

SECURING DIGITAL LEADERSHIP • World's first all-electric mine
Need for chill drives demand • HYDROGEN POWERS FUEL CELLS

MEET #2-2018 SANDVIK

SANDVIK GROUP MAGAZINE



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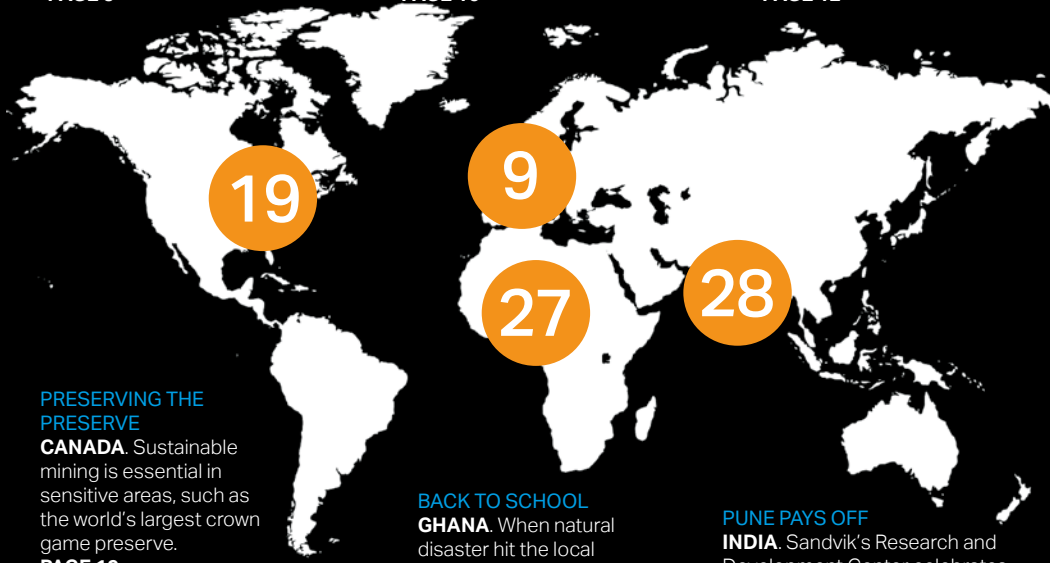
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MEET SANDVIK: The Sandvik Group magazine

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GOALS THAT GENERATE OPPORTUNITIES

THREE YEARS AGO, the 193 member countries of the United Nations adopted 17 Sustainable Development Goals (SDGs). The goals aim to achieve global sustainable development by the year 2030.

The goals are ambitious, ranging from ending hunger and poverty to ensuring access to clean water and clean energy and promoting sustainable consumption and production. Fulfilling them will require new ways of thinking and working, as well as cooperation across the boundaries between government, businesses and academic institutions. Innovation and the opportunities created by digitalization are key factors in achieving the goals.

AT SANDVIK, WE'VE chosen to focus on seven of the goals that we consider most relevant to us and where we can make the most significant contribution. In this issue of Meet Sandvik, you can read about how hydrogen cells are creating new opportunities for clean energy, how our battery-powered mining equipment eliminates diesel particles underground and how a district heating project is reducing oil consumption and carbon dioxide emissions. The SDGs represent good business opportunities, which we intend to do our best to harness.

In this issue you can also read about our major acquisition of metrology software company Metrologic. The acquisition is an initial significant step toward expanding our offering within digital manufacturing, which will enable us to help customers achieve a more seamless manufacturing chain.

Björn Rosengren, President and CEO

VASA GETS A LEASE ON LIFE

The Vasa warship capsized and sank on its virgin journey out of Stockholm in 1628, due to an unstable, top-heavy design. For a brief few minutes, however, she was the most powerfully armed ship in the Baltic, if not the world. Her cannons could fire 250 kilograms of ammunition in a single broadside, and when the heavy iron shot was blasted from the muzzles, it traveled at nearly the speed of sound.

When the ship was salvaged in 1961, the bolts that originally held the vessel together had completely rusted away. New bolts were inserted where the original bolts were previously seated, but eventually they also started to rust. Now, more than 4,000 bolts have been replaced with specially constructed high-alloy stainless bolts from Sandvik; they will last for at least 150 years and has decreased Vasa's weight by eight tons, corresponding to the weight of two elephants. Read more about the project on home.sandvik/vasa.





NEWS



SANDVIK CEO BJÖRN

ROSENGREN

was voted "Presenter of the year" by analytics and investors when events company Financial Hearings presented their yearly awards.

19.4

In the second quarter of 2018, Sandvik's adjusted operating margin reached an all-time high of 19.4%, supported by strong organic growth.

LARGE TUBULAR ORDER

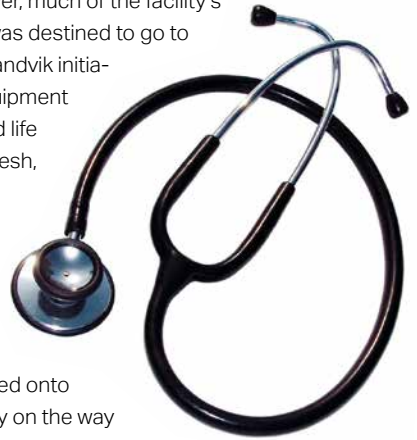
SANDVIK HAS SECURED a major order for advanced tubes related to the energy segment. The order value is approximately 500 million SEK, booked in the second quarter of 2018, and deliveries are primarily scheduled as from 2020.



Sandvik provides an extensive range of stainless steel tubes.

CARE EN ROUTE

WHEN SANDVIK'S PRODUCTION unit in Gimo, Sweden, recently outsourced its employee health care to an external caregiver, much of the facility's medical equipment was destined to go to waste. Thanks to a Sandvik initiative, however, the equipment will be given a second life in Africa and Bangladesh, in areas where such equipment is in short supply. Everything from stethoscopes and microscopes to forceps and bandages has been loaded onto trucks and is currently on the way to those destinations.



SANDVIK DIVESTS STAINLESS WIRE BUSINESS

IN JUNE, SANDVIK signed an agreement to divest its stainless wire business to Zapp Group, a German family-owned leading supplier of advanced metal products.

The deal includes the production unit in Sandviken, Sweden and the global sales organization, along with selected trademarks and patents. The enterprise value is 183 million SEK and closing of the divestments is expected in the third quarter of 2018.

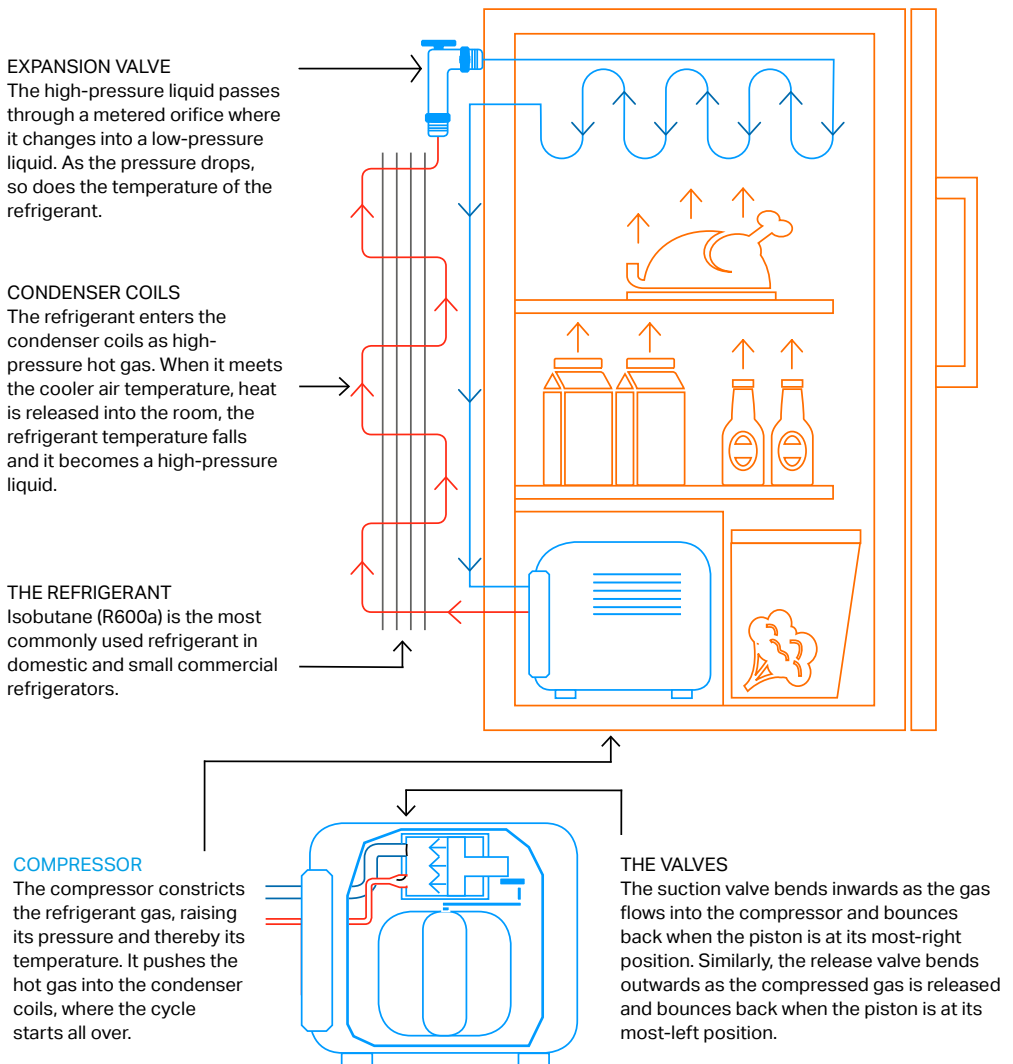
In May, Sandvik announced a divestment of its 50 percent stake in Fagersta Stainless wire rod mill. It is a joint venture with Outokumpu, who will now take full ownership of Fagersta Stainless to the purchase price of 184 million SEK. The transaction is expected to close by end of 2019. These two deals complete the full scope of the divestment plan for the welding and stainless wire operations, initially announced in 2017.

HOW A FRIDGE WORKS

THE TEMPERATURE IN your fridge is controlled by a closed circuit in which a refrigerant flows through condenser coils, an expansion valve, evaporator coils and a compressor.

The compressor is the engine of the refrigeration cycle. Powered by electricity, a piston works back and forth to suck in the warm low-pressure gas and push out the hot high-pressure gas.

Read more on page 22 about how Sandvik's materials can make fridges 50 percent more energy effective.



GONE FISHING

Christer Johansson, Master Technician at Sandvik's steel research department, began his career at Sandvik as an errand boy in 1966 at the age of 15. He retired this past May, after an amazing Sandvik career that spanned 52 years.

"I have really felt at home here throughout the years," he comments, looking back. "It is a work-place that has suited me. I have participated in a lot of interesting research projects, and I have had the benefit of many fantastic colleagues. I think Sandvik excels in recruiting good people." As Master Technician, Johansson investigates the microstructure of different materials.

Johansson plans to spend his days as a retiree at his house by Lake Storsjön in Sandviken. "There's always plenty to do, with the garden and in the greenhouse," he says. "I also enjoy hiking and look forward to going fishing more often. But no golf, please!"

In 2018, two employees with more than 50 years (!) within Sandvik have retired. The corresponding figure in 2017 was three.



SANDVIK IN PRESTIGIOUS PROJECT WITH CERN

CERN, THE EUROPEAN Organization for Nuclear Research, is regarded as the leading laboratory in the world for high energy physics and the world's biggest laboratory for particle physics research. With the help of particle accelerators, they are trying to understand how the universe was formed and which fundamental laws rule our world. Sandvik has gotten an order for an upgrade project for the Large Hadron Collider, where Sandvik's advanced stainless steel will be used to keep the particle beam in position in the accelerator. The project is CERN's most extensive during the coming decade, and entails an investment close to 1 billion EUR.



At CERN, outside Geneva in Switzerland, the Globe of Science and Innovation is a symbol of Planet Earth. Photo: CERN

SANDVIK ACQUIRES INDUSTRIAL HEATING COMPANY

SANDVIK ACQUIRES privately owned Custom Electric Manufacturing Co., headquartered in Wixom, Michigan, USA. The company is a leading manufac-

turer of original equipment and replacement heating elements on the North American market.

"Through this acquisition we add further strength to our lead-

ing position in industrial heating systems," says Göran Björkman, President, Sandvik Materials Technology.

In 2017, the company had revenues of 5.2 million USD, approximately 20 employees and a strong sales network in North America. Custom Electric Manufacturing will continue to go to market under its own brand.

The parties have agreed not to disclose the purchase price. The deal is accretive to earnings per share from the start.





Sandvik has acquired Metrologic, which offers software for metrology, automation and robotics control as well as services for calibration and 3D measuring. Products are used globally in most industries, including automotive, aerospace, energy, general engineering and consumer goods,

ENABLING DIGITAL MANUFACTURING

In a connected manufacturing world, continuous measurements cut lead times and reduce scrap and the amount of material used. Sandvik has acquired a software company with technology that holds the key.

IN RECOGNITION OF an industry-wide transformation to digital manufacturing, Sandvik has acquired Metrologic Group, a leading supplier of 3D inspection software and electronics, at a price of 360 million EUR (3.7 billion SEK). It's a logical part of the strategy to take a leading position in operational excellence, technology and customer interactions, says Klas Forsström, President for business area Sandvik Machining Solutions.

"Historically, design, machining and analysis have been three clear phases of manufacturing," Forsström says.

"New technology allows for instant data

capturing and analysis, which means that the verification phase will be totally integrated into the process," he says. "This will be even more so in the future."

In the short term, the acquisition will provide customer value through added measurement technology capacity that Sandvik can offer. Going forward, the plan is to develop integrated solutions throughout the manufacturing chain.

"This is a step toward a digital manufacturing offering," Forsström says.

"Within, say, five or ten years hardly any manual measuring will be performed in a workshop. Instead, machine learning and connectivity between systems,

"Digitalization allows for continuous control of every single component, and this is where Metrologic comes in."

machines and tools will allow for continuous measuring throughout the whole process – all the way to the cutting edge."

In a connected manufacturing world, continuous measurements will cut lead times and reduce scrap and customer recalls, as well as reduce the amount of material used in the process.

"Today, measurements are made on statistical samples," Forsström explains. "Measuring every tenth component with satisfactory results indicates that the other nine also qualify. It's too expensive to measure every component, so you have to balance time, cost and quality. Digitalization, however, allows for continuous control of every single component, and this is where Metrologic Group comes into the picture in the long run."

METROLOGIC WAS FOUNDED in 1980. It offers agnostic metrology software, meaning that the software is compatible with measuring equipment from different suppliers. The agnostic part was critical for Sandvik.

"Many of our customers don't want to be locked up with a single supplier," Forsström says. "They typically want to compare performance between machines, production lines and plants with different equipment. Hence, we need to offer a solution that allows for multiple equipment brands."

Metrologic, with headquarters in

Meylan, France, employs 160 people in seven countries and offers support in more than 30 countries. In its fiscal year ending in September 2017, Metrologic Group generated revenues of 43.3 million EUR. The group approaches customers in the same segments as Sandvik and has a similar geographical footprint. Metrologic will keep its strong brand.

WITH THIS MOVE, Sandvik declares a digital leadership in the manufacturing arena. But the competitive landscape is continuously changing, Forsström continues. "All metal-cutting tool suppliers are working with digitalization in one way or another, but along with these traditional competitors, you need to add measurement companies, hardware and software suppliers. Everyone wants a piece of the manufacturing cake, but I feel confident that we have a head start with our deep manufacturing competence and close and strong collaboration with hundreds of thousands of customers."



Klas Forsström
President, Business
Area Sandvik
Machining Solutions.

FOCUS

GLOBAL GOALS CREATE BUSINESS OPPORTUNITIES

The UN Sustainable Development Goals are affecting everything from health and the environment, to infrastructure, to gender equality – and they are having a profound impact on how many companies, including Sandvik, do business.



THE GLOBAL GOALS
For Sustainable Development

LET'S

GET THE JOB DONE

THE GLOBAL GOALS
For Sustainable Development

1. No Poverty
2. Zero Hunger
3. Good Health and Well-being
4. Quality Education
5. Gender Equality
6. Clean Water and Sanitation
7. Affordable and Clean Energy
8. Decent Work and Economic Growth
9. Industry, Innovation and Infrastructure
10. Reduced Inequalities
11. Sustainable Cities and Communities
12. Responsible Consumption and Production
13. Climate Action
14. Life Below Water
15. Life on Land
16. Peace, Justice and Strong Institutions
17. Partnerships for the Goals

SUSTAINABLE DEVELOPMENT GOALS

THE SUSTAINABLE DEVELOPMENT GOALS (SDGs) were set in motion by the United Nations' 193 member states in 2015, with the highly ambitious goals of ending poverty, protecting the planet and ensuring prosperity for everyone in the world by 2030.

The SDGs continue the work that started with eight Millennium Development Goals (MDGs), which expired in 2015. The new goals take the agenda even further and are broader in scope. They include poverty and climate issues, as well as additional areas such as human rights, economic inequality, innovation and sustainable consumption.

Another key difference is that this time around, the private sector is playing a bigger role in achieving the goals. The private sector was also at the table when it came to defining and selecting the 17 SDGs. This process included open working groups, with representatives from 70 countries, including Non-Governmental Organizations (NGOs), government and business representatives, as well as the participation of the general public. "The process was based on surveys, focus groups, input from social media and regional meetings, where people identified their priorities," says Renaud Meyer of the United Nations Development Programme, currently working as the Country Director in Nepal.

EACH OF THE 17 GOALS has specific targets to be achieved by 2030 and a globally agreed common set of indicators allows countries to measure progress and compare, says Meyer. "We can see which countries are on track or facing difficulties and can align our systems and attention to those countries lagging behind. The next level is to try to break down the SDGs within countries and fine tune them to the local context."



Stella Pfisterer
Research Associate
at the Partnerships
Resource Centre,
Rotterdam School
of Management
Erasmus University

“Every single goal that you start investing in requires money, but it also generates markets.”

The 17 SDGs are broken down into 232 subindicators that further detail the scope of the goals and render them more instrumental and executable.

All of the UN member countries are now working with the goals on a local level, but as Meyer says, government cannot achieve the SDGs on its own. “This is a common agenda and everybody has to contribute. You can’t afford to say ‘I don’t care.’”

Stella Pfisterer, Research Associate at the Partnerships Resource Centre, Rotterdam School of Management Erasmus University, is an expert on multi-stakeholder partnerships for the SDGs and making them more effective.

“Multi-stakeholder partnerships create mutuality in diversity,” Pfisterer says. “When businesses, NGOs, government and knowledge institutions come together, they can come up with much more creative and innovative solutions to address challenges. Multi-stakeholder partnerships are also more inclusive and more sustainable in the long run, creating much more than a single organization can achieve.”

PFISTERER ADVISES ORGANIZATIONS to really incorporate the SDGs into their operations. “Just stating that you support the SDGs is not enough. Companies and others need to integrate the goals in their strategies, internal processes and products, using the goals for product development. But walking the talk is not easy,” she adds.

Whenever Meyer encounters reluctance to adopt the SDGs, he lets the numbers do the talking. While an estimated USD 5 trillion will be needed to successfully achieve the SDGs, the economic opportunities that can come from sustainable business models and the process are worth up to USD 12 trillion, according to a Better Business Better World report. “Every single goal that you start investing in requires money, but it also generates markets,” says Meyer. “And imagine a world where we fail to achieve these goals and fail to invest in mitigation and improving the resilience of countries. If we don’t do that, you can close down your company.” ■



Opportunities from sustainable business models may be worth up to USD 12 trillion, says Renaud Meyer of the United Nations Development Programme.

SANDVIK ALIGNED WITH UN AGENDA

“We are committed to the UN goals because we are a global company that is affected by everything that happens in the world.”

SANDVIK'S SEVEN FOCUS GOALS



SANDVIK HAS HIGHLIGHTED seven UN Sustainable Development Goals that have a direct impact on its core business and strategy.

“We are raising the bar with these seven goals, which have a strong link to our core business.”

SANDVIK'S INVOLVEMENT in the United Nations (UN) Sustainable Development Goals (SDGs) dates back to before the goals were even adopted. The company was engaged in forming the SDGs as early as 2013, when over 20 Swedish companies were invited to join a network with three research organizations, facilitated by the Swedish development agency, Sida.

“We are committed to the UN goals because we are a global company that is affected by everything that happens in the world,” says Sandvik’s Head of Sustainable Business, Christina Båge-Friborg. “Sustainable development is relevant to us in the business sense, for example, to show how our products and services help our customers decrease climate change. Doing business in a more developed market also decreases business risks, such as corruption.”

Sandvik has aligned its own sustainability goals with the UN global agenda, which complement Sandvik’s initiatives for sustainability. Båge-Friborg points out that the new SDGs are much more relevant for business than the UN’s previous Millennium Development Goals (MDGs), where the focus was mainly on development issues.

“The SDGs have received wide acceptance from all types of groups

– government, NGOs, academia and business – and the business sector is now regarded as part of the solution to sustainable development,” says Båge-Friborg. “Everyone is working towards this common global agenda where we are able to show our contribution through the goals, targets and indicators.”

WHILE SANDVIK SUPPORTS all 17 UN goals, the company has highlighted seven goals in particular that have a direct impact on the company’s core business and strategy. “We are raising the bar with these seven goals, which have a strong link to our core business and where we can really show from an offering and an operational perspective how we are making a concrete contribution to achieving the goals,” says Båge-Friborg. ■



Christina Båge-Friborg
Head of Sustainable Business.



"THE AIR IS SO FRESH"

Goldcorp is developing the world's first all-electric underground mine, an ambitious project the company hopes will help inspire an industry-wide shift to more sustainable mining.

Borden Lake is a spring-fed lake over 12 miles long and up to 200 feet deep, situated in the world's largest game reserve: Chapleau Crown Game Preserve in Canada. Thanks to a unique combination of minerals, the lake water sustains incredible populations of fish.

“The elimination of diesel particulate matter in underground environments is hugely beneficial to the health of the workforce.”

GOLDCORP'S BORDEN LAKE mine lies in the vicinity of the Chapleau Crown Game Preserve in Canada, the world's largest at 2 million acres (700,000 hectares). The site is a stone's throw from the pristine body of fresh-water for which the mine is named, brimming with trophy fish each spring. Also, the water of the lake is sacred for the area's four First Nations communities.

Mining is brand new in this area, so it's essential to build a sustainable mine. With that in mind, the company has designed Borden Lake to become the world's first all-electric underground mine when it reaches commercial production next year, an undertaking the company expects to not only help minimize community and environmental impact but also improve health and safety for employees – all while boosting Goldcorp's bottom line.

“We knew that we had to create a mine in close collaboration and coexistence with our local stakeholders. It

was very important to us to minimize all sources of emission, whether it's noise, dust or other pollutants. Going electric really helped in achieving those goals,” says Goldcorp senior project engineer Maarten van Koppen, who produced Borden's pre-feasibility study and all associated engineering leading up to it.

BY THE TIME BORDEN is in full production, there will be no diesel-powered equipment underground. A combination of tethered electric and quick-charge battery-powered equipment will comprise the entire fleet.

“The battery technology advancements really enable us to go fully electric,” says project manager Luc Joncas. “Not only do we plan to prove to the industry it's possible, we're keen to prove that it will be cost effective and bring even more value to our shareholders than a conventional mine. We believe electrifying Borden makes sense economically, environmentally and socially.”

ZERO-EMISSION JUMBO

Sandvik DD422iE is an electric development jumbo designed to drive down production

costs while reducing the environmental impacts of drilling and tunneling. By using electric energy from an onboard battery during tramming, Sandvik

DD422iE produces zero emissions while manoeuvring between headings. This improves health and safety for miners working underground.

BY ELIMINATING DIESEL underground and fully electrifying Borden, Goldcorp anticipates a 70 percent reduction in greenhouse gases and annual savings of 2 million liters of diesel fuel and 1 million liters of propane. The company also expects to save 35,000 megawatt hours of electricity yearly, due in large part to drastically reduced ventilation needs.

“Electrification is the ultimate win-win, especially complemented by innovations like ventilation on demand and full connectivity,” says van Koppen. “The main benefits that we see with going electric are certainly the elimination of fuel, reduced maintenance, reduced greenhouse gases, reduced power consumption, and of course the biggest one is the elimination of diesel particulate matter in underground environments, which is hugely beneficial to the health of the workforce.”

Miner Randy Harrison appreciates the absence of underground emissions at Borden after working in conventional diesel mines across four continents since 1980.

“This is like no other underground environment I’ve ever worked in. The air is so fresh.” ■



“Electrification is the ultimate win-win,” says Goldcorp senior project engineer Maarten van Koppen.



<p>GREEN GAINS By eliminating diesel underground and fully electrifying Borden,</p>	<p>Goldcorp anticipates a 70 percent reduction in greenhouse gases and annual savings of 2 mil-</p>	<p>lion liters of diesel fuel, 1 million liters of propane and 35,000 megawatt hours of electricity.</p>
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A GREEN FACTORY

Sandvik Coromant has a vision to make its Swedish Gimo site a “green” factory. A new initiative will reduce greenhouse-gas emissions by 1,850 tons annually and make the site basically carbon neutral.

THE GIMO PLANT is the largest unit for tool production in the world. At the 110,000-square-meter facility, some 1,500 employees work around the clock to produce inserts and tool holders. The production requires a lot of energy and produces plenty of heat.

The latest measure taken to fulfil the company’s green vision is the factory’s conversion to a combination of district heating and heat pumps, which means that it will be totally independent of oil and will be almost carbon-dioxide-neutral in terms of production. A culvert between two separate production areas was built in 2018 through which surplus heat can be transmitted. This vastly increases the plant’s total energy efficiency in a way not possible before.

Joakim Fagerudd, site manager at Gimo, explains that the district heat is produced from biofuel, which creates

great environmental benefits. “Since 2012, we have reduced the use of heating oil by 70 percent,” he says. “The conversion to district heating will further reduce that number to close to zero. Annually we have estimated that the new district heating solution will reduce our greenhouse-gas emissions by 1,850 tons.” The investment is made in partnership with bioenergy company Neova.

ALREADY AT THE plant, Sandvik has an extensive recycling program whereby most of the material for the solid carbide tools it produces comes from recycled carbides. Making new tools from recycled solid carbide requires 70 percent less energy than making them from virgin raw materials. It also means that 40 percent less carbon dioxide is emitted.

In addition to the plant’s extensive recycling program,



Joakim Fagerudd, site manager at Gimo, explains that the district heat is produced from biofuel, which creates great environmental benefits.

it was also early in adopting methods to recover surplus heat from the production processes. In 2016, a new unit for climate control was installed, which is recycling 90 percent of the heat produced in the sintering process. ■



“Since 2012, we have reduced the use of heating oil by 70 percent.”

COOL IS HOT

Coolers, refrigerators, freezers and air conditioning units represent a large part of household electricity consumption. Sandvik’s specially designed valve steel contributes to energy-efficient designs.

HOUSEHOLD NEEDS FOR

the chilling of both food and air are driving the demand for compressors, which are used for refrigerators, freezers and air conditioning units.

“During the past ten years, sales have really exploded in, for example, China, where a considerable amount of the compressor production is also located,” says Stefan Jonsson, Product Specialist for valve steel at Sandvik. “Compressors are now calculated to account for more than 15 percent of total electricity consumption in the world, so every watt one can save is important.”

Today a new refrigerator uses half as much energy as a ten-year-old unit, but this is still not enough. As cooling and refrigeration units have become a global mass market, more and more countries



The young generation knows how to chill out.

are defining government regulations and directives to further reduce energy consumption.

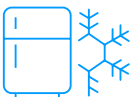
“This is a major challenge that the industry has to handle, by making more efficient compressors that also cope with greater stress on all

of the components,” says Jonsson. “A critical part of the equipment is the valve that controls the pressure on the refrigerant by continuously opening and closing based on the compressor’s operating frequency. This means that metal strikes metal between 50 and 150 times a second – a tough environment for the thin valve steel, which is usually 0.1 to 0.3 millimeters thick, depending on the specific usage.”

ANOTHER CHALLENGE IS

that the new, more environmentally friendly refrigerants require a higher pressure to work efficiently, which means that manufacturers have to find durable material that withstands the pressure and can cope with being subjected to both bending and impact stress.

DIFFERENT AREAS OF USE FOR COMPRESSOR VALVES



Refrigerators and freezers



Heat pumps



Industrial air compressors



Vacuum pumps



Air-conditioning equipment



Brake systems

“Today’s compressors can be up to 50 percent more efficient.”

With regard to valve steel, developments in the past 50 years have evolved from carbon steel with general characteristics, via the stainless steel of the mid 70s, which had better durability against fatigue, to today’s Sandvik Hiflex®, used by the world’s leading compressor manufacturers since the early 2000s.

“Sandvik Hiflex enables a design that makes the compressor more efficient. More cooling power is achieved with the same number of watts,” says Jonsson. Sandvik is now ready to introduce the next generation of valve steel for the compressor market. After two years of research and development work, the



Sandvik offers three types of hardened and tempered strip steel for the manufacturing of compressor valves.

goal is to launch a brand new material in the fourth quarter of 2018, which will be even more impact- and bending-resistant than its predecessor, enabling the design of

even more energy-efficient compressors.

Today’s compressors for refrigerators and residential air conditioning systems with smarter designs and new technology can be up to 50 percent more efficient than earlier compressors.

“Material technology is crucial for the industry’s survival,” says Jonsson. We feel a responsibility to continue developing our valve steel and to provide even better characteristics, which help make compressor technology viable and sustainable.” ■



OTHER SANDVIK MATERIALS THAT ADD TO SUSTAINABILITY

CLEANER FLOWS

Flow heaters from Kanthal are used for heating gases in the aluminum industry and can handle temperatures of up to 1,100 degrees Celsius, about 300°C higher than with traditional techniques. The higher temperature enables more stringent tests of new materials for the automotive industry’s ever more compact engine designs. The benefits compared with gas burners are increased safety and efficiency, as well as simpler installation, a

cleaner working environment and an avoidance of carbon dioxide and nitrogen oxides.

DIRECT INJECTION SAVES FUEL

The stainless steel Pressurfert® is designed to withstand the high pressure required in fuel systems with modern direct injection technology. This enables more power to be produced with significantly reduced fuel consumption. This also reduces emission levels from cars with internal combustion engines.



Sandvik is playing a key role in developing new fossil-free ways of extracting energy. Specially coated, straight, wafer-thin steel strips that can cope with the tough environment in high-efficiency fuel cells are in great demand in many sectors.

THE SWITCH TO more sustainable energy production is placing great demands on materials and structures. Fuel cell technology is an area where Sandvik's high-quality coated steel can shine.

A fuel cell is based on the same principle as a battery, i.e., the conversion of chemical energy to electricity. The difference is that the fuel cell enables higher energy density, as it is powered by hydrogen.

"The technology for fuel cells already exists," says Håkan Holmberg, Business Development Manager for Coated Products at Sandvik Materials Technology's Surface Technology unit. "The challenge for manufacturers is to find the right material choice and produc-

tion technology to make it scalable and commercially viable in the market. This requires smart industrial solutions, which we can offer for one of the most critical components of the fuel cells."

SANDVIK PRODUCES COATED strip steel for the bipolar plates needed to extract electricity from the fuel cells. Each cell acts as a small battery, using approximately 400 fuel cells connected in series and packed together in a stack to power, for example, the electric engine in a vehicle. Between each fuel cell is a thin metal plate that distributes the fuel and conducts the electricity.

"It's a tough environment, one that places a lot of wear on the components," says Holmberg. "Steel is a

good base material, but it needs to be reinforced at some points to cope with the stresses. Our solution is to coat the steel with a carbon layer in nano-meter scale that improves electrical conductivity and makes it resistant to corrosion, while retaining the material's deformability. It's one thing to do this in a lab environment, but we have also developed large-scale methods and for several years have been operating a fully functional production line for specially coated steel strip for fuel cells."

FUEL CELLS HAVE many applications, but these are usually divided into three main areas: portable, stationary and transportation-related. The latter is the most widely discussed, as it relates to fuel cells for car engines and other vehicles. But Sandvik also believes strongly in fuel-cell-powered emergency generators to replace the diesel power plants that are currently available. In the long term, there is also a market for applications that charge mobile phones and other portable devices without access to the grid.

"We also see great opportunities

to use fuel cells and hydrogen for combined heat and electricity supply to homes in a more sustainable way," Holmberg says. He explains that one of the challenges for electricity producers is to store energy from renewable sources such as wind and solar power.

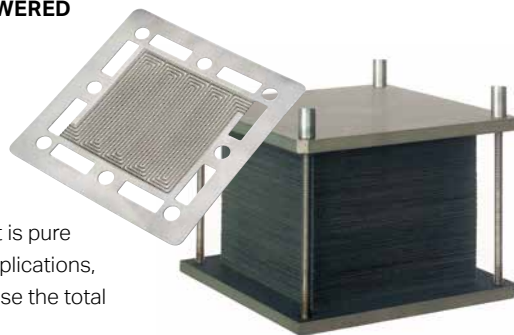
BECAUSE SUNSHINE AND wind vary over time, this sometimes results in a surplus of electricity, which can be used to produce hydrogen through electrolysis. The hydrogen can then be used as industrial gas or to power fuel cell cars, but it can also be sent to residential buildings to provide electricity and heating – and this can also be done with fuel cells.

"Many countries have well-developed town gas networks, which means that pipelines have already been brought to the kitchen," Holmberg says. "In this case, CHP [combined heat and power] fuel cells can generate electricity and domestic hot water from the gas." ■



THIS IS HOW A HYDROGEN-POWERED FUEL CELL WORKS

A fuel cell is powered by hydrogen, which is split into protons and electrons at one pole (anode) to generate electricity and a reaction with oxygen at the other pole (cathode); the only residual product is pure water and heat. In many fuel cell applications, the heat can also be used to increase the total energy efficiency of the fuel cell.



Reconstruction of the school building will help students focus on learning again.



HELPING A NEIGHBOR IN NEED

When a rainstorm devastated a local school in rural Ghana, Sandvik answered the call for help.

THE STUDENTS AT Pakyi School No. 1 dream of becoming doctors, pilots and engineers. Their teachers encourage them to take their studies seriously, emphasizing how this helps to improve their future career prospects.

Conditions were not conducive to learning after a rainstorm in December 2014 destroyed classrooms at the 900-student school in a rural farming community 20 kilometers south of Kumasi, Ghana's second city.

Teacher Hannah Amankwah vividly remembers the Friday downpour.

"School had closed for the day, so we were at home," Amankwah says. "We woke up the next morning to find that some parts of the building had collapsed."

In the weeks that followed, teachers

improvised to keep the school open for the displaced students. Some primary classes were combined into already-overcrowded classrooms that had survived the rainstorm.

"It was stressful for the students and the teachers," says headmaster Jacob Anane. "Children were easily distracted."

TO ENABLE YOUNGER students to remain indoors, makeshift outdoor classrooms were established under trees for the older students. On rainy days, their classes had to be canceled.

"It was very difficult for us to learn sitting under the trees," says student Janet Appiah, who hopes to someday become a nurse.

When repeated attempts by Pakyi commu-

nity leaders and school authorities to obtain financial assistance from the cash-strapped Ghana Education Service proved unsuccessful, they turned to neighbor Sandvik for help to rebuild.

THE COMPANY OPENED its West Africa service center and warehouse facility just a few minutes' drive from the school in 2013. The storm that hit the school also severely damaged the Sandvik facility.

After Sandvik restored its facility, Nuhu Salifu, vice president Sales Area West Africa, visited the school and was moved by the damage.

"Wherever Sandvik has a presence in the world, it is our view that we should have a positive impact on the life of the local community," Salifu says.

Local Sandvik leadership obtained top management approval to finance construction of a six-classroom building. Following con-

sultations with local officials and traditional rulers of the community and the necessary approvals from the authorities, building work began in 2017.

Recognizing Sandvik's commitment to the environment, parts of the new facility's roof incorporate wood that has been recycled from pallets and containers that have been used in the shipment of Sandvik equipment and spare parts.

FIFTY YEARS AFTER the school was first built, Sandvik inaugurated the new six-unit classroom block in early 2018.

"We really appreciate the new classroom facility that Sandvik has built for us," Appiah says. "It will help us to focus on learning again."



The students at Pakyi School No. 1 in Kumasi, Ghana, dream of becoming doctors, pilots and engineers.

200,000 FOLLOWERS ON LINKEDIN

SANDVIK HAS REACHED the milestone of 200,000 LinkedIn followers and LinkedIn's talent pool is Sandvik's most important recruitment tool. In 2017 the Group saved more than EUR 400,000 using LinkedIn compared to other recruitment initiatives. At the same time, Sandvik managed to effectively pin-point key talents to meet future competence needs.

"Using LinkedIn as a recruitment tool has provided us with a fabulous opportunity to find the right candidates, faster, and to engage and build a pipeline of talent in a cost-efficient way, all whilst growing the strength of our employer brand," says Gill Peden, Employee Experience Expert.



"LinkedIn strengthens Sandvik's brand," says Gill Peden.

INDIAN R&D CENTER CELEBRATES TEN YEARS

WHEN SANDVIK'S RESEARCH and Development Center in Pune, India, was inaugurated in 2008, it was the first of its kind outside Sweden. Its main strength revolves around modelling and simulation, with focus on alloy and process development and the Center has expanded its capability substantially over the years.

Capabilities on experimental techniques for material characterization, model validation and prototyping are other areas where the Center can help to enhance the fundamental understanding. Another key competence currently being developed is data analytics.



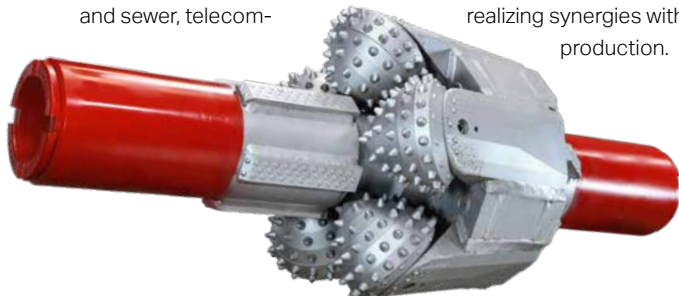
SANDVIK ACQUIRES ROCK DRILLING TOOLS SUPPLIER

Sandvik acquires Inrock, a leading supplier of rock drilling tools and services for Horizontal Directional Drilling (HDD) in North America. Headquartered in Houston, Inrock is a market leader in pilot hole bits, reamers, guidance systems, accessories and services for the premium maxi rig segment within HDD.

The combined expertise

of Sandvik and Inrock will support further development of the HDD product portfolio to customers operating and servicing infrastructure applications such as oil and gas pipelines, water and sewer, telecom-

munications, electricity and alternative energy production and storage. This includes expanding into the midi rig segment, accelerating the global footprint of the business and also realizing synergies within production.



RECORD QUARTER

ON THE BACK OF increased demand in all three major geographical regions stemming from positive development in all customer segments, Sandvik reported record-high orders and revenues for the second quarter of 2018. The high activity level in combination with a sustained focus on efficiency resulted in both adjusted operating profit and the operating margin of 19.4 percent reaching all-time-high levels.

All three business areas reported positive growth in orders and revenues, for a total book-to-bill of 104 percent. Free operating cashflow of 2.2 billion SEK (2.6) was positively impacted by strong development in operating profit. However, this was more than offset by a seasonal build-up of net working capital to support future deliveries. The balance sheet was strengthened compared with the year-earlier period with

net gearing at 0.34 (0.71).

Sandvik's strong operational performance and financial position was acknowledged by Standard & Poor's Global Ratings, which revised its outlook for Sandvik AB to positive from stable. At the same time, the credit rating BBB+ was reconfirmed.

For more information, please visit home.sandvik/investors

MARKET DEVELOPMENT Q2 2018

	% of group revenue FY 2017	Y/Y order intake	Mining	Engineering	Auto-motive	Energy	Construction	Aero-space	Sequential underlying demand trend Q2 2018/ Q2 2017
EUROPE	39%	+16	↗	↗	↗	↗	↗	→	→
NORTH AMERICA	21%	+8	↗	↗	→	↗	↗	↗	↗
ASIA	20%	+17	↗	↗	↗	→	↗	↗	→
AFRICA/MIDDLE EAST	9%	+7	↗	↗					→
AUSTRALIA	6%	+13	↗						↗
SOUTH AMERICA	5%	-5	↗						→

SUMMARY Q2 2018

DEMAND ON RECORD LEVEL

- Strong growth in all business areas
- Sandvik Machining Solutions orders on record-high level
- Large order in Sandvik Materials Technology

ALL-TIME HIGH EARNINGS AND MARGIN AT 19.4%

ACTIVE PORTFOLIO MANAGEMENT WITH INCREASED PACE IN MERGERS AND ACQUISITIONS

- Acquisition: Metrologic Group
- Divestments: Sandvik Materials Technology's stainless wire business and the Fagersta Stainless joint venture

After the close of Q2: Closing of divestment of Hyperion and announced acquisition of Inrock

VALUE-CREATING OFFERING

Sandvik is a high-tech and global engineering group offering products and services that enhance customer productivity, profitability and safety. In 2017, the Group had approximately 43,000 employees and sales of 91 billion SEK in more than 150 countries.

BUSINESS AREAS



SANDVIK MACHINING SOLUTIONS

A market-leading manufacturer of tools and tooling systems for advanced metal cutting.

SHARE OF REVENUES 39%
SHARE OF ADJUSTED OPERATING PROFIT 55%



SANDVIK MINING AND ROCK TECHNOLOGY

A leading supplier in equipment and tools, service and technical solutions for the mining industry and rock excavation within the construction industry.

SHARE OF REVENUES 40%
SHARE OF ADJUSTED OPERATING PROFIT 38%



SANDVIK MATERIALS TECHNOLOGY

A leading developer and manufacturer of advanced stainless steels, powderbased alloys and special alloys for the most demanding industries.

SHARE OF REVENUES 15%
SHARE OF ADJUSTED OPERATING PROFIT 4%

RECOGNITION AND MEMBERSHIPS



MEMBER OF
Dow Jones Sustainability Indices
 In Collaboration with RobecoSAM



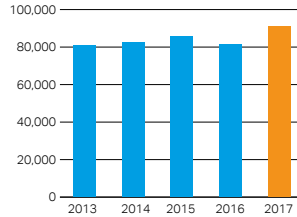
ROBECOSAM Sustainability Award Bronze Class 2018



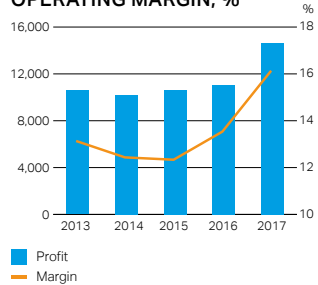
1) Adjusted for items affecting comparability of -450 million SEK in Q2 2017 and +3,910 million SEK in Q4 2017

THE GROUP

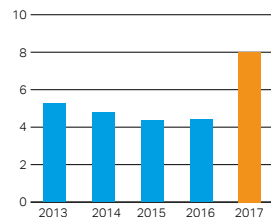
REVENUES, MSEK



ADJUSTED OPERATING PROFIT, MSEK AND ADJUSTED OPERATING MARGIN, %¹



ADJUSTED EARNINGS PER SHARE, GROUP TOTAL, SEK¹



MAIN CUSTOMER SEGMENTS**MINING**

We deliver drill rigs, rock-drilling tools and systems, mobile and stationary crushers, load and haul machines, tunneling equipment, continuous mining and mechanical cutting equipment, as well as various solutions to increase automation, safety and customer productivity.

SHARE OF REVENUES 31%

**ENGINEERING**

Our tools and tooling systems for metal cutting as well as advanced materials and components are used in engineering industries worldwide, improving productivity, profitability, quality, output, safety and environment. Sandvik is also a global leader in high-alloy metal powder for different applications.

SHARE OF REVENUES 24%

**AUTOMOTIVE**

Our tools and tooling systems for turning, milling and drilling in metals raise productivity when manufacturing e.g. engines and transmissions. Our stainless and high-alloy products are found in, for example, safety belts, airbags, brakes, air conditioning and various instruments.

SHARE OF REVENUES 13%

**ENERGY**

Sandvik offers solutions for all forms of energy production, including clean and renewable energy. We supply high-alloy products, such as seamless stainless steel tubes as well as tools and tooling systems to satisfy the industry's metal-cutting needs.

SHARE OF REVENUES 11%

**CONSTRUCTION**

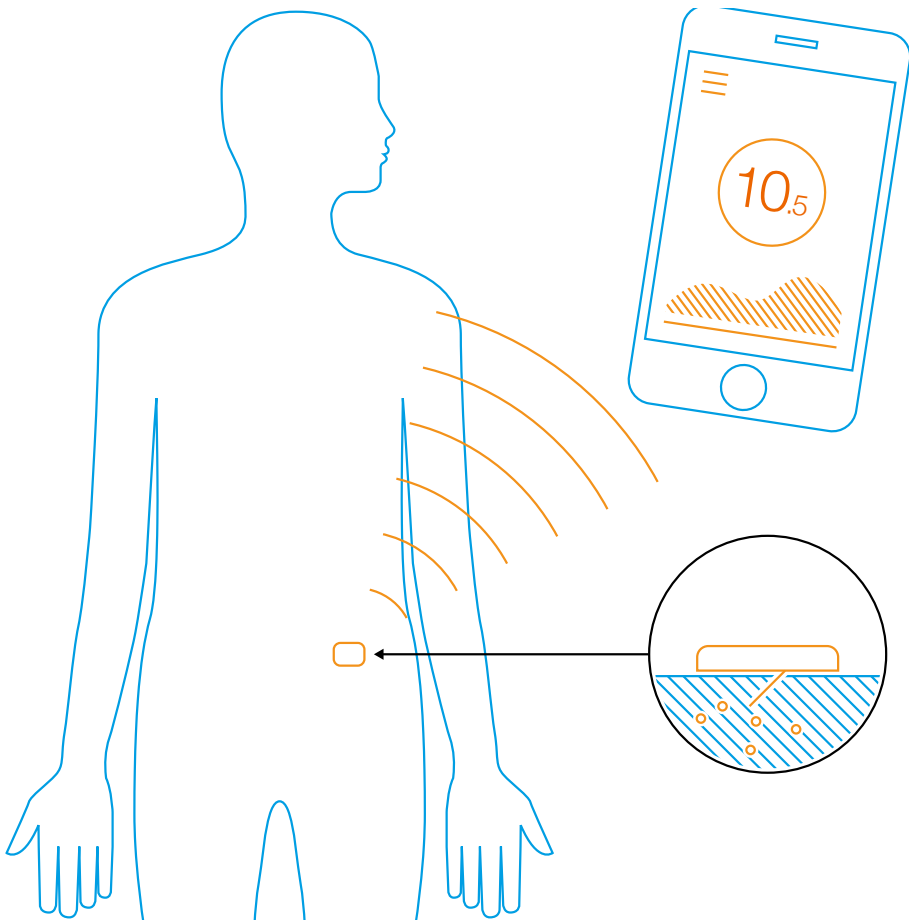
We offer products and services that increase safety and customer productivity in the breaking, drilling, tunneling, crushing and screening niches of the construction industry.

SHARE OF REVENUES 11%

**AEROSPACE**

Sandvik works closely with the world's aerospace companies. As they apply new materials to manufacture airplanes that are lighter, safer and more fuel efficient, advanced tooling solutions and light-weight materials from the Group are critical.

SHARE OF REVENUES 6%



THE OBJECT | Digital diabetes care

Diabetes may cause blindness, kidney failure, heart attack and stroke. The number of people suffering from diabetic disorders worldwide is over four times higher than 40 years ago.

Body-attached continuous glucose measurement sensors connected to apps provide diabetics (and their families) information about glucose direction and rate of change round the clock. This helps reduce the risk for hypoglycemia and significantly contributes to quality of life.

Sandvik's EXERA™ medical wire is used in many body-attached sensors.

