The great success!

Canada: Hush-hush loading  TH Trucks: Efficiency personified

Bolter miner: a hit in China

Busy times in the Zeltweg plant, Austria

Intelligence: How to reach the carbon emission goal
Dear reader,

YOU MAY BE aware that there have been some changes going on within the Sandvik Group over the past few months. One of the changes is that a new business area has been created, Sandvik Mining.

Mining, of course, a core business within the Sandvik Group, and the creation of this new, dedicated business area means that we will be able to place an even greater focus on our mining customers.

We will, as always, continue to listen to your needs and act with speed to serve you in the best way. I personally commit to setting aside time to visit and interact with customers as often as possible, to gain an even deeper understanding of how we as an organization can support our customers in their business and make a difference to their bottom line.

ENVIRONMENT, HEALTH AND Safety (EHS) has always been a cornerstone in our values. We want to continue to work alongside our customers in developing our efforts in this area, as our ambition is to have the safest equipment on the market.

Here in the latest issue of Solid Ground you can read about our recently launched underground trucks Sandvik TH540 and TH550, both of which are great examples of safety and efficiency. Another good example is the Sandvik MB600 series of bolter miners, where combining the cutting and bolting processes not only results in increased speed but also increases operator safety.

Enjoy reading Solid Ground and learning about the latest developments within Sandvik Mining. I hope to see some of you personally in the near future!
18 Power and capacity - the new TH Trucks bring it on.

32 The importance of safety awareness for customers.

10 Going deep below to get hold of the black gold.

36 Fasten your spaceship-belts: prospecting is coming to the Moon.

26 Lean, mean working machine.

7 Mining coal from the fleet manager’s point of view.
When a torrential rainstorm flooded Italy’s picturesque Cinque Terre region last October, Sandvik sprang into action. The company sent a TORO 151D and a 400D — original models of today’s LH series compact loaders — from client IM-Fabi to Vernazza, the hardest hit of the region’s five coastal villages.

The loaders were quickly freed from operation at a mine near the client’s headquarters more than 250 kilometres away to clear the mouth of the Vernazza River, which reaches the sea through a tunnel that was clogged by mud. This relief work enabled drainage of water flooding the town square.

A team of operators ran the Sandvik machines for 22 hours a day in alternating shifts, racing the clock to clear mud and debris from the mouth of the river during a forecast three-day break in the weather. The rainstorm brought half a metre of water to the region. Streets quickly turned into muddy, debris-filled rivers in Vernazza. The harbour flooded and three people drowned before the town was evacuated. Property damage was extensive.

“We took the situation to heart and responded quickly, identifying and procuring suitable means and coordinating the logistics, transport and technical assistance,” says Federico Scialari, territory manager for Italy and the Mediterranean.

“When there is a community in need, we try to stand by that community and help those most in need.”

Rock tools for Russian gold

- Russian gold mining company Buryatzo-loto has ordered tapered rock tools for handheld drills from Sandvik to a value of 1 million euros, for delivery during 2012. The order includes drill rods and bits featuring the new XT48 grade, with a carefully engineered combination of wear resistance, ductility and hardness. Tests made at Buryatzo-loto’s Holbinsky mine have shown significantly increased tool life compared with other alternatives on the market, with improved productivity as a result. Buryatzo-loto is part of the Severstal Group and is located in Russia’s Dauria region east of Lake Baikal. Sandvik has provided the company with mining tools since 1997.

- Gold Fields’ South Deep gold mine has deployed the first fully mechanized rock bolter in the South African mining industry. The Sandvik DS210L-M is a one-man-operated electrohydraulic low-profile rock-bolting rig, enabling several rows of bolts to be installed without moving the machine.

The South African mining industry is increasingly focusing on mechanized mining, which has proved to be safer than conventional mining methods in many applications. The Sandvik DS210L-M is capable of executing rock reinforcement in excavations with headroom as low as 1.6 metres.

Safer South African rock bolting

- Sandvik Mining has been awarded a contract for the supply of 14 LH517 LHDs (load-haul-dumps) for Newcrest Mining’s Cadia East mine near Orange in New South Wales, Australia. Released in late 2009, the Sandvik LH517 is a new-generation high-capacity underground LHD. It offers improved safety and higher productivity than previous models, through redesigned hydraulic and electronic systems.

The project involves development of the massive Cadia East deposit, one of the world’s largest gold deposits.
Major materials handling orders

- Sandvik has signed three major materials handling contracts with a combined value of more than 1.6 billion Swedish kronor (180 million euros). The orders come from companies in Australia and Latin America and will be executed from 2012 to 2014. In Australia the order refers to design, supply and installation of materials handling equipment for iron ore stacking and reclaiming in Rio Tinto’s Nammuldi Project. The Latin American orders include the design and supply of continuous mining equipment for a fully truckless In-Pit Crushing and Conveying (IPCC) system and two surface-mine waste lines.

Sandvik Mining extra social

- Mining professionals who want to keep up to date on industry developments in general – and Sandvik Mining’s technology in particular – have several digital channels at their disposal. Solid Ground’s website serves as a hub for news, features and product articles from around the world. The magazine is also available as an iPad application. For details on Sandvik Mining and its products, a visit to the company homepage is recommended.

THE QUOTE

“Even though we don’t have the cheapest product per piece, it should still be the cheapest product for our customers to use.”

-Sandvik CEO Olof Faxander, addressing a sold-out luncheon of Australia’s Melbourne Mining Club in March. Faxander discussed trends driving the development of the industry and their influence on mining technology.

Heap of bolter miners destined for China coal mines

- Chinese coal company Shenhua Shendong has signed contracts with Sandvik including 21 bolter miners. The value of the contracts exceeds 500 million Swedish kronor (56 million euros), and delivery of the equipment is scheduled during 2012 and 2013. Sandvik bolter miners have a strong performance record in Chinese coal mines and an outstanding safety record. There are already 26 Sandvik bolter miners in operation in Shenhua Shendong’s sites, and another three units are currently in the process of being delivered. By 2013, the company’s Sandvik bolter miner fleet will comprise a total of 50 units.

Read more about bolter miners on page 26.
MINExpo’s next dimension
Sandvik showcase goes 3-D

Visitors to the Sandvik booth at MINExpo International 2012 will have a unique opportunity to explore products in 3-D, thanks to the new Sandvik Virtual World.

First demonstrated as a prototype at Bauma China 2010, Sandvik Virtual World lets exhibition attendees harness the power of the company’s equipment in digital mine environments.

“The 3-D format allows us to present our equipment in action and focus on benefits and features via animations,” says Helene Carlsson, marketing communications manager for programmes and events. “The Sandvik Virtual World makes it easy to show our leading-edge technology, and we welcome visitors to ‘surf’ and explore our products. Passersby can follow the experience on a larger 2-D screen.”

Sandvik Virtual World will showcase the strengths and functionality of some of the company’s latest products. Surface mining products included in Sandvik Virtual World are the CR810 Hybrid Crusher, PF300 Fully Mobile Crushing Plant with PB400 Belt Bridge, PA200 Spreader and DR560 DTH Surface Drill. Underground products featured are the company’s MH620 Roadheader, DD421 Mining Jumbo, MB670 Bolter Miner and TH550 Underground Truck.

REVOLUTIONARY CRUSHER
Sandvik products on display in Las Vegas will include the MB610 Bolter Miner, DR560 DTH Surface Drill, underground trucks, rock tools and conveyor components. Sandvik will also unveil a new eco-efficient comminution machine that Chris Blunk, of marketing communications and sales support, calls “revolutionary.”

The products and Sandvik Virtual World will be the centrepieces of Sandvik’s 16,415-square-foot (1,525-square-metre) booth, which will incorporate contemporary global design trends with organic shapes and LED screens over printed graphics. Efficiency, Sandvik’s overall theme for the event, will be embodied throughout the booth.

“Visitors should leave knowing that Sandvik Mining is the most innovative company in terms of resource efficiency, and understand how it is optimized and crucial for achieving productivity and profitability,” Blunk says. “We want to show visitors that Sandvik Mining is the needed solution if you want to get ‘more from less’, whether it’s in terms of human talent and innovation, capital, time, environment or equipment and tools. We understand the value chain: how the elements of mining mesh to deliver resource efficiency.”

MINExpo in figures

The world’s largest exhibition for mining equipment, products and services will reunite the world’s mine operators at the Las Vegas Convention Center in September for the fifth time since 1996.

850,000
Square feet (79,000 square metres) of exhibit space is projected, which includes 11 exhibit halls and outdoor exhibit areas.

38,000
Visitors expected to attend the three-day trade show this year.

1,700
Exhibitors expected to showcase equipment, products and services, an increase of nearly 500 from MINExpo 2008.

70%
Approximate percentage of visitors representing U.S. companies. The next-largest contingents come from Canada and Latin America.

89%
Measured percentage of visitors who have buying power.

$9,300,000
Average planned expenditure for equipment, products and services. As many as 65 percent of attendees plan to make a purchase.
IN THE NORTHERN Chinese region of Inner Mongolia, around the booming city of Ordos, miners are ramping up coal production using modern equipment and new technology. Yan Hongqi, fleet manager at the Shenhua Shendong Group’s Wanli No. 1 mine, has seen the risk of accidents almost entirely eliminated after the introduction of Sandvik’s bolter miners.

WHAT ARE YOUR JOB RESPONSIBILITIES AS FLEET MANAGER?  
“I’m responsible for the overall operation of the No. 2 fleet of Wanli No. 1 mine.”

WHAT ARE THE CHALLENGES IN YOUR WORK?  
“The geological conditions at this mine are very complex. The roof and floor are not in good condition, making it difficult to install bolts. Thanks to the Sandvik MB670, which can cut roadways while installing bolts, roof-fall accidents have been totally eliminated at the Wanli No. 1 mine.”

WHEN DID YOU START YOUR COLLABORATION WITH SANDVIK?  
“Our first Sandvik bolter miner arrived in 2008. Sandvik engineers assembled it on-site and provided detailed instructions about its operation. Now the number of Sandvik bolter miners in our fleet has increased to five.”

WHAT DO YOU THINK OF SANDVIK’S SERVICES?  
“The cooperation with Sandvik has been going very well. Their engineers are professional and committed, standing ready to help us solve problems.”

MINING WITHOUT RISKS
Foreign farewell

Indonesia looks inward

- In a move to claim a larger share of the country’s mineral resource profits, the Indonesian government will limit foreign mine ownership to no more than 49 percent by the 10th year of production.

- To accelerate reduction of foreign ownership, Indonesia may also ask foreign mine investors to sell shares to the government.

- The new rules, announced in March on the mining ministry’s website and signed by President Susilo Bambang Yudhoyono, seek to boost domestic ownership even further. In 2009, the government enacted a law that required local ownership of 20 percent by the sixth year of production.

- The new regulations apply to both new and existing foreign licence holders, though asset divestment deadlines have yet to be established.

- Indonesia is the world’s top exporter of thermal coal and tin. The country is also home to plentiful gold and copper reserves.

Billionaire springs for hot iron

- Australian iron is in demand. Billionaire Gina Rinehart plans to develop the world’s largest iron ore mine in Western Australia and aims to start production and shipping by the end of 2014. The mine is expected to produce up to 55 million tonnes of iron ore annually.

- Other interests are South Korean steelmaker POSCO, trader STX Corporation and Japan’s Marubeni trading company, who agreed to pay $3.67 billion this spring for a 30 percent stake in Australia’s Roy Hill iron ore venture.

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Gold gained again in 2011

- Gold prices increased in 2011 for the 10th straight year, fueled by global economic uncertainty, the banking crisis in Europe and the budget emergency in the United States. Gold soared to a record price of $1,921 per ounce last September and closed the year near its 2011 average of $1,590 — a 10 percent increase from 2010.

- The rising prices improved profit margins and cash flow across the mining industry last year. While bullion demand in emerging markets such as China and India has slowed in 2012 and gold fell to a three-month low in early April, it remained above last year’s average.

Proposed mine smells fishy to Alaskans

- A proposed mine near the world’s largest salmon fishery in Alaska has provoked significant opposition from the local community and commercial and sportfishing businesses.

- UK mining company Anglo American and its Canadian partner Northern Dynasty seek to develop North America’s largest copper and gold mine at the headwaters of Alaska’s Bristol Bay watershed.

- An investor advisory published earlier this year by environmental protection nonprofit Earthworks identified “unprecedented” infrastructure requirements for the project, including massive tailings ponds and dams, a deepwater port, four pipelines, a 378-megawatt power plant, 200 miles of power transmission lines and a 100-mile road.

- Legal, environmental, operational and reputational risks may prevent the mine from ever being built, Earthworks asserts.

Putin plans to push east

- Russian President Vladimir Putin wants to develop the country’s unspoiled Far East and eastern Siberia and restart some old mines dating back to Tsar Nicholas II, Russia’s last emperor.

- Putin, who won another six-year term as president in March, suggested during his campaign that Russia needs a state corporation to accelerate projects.

- The country will need to invest billions in the coming years to develop the infrastructure necessary to reach, extract and export the untouched deposits of iron ore, gold and coal.

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A breakthrough project to extract gold, copper and other minerals from the seafloor off the coast of Papua New Guinea is gaining speed. Increased global demand coupled with recent advances in technology made the Solwara 1 project economically viable for Canada’s Nautilus Minerals.

Ray Binns of the Commonwealth Scientific and Industrial Research Organisation and Steve Scott, professor emeritus of ore genesis geology at the University of Toronto, first discovered the hydrothermal field of high-grade seafloor massive sulfide (SMS) mineral deposits in the Bismarck Sea more than 15 years ago. SMS deposits, the modern equivalents of ancient volcanogenic massive sulfide (VMS) ore deposits, were formed over the course of thousands of years by natural hot springs on the seafloor.

Nautilus initiated Solwara 1 in 2005. The licence from New Guinea allows the company to mine a site roughly the size of 21 football fields. After several years of mapping, surface sampling and core drilling exploration, Nautilus plans to initiate subsea lift pump testing by the end of the year and hopes to launch initial production by the end of 2013.

Q: What are the primary technical challenges of seafloor mining?
A: It’s a challenge insofar as it’s never been done before, but engineering things to work in the deep sea is not new. The technical challenge really is to make all the machinery work together in unison. Working 1,600 metres below sea level, there are obvious technical challenges. But as I ask people, what’s easier – going down through 1,600 metres of water or 1,600 metres of rock?

Q: How large are seafloor mineral reserves compared to those on land?
A: The deposits range from the size of a living room to several million tonnes.

Q: What are the most important environmental considerations of seafloor mining?
A: The big issue is biology and ecology — destroying the only living example of something that could never be studied again — and Nautilus is well aware of that. They’re being very environmentally conscious. That’s probably why they’ve made so much ship time available to biologists and asked them to do a detailed survey of the area they want to mine and developed plans for how to mitigate the serious problems.

Digging deep
Nautilus Minerals will soon mine seafloor

Mongolia poised for mining boom

Mega-mines like Tavan Tolgoi in Mongolia’s southern Gobi desert could triple the size of the impoverished country’s economy in the next 10 years.

The open pit mine’s reserves hold more than 5 billion tonnes of coal. Coupled with other massive deposit discoveries like Ovoot Tolgoi, Mongolia appears poised to be one of the world’s most promising emerging resource markets.

The resources are in great demand from Mongolia’s southern neighbor China.
SECOND LIFE
**KATOWICE, POLAND.** The more than a century-old PG Silesia coal mine in southern Poland has been reborn under new Czech owners. Safety was a determining factor when choosing tunnelling machines. A pair of Sandvik Roadheader MR 340s are now forging the way.
Rebirth. New owners in southern Poland are breathing life into the 110-year-old PG Silesia coal mine where Sandvik’s Roadheader MR 340s forge the tunnels to get to the “black gold”. After many years of restructuring, dwindling production and lack of capital, Europe’s largest coal industry is once again exuding confidence.

Katowice, in southern Poland near the Czech border, is the throbbing heart of the district of mines and heavy industry. Towns, mines, car factories and smoking chimneys are all mixed up here and, since the fall of communism, enormous shopping malls have added to the chaos.

The activity underground is equally intense. Coal has been mined for centuries in the area. In the 1980s, 200 million tonnes of pit coal and 36 million tonnes of lignite were mined throughout Poland annually.

Since then mining has dropped by more than half while imports have increased substantially. Today coal produces 93 percent of the country’s electricity, more than anywhere else in Europe.

“We have difficult years behind us,” sighs 58-year-old Zbigniew Kluka, who spent his entire working life at PG Silesia and now, eight years after his retirement, has returned to help give new life to the underfunded mine.

“Once a miner, always a miner,” he says proudly, removing his helmet to wipe the sweat from his brow.

PG Silesia is near Czechowice-Dziedzice, 50 kilometres south of Katowice. For a long time, the life of the mine was considered to have come to an end. The state-owned parent company Kompania Weglowa, which is to be privatized in 2014, lacked
resources, and for many years no investments in new machinery were made. Finally the transport system and safety equipment became hopelessly out of date.

It was a depressing sight,” recalls Ewa Szpejna, the mine’s head of communications. “The machines were old and worn out, and you could see immediately that the entire mine was underinvested.” Szpejna, 36, started at PG Silesia in December 2010 when the Czech energy group Energeticki a Prumyslovy Holding acquired the company and its 750 employees.

Times have changed since then. Investments of 150 million euros have been planned, of which 110 million euros have already been pumped into the company. Transport systems and cleaning and processing plants have been modernized or demolished and rebuilt. Traces of the old days can be seen between the buildings: discarded machinery, rusty tools and electric cabinets with loose cables fluttering in the wind.

Some 250 employees have either retired or left the company, but at the same time 1,000 new jobs have been created, and confidence is growing. “We had become accustomed to promises that were never fulfilled,” says Jacek Kastelik, who has worked in the mine for 21 years and is now PG
The Sandvik MR340 cuts kilometres-long tunnels to the black gold, at 700 metres below ground. Here the machine is on pause for inspection.
Silesia’s head of safety. “But now we can see with our own eyes that investments are being made in new machines and fresh new premises.”

Safety is central to the Czech owner, whose goal is to transform PG Silesia into Poland’s most modern coal mine. “As a private company in a state-dominated industry, we want to show off with our exemplary safety,” says Thoralf Klehm, PG Silesia’s vice managing director.

Klehm is a veteran who for decades has worked in various managerial positions in coal mines everywhere from Africa and Russia to Kazakhstan and eastern Germany’s brown coal belt.

Safety was a determining factor for the new owner to choose Sandvik’s Roadheader instead of smaller Polish machines that can’t forge tunnels of similar dimensions. The air flowing through is greater in the larger tunnels with a cross-section of 22 square metres, and at the same time there is also space to install more powerful ventilation systems with a capacity to suck out the dangerous methane gas.

Klehm stresses that when choosing machine suppliers, he attached great importance to both their attitude towards safety and their ability to carry out both practical and theoretical training. “We wrote a clause in the contract that Sandvik should have a shift manager and operator in place for the first few months to train our employees and get the whole activity working,” he says. “This was very crucial for us. They hadn’t made any investments in the mine for many years, and the employees needed to receive some thorough training.”

Sandvik, with its headquarters in the town of Tychy, in the heart of the Polish mining district, delivered two Roadheader 340s last year. The 10-metre-long, 52-tonne heavy giants are now slicing out the new roadways, 600 metres below the surface. They are working slowly forward in a compact cloud of dust, just over half a metre at a time before they
stop for the newly made distance to be secured with iron sections.

Operator Grzegorz Radon explains that he received five days of intense training both in the mine and at Sandvik’s premises in Tychy. After that he received 20 days of practical training down in the mine, conducted by Sandvik specialists.

“But now we can manage on our own,” he says with a broad smile that lights up his dusty face. “And the machines, they just keep on going, even if we sometimes have to improvise a bit when the rock is harder than normal. Then we try to find a softer place.” Including the operator, 11 people work on the machine at each shift.

The pit coal mined in PG Silesia is intended for the border region between Poland, the Czech Republic and Slovakia, where a large part of the three countries’ coal power stations are situated and where the majority of households and many companies use coal for heating. Initially, production is set for a maximum of 1.3 million tonnes per year. But already by mid-2013, when the extension and modernization is completed, mining will increase to 3 million tonnes.

Compared with several other large mining companies in Poland, PG Silesia is small-scale. Kompania Weglowa, the former owner, is the European Union’s largest pit coal company with annual production of 45 million tonnes and 60,000 employees in 15 mines. State-owned Katowicki Holding Weglowy is also a major player, producing 13 million tonnes, and LW Bogdanka, which has now gone public, produces 8.7 million tonnes. Poland is also the European Union’s largest producer of coke: Jastrzebska Spolka Weglowa, listed on the Warsaw stock exchange, sold more than 12 million tonnes in 2011.

PG Silesia may be small, “but the reserves are considerable,” Klehm says. On a piece of A4 paper he sketches an area of the mine that is several kilometres long and wide, with so-called longwalls and different layers or types of rock that are no higher than 2.5 metres but more than a kilometre long. “We are sitting on geologically established reserves of 500 million tonnes as well as industrial reserves of 130 million tonnes,” he says. “And that is enough for at least 40 years.”

Three-quarters of the production is intended for power stations in the region and the rest for heating. No other country in the EU is as dependent on coal as Poland, which produced just over 75 million tonnes in 2011 and imported about 16 million tonnes. The same year coal accounted for 93 percent of the electricity supply and almost 90 percent of heating. With its 38 million inhabitants, Poland ranked 10th amongst the world’s largest coal consumers.
This energy profile contrasts sharply with the drastically increased environmental demands within the EU, where greenhouse gas emissions must be reduced by 85 to 90 percent by 2050 from their 1990 levels. The price Poland must pay for the adjustment, according to Environmental Minister Marcin Korolec, is 1 percent of gross national product up until 2030.

Poland has thus decided to build its own nuclear power plant, in spite of sharp division amongst its citizens between advocates and adversaries. At the start of the next decade, a 3-gigawatt reactor will be put into operation. Ten years later the capacity will be doubled. At the same time, investment is continuing into renewable sources of energy, chiefly wind power and biomass. A third alternative is the so-called unconventional extraction of domestic shale gas that will reduce dependency of gas imports, mainly from Russia.

At present, all this exists only on paper. However, investments are now being made for the modernization of antiquated coal power plants where the grade of extraction is being raised and emissions of carbon dioxide are reduced at the same time that six to eight new power plants are being planned. The driving force is rising electricity prices as well as future costs for emission certificates. Poland is currently exempt from the certificate requirement, but it will have to pay in full for a large portion of its emission rights from 2020 on.

This is the best of all possible worlds for mines such as PG Silesia that are modernizing and reducing production costs. “In our marketing analysis we are counting on stable demand for some foreseeable time,” Klehm says. PG Silesia is not alone in this view. For the first time in a long time, there are plans to start up new mines just as the old state-owned mines are being privatized and will be provided with fresh capital.

A sign of the times is that Poland’s second-richest industrialist, Jan Kulczyk, has applied for permission for geological surveys in Katowice where he plans to start two new mines, investing at least 300 million euros in each one. “One should be careful not to exaggerate, but the fact is that right now we are experiencing something of a boom in the Polish coal mines,” says Andreas Jagiello, head of mining for central and eastern Europe.

Bronislaw Janik, 44, who looks after the squeaking mine hoist high above the pit and who has worked in the mine for 26 years, cannot imagine a future without coal mines. “My father and my grandfather were miners here in PG Silesia. And now my 22-year-old son has started to study rock technology in order to continue the tradition.” Then he snorts disdainfully. “Those people who say that coal has played its part don’t know what they’re talking about.”
When Sandvik developed its new Sandvik TH550 and TH540 underground trucks, the company started by getting the big picture to answer an important question: What are the real factors that affect productivity and operating costs for these types of vehicles? Product manager Mark Ryan at Sandvik thinks that the way forward is to look at overall costs and productivity of a mine, and that you don’t achieve as much as you might think just by making underground trucks go faster.

“Mines are getting deeper and the haulage distances longer, with higher operating hours per day being scheduled,” Ryan says. “Increasing the maximum speed does not guarantee more production per shift. More operational hours per year is the key.” Field studies and other analysis showed that other factors need to be considered besides just the trucks’ technical

Other factors than just added speed are more important when it comes to productivity. So Sandvik decided to develop a new line of underground trucks for maximum fuel efficiency and uptime.

Text: ÅKE R MALM
Illustration: KJELL THORSSON
Daily maintenance can be conducted from ground level

What’s new?

- Vibration-reducing seat
- New dashboard
- Adjustable climate control
- Large tank capacity
- Hydraulic piston pumps
- Stainless steel hydraulic tubing
- Durable tires
- New steering cylinders

Healthier underground air

- Trucks for underground mining operations must offer high productivity and low operating costs. They should also have low exhaust emission levels and minimum heat dissipation, while minimizing the ventilation requirement costs. Sandvik has developed the Sandvik TH550 and TH540, two new underground trucks with a Tier 4i/Stage IIIB compliant engine option featuring a selective catalytic reduction (SCR) system. Together with a high payload per envelope size and empty vehicle weight, they have very low emissions of nitrogen oxides (NOx) and diesel particulate matter (DPM).
“The ventilation and fuel requirements for these trucks are the lowest in the market.”

MARK RYAN

...performance in terms of power and speed. You also have to consider their impact on the environment. “One of the big costs that mines have is ventilation, so we decided to go with more efficient and cleaner engines,” Ryan says.

This is why the TH550 and TH540 come with two engine choices that meet the emission levels set out by Tier 2/Euro Stage IIA or Tier 4i/Stage IIIB. They are two emission standards that regulate the maximum levels of nitrogen oxides (NOx) and particulate matter for diesel engines (DPM) in off-road vehicles, as mandated by legislation in different parts of the world. Although transitional rules allow manufacturers certain flexibility in the implementation of these standards, Sandvik has decided to be in the front line with this new technology in underground applications.

In addition to low levels of NOx and DPM, the new trucks offer lower fuel consumption than the earlier T50 and T40 generation, but with more torque. High-efficiency engines generate less heat than higher-powered engines while doing the same amount of work. “The engines work smarter, not harder,” says Ryan. “The ventilation and fuel requirements for these trucks are the lowest in the market.”

A key word when it comes to productivity is uptime, and lower fuel consumption obviously extends the refuelling intervals. Sandvik’s engineers have also designed other uptime-increasing features for the TH550 and TH540, adding to the proven reliability of the earlier generation of Sandvik trucks.

One example is the electrical wiring and VCM (vehicle control and management) system. Components that can be negatively affected by water in the mine, such as wire harnesses and battery packs, have been mounted higher up on the vehicle for better protection. In addition, there are fewer wires and relays, to reduce the number of possible failure points. Everything is connected to the VCM system with an interface that displays the vehicle status in real time.

“...performance in terms of power and speed. You also have to consider their impact on the environment. “One of the big costs that mines have is ventilation, so we decided to go with more efficient and cleaner engines,” Ryan says. “This means there will be much more uptime due to less time needed for troubleshooting.”

The TH550 has a payload capacity of 50 tonnes, while the TH540 is rated at 40 tonnes. A look under the hood reveals a 603hp/450kw Volvo TAD1661VE for the TH550 and a 543hp/405kw TAD1660VE for the TH540. These engines give the two underground trucks a high power-to-weight ratio, which combined with a high payload per envelope size and empty vehicle weight give an overall performance advantage in underground applications. “We chose Volvo because they came up with the best solution for our application,” Ryan says. “Overall it is a good engine that is reliable and fuel-efficient.”

The approach Sandvik chose for the new underground trucks has been to take a wider perspective instead of just cranking up the power another step. “This also brought us back to one of our core values: to offer the lowest cost per tonne hauled,” Ryan says.
MALARTIC, QUEBEC, CANADA. It doesn’t take long to discover that Canada’s newest and soon to be largest gold mine is unusual. The first clue is a church steeple that peeks out of a barrier wall (a linear park), surrounding Osisko Mining’s massive Canadian Malartic mine. The mine is built on what used to be a residential neighborhood.
The church steeple is not an illusion. Far from being in the middle of nowhere, the open-pit mine in Malartic, Quebec, is literally built on what used to be a residential neighbourhood in this town of 3,700 people.

An area that was once lined with modest homes now expects to see proven and probable reserves of 10.7 million ounces of gold during its current estimated mine life of at least 16 years. Investment in construction and development at Canadian Malartic, located about 500 kilometres northwest of Montreal, has already reached nearly $1.1 billion. “This is one of the biggest gold mines in the world right now,” says François Vézina, mine manager at Osisko Canadian Malartic. “The potential is incredible.”

But the mine’s lucrative potential would not have been possible if Osisko had not been able to move some 700 people who were living on the site. Fortunately, almost all the residents agreed to be relocated to a new subdivision in the town, especially since Osisko came up with a novel plan: instead of just buying the homes and tearing them down, it would move the homes to a new site.

Cash and demolitions would have been simple, fast and cheap, but it wouldn’t have been sustainable, says Denis Cimon, general manager of Osisko Canadian Malartic. Malartic’s population was decreasing rapidly and that strategy would have resulted in so many departures that it could have been the town’s death knell. “Osisko said, No, we’re going to do things differently.” By moving the homes – and often renovating them as well – it meant that “at the end of the day, people were back in their homes.”

Not all the homes could be moved because of structural problems, so Osisko built 20 brand new ones. Out of 205 homes, 130 ended up being moved. Families also received compensation for relocation costs. During the peak moving period in 2007, Osisko was moving three homes a day, three times a week, in a two-kilometre convoy that snaked along the town’s main road.

As if that weren’t enough, Osisko also had to rebuild a primary school, long-term care facility, cultural centre and daycare – none of which could be moved. The result? The primary school is the top-notch primary school in the province, Cimon says. “We’re pretty
proud of it.” Built with local wood, it features interactive boards and laboratories in all classrooms and computer-controlled lighting. “The principal says for the first time in his life he’s hearing from teachers who want to come and teach here.” Osisko is now investing $150,000 in interactive boards in the local high school as well, because the students who graduate from the primary school are used to better things.

While authorities warned Osisko that 20 percent of the residents of the long-term care facility could die because they were so attached to their old environment, nothing happened. “We brought their families here to help them adapt to the new environment, and everything worked pretty well,” Cimon says.

With the move of the residents successfully completed, Osisko could set its sights on building the huge open-pit mine, some 1.5 kilometres in length. It held its official opening in late May. But the fact the mine is located in a town continues to create a host of challenges for Osisko and its suppliers.

“With a town close by, the technical problems are incredible,” Vézina says. Blasting, for example, has to be done with consideration paid to the town. “We’re not used to that in open-pit.” Instead of drilling 12-inch holes, Osisko is only drilling 8.5 inches, because it is limited in the amount of explosives it can detonate per detonation. The mine is only allowed to blast twice a day – between 11 and 11:30 a.m. and 3 and 3:30 p.m., when the population is either at work, at school or going about their daily business. And it can’t blast under certain wind conditions.

For the drilling, Osisko is using QXR920 Cubex drill rigs equipped with Sandvik’s consumable tooling. Thanks to a new distribution deal between Sandvik and Cubex, the mine can purchase both the machines and the tooling from Sandvik. The drills are being used in the development phase to make holes in the bedrock which can then be filled with explosives, so that Osisko can reach the ore at the site.

Aside from providing the tooling – bits, hammers, rods – Sandvik is now distributing the Cubex drills as well, thanks to a global distribution and intellectual property rights deal that Sandvik recently signed with Cubex.

Given the restrictions it faces in having a town nearby, Osisko has to drill smaller holes on the site than is usually the case for open-pit mining. And because the holes are small, many more than usual are needed to maintain productivity, Vézina says.

Fortunately, he notes, Sandvik has been testing new bits with special carbides that may be setting records “and are probably going to revolutionize the drilling industry.” An Osisko driller recently drilled 350 metres in a 12-hour shift by drilling 31 holes in with one bit. “This is quite incredible,” Vézina says. “We never dreamed of having that performance.”
performance far surpassed Osisko’s objective of 225 to 250 metres of drilling in one day.

By drilling that amount in one shift without changing bits, “you’re gaining the time it usually takes to change the bit,” Vézina says. “It’s making a huge difference not just on performance but on cost as well.”

To fulfil the constant need for drilling consumables and service on-site, Sandvik is opening a container shop at the mine to regrind and repair the hammers and bits. “For the size of the contract, it’s a necessity,” says Dany Gaudreault, customer representative for Sandvik based in Val d’Or, Quebec. When it’s in full production, there will be 12 technicians in the shop, which will operate around the clock, he says.

Aside from providing drilling consumables and delivering them to the drills, technicians will provide training to Osisko operators and mechanics and help with preventive maintenance. Sandvik will aim to hire as many of the 12 on-site employees as possible from Malartic, which will go a long way towards fulfilling Osisko’s wish to hire local.

Vézina says the deal with Sandvik springs from a lesson he has learned the hard way, that mining equipment is only as good as the service you’re going to get. “You can have the best car in the world, but if you’re not able to get parts for the mechanic to repair it, it’s still broken. Service has a huge impact. I wanted something turnkey.”

Osisko is also turning to Sandvik to reduce the noise emanating from the site, to respect residents’ sensibilities. To reduce the sound levels generated by the drills, engineers are looking at the muffler for the motor and other areas where there may be sound reduction opportunities. “The Cubex is generating 121 decibels, but we’d love to go to about 115,” Vézina says. “It doesn’t sound like much, but it’s a huge difference.”

Osisko also approached Sandvik for a solution to reduce the annoying sound that is made when rock is loaded into Caterpillar 240-tonne trucks. “I said to Dany, ‘We need it as soon as possible. We’re generating too much noise,’” Vézina says. Sandvik came up with a rubber liner that serves as a shock absorber when the rock is loaded.

“We pushed on Sandvik and they succeeded in delivering it in a short amount of time.” (See sidebar for additional information.) “We’re putting a little bit of pressure on Sandvik,” Vézina says. “But suppliers know that everybody has to be more environmentally friendly, make less noise and be more fuel-efficient. Having suppliers that are taking that step with us is a success story.”

Osisko is working on several other noise abatement measures. For example, when trucks go into reverse, the “beep-beep” sound has been reduced by using white noise – a lower-frequency sound that is more directional. As a result, if you’re standing on the side of the truck you’re not going to hear it. And at night, the “beep-beep” has been eliminated altogether and replaced with blue lights. In addition, water cannons, fog cannons and even snow cannons in winter are constantly being deployed to reduce dust levels in the town.

While the mining industry is generally conservative, “we’re pushing the latest technology,” Vézina says. “It’s a brand new mine, and we want it to be as efficient as possible. If it doesn’t exist, we’re going to develop it.”

Fortune favours the brave

SEVERAL YEARS AGO, Montreal-based junior miner Osisko Mining Corp. decided to go against the grain by looking for low-grade, bulk tonnage deposits in the area of Val d’Or, Quebec. The area has long been known for its high-deposit underground mines.

The gamble paid off big when Osisko found interesting potential at Malartic, which has had several other producing mines.

By 2009, the company had completed more than 51 billion in financing, in the midst of the recession. Opened this year, the Canadian Malartic gold mine now has 477 employees and counting, and it has given a new breath of life to an economically depressed town.
The sound of rock hitting metal can be annoying, to say the least. But when 50 tonnes of rock are loaded into a 240-tonne truck, the sound can be nightmarish. That’s the situation Osisko was facing at its Canadian Malartic mine, which is within the town limits of Malartic.

Sandvik devised a solution to supply a rubber lining that is molded into the truck boxes. Not only do the liners reduce noise and absorb shock, but they result in longer lives for the trucks, says Roger Coutu, area manager for Sandvik. The company has previously used the solution on 90-tonne trucks, but this is the first time it has tried it on a 240-tonne Caterpillar truck, the Caterpillar 793.

“The gains are incredible,” saysFrançois Vézina, the Osisko Canadian Malartic mine manager. There is at least a three-decibel drop on the first bucket. That might not sound like much, but for the human ear, the rule of thumb is that three decibels equals a doubling in sound. “Instead of dropping rock on steel, you’re dropping rock on rubber.”

Osisko bought five liners from Sandvik and five from Caterpillar. After evaluating the liners for close to a year, the mine opted to continue with just the Sandvik model. The mine ordered 20 liners from Sandvik worth $3.2 million, the biggest order ever for this product line.
Double Sandvik bolter miners have an integrated conveying system.
worker

Efficient gateroad development means getting where the action is quickly and safely. Sandvik bolter miners, used mainly in coal mines, save costly time by bolting the roof walls as they cut, load and convey.
When you develop a gateroad in a coal seam it should go as fast as possible, because securing the path to the coal just represents money spent and little gained. At the same time you must make sure the gateroad is safe by securing the roof and sometimes the walls with bolts. All this was once done in separate steps, forcing a drill rig to take turns with a machine cutting the gateroad.

“Doing one step after the other took time, and coal mines were looking for a way to speed up the process by doing them in parallel,” says Hanno Bertignoll, marketing communications manager at Sandvik Mining.

An answer to that demand is the Sandvik MB600 series of bolter miners, which have changed the whole scenario. A bolter miner is a continuous mining machine that drills and bolts at the same time as it cuts, loads and conveys the material that is removed for the gateroad.

“The biggest challenge was to build what is basically two machines within the size of one,” Bertignoll says. “We had to find space for the sliding frame arrangement with all its components and still provide enough space to give the operators a safe and ergonomic workplace.”

Sandvik MB600 bolter miners move on crawlers and have a hydraulic sliding frame with a cutter drum up front. Integrated on the frame are up to six bolting rigs, four roof bolters and two rib bolters for the walls. An operating cycle begins by tramming the bolter miner into cutting position in front of the face. Two stab jacks located at the rear are set and the canopy in front is raised to stabilize the machine between roof and floor.

Bolter miners in the MB600 series cope easily with sandstone intrusions and similar materials that are hard to cut. They also offer an advantage when the mine floor is soft and would be destroyed by continuous mining machines on crawlers. Bolter miners don’t do that because the whole unit is locked in position by the stab jacks and canopy, while the hydraulic boom pushes the cutter drum forward. No crawlers are needed to sump in.

A bonus from this concept is that MB600 bolter miners are sometimes used for production mining under soft floor conditions. In that case you just stabilize and sump in without any drilling and bolting.

The operating cycle continues with the bolting mode engaged, and the cutter boom is raised to sump in and start drilling for the bolts. As drilling and bolting begins, the rotating cutter drum is moved forward via the slide frame. An apron with a loading device and a conveyor is also moved forward for best possible material clearance. Starting in top position the cutter repeatedly shears down to floor level until the required advance has been reached, up to a maximum of one metre. When cutting and bolting have been completed, the cutter drum and canopy are retracted. Then the stab jacks are raised and the cutter bolter can move forward in position for the next cycle.

**TECH SPECS SANDVIK MB600**

- Total length: 11.36 m
- Total weight: 102 tonnes
- Working height: 2.9 up to 4.5 m
- Working width: 5.5 m
- Drum diameter: 1,200 mm
- Sump distance: 1 m
- Cutter motor power: 270 kW
- Total installed power: 510 kW
- Propulsion system: Electro-hydraulic
- Moves on: Crawlers
- Roof bolters: 4 units
- Rib bolters: 2 units
- Loading and conveying capacity: 20 tonnes/min
- Variable tram speed: 3.5, 7 and 15 m/min
- Control system: PLC with function interlock, electronic level and cutting height control, full radio remote control
The cutter drum has a diameter of 1,200 millimetres.
Simultaneous capacity

Coal mines were looking for a method to speed up gateroad development and reach the coal seam faster. The dominant method had been to let a continuous miner cut the gateroad first and then use a drill rig to secure it with bolts.

Sandvik developed a bolter miner that does both things at the same time with improved work safety. The latest generation is the MB600 series that includes various sizes for different needs.

“The main benefit from combining cutting and bolting is the time it saves through increased speed, but it also makes the job safer for the operators,” Bertignoll says. “On the machine they are well protected by a support canopy behind the cutter drum, and the risk of accidents is reduced.”

Based on an analysis of mine accident statistics and operator experiences, the MB600 series of bolter miners have large platforms with ergonomically positioned controls. The platforms can be lifted and lowered hydraulically, giving operators comfortable reach to all bolting positions. The drill rigs are manoeuvred with push-button controls that allow electronic mapping of drilling data. Intensive lighting around the platforms reduces the risk of accidents considerably, and the hydraulic power pack that propels the bolter miner has been soundproofed to reduce the noise.

Other important features that improve the working environment are high-pressure water sprays and ventilation at the face to remove dust and gas. The generation of dust is also kept down by a low pick tip speed.

It is important that the resulting gateroad is big enough to allow access for all machinery to the longwall where coal is mined. The gateroad must also allow enough fresh air to flow through so that the mine is properly ventilated.

The MB600 series includes three basic models with different operating heights, covering a range from 2.9 to 4.5 metres. “They should be as small as possible but as large as needed,” Bertignoll says.
Two decades of success

The first bolter miner was commissioned in Australia in 1991. More than 300 of the machines have been delivered around the world since then, primarily for use in coal mines. An order for 21 units was recently made by Chinese company Shenhua Shendong, adding to the 26 already in service there. This is the first coal miner in China to achieve annual output of 100 million tonnes.

The value of the contract exceeds 500 million Swedish kronor (57 million euros) and the deliveries will take place in 2012 and 2013. Using the MB600 series of bolter miners, Shenhua Shendong has recorded a maximum monthly advance rate of 1,482 metres.
Mining is a risky business that requires special precautions, and the same applies to plants that make mining equipment. A Sandvik plant in India uses the country’s National Safety Week as an opportunity to reinforce basic approaches to the environment, health and safety.

Text: ERIC GOURLEY   Illustration: THE SURGERY
Miners wear full safety gear to protect against many of the risks they face daily.

“There’s nothing more valuable than a person’s life.”

BC RAO

“The hazards and risks are different than what miners face, but they are no less dangerous for our employees,” says Rao, who has seen the importance placed on health and safety increase every year since he started at the Patancheru plant in 1993, before Sandvik acquired it in 2004.

During safety week at the Sandvik Patancheru plant, Sandvik employees watch safety videos, compete in a reflection essay contest and make a formal safety pledge. The week also includes product exhibitions, community awareness activities and training programmes on fire extinguisher operation and first aid administration.

In a closing session, employees and management invite external experts to discuss health and safety concerns and initiatives to address them.

Safety from the start

FOR OPERATORS of Sandvik tools and equipment, safety considerations exist even before they don protective gear and enter a mine site.

When Rao’s unit was alerted to a shipping problem that created unsafe handling conditions for miners, the issue was resolved swiftly.

“Some of our packaging was getting damaged during transit from Patancheru to the warehouse in Kolkata, and miners were ultimately finding the boxes difficult to open without risking injury to their fingers, in part due to the way we were strapping them,” Rao says. “We improved our box thickness and enhanced our packing procedure, and the result has been better user-friendly handling at mines.”

Furthermore, the resolution improved the ability of miners who lacked factory equipment to transport boxes by hand.

Another operator indicated that sharp edges on guide sleeves in rotary hammer assemblies were shearing the O-rings, causing the guide sleeves to fall out of the hammers and posing a safety hazard to miners.

“They suggested that blunting the edges would make the product safer to handle without affecting performance,” Rao says. “We analyzed the feedback, went back to the design and successfully rounded the edges to improve safety and meet the miners’ expectations.”

EHS Conduct

Multiple sections of Sandvik’s Code of Conduct, the set of policies and guidelines that form the foundation for improving business, contain specific operational guidelines for Environment, Health and Safety:

Matters pertaining to the environment, health and safety are an integral part of Sandvik’s total operations. Continuous improvements are achieved in these areas through management by objectives. We consider that the greatest effect is achieved through preventive action.

Sandvik shall provide a safe and healthy working environment and shall take reasonable steps to prevent accidents and injuries. Workplace violence, including threats, threatening behavior, harassment, intimidation, assaults and similar conduct, will not be tolerated. Firearms are not permitted at any Sandvik facility.

We strive to offer working conditions that stimulate employees to perform effectively, assume responsibility and continue to develop in their personal and professional pursuits.

The Code is based on fundamental values with respect to sound business, human rights, employment conditions and the environment:

To ensure that the values that officially govern Sandvik’s conduct are also reflected in the way Sandvik acts in practice, these values have been assigned high priority in Sandvik’s business operations.

The Code of Conduct is part of the Power of Sandvik, the common platform for the company’s way of doing business. Managers are responsible for ensuring Code compliance.

BC Rao has seen the importance placed on health and safety increase every year since he started at the Patancheru plant in 1993, 11 years before Sandvik acquired it.
Coal is one of the most widely used fossil fuels on the planet – and probably the dirtiest. So what is the future of coal in a world energy picture dominated by environmental concerns? Solid Ground examines the issue.

Coal has been around since prehistoric people used it to heat their caves. The fossil fuel drove the Industrial Revolution in Europe and the United States, where it remains the top power source, producing as much as 70 percent of all electricity. Coal is also spurring development and prosperity in the fast-emerging economies of China, India and elsewhere.

On the downside, coal-fired plants in the United States alone have been estimated to emit around 2.5 billion tonnes of carbon dioxide every year, leading to predictions about the imminent demise of coal due to environmental concerns and the surge of nuclear power and renewable energy sources.

Nonetheless, despite causing the highest CO2 emissions of all fossil fuels, old king coal is alive and well. Almost all international energy organizations and experts predict it will play the major role in the world’s energy supply for decades to come.

Coal is playing a large role in the economic expansion of most emerging economies such as China, Brazil, Russia and India. In its 2011 World Energy Outlook, the U.S. Energy Information Administration (EIA) forecasts coal will continue to reign as the world’s largest source of power in 2035.

Although coal use is expected to decline in developed countries, there are anomalies. In Germany, for example, coal is suddenly back on the agenda as the country accelerates away from nuclear energy in the wake of the Fukushima nuclear crisis in Japan.

According to Professor Karl Rose, director of policies and scenarios at the World Energy Council and one of Europe’s leading energy experts, governments everywhere are being confronted with the “trifecta” of finding a way to balance the core issues of energy security, affordability and environment.

“Coal has been a very attractive source of energy for generations and remains so for very good accessibility and economic reasons,” Rose says. On the other hand, he says there is no avoiding the credible arguments by coal’s opponents that it remains a dirty source of power.

Efforts to reduce the impact of coal mining are focused largely today on tackling CO2 emissions, which has spawned the idea of “green” or clean coal, according to Rose.

“It is not easy for heavy industry to switch away from carbon fossil fuels,” Rose says. “Electricity production and steel making are dependent for their survival on competitive pricing, security of availability and environmental impact. When it comes to coal, we can assure the first two already today in Europe, which is why the European focus now is on the third issue, our environment.”

The silver bullet being touted as the solution to allow ongoing use of fossil fuels such as coal without letting the carbon enter the atmosphere is known as carbon capture and storage, or CCS.

The principle involves using existing technologies to capture, transport and store carbon dioxide emissions from sources such as power stations and steel mills. The captured carbon would be buried deep underground in aquifers or in disused oil fields, where perhaps it could be used to help force out oil that is difficult to extract.

Rose stresses the fact that the whole issue of global energy is too complex for one single solution.

“Carbon capture is an important step to achieving a balanced energy mix,” he says. “While it is true that CCS will contribute to creating a ‘green coal’ world, our focus must be on successfully meeting the tripartite goals of economic growth, energy security and reduced environmental impact.”

Many European energy policy makers see CCS and its potential of capturing at least 90 percent of CO2 emissions as the only realistic alternative for fossil fuels to meet the long-term goal of reducing greenhouse gas emissions by 2050.
Mining the Moon

The idea may sound like pie in the sky, but some scientists say that mining the Moon could be a reality in the not too distant future.

IT MAY still read like an idea for a science fiction novel, but experts insist mining rovers could be roaming the Moon by the end of the decade. The Northern Centre for Advanced Technology, NORCAT, a not-for-profit mining technology organization, has been developing drills for NASA and the Canadian Space Agency since 1999.

“I think we’re kind of on the threshold of a mining boom on the Moon, and I think that we’re very close,” NORCAT senior developer Dale Beucher told the Canadian Press earlier this year.

Heads of the world’s five largest space agencies met in Quebec this year to discuss advancing human space exploration, including mining on the Moon. Canada and China are among the first countries that have expressed interest in extracting the moon’s resources.

Scientists have detected valuable minerals like gold and other rare elements, including the highly energetic isotope helium-3, which could be mined and used to generate power through a fusion reaction.

In cooperation with the U.S. space agency NASA, the Canadian Space Agency has been developing and Earth-testing prototype lunar rovers outfitted with excavating drills. The China National Space Administration plans to send a rover to the Moon next year.

NASA’s 1999 Lunar Prospector mission discovered water ice deposits near the Moon’s South Pole, which could theoretically save countries fortunes on the exorbitant cost of transporting drinking water into space.

Questions about financial and logistical challenges and legal issues of mining in space abound, but at least two of the world’s major space programmes believe extracting lunar resources will soon be a practical enterprise. ■

ERIC GOURLEY

Lunar lowdown

A LONG FLIGHT: Apart from the Earth, the Moon is the only body in the solar system to have been visited by humans. The Moon’s average distance from Earth is 384,400 kilometres, or about 9.5 times the Earth’s circumference.

DARK SIDE OF THE MOON: Less than 60 percent of the Moon’s surface is ever visible from Earth.

WATER WEALTH: The cost of launching one pound (454 grams) of material to the Moon is around $50,000. Since a liter of water weighs more than two pounds (one kilogram) and water can be converted to hydrogen and oxygen for use as rocket fuel, water mining near the Moon’s South Pole could theoretically be more financially viable than gold mining.
For 150 years, the name Sandvik has been synonymous with quality. The company has invested heavily in research and development to find the best possible solution to its customers’ challenges. Whatever the job, you will find the right tools and equipment for your mining needs in Sandvik’s product range.

**ROCK TOOLS AND SYSTEMS**

**Deep impact.** Sandvik offers the world’s most comprehensive range of tools for exploration, rock drilling, raise boring, coal cutting, mineral mining, tunnelling, trenching, road grading and cold planing. As world leaders in steel and cemented carbide technology, our products have revolutionized the rock drilling industry, while our advanced tool systems for machines raise productivity sharply.

**DRILL RIGS AND ROCK DRILLS**

**King of the pit.** Sandvik rock drilling equipment is renowned for quality, reliability and productivity. Every machine we make is designed to give the lowest possible cost per foot drilled and a low life-cycle cost. To meet the needs of all customers, we offer a wide choice of machines, ranging from robust and simple drill rigs to semi-automated units that give extraordinary production rates and low total cost.

**LOAD AND HAUL MACHINES**

**The powerful loaders.** Sandvik underground loaders and haul trucks are extremely productive and reliable. They are vigorous and highly manoeuvrable, offer enormous capacity for their size and return a very low cost per tonne.

**CONTINUOUS MINING AND TUNNELLING**

**Keep on going.** Sandvik continuous mining and tunnelling equipment reflects the unique advantages of total in-house control over the machines and their cutting tools alike. Optimized cutting technology and machine design result in high productivity, long service life and low total costs.

Find the complete range at mining.sandvik.com
BULK MATERIALS HANDLING EQUIPMENT

**Total handling.** Sandvik has the long-term experience to design, manufacture and install virtually any kind of bulk materials handling system. From continuous open-cast mining systems to integrated stacking and reclaiming systems for mines, terminals, power plants 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.

CONVEYORS AND CONVEYOR COMPONENTS

**Roll it up.** Sandvik focuses on developing and manufacturing conveyor components to meet customer needs in mining applications. Sandvik’s complete offering supports modern mining practices and includes rollers, frames, pulleys and belt cleaners, safety and control devices, and dust control systems. With an emphasis on performance and reliability, they are easily available through the global Sandvik network both as original components and as replacements in existing systems.

CRUSHERS AND SCREENS

**Maximum size reduction.** Sandvik crushing and screening equipment is engineered for productivity. 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 a wide range of consumables.

SAFE AND ENVIRONMENT

**Keep it safe.** Sandvik focuses on the environmental, health and safety aspects of all its products, but some are designed especially for safety. An example is the broad range of products for fire protection.

MINE AUTOMATION

**Total control.** Sandvik has a deep understanding of modern mining operations and of how automation of loading and hauling processes can contribute to safer, more efficient transportation.

BREAKERS AND DEMOLITION TOOLS

**Hit harder.** Sandvik demolition tools make short work of difficult breaking and demolition jobs. They are optimized to deliver high-impact cutting or crushing force. With high power-to-weight ratios, easy interfaces and simple connections, they transform a wide range of excavators into highly productive demolition machines.
How can you increase both safety and your production rate?

This way!

If you are in the mining business, you know that an improved safety record means a lot to your employees and your entire company. This safety mind-set is part of everything we do – from research and product development to on-site service.

Join the movement towards The Future of Mining. It’s This Way: sandvik.com/thisway