficient pace. These tools have improved operations by increasing production, offering better cost-per-tonne efficiency, improved process cost savings and enhanced energy efficiency.

TECH SPECS SANDVIK MR340 ROADHEADER

Main dimensions

- Total weight 52 t
- Total length 10,300 mm
- Height over canopy 1,850 mm
- Width over loading table 2,800 mm
- Ground pressure 0.13 MPa
- Electrical system 1000 V/50 Hz
- Cutter motor 200 kW
- Hydraulic power pack motor 63 kW
- Loader motors 2 x 36 kW

Power supply demand

- Via transformer 630 kVA
- Via generator set 800 kVA

Conveying system

- Loader star drive via conveyor motors
- Chain speed 1.1 m/s
- Capacity of conveyor max. 400 m³/h

Cutting profile


- Height 4,870 mm
- Width 7,400 mm
- Undercut 350 mm
- Negotiable gradients +/- 20 gon
- Speed of cutter head 2.3 m/s
- Tramming speed 0 - 8.8 m/min



Communication is key deep within the coking coal mine.



A big advantage with this roadheader, other than its toughness, is the visualization it offers



The roadheader strips away the rock face to access the coking coal beneath.

tools used at the mine is directly correlated to downtime, lost production and higher labour costs. Sandvik TriSpec tools are equipped with double carbide rings that substantially improve wear resistance, an essential feature in the harsh environment of a coal mine.

“Before Sandvik won the contract, each potential supplier was asked to participate in a number of obligatory tests even before actual negotiations commenced,” says Marcin Świst, Sandvik rock tools manager. “Our products performed extremely well in these tests, outperforming competing products by 150 percent.”

Janusz Piechoczek, another road-header operator with eight years on the roadway development team, knows how important it is to have robust cutting tools. “We use around five Sandvik TriSpec tools for every 20 metres of excavation,” Piechoczek says. “The quality of the tools is excellent, and these ones don’t get worn out quickly, so they have to be changed less frequently. It makes the whole project go much faster.”

Czarnecki was also impressed with the performance of the tools. “The tools the mine used earlier wore out very quickly,” he says. “With the new Sandvik TriSpec tools, the efficiency of the process was raised by some 50 to 80 percent, and the process of excavating the rock became more productive. The interruptions for the change of tools are shorter and fewer. The cutter drums are

also protected, and this is comforting for the operator, who does not have to worry about what is going on at the front of the face and can concentrate on the excavation process.

The cooperation between Sandvik and Borynia-Zofiówka-Jastrzębie extends well beyond the supply of robust tools, and looks to continue for some time in the future.

“My experience with Sandvik has been very positive,” Czarnecki says. “Each and every time I have a remark about anything, there is always a quick reaction from their side. We definitely see a continued partnership going forward.”

Once the difficult work of clearing the rock away is complete, the excavation of the coking coal can commence. When the mine is running at full capacity, express elevators ship around 15 tonnes of coking coal up to the surface every 30 seconds. After that, the coking coal is processed and prepared for shipping to the coke plant, all run by JSW. It is an efficient process, one dependent on the developmental phase, which is made even more productive when the tools are right and strong enough to tackle hard rock deep down inside the mine. ■

Our products performed extremely well in these tests, outperforming those of the competition by 150 percent



See a video about
the coking coal mine at
www.minestories.com



Interconnected railways link the site's outlying areas, making transport across the vast site easier.



About JSW SA:

- Established in April 1993, JSW SA comprises five mines that extract coking coal and steam coal: Borynia-Zofiówka-Jastrzębie, Budryk, Krupiński, Pniówek and Knurów-Szczygłowie. The company processes about 50 percent of the coking coal it produces, enabling JSW SA to offer a higher-value final product. In 2013, JSW SA's mines produced 9.8 million tonnes of coking coal (including 7.8 million tonnes of hard coking coal) and 3.8 million tonnes of steam coal. In the same year, JSW SA's coking plants produced 3.9 million tonnes of coke.

MID-SIZED MARVELS

■ The new Sandvik CH860 and Sandvik CH865 cone crushers provide advanced solutions for secondary and tertiary crushing and unrivalled benefits for their class, leading to improved reliability and productivity, and enhanced environment, health and safety attributes.

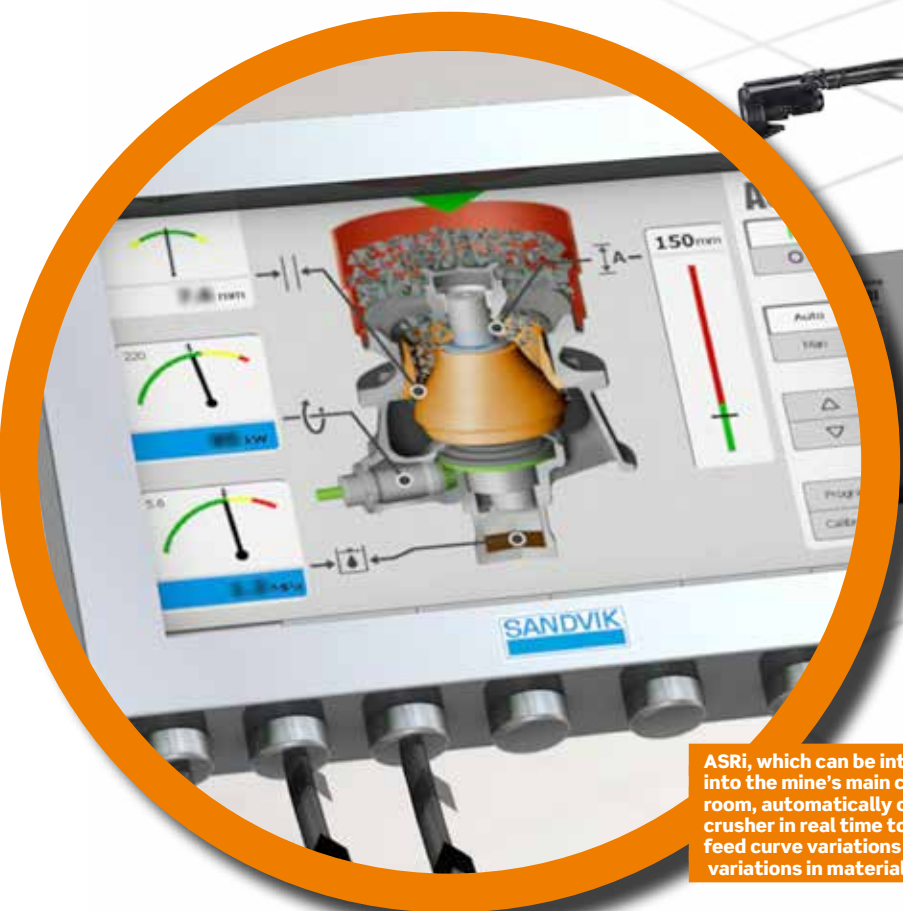
Text: **TURKKA KULMALA** Illustrations: **BORGS.NU**



Strength-optimized top shells dedicated to specific applications.

Rubber dampers reduce dynamic load by 75% for mounting on a steel structure.

ASRI, which can be integrated into the mine's main control room, automatically controls the crusher in real time to match feed curve variations and variations in material hardness.



WHAT REAL-LIFE
benefits do the
new Sandvik
CH860 and
Sandvik CH865

cone crushers offer to a mine manager looking for a healthy return on equipment investments, or a maintenance engineer concerned about the process security, or an operator keen to arrive home safe and sound after the day's work?

The role of a cone crusher can vary depending on the comminution process – a secondary, tertiary, quaternary or pebble crushing stage application. Consequently, the key performance criteria can focus on either high crushing capacity or high reduction in order to achieve the proper balance in the processing circuit.

As part of a commitment to offer new products based on field-proven technology, Sandvik builds on its traditional cone crusher strengths: the main shaft design with support at both ends as well as hydraulic support; a strong unibody structure without moving parts; adjustable eccentric throw; a constant intake opening (CLP); the Hydroset system for hydraulic setting adjustment; the automatic setting regulation system ASRi; and a slim installation footprint.

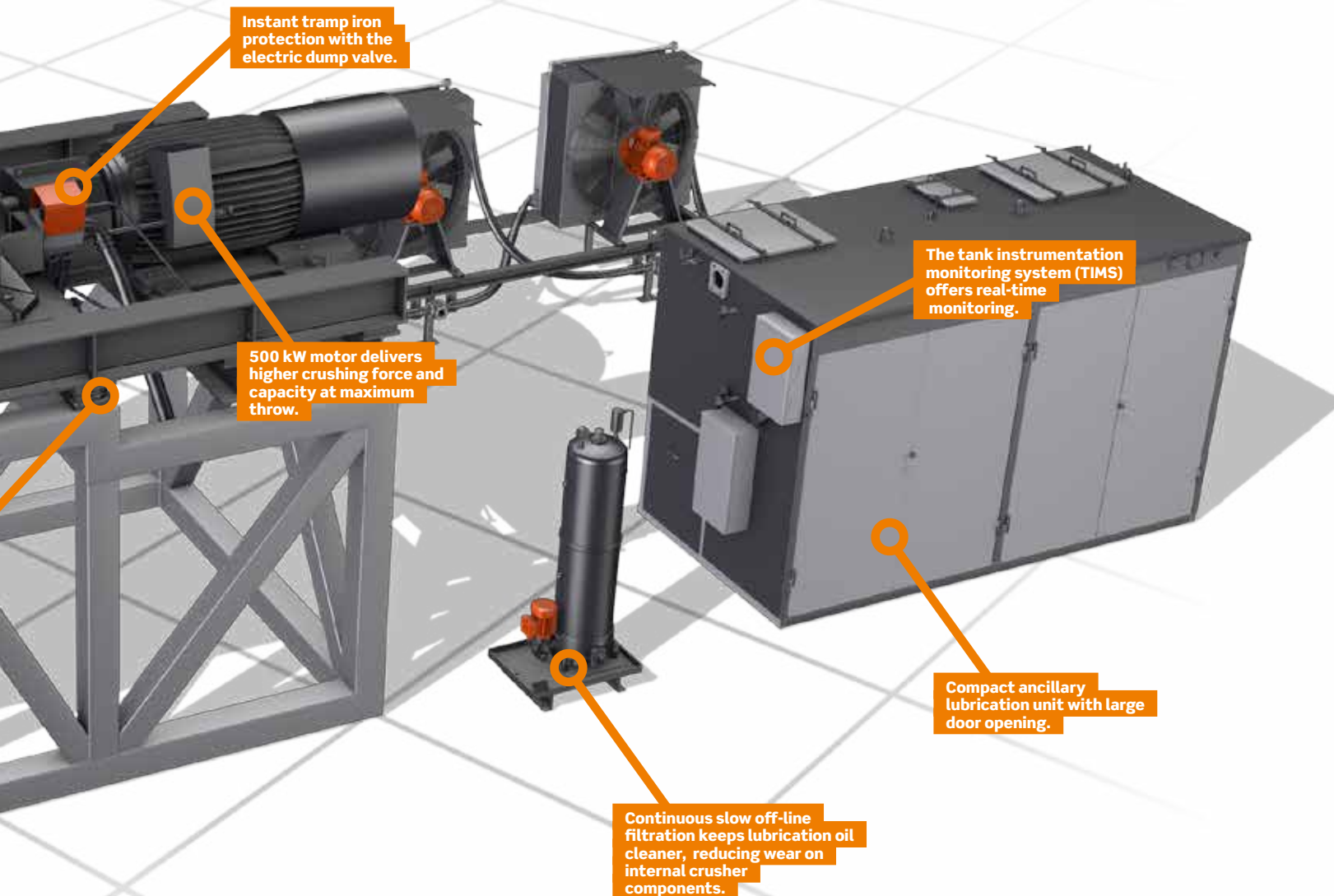
“We are expanding our CH800-series mining cone crushers to be even more competitive in the mid-range segment,” says Andreas Christoffersson, product line manager for cone crushers, Sandvik Mining. “Essentially we scaled down our successful bigger Sandvik CH890 and Sandvik CH895 mining crushers

Our goal was to create the best mid-range mining machines on the market

but added even more performance, strength and beneficial features. Our goal was to create the best mid-range mining machines on the market, and I'm confident to say that we succeeded.”

THE NEW CONE crushers can be summed up in four key words: safety, outperformance, robustness and intelligence.

High awareness of environment, health and safety (EHS) aspects is a constant focus for Sandvik Mining, and Sandvik CH860 and Sandvik CH865, ▶





A main shaft supported at both ends gives the crusher an extremely powerful crushing force.

▶ with their ease and safety of maintenance, are no exception. Having fewer moving parts than competing crushers is a good start. Non-welded, bolted liners on the top and bottom shell enhance safety thanks to easier maintenance. Health hazards related to plastics and adhesives are eliminated by plastic-free fastening of the mantle and concave. Various lifting and extracting tools make the maintenance easier and safer. Efficient off-line filtering of oil means less frequent oil and filter changes and thus an environmental benefit.

“Sandvik CH860 and Sandvik CH865 offer better safety, easier maintenance, improved reliability and higher productivity all in the same package,” Christoffersson says.

Depending on the application, the new Sandvik CH860 and Sandvik CH865 crushers outperform competing equipment in the mid-range segment by up to 30 percent. The higher crushing force relative to the mantle diameter coupled with a 500 kW motor and the intelligent automation ASRi yield better performance, less circulating load and improved

TECH SPECS

	CH860 (secondary)	CH865 (tertiary/pebble)
Nominal capacity, mtpH (stph):	214-1024 [236-1,129]	127-560 [140-617]
Max. feed size, mm (inches):	140-275 [5 ½"-10 13/16"]	60-100 [2 3/8"-3 15/16"]
Max. motor power, kW (hp):	500 [670]	500 [670]
CSS range, mm (inches):	13-51 [½"-2"]	8-44 [5/16"-1 23/32"]
Throw (range), mm (inches):	30-70 [1 13/16"-2 3/4"]	30-70 [1 13/16"-2 3/4"]
Weight (crusher only), mt (st):	40 (41)	39 (40)



Andreas Christoffersson, Sandvik product line manager for cone crushers.

profitability. Combined with a broad concave and mantle offering, the result is significantly better productivity and profitability – outperformance, as Sandvik Mining calls it.

THE INTELLIGENT SYSTEMS in Sandvik CH860 and Sandvik CH865 enable real-time performance management, most tangibly maximized crusher performance and productivity. Other major benefits include easy and quick calibration and flexible capacity balancing as well as platform and parts commonality. Smart, compact design solutions reduce dynamic loads and

minimize the engineering and installation work. The tank instrumentation monitoring system, a part of the enclosed three-in-one compact lubrication tank, guarantees high reliability and real-time monitoring of the main and pinion shaft lubrication as well as the Hydroset hydraulic tank.

ROBUSTNESS REFERS TO the overall reliability and durability benefits of the new Sandvik Mining crushers. High structural strength and advanced systems protect your investment from unplanned downtime. The electric dump valve offers instant tramp iron protection from uncrushables and reduces potentially destructive pressure peaks by more than 90 percent. The high sampling rate (200 times per second) of the PLC control system enables immediate response to the first pressure peak and active control of the pilot valve opening time and thus lowers the mainshaft, allowing the tramp iron to pass. Wear and seizure risk is reduced thanks to an improved over-pressure system that prevents dust from entering the dust seal ring. Offline filtering helps to keep the lubrication oil clean, which further reduces the wear on internal components and the risk of seizures. ■

SANDVIK SOLUTION: Automation for outperformance

THE NEW SANDVIK CH860 and CH865 cone crushers combine a range of advanced automation features for a more secure and productive process.

The Hydroset main shaft support system provides protection from overloads by permitting tramp iron and other uncrushables to pass through the crusher, and then automatically returns to the original setting.

The “brain” of the control system is ASRi, the Automatic Setting Regulation system, which constantly monitors the power draw, Hydroset pressure and mainshaft position (and thus CSS) in

real time and automatically adjusts according to the data. The system compensates for crushing chamber wear to provide consistent product size. ASRi also allows quick and easy remote calibration, and is included as standard in both crushers.

Another standard feature is the Tank Instrumentation Monitoring System for controlling temperatures, pressures and oil flows in the lubrication system. The tank unit maintains automatic oil flow to bearings and permits full lubrication independently of the crusher itself and alerts the operator when preset limits are exceeded.



A WORLD FIRST IN FIRE- FIGHTING

■ Australia plans to tighten regulations banning the use of harmful fluorine-based agents in fire-suppression systems. Enter Eclipse, the world's first fluorine-free foam for mobile fire suppression.

Text: **ALANNAH EAMES** Photo: **SANDVIK**

USUALLY WHEN FIGHTING a fire, the first thought is how to put it out as quickly as possible to avoid loss of human life and limit the damage to equipment and buildings. But have you ever thought about what's in the foam used to extinguish a fire? Or what happens once this foam soaks into the ground around the scene of the fire?

In 2013 Sandvik Fire Suppression, headquartered in Australia, set out to develop a new foam for mobile fire suppression. The goal was to come up with a firefighting product that would have less of an impact on the environment than anything else on the market. To do this, Sandvik wanted to create a fluorine-free product that would not cause long-term damage to the environment.

The result is Sandvik Eclipse, a world first, which has numerous benefits for customers who use mobile equipment in surface and underground mining, construction, forestry, waste management, materials and freight handling and locomotives.

Sandvik Eclipse extinguishes fires faster than old-technology fire-suppression solutions, and it has better post-fire protection to ensure that the fire cannot be reignited. Firefighters will also avoid inhaling fluorine, which can cause serious health concerns.

"It's a win-win situation," says Michael Sargaion, sales manager for Sandvik Fire Suppression, who managed the Eclipse project. "Our customers will better protect their staff, their facility and their production from the risk of fire. There's another bonus for cost-conscious customers. It's roughly the same price as other foam systems but will cost companies less in clean-up operations due to the lower environmental impact."

Most firefighting foams contain fluorinated compounds that can pose a threat to human health and the environment when released into the air or soil. Often these fluorine-based substances accumulate in waterways and underground aquifers, such as

Australia's Great Artesian Basin, polluting the water and interfering with the local plant and animal life. Over time, the pollution builds up to toxic levels, making many of these marine habitats unusable.

"We wanted to seek an alternative product that would offer superior protection for human health and our customers' production, reducing these chronic health and environmental risks," Sargaion says.

SANDVIK ECLIPSE was developed and launched in Australia, a country with some of the toughest environmental regulations in the world.

"Australia was a logical choice for the launch as it leads the world in the development of fluorine-free foam fire-suppression agents," Sargaion says. "Our regulatory framework demands that all fluorinated

Sandvik Eclipse is perfect for customers who use mobile equipment in a variety of locations.



This will become the new standard for mobile fire suppression



Sandvik Eclipse is fluorine-free foam that completely degrades within 60 days, leaving no harmful residues behind.

foams must be restricted from release into the environment, lest they add further to the current level of contamination.

“The one limitation of the Eclipse is that it has suboptimal performance in temperatures below zero, thus limiting the range of countries in which it can be sold. Nevertheless, R&D continues working to improve and expand its range.”

No sooner was Eclipse launched than many major Australian mining houses and contractors made it the new standard for foam fire suppression at their facilities and on their vehicles.

Sargaion’s team intensively researched fluorine-free agents that would minimize environmental impact and meet the Sandvik ‘Zero Harm’ commitment.

“We shortlisted several potential candidates during this gruelling process and then conducted live fire testing at the Queensland Fire and Rescue

Service Live Fire Campus in Brisbane,” Sargaion says. “This was a good place to test it as they, like most public sector organisations in Australia, don’t allow fluorinated foam fire-suppression agents at their facilities.”

After the initial testing at Brisbane’s Whyte Island facility, and internally to ensure the new solution would be compatible with other Sandvik systems, one agent was chosen. This agent was then tested for compliance with the Australian Standard 5062-2006, which regulates mobile plant fire-suppression systems across the country. It passed the test and was awarded a place on the ActivFire listing scheme for fire-protection equipment.

THE PRODUCT QUICKLY made headlines as the world’s first fluorine-free fire-suppression foam for mobile equipment. It can be used on all fires for mobile plants and equipment and can be safely discharged into soil. Unlike other fluorine-based foams that can remain trapped in soil or water for up to a thousand years, Sandvik Eclipse foam completely degrades within 60 days, leaving no contaminants or harmful residues behind.

“The Eclipse system will appeal to any customer who wants the most effective, most environmentally sustainable fire suppression for their mobile plant,” Sargaion says. “The uptake in Australia has been rapid, as corporate Australian business places a high emphasis on environmentally sustainable practice that has a minimum impact on our fragile ecosystems.”

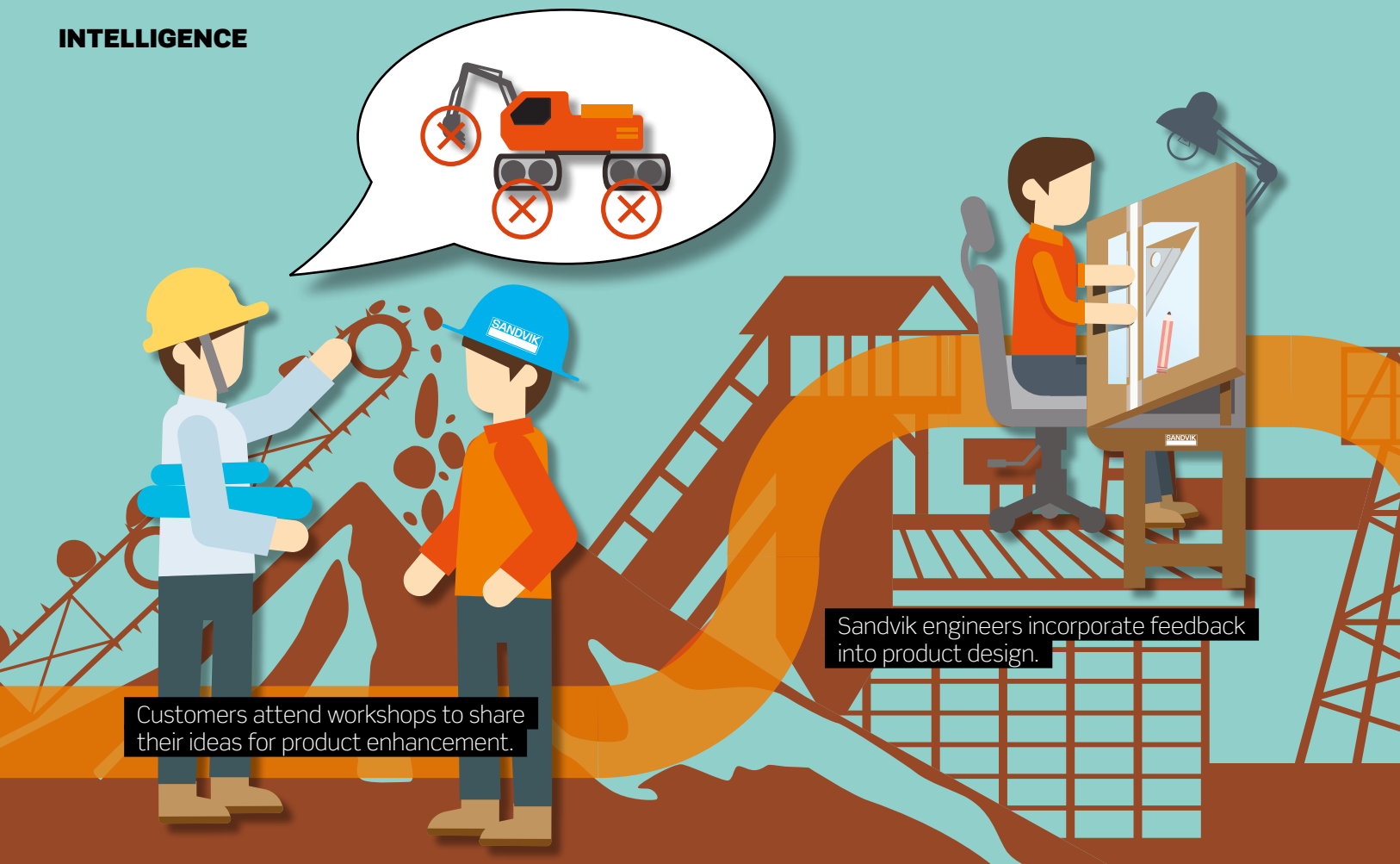
All Sandvik-compliant fire-suppression systems that are serviced by Sandvik will be converted to Eclipse. Sandvik can then recommission them as fluorine-free systems and provide all the required documentation.

“This will become the new standard for mobile fire suppression,” Sargaion says. “The new government policies on the use and disposal of fluorinated foams will be a major driver of this new technology.” ■



About Sandvik Eclipse

SANDVIK LAUNCHED ECLIPSE in July 2014. Developed and produced in Australia, it is the first fluorine-free fire-suppressant foam of its kind in the world. It is suitable for mobile plants and equipment used in surface and underground mining, construction, forestry, waste management, materials and freight handling and locomotives. It can be used in all new and existing Sandvik-compliant fire-suppression systems. It has AS5062 2006 certification from the Australian regulatory authorities. Eclipse is perfect for warm weather climates and currently sold in Australia, Southeast Asia, Africa, Europe and North and South America.



Customers attend workshops to share their ideas for product enhancement.

Sandvik engineers incorporate feedback into product design.

FROM INPUT TO INNOVATION

■ Little did Peter Campain know that his input at a workshop in 2011 would result in a redesigned Sandvik TH663 truck and a new fleet for underground mining contractor Barminco.

Text: **JIM WARD** Illustration: **SPOON**

EARLY IN 2013 Peter Campain, general manager of assets at leading Australian underground mining contractor Barminco, extended an intriguing invitation to three of the world's leading underground truck manufacturers.

He explained that he would be retiring the company's entire truck fleet of 54 pieces over the next three years and would be looking to replace them with 30 to 50 new pieces.

He added one proviso: The entire new fleet would be made up of a single make and model of truck.

"We knew that by running a single-model fleet we could substantially reduce our investment in inventory, and our fitters would become specialists, dealing with only one set of systems," Campain says.

Fifteen years ago, Sandvik 50D and Sandvik 50 Plus trucks were the core of the Barminco fleet, but the contractor had phased these out by 2006.

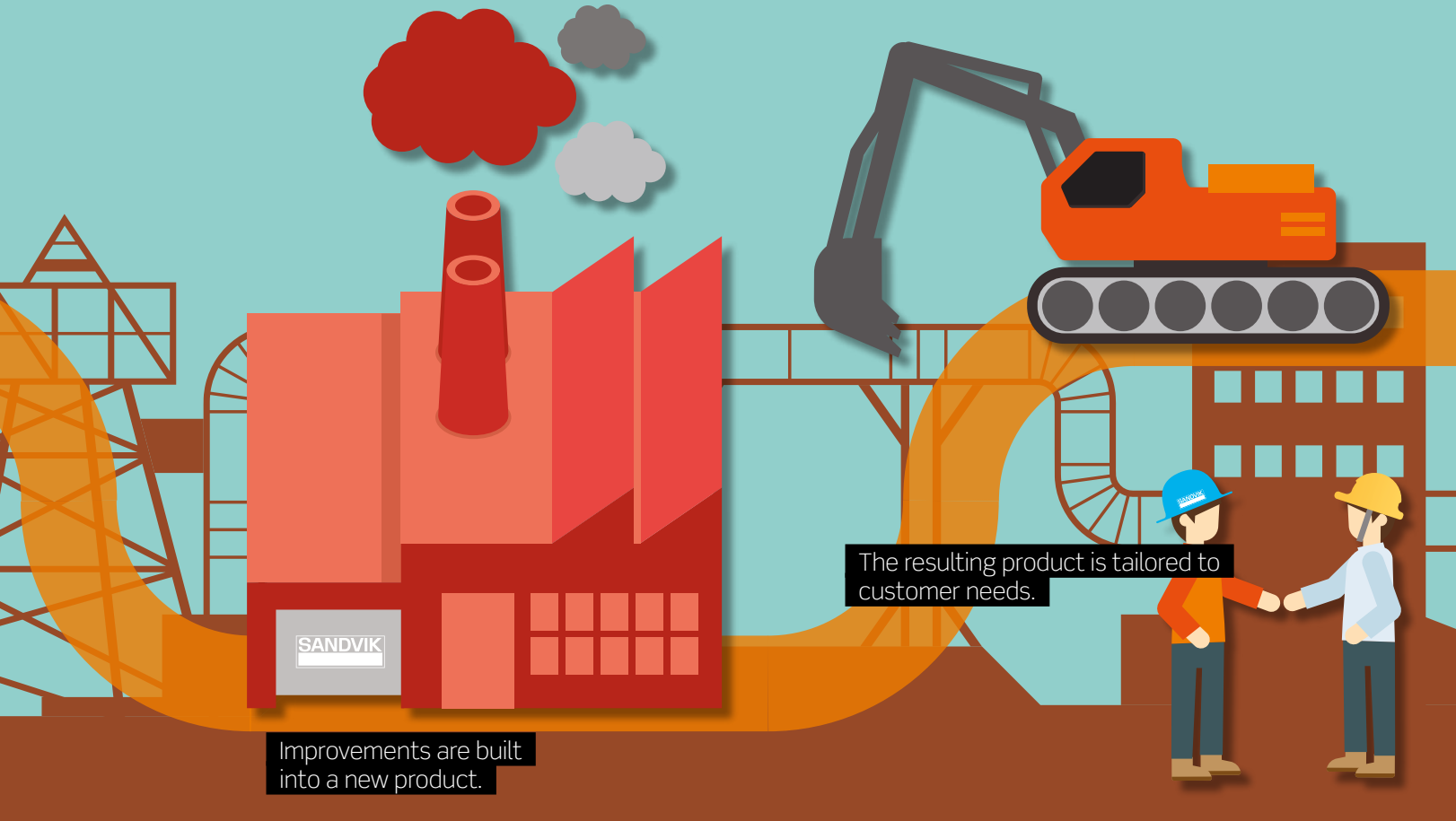
Campain did not initially place Sandvik at the top of his shopping list, in part because of the company's

reluctance to provide detailed information on its new Sandvik TH663 trucks, the first prototypes of which he had a hand in designing and were in trials at the Darlot gold mine in Western Australia.

CAMPAIN'S INVOLVEMENT WITH the development of TH663 dates back to a time when the new truck was just a gleam in the eyes of the Sandvik design team. In 2011, Campain accepted an invitation to attend a Sandvik industry workshop in Perth, one of an ongoing series that the company puts on around the world to get customer feedback on its product range.

Following presentations on all the main product groups, delegates were split into small teams to follow a highly structured process of identifying what they liked and didn't like about the equipment, and what changes they would put on their wish list.

"When I finally saw the prototype, late in 2013, I was impressed to see how much of what we had discussed had been incorporated into the truck's final make-up," Campain says.



ALSO OF SPECIAL interest for him was diagnostics, particularly the wireless transmission of data. Past experience in this area with a number of OEMs had left him dubious, he says.

“This truck’s CANbus system provides a very high level of diagnostics,” he says. “A Sandvik technical crew is working with us at Sunrise Dam to develop a wireless data logging system that will ultimately enable data to be remotely accessed from any point in the mine by Barmenco and Sandvik personnel at the mine site and in Perth.

“With this system in place, mine management will have minute-by-minute access to production data, and our maintenance staff will be able to pick up problems at an early stage, leading to faster and more economical repairs.”

Service access was another aspect of the design that Campain focused on at the forum. Underground material, by its nature, has to be very compact, and this can often create access difficulties.

“I was very happy to see how well thought-out the hatches and access ways are on the finished truck, particularly the engine bay cover, which is designed

35

percent larger than its predecessor, TH663’s cabin was designed with operator safety and comfort in mind.

to be lifted in one piece,” he says. “Most trucks suffer external damage to protruding components like lights. Sandvik has addressed this sort of thing well. All lights are recessed, and they’ve even included a special housing for the fire extinguisher. Time and again I find myself looking at different aspects of the truck and thinking, ‘Someone has put a lot of thought into this.’”

Overall, Campain says, the customer consultation process was a welcome initiative that definitely helped Sandvik make its TH663 the truck it is today.

“I’m happy to have made some input into the design of this truck. More importantly, I’m looking forward to working with Sandvik personnel on site on an ongoing basis to continually fine-tune and upgrade what is, in my view, the very best performance-for-price underground truck currently available.”

Barmenco’s one-model fleet replacement programme is now under way. The company purchased five TH663s in 2014, with a further six scheduled for delivery in the first quarter of 2015. ■

ABOUT TH663

- Sandvik TH663 weighs in at 43 tonnes, approximately eight tonnes lighter than the model it has replaced, with a resultant drop in fuel consumption.

Operator comfort and safety are enhanced by an ergonomic and noise-suppressed safety cabin, 35% larger than on earlier models.

The new front frame suspension has been designed to reduce jarring vibrations that contribute to driver fatigue and can cause long-term back and shoulder problems. It has been designed with speed and safety of maintenance in mind. Regular service points are accessible from the ground level.

A unique feature of the truck is its built-in jack system, which provides a much faster and safer means of changing a wheel in the event of a tyre blowout underground.

With an overall length of 11.58 metres and a width of 3.48 metres, the truck has an outside turning circle radius of 9.35 metres.



SPACE INVADERS

T-minus 10...9...8.... Mining in space may be years away, but the countdown has started, and several companies are now seeking to be the first miners in space.

Text: JEAN-PAUL SMALL Illustration: MIKKEL JUUL JENSEN

▶ **ASTEROID MINING MAY** sound like science fiction. In fact, modern-day films like *Alien* and *Moon* and a myriad of books use interstellar mining as a background setting for their narratives. But this is no work of fiction. More and more companies, such as Planetary Resources and Deep Space Industries, focusing on mining large asteroidal specimens have popped up recently. Their goal: to find cost-efficient ways to access the precious resources within these floating cash cows, whose yields are estimated in the trillions of dollars.

Asteroids, the rocky-metallic bodies left over from the formation of the solar system and still in the sun's orbit, are replete with water, platinum, nickel and cobalt. While the benefits of mining scarce minerals like platinum are obvious, the water within asteroids can be broken down into hydrogen and oxygen for fuel and left in orbiting caches in space, solving one of the great problems of space exploration: fuel availability.

Accessing these floating deposits is another

matter entirely. The three most logical options for mining involve bringing raw asteroidal material to Earth for use; processing the asteroids in space and bringing back only the desired materials; or transporting the asteroid into a safe orbit around the Moon, Earth or International Space Station.

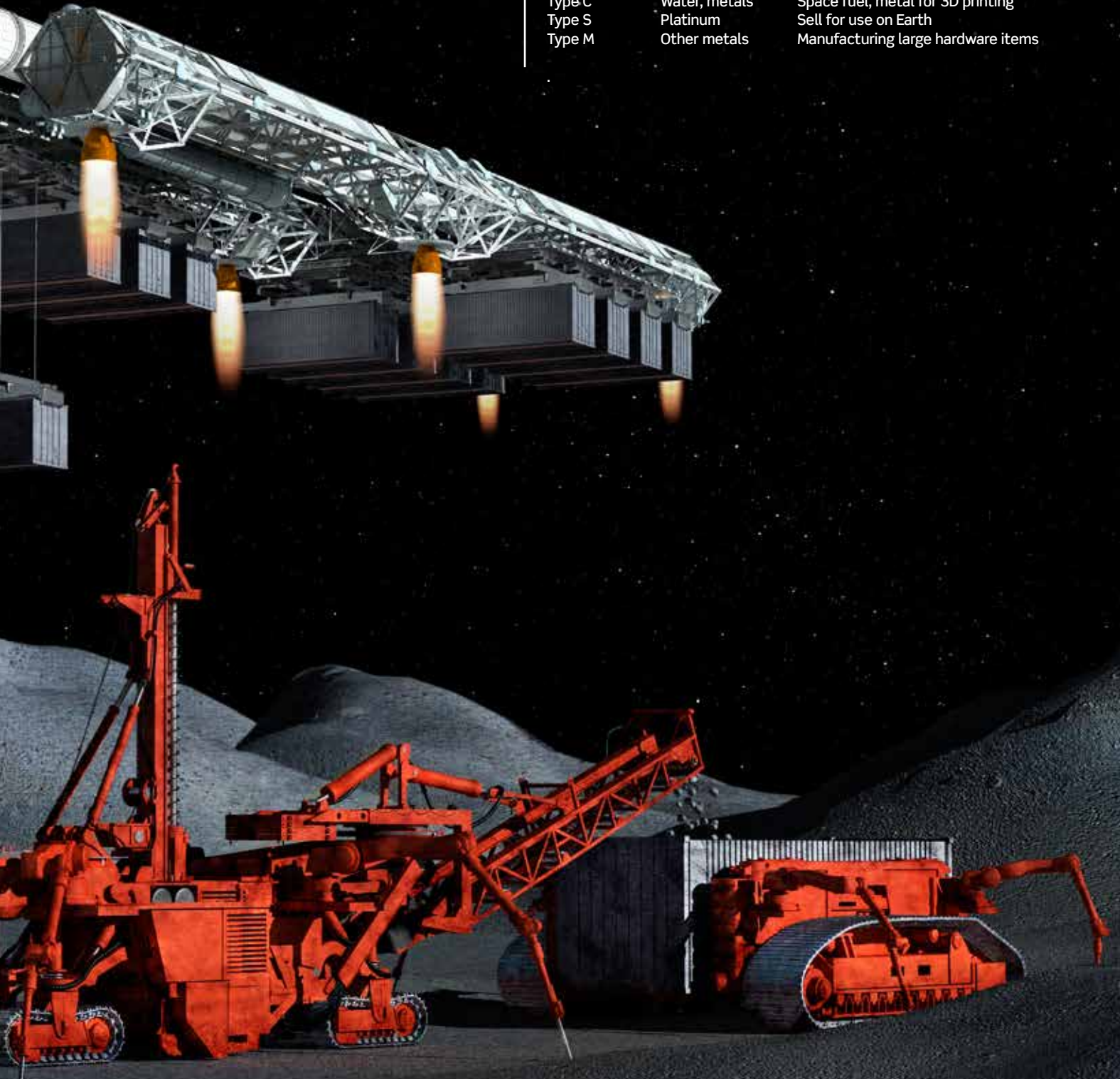
And because not all asteroids are created equal, there's the problem of determining which ones are even worth mining. Planetary Resources is attempting to solve this issue with space telescopes, small spacecraft (30 to 50 kilograms) that employ a laser-optical system that can be used to survey and examine near-Earth asteroids. The company placed a small version of the telescope aboard the Antares rocket on an unmanned mission in October 2014, but the rocket exploded just seconds after liftoff, destroying the cargo. Clearly, there is still a long way to go before asteroid mining is commonplace, but the first small steps are being taken now, and more likely than not they will end up being giant leaps forward. ■





Asteroid types for mining in space

<i>Spectral type</i>	<i>Resources</i>	<i>Purpose</i>
Type C	Water, metals	Space fuel, metal for 3D printing
Type S	Platinum	Sell for use on Earth
Type M	Other metals	Manufacturing large hardware items



Theoretically, there are many ways to extract the essential elements from asteroids including strip mining, shaft mining, heating and magnetic rakes for mining heavy metals.

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Ready to roll.

Our complete components offering supports modern conveying practices in mining and includes rollers and frames, idlers, pulleys and belt cleaners, condition monitoring and safety control devices and loading sections. With an emphasis on performance and reliability, products are easily available through the global Sandvik network both as original components and as replacements in existing systems.



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Total handling.

Sandvik has the long-term experience to design, manufacture and install virtually any kind of bulk materials handling system. From mining systems on surface and underground to integrated stacking and reclaiming systems for mines, terminals and port facilities, we offer total solutions and turnkey installations. We also offer a wide range of conveying equipment and quality components for plants, as well as upgrading and modernization services.



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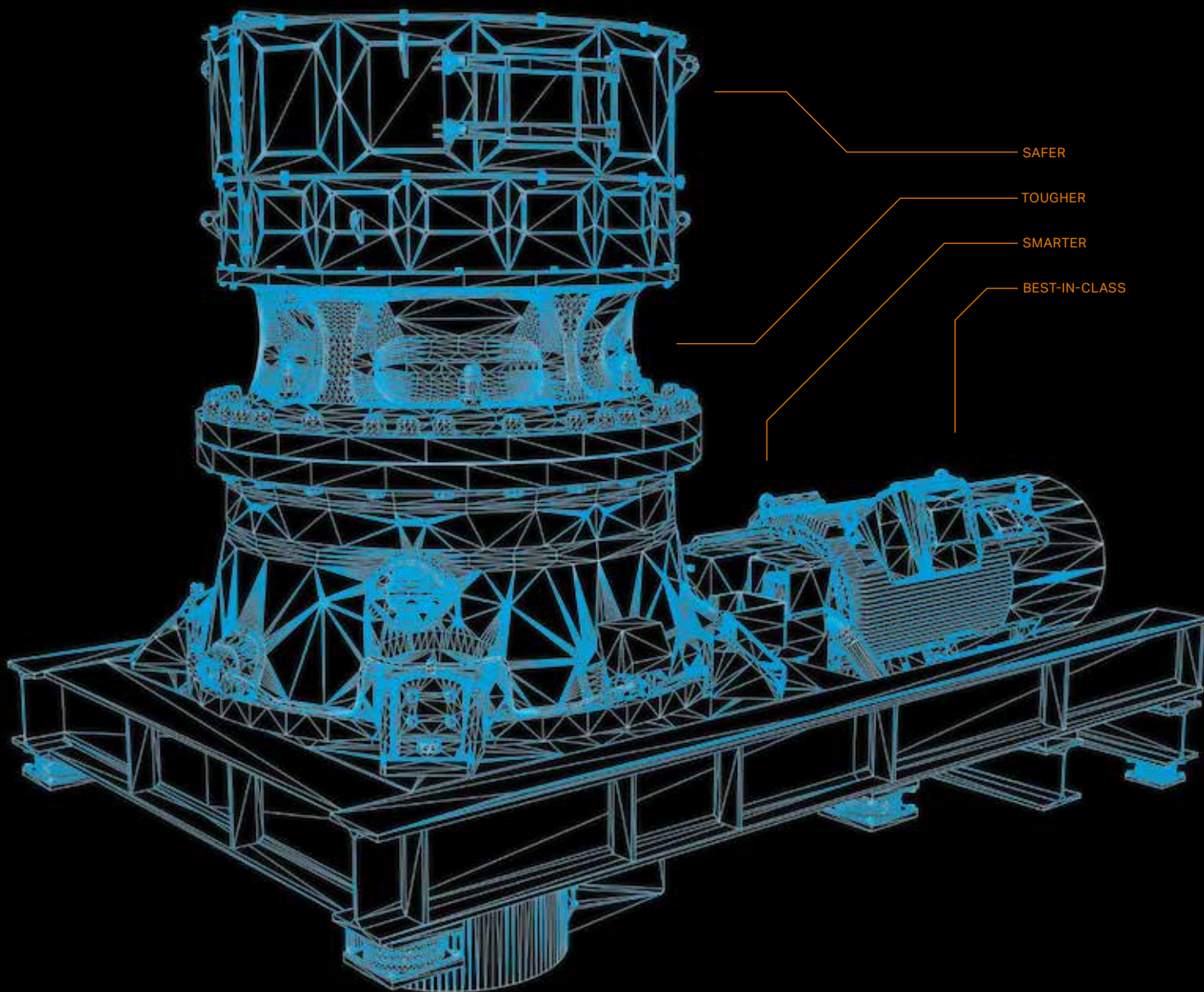


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