THE FUTURE OF ROBOTICS • Solving the mystery of the Big Bang • Record-breaking bar • NEW ADDITIVE MANUFACTURING CENTER • 3D-PRINTED HEART • Meet the new CEO • KEEPING UPTIME UP

MEET SANDVIK

#3-2015

SANDVIK GROUP MAGAZINE

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Huge potential for increased productivity in industrial digitalization. **PAGE 10.**

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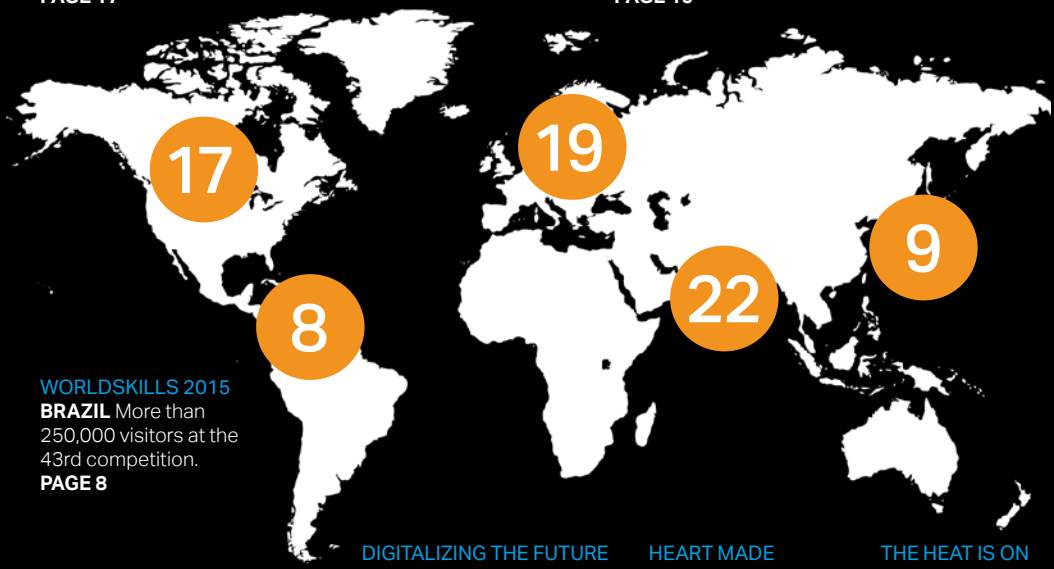

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SANDVIK

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DEAR READERS,

BY THE TIME YOU READ THIS, I will already have had the opportunity, as the new President and CEO of Sandvik, to meet with many of this fine company's employees and customers, learning more about its production facilities and competencies gathered in various locations around the world.

One of Sandvik's core values is "Passion to win," and I have been pleased to note this value in action when speaking to many Sandvik employees. As a competitive person, I know the feeling one gets when reaching one's personal targets. This is also important in our working lives.

As we all know, Sandvik is facing tough challenges ahead. We are seeing major insecurity in the macroeconomy and reduced demand within several of our customer segments. Sandvik is a market leader today in several product areas, but this does not exclude us from being affected by a severe market situation. Now is the time for everyone to step forward and make sure that we are keeping sales levels up while keeping costs down.

What is good can still improve. To me, it is important to create the right conditions for Sandvik. There are so many good things to build on when it comes to Sandvik's products and solutions. We must make sure that we are our customers' first choice – now and in the future.

IN THIS ISSUE, you can read about how we develop productive solutions for customers and prepare for the development of efficient and flexible production, for example through increased digitalization. This is an important change in the industry, and we at Sandvik are ready to meet that change with new technical solutions.

I have a lot of confidence in Sandvik's future, and feel humbled by having the privilege to lead Sandvik into this exciting future. This is a fantastic company, but a lot needs to be done. I will make sure we create the right environment and prerequisites for Sandvik to be a winning team.

Björn Rosengren, President and CEO

Read the full story about this potentially groundbreaking project on http://smt.sandvik.com/en/news-media

PROBING THE ORIGINS OF THE UNIVERSE

Scientists from Johns Hopkins University in the U.S. state of Maryland, along with NASA and other partners, hope to solve the mystery of the origins of the universe.

Four advanced telescopes, positioned at 5,200 meters above sea level in Chile's Atacama Desert, will map cosmic microwave background polarization to look for the faint imprint of gravitational waves from the first very energetic moments after the Big Bang.

To optimize the analysis, the detectors will be cooled down to -273 C (or -460 F), which is barely above absolute zero. Sandvik provides the components to support these fragile detectors, producing and machining its Controlled Expansion Alloy product, Osprey CE7F. This alloy is able to provide the right thermal and mechanical properties to protect the detectors in this extreme environment. ■

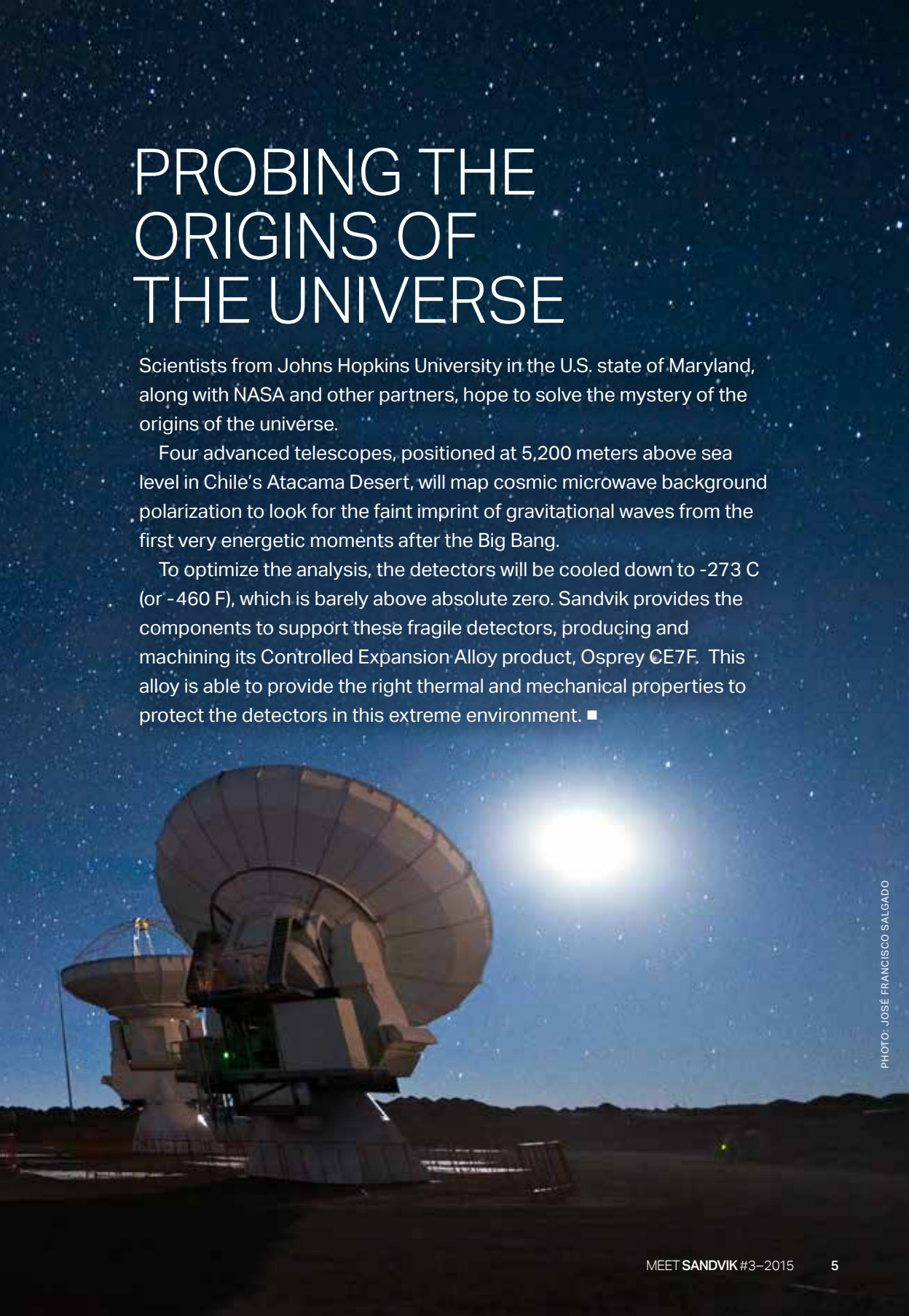


PHOTO: JOSÉ FRANCISCO SALGADO

NEWS

FIRST GLOBAL COMPANY IN THE UN
Sandvik made history in June as the first global company to be invited to speak directly at UN negotiations. Full story on sandvik.com.

21

On 18 October, 21 Sandvik employees participated in the Amsterdam Marathon. The goal was to raise 10,000 euros for the Dutch Cancer Society.

Sandvik Mining committed to tripling the donations, provided that 75 percent of the committed kilometers were completed, and final donations amounted to 11,500 euros.

LOW ENERGY COOLING

AS THE NUMBER OF households equipped with air conditioners in China is predicted to rise significantly, Chinese companies are under pressure to meet new energy demands. Giant compressor manufacturer GMCC knew it faced a design challenge out of the ordinary and chose Sandvik Hiflex™ strip steel for its valves.

The material swap was performed for air-conditioning units developed and manufactured on and for the Chinese market. With material that enabled a smaller and more advanced compressor, energy-saving was a factor on two fronts. First, the operating frequency of the compressor valves went from 120 to 180 Hz – increasing the energy-saving effect by 50 percent. Second, thanks to the unique material properties of the steel, this higher frequency was not only reached but was achieved in a compressor half the size of previous models.

In summary, the new compressor model had received a higher COP (coefficient of performance), meaning that it costs the consumer less in electricity while leaving a smaller footprint on the planet.

UGLY CHALLENGES BEAUTIFUL POSSIBILITIES

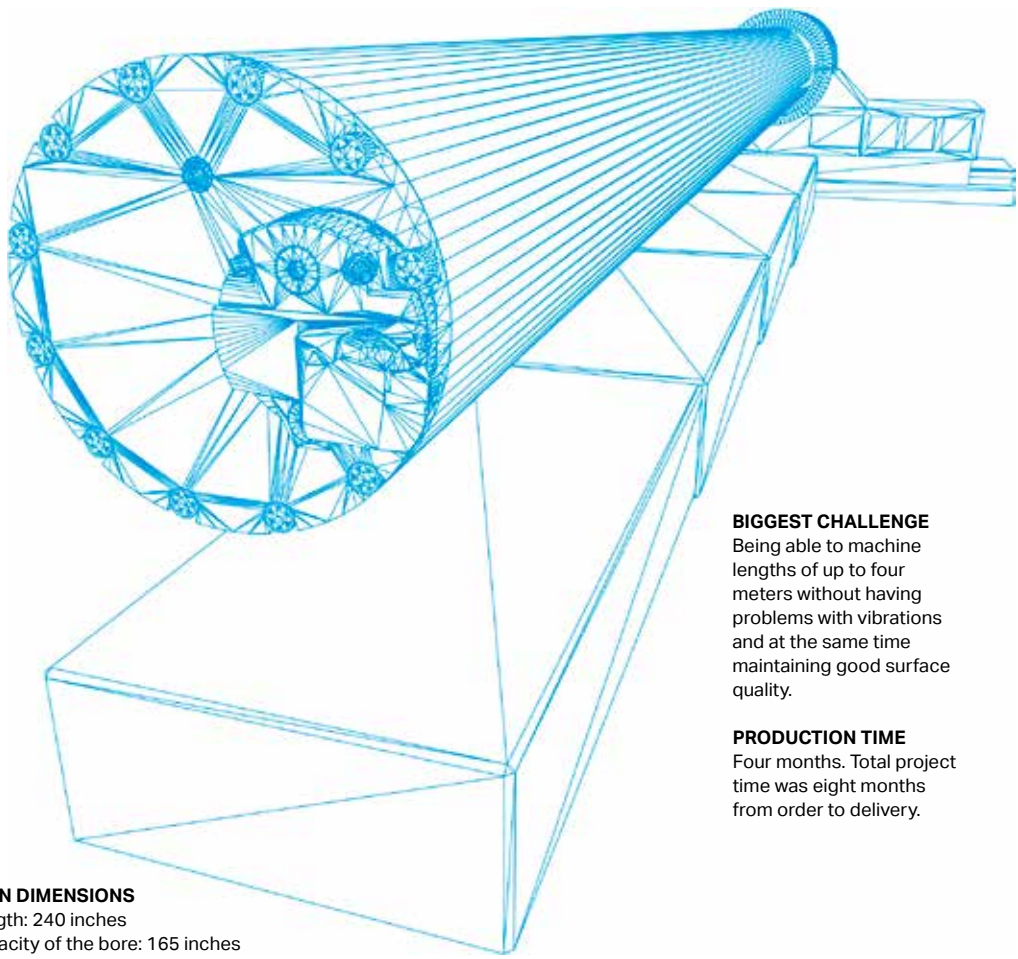
A Sandvik oil and gas advertisement recently received international recognition for "Advertisements of Greatest Interest" from NACE International, the premier authority for corrosion control solutions.

THE WORLD'S LARGEST ANTI-VIBRATION BORING BAR

A MILESTONE HAS BEEN ACHIEVED when setting a new world record. The world's largest reinforced anti-vibration boring bar was manufactured by Sandvik and mounted inside a 20-meter (66-foot) lathe.

The project is a collaboration with Spain-based Gurutzpe, one of the largest manufacturers of heavy horizontal lathes in Europe. The cooperation also extends to the design of the clamp for the machine. The end customer is a Saudi Arabian company.

The anti-vibration boring bar has the capacity for a maximum length of 4.2 meters or 165 inches, which is about 14 times the bar's diameter of 12 inches.



BIGGEST CHALLENGE
Being able to machine lengths of up to four meters without having problems with vibrations and at the same time maintaining good surface quality.

PRODUCTION TIME
Four months. Total project time was eight months from order to delivery.

MAIN DIMENSIONS
Length: 240 inches
Capacity of the bore: 165 inches
Overhang: 14 times the diameter
Diameter: 12 inches

WORLDSKILLS 2015

The 43rd WorldSkills competition took place in Brazil in August 2015, bringing together students, schools, companies, sponsors and more than 250,000 visitors over a four-day period. Sandvik was one of the sponsors.

WHEN THE 43RD WorldSkills Competition wrapped up after four days of skills competitions and discussions about the importance of vocational education to the sustainability of the global economy, the numbers were impressive. 1,189 competitors from 59 countries had competed for medals in 50 different technical skills, with technical support from 1,144 experts, additional support from some 70 sponsors and partners and admiration from the more than 250,000 visitors in attendance. Simon Bartley, CEO of WorldSkills, says the competition represents an opportunity for the countries and educational institutions involved to gain information and insights to help them improve the quality of their technical education and to encourage young people to take up technical careers to better meet the needs and expectations of a globalized world. "This year's WorldSkills took a big step toward becoming a truly global movement," Bartley says.

> "The competition represents an opportunity for the countries and educational institutions involved to gain information and insights."
>
> Simon Bartley, CEO of WorldSkills

THE HEAT IS ON

SANICRO™ 25 is a next-generation austenitic stainless steel alloy developed by Sandvik to cope with extreme heat. As environmental demands increase for coal-based boiler fabricators and their end-user power plants, this alloy has the potential to contribute to greater efficiency and to significantly reduce CO_2 emissions. Sanicro™ 25 was successfully launched in the Chinese market in June during a symposium in Zhenjiang.

SANDVIK.COM "BEST CORPORATE WEBSITE" AGAIN
For the second consecutive year, sandvik.com ranked No. 1 in the category "Best Corporate Website" in a survey conducted by E-space Communication.

SANDVIK LAUNCHES UPGRADED BOLTER MINER

Sandvik MB670-1 bolter miner is the latest in a range of proven, productive and reliable bolter miners that increases productivity, reduces total cost of ownership and improves safety and ergonomics for operators. It is purpose-built for longwall mining, and the fully automatic cutting cycle results in constant and faster advances, shortening panel development times in stable ground conditions by up to 30 percent and ensuring smoother mine floor conditions.

AIMING FOR **FUTURE LEADERSHIP**

ELEVEN NEW PARTICIPANTS entered Sandvik's Global Trainee Program. The trainees will undergo 18 months of extensive training, including on-the-job work experiences. The purpose of the program is to attract students in selected markets, and for candidates to become Sandvik Global Future Leaders.

MADE FROM SANDVIK® STEEL

PROFESSIONAL SECRETS is a community for foodies in which experienced chefs share knowledge and recipes. In collaboration with top chefs, they have developed a professional knife for domestic use. The material of choice was SanEdge™ steel from Sandvik.

A chef's knife requires stainless steel of the highest quality. The material must be hard enough to render a sharp blade, but soft enough to be easily ground and allow for flexibility. Among other criteria are wear and corrosion resistance and edge stability.

10 **Sandvik was selected as a member of the prestigious Dow Jones Sustainability Index,** which means Sandvik ranks among the top 10 percent of the economic, environmental and social performers in its industry globally.

FOCUS

PRODUCTIVITY – THE VALUE OF DIGITALIZATION

Although manufacturing is still in the early stages of transformation, the future of manufacturing is already here. This massive digitalization implies a huge potential for increased productivity, agility and improvements in work environments.

TEXT: JOHAN RAPP

AT SANDVIK, ranked as one of the 100 most innovative companies in the world*, researchers are focusing on how the Internet of Things (IoT), Big Data and continued massive digitalization can help customers reduce costs, increase productivity and create new business opportunities.

"In many ways, this is not new to us," says Ulf Hermansson, Strategical Technical Analyst at Sandvik Group Research and Development (R&D). "We've been working with automation, smart systems and other digital solutions for years, but now we are seeing accelerated development and new potential."

Unlike finance, music, retail and other industries that are being radically transformed by the digital revolution, manufacturing is still in the early stages of transformation. Hermansson sees several reasons why that is changing:

1. The rapid increase in processor power at lower cost.
2. The building of wireless networks and other infrastructure, which allows the development of commercially viable inventions and applications.
3. The reduced cost of sensors.
4. The change in attitudes. Ten years ago many saw digitalization as a threat, something that would take jobs away from humans. Now it is largely seen as a means to improve competitiveness.
5. The opportunity to reduce production costs. In many activities, digitalization has become the first alternative, rather than outsourcing to low-wage countries.

INDUSTRY 4.0 IS THE VISION of manufacturing in the future. In this highly automated mode of production, sensors and IoT enable machines and products to "talk" and interact with one another and other relevant parts of the value chain, while providing continuous information to those monitoring the flow. It is possible to identify improvements in every part of the process. Machines can predict failures and trigger maintenance processes autonomously, and self-organized logistics can react to unexpected changes in production. The potential for increased productivity, agility and improvements in work environments for humans, both in industrial production and mining, is huge.

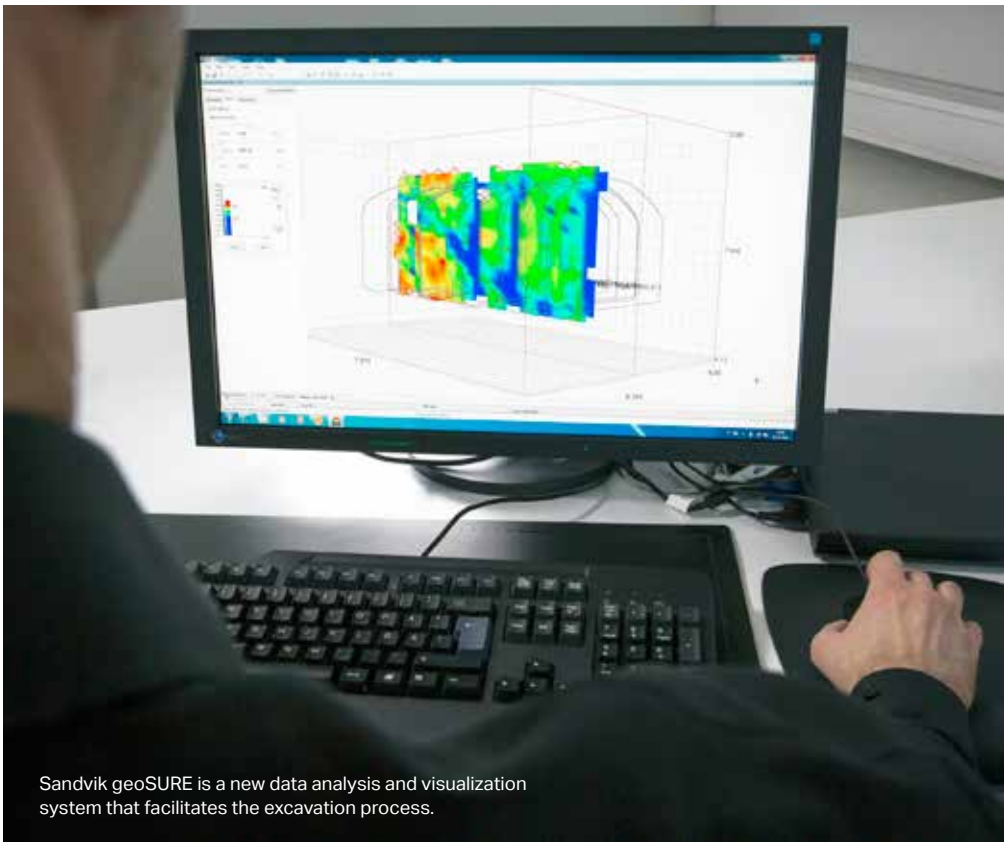
"There are many challenges on the way, but the technology exists," Hermansson says. "We are doing a lot of research and continuously releasing new products and solutions in this direction."

SANDVIK HAS A LONG HISTORY of developing solutions for underground mining automation, which not only reduces the need for manual work, but also enables the finding of new sources of ore by mining in places where humans cannot safely go. ⟶

* *Forbes* magazine ranked Sandvik No. 74 on its list of the world's most innovative big companies.

"We've been working with automation, smart systems and other digital solutions for years, but now we are seeing accelerated development and new potential."

Ulf Hermansson, Strategical Technical Analyst
at Sandvik Group Research and Development (R&D)



Sandvik geoSURE is a new data analysis and visualization system that facilitates the excavation process.

Recent years have seen strong development of information management systems.

Tuomo Pirinen, Research Manager at Sandvik Construction, says, "We help virtualize projects with software that enables customers to do detailed planning of how to proceed with drilling and blasting projects."

When the actual work starts, sensors and other sources align the information management system with exact data on rock conditions, effects of blasts, status of equipment and so on, allowing for immediate quality control, adjustments and optimization.

A recently released system for underground drilling, geoSURE, makes the drill a sensor that continuously feeds the excavation process with real-time data and analysis.

"You want information to be as accurate, fast and detailed as possible," Pirinen says.

RIKU PULLI, Vice President Mine Automation at Sandvik Mining, says sensors are now providing exponential amounts of data that pave the way for data-driven productivity improvements.

"Together with customers, we develop systems and algorithms to better understand and evolve the machines and the processes," he says.

Development of IoT and increased understanding of Big Data signal a shift of business models in all kinds of industries, including mining.

"In the future, companies can sell performance rather than just equipment," Pulli says. "We are definitely headed that way."

Vahid Kalhori, Manager Intelligent Machining at Sandvik Coromant, stresses that smart factories are more than just sensors, machine-to-machine (M2M) connectivity and human interaction.

"You need immediately accessible, available and reliable knowledge and know-how in order to make quick and accurate decisions," Kalhori says. "Not only is this relevant to meet the demands of highly customized and profitable production and solutions, but we need to embed know-how that risks being lost as experienced engineers retire."

Product Life Cycle Management, virtualization and other information systems and tools need to be developed to meet the higher demands of fast decision making. "Several of our recent solutions offered to the market answer to these needs," Kalhori says.

For instance, Adveon™, an open virtual cutting tool library developed together with partners, paves the way for more simulation and testing in 3D environments, dramatically facilitating the development of cost-effective and innovative solutions. InvoMilling™, used to produce gear of different profiles and dimensions, is a software with embedded pre-machining steps such as process planning, tool assembly and cutting data, enabling automated mass customization at the touch of a button.

"The customers can focus on design of the gears and send the instructions to the machine that will make the product," Kalhori says.

RESEARCHERS IN SANDVIK'S different business areas agree that the development toward future manufacturing is picking up speed. They say it is an exciting time, but the journey is long.

"The next step is to interconnect everything – machines, tools and personnel – more than we are already doing, and create self-learning, smart factories," says Pasi Kangas, Research Manager at Sandvik Materials Technology.

Kalhori says manufacturing is learning how to use the potential in data and make new inventions by putting the pieces together. "We are where banks were 10 years ago," he says. "But access to data, digital environments and the ability to analyze and make sense of the data is setting the stage for change. We are about to see an explosive development." ■

PICKING PENNY

Predictable productivity is what Penny brings to Sandvik's insert manufacturing process.

PENNY WORKS HARD. She works all day, and never tire from the tedium of her job of moving carbide inserts from one side of a metal cage to the other.

Some might call her a robot, but Penny is far more than that. She's a custom-built material-handling solution, designed and built by the Sandvik Production Equipment team in Gimo, Sweden, under the direction of Project Manager Johan Eriksson.

"Penny is the first of her kind," Eriksson says. Once the final specifications were agreed to, she required more than a year to build. She has just recently been delivered to Sandvik's facility in Gimo, "the largest carbide insert factory in the world," where she is undergoing final acceptance testing.

Penny performs a critical step in the insert manufacturing process, placing up to 1,600 precision-ground inserts per hour onto racks for the PVD coating furnace, then sending the completed inserts off for marking and packaging.

Because Penny has an advanced vision system, she can "see in 3D" what she is doing and is smart enough to self-calibrate her movements. She is fast and accurate, but she also has a delicate grip – picking up one-millimeter-wide inserts is no problem for her, and there is never a risk of damaged or misplaced inserts.

Because of her predictable productivity, Sandvik can continue to offer high-quality products at a competitive price. "What we do here at Sandvik is a fine art," says an understandably proud Eriksson. "There's nothing else on the market quite like Penny." ■

"She can 'see in 3D' what she is doing and is smart enough to self-calibrate her movements."

PHOTO: RETHINK ROBOTICS

A new collaborative friend at Standby Screw, customer of Rethink Robotics.

I, COBOT: THE FUTURE OF ROBOTICS IS HERE

A mainstay of industrial production for several decades, robots are evolving into smarter, friendlier devices that promise to revolutionize the workplace.

INDUSTRIAL ROBOTS have long been associated with repetitive or dangerous tasks, helping countless manufacturers to improve quality and increase productivity. Yet these untiring worker bees have traditionally required complex programming and expensive integration to work with machine tools and must be surrounded with safety barriers to protect the people working around them. A new breed of robot is coming, however: the collaborative robot. The "cobot" is simple to install and program, works alongside humans without risk of injury or need for guarding and – if proponents are right – will one day be as commonplace as CNC machine tools.

Bob Doyle, Director of Communications for Michigan, U.S.-based Robotic Industries Association, thinks so. Doyle says collaborative robotics is an exciting new industry segment, one that promises to greatly expand the job description of devices once limited to welding, painting and machine tending. "Look at Relay, a robotic butler now being employed in hotels, or the robots Amazon uses to pick products in its →

warehouses," says Doyle. "These are just two examples of how collaborative robots are becoming more prevalent outside factory walls."

WITHIN THE FACTORY, collaborative robots are making work simpler and more profitable. Setup and programming are no more difficult than setting the robot in the work area and teaching it what task to perform, making it an ideal set of "helping hands" to lift heavy products, insert components into assemblies and perform virtually any chore that helps humans be more efficient. "It's all about utilizing robots to help people," Doyle explains.

One machine with this goal in mind is Sawyer, the latest addition to the cobot product line at Massachusetts, U.S.-based Rethink Robotics Inc. Chief Marketing Officer Jim Lawton says Sawyer is equipped with a force-sensing feature that allows it to "feel its way" into tight corners and a machine vision system that can read barcodes and recognize objects in the work environment.

"There are certain high-dexterity, cognitive tasks that will always need a person," he says. "But there are also many routine tasks – performing the same motion over and over, for example, or counting large numbers of parts. This is where collaborative robots shine."

THE NEED IS GLOBAL, Lawton points out. For decades companies have moved manufacturing activities from country to country, chasing the lowest labor costs in an effort to remain competitive. The consequences are lengthy supply chains, unpredictable quality and turmoil. Until quite recently, the best alternative to low-cost labor was automation, but this has often seemed like overkill for many smaller manufacturers and job shops. Cobots, with their relatively low price tags and easy implementation, have the potential to change all that. "Consider a packaging job," says Lawton. "With a human, you just show him the boxes and tell him what to put inside and where to stack it when done. Collaborative robots can cost-effectively perform tasks like this, and do so with humans working around them."

Corey Ryan, Manager for Medical Robotics at KUKA Robotics Corporation in Germany, agrees. "We've seen a big surge in people trying new applications recently. Many go into it not knowing what to expect, but once they start experimenting with all that a collaborative robot can do, the uses for them explode."

Ryan says this trend will continue as cobots become more mobile. Now that KUKA and other robot manufacturers have removed the safety cage, the next logical step is to give these little droids wheels or tracks so that they can travel to the worksite when called, bring material to their human coworkers and move goods to other areas as necessary. All this is made possible through the increasing intelligence and improved vision and motion-sensing capabilities of cobots, as well as a growing awareness of what's possible. "There are really very few limitations," Ryan says. "It's an exciting time for the industry." ■

RESEARCHING THE FUTURE

A brand new research and development center for additive manufacturing in Sandviken, Sweden, paves the way for exciting new products and methods as well as new business opportunities. What is close to impossible to manufacture today may very well be ready for mass production tomorrow.

THE NEW LABORATORY for additive manufacturing, commonly known as 3D printing, is housed in a modest one-story building at the heart of Sandvik's industrial plant in Sandviken.

A strong team of researchers, designers and technicians will, with the help of several different kinds of machinery for multiple additive processes and methods, explore new possibilities for existing products as well as future products and production methods.

"The investment in additive manufacturing creates opportunities to produce products that have been nearly impossible to make, and in a reasonably productive way," says Mikael Schuisky, Operations Manager for the new Additive Manufacturing Center.

One industry that has already explored the advantages of this technology is aerospace, where there is a huge demand for lightweight framework structures. A weight reduction of one kilo of an airplane saves 3,000 USD in fuel a year. Also within the medical field, additive manufacturing has achieved major scientific achievements with a growing production of custom-made parts for implants.

"Additive manufacturing makes it possible, to take one example, to create the right porous surface for the body tissue to grow on a hip prosthesis," says Schuisky. →

"With our expertise and knowledge in metallurgy, in combination with our advanced portfolio of metal powders, we will certainly be in the forefront."

Mikael Schuisky, Operations Manager for the new Additive Manufacturing Center

However, it is too early to tell where the investment in additive manufacturing will take Sandvik.

"The new center will provide new tools to evolve and elaborate," Schuisky says. "Our work ahead will show what products and designs fit these specific manufacturing techniques, and which ones are better suited for current production methods."

Schuisky is a bit secretive about the team's achievements so far and what is really going on behind those lab walls. But one project he can reveal is the ongoing work with a tool holder for the metalcutting industry, one of many promising projects in the pipeline.

Spare parts produced on-site for customers is another vision that has become a reality. Offshore industries, such as oil platforms, cannot carry a huge stock of spare parts. With a 3D printer, this could be quickly fixed, saving time when a part needs to be replaced and the delivery time is otherwise long, due to geographical or other reasons.

"At present, the time-consuming building process slows down the development," says Schuisky. "As every layer of metal powder is only 40 micromillimeters, specific objects can take several days to produce. The machine suppliers are currently working on adding multiple laser beams to speed up the process."

He adds: "In my world, what would really make these new techniques take off would be automating the entire manufacturing process. We need to speed up the flow from drawing board →

to finished product. Even if the additive process with 3D printing machines is technically advanced, it is still a very manual and time-consuming process to prepare and harvest any results."

Schuisky says, however, that it is only a matter of time before the printers will become faster and the processes more automated. "When that happens, we are already on board," he says. "With our expertise and knowledge in metallurgy, in combination with our advanced portfolio of metal powders, we will certainly be in the forefront."

It is not clear when the first pilot production line will be ready to be presented. "We are not quite there yet, but it will happen sooner than I initially thought. Maybe by the beginning of 2017."

The additive manufacturing team works closely with other research and development teams within Sandvik to explore possible business benefits of the new technique. In addition to building up a strong internal network, the goal has been to establish a dynamic research team with members prepared to challenge themselves as well as each other and the present 3D techniques. Doctors in metallurgy work side by side with non-academic technicians, ready to question, try and explore. As skills and competencies build up within the center, all business units can get all the guidance they need to acquire the right machinery or the optimal metal powder for a specific additive manufacturing project. ■

SKILLING UP FOR THE FUTURE

New technologies require new skills and competencies, and a lot of the future experts can be found among Sandvik's employees. Meet technician Louise Hansson, 20, the youngest team member at Sandvik's new Additive Manufacturing Center.

WHAT MADE YOU APPLY FOR THIS JOB?

"Additive manufacturing is something new and exciting. This is a great opportunity to develop myself and a new technique, as well as the company I work for."

WHAT IS YOUR BACKGROUND?

"After graduation from the technical secondary school in Sandviken, I worked with research and development here at Sandvik until this opportunity came up."

HOW CAN YOU CONTRIBUTE TO THE TEAM?

"I think my youth perhaps makes me think in new and different ways than some of the older team members. By working together, we can inspire and learn from each other."

ON AN AVERAGE WORKDAY, WHAT DO YOU DO?

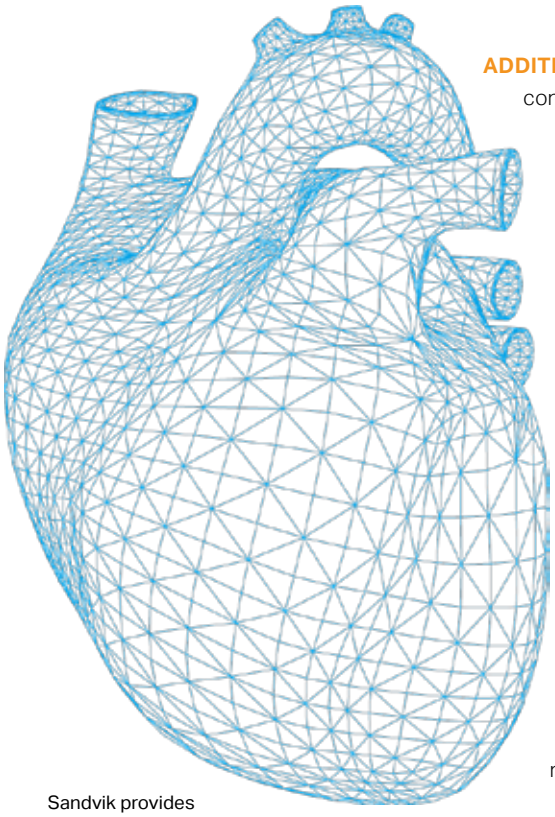
"Most of the time I prepare and operate additive manufacturing machines. I also do mechanical tests of additive manufacturing parts. In addition, I test the properties of the metal powders in the different types of techniques to see how they perform, for example in a machine using a laser melting technique or electron-beam melting."

WHAT WILL YOU BE PRINTING IN TEN YEARS?

"By then I think everyone will have a type of additive manufacturing printer at home. Myself? I might be printing a pair of new candle holders for my home." ■

HEART MADE TO ORDER

Additive manufacturing opens the door to lifesaving advances in medical technology. With the 3D printing of heart models and patient-specific implants, replacements and prostheses, the future is already here.



Sandvik provides materials, advanced tooling and machining solutions for medical devices.

ADDITIVE MANUFACTURING, more commonly known as 3D printing, is the process of transforming digital models of almost any shape imaginable into solid metal, plastic or composite objects. Traditionally used for prototyping parts that will eventually be machined or injection molded, the process is becoming an indispensable tool for medical researchers, physicians and surgeons alike.

With the ability to quickly print a variety of organic shapes, doctors can create patient-specific replacements for worn joints and broken bones, build custom prostheses for injured patients and possibly at some point even make human organs.

A quick search on the Internet reveals dozens of novel applications for this exciting technology. In the United States, a hospital in Boston uses 3D printing to build implants for reconstructive facial surgery patients, and the University of California has printed prototypes of miniature fish-shaped →

robots that may one day deliver drugs by swimming through the human bloodstream. Meanwhile, in Germany, neurosurgeons at the Klinikum Karlsruhe are using selective laser melting, a metal-based 3D printing process, to build custom titanium spinal implants. And cancer researchers everywhere are 3D-printing tumors from human cells to test the effectiveness of cancer treatments.

ONE INCREASINGLY prevalent example of the benefits that additive manufacturing brings to healthcare is the use of 3D-printed models as part of the surgical process. That's because while CAT scans and MRI technology can go a long way in displaying the topography of the human body, no amount of imaging can compare with a "hands-on" view of organs and internal structures. As a result, surgeons, despite their extensive knowledge and experience, must often begin procedures that are prone to surprises. With 3D printing, physicians can hold a physical replica of a human brain, heart, kidney or spleen beforehand, study it and make better medical decisions as a result.

ONE EXAMPLE OF THIS is the case of Lavesh Navedkar, a baby boy from India born with a double outlet right ventricle (DORV), a heart defect that prevents proper blood flow. Surgeons wanted to perform a delicate surgery to repair the defective aorta but felt it was too risky, given the age of the patient and the complex preparations required to ensure success. However, by working with additive manufacturing service provider Sahas Softech LLP in Mumbai, the doctors were able to scan the 6-month-old boy's heart and provide the data needed to print several iterations of his ailing heart – and do so within days. This gave surgeons the opportunity to "practice" the surgery in advance, thus greatly increasing the boy's chances.

The surgery was a success. Thanks to 3D printing – and of course the skills of the surgical team – young Lavesh Navedkar can now look forward to a long and healthy life. "The boy is doing great," says Firoza Kothari, head of healthcare at Sahas Softech. "We've been keeping in touch with his family and he's recovering very well."

PHOTO: SAHAS SOFTECH

THE COMPANY is currently working with five other DORV patients, but Kothari points out that 3D printing is not limited to hearts. "Give us a CT or MRI scan of any part of the human body and we can build a model," she says. "The technology is applicable to any kind of abnormality. The most difficult part for us was some slight manual adjustment that had to be made to the electronic model, but we were still able to provide accurate replicas within 48 hours." ■

REPORT

Figures from the Interim Report
• Trends and tendencies • Key figures and news
• Keeping uptime up • Meet the CEO

TRENDS AND TENDENCIES
MATS BACKMAN, CFO

HOW WOULD YOU DESCRIBE SANDVIK'S THIRD QUARTER?

Sandvik noted its strongest-ever third-quarter cash flow of SEK 4 billion from continuing operations, and also record-high cash flow of SEK 9.4 billion for the first nine months of 2015. This is not least a result of the continuous focus on improved management of net working capital.

We noted weaker demand compared with the year-earlier period, and order intake declined in all business areas and for the major geographical regions. Demand for mining equipment remained stable at a low level, although we noted a slightly softening demand for consumables, rock tools, in the aftermarket business.

In summary, it is a tough market situation and we are adjusting the organization accordingly.

WHICH MARKETS ARE DEVELOPING THE MOST AND LEAST FAVORABLY RIGHT NOW?

Demand was weak across all regions, with aerospace and automotive the relatively stronger segments. The low oil price continued to hamper demand in energy and general engineering.

Europe appears to be the bright spot despite a lack of growth and in light of contraction in other regions. China is the main area of concern right now.

CAN YOU ELABORATE ON THE MEASURES SANDVIK IS TAKING TO MEET ITS MARKET CHALLENGES?

Our focus is on customers, targets and our operation.

We prioritize customer-focused innovation and have further increased the launch pace of new products, solutions and services. We aim to develop toward fast-growing markets and continue to grow our aftermarket business, especially within Sandvik Mining.

We have initiated cost-saving measures and are focused on keeping our costs down. Activities and projects are carefully selected based on business priorities.

We continue to focus on capital efficiency and further reductions of net working capital. ■

FIGURES from the Interim Report Q3 2015

INVOICED SALES BY BUSINESS AREA

MSEK	Q3 2015	Q3 2014	Change %	Change % [1]
Sandvik Machining Solutions	7,836	7,658	+2	– 5
Sandvik Mining	5,712	5,121	+12	+ 7
Sandvik Materials Technology	3,161	3,735	–15	– 13
Sandvik Construction	2,037	2,232	– 9	– 15
Sandvik Venture	1,994	2,155	– 7	– 14
Group Activities	5	7		
Continuing operations	**20,745**	**20,908**	**– 1**	**– 6**

1) Change compared with preceding year at fixed exchange rates for comparable units.

OPERATING PROFIT BY BUSINESS AREA

MSEK	Q3 2015	Q3 2014	Change %
Sandvik Machining Solutions	1,459	1,496	– 2
Sandvik Mining	847	640	+ 32
Sandvik Materials Technology	49	482	– 90
Sandvik Construction	99	1	N/M
Sandvik Venture	91	133	– 31
Group Activities	– 220	– 264	
Continuing operations [2]	**2,325**	**2,488**	**– 7**

2) Internal transactions had negligible effect on business area profits.

OPERATING MARGIN BY BUSINESS AREA

% OF INVOICING	Q3 2015	Q3 2014
Sandvik Machining Solutions	18.6	19.5
Sandvik Mining	14.8	12.5
Sandvik Materials Technology	1.5	12.9
Sandvik Construction	4.9	0.0
Sandvik Venture	4.6	6.2
Continuing operations	**11.2**	**11.9**

INVOICED SALES Business area share of Group's total invoiced sales

38 %
7,836 MSEK
Sandvik Machining Solutions

27 %
5,712 MSEK
Sandvik Mining

15 %
3,161 MSEK
Sandvik Materials Technology

10 %
2,037 MSEK
Sandvik Construction

10 %
1,994 MSEK
Sandvik Venture

KEEPING UPTIME UP

"When you can predict productivity, you can predict profitability."

THE MESSAGE is simple enough, but the challenge is how to prove it to customers. It was from this starting point that the Sandvik 365 concept evolved.

"The services we provide around the equipment are what keep it running 365 days a year," says Marie Brodin, Vice President Marketing and Communications, Sandvik Mining. "This is our way to get our arms around that, to package it and to make it easier for customers to understand it and for sales people to sell it."

Beyond words, though, the proof of the concept will come in concrete numbers. In an industry where an hour of downtime can cost thousands, Sandvik 365 can save customers millions. In Australia, for example, a Sandvik service program has demonstrated a 30 percent reduction in parts and significantly improved productivity, reliability and safety.

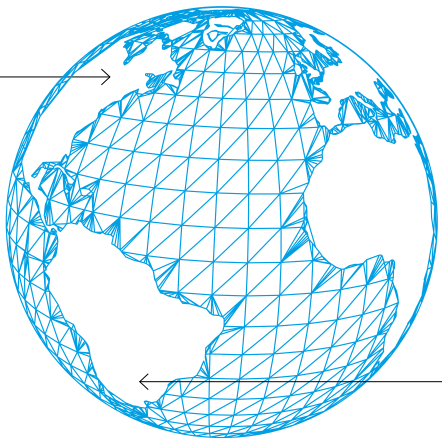
Using a certain drill bit can increase service lifetime by up to 50 percent compared with the previous technology, while Sandvik protective services offer 80 percent coverage of spare parts and deliver increased uptime productivity in a risk-controlled crushing and screening operation. The opportunities are many. "It's about keeping uptime up," Brodin says. "You can spoil everything if you don't take care of the entire solution in the right way."

The initial reaction from colleagues all over the world has been extremely positive, so much so that the global concept has already been translated into seven languages.

The industry is changing and the company is adapting to meet those needs, aiming to be proactive rather than reactive. It is not just about numbers, though. While increased sales for Sandvik and its customers will be one sign of success, another very important one will be customer satisfaction.

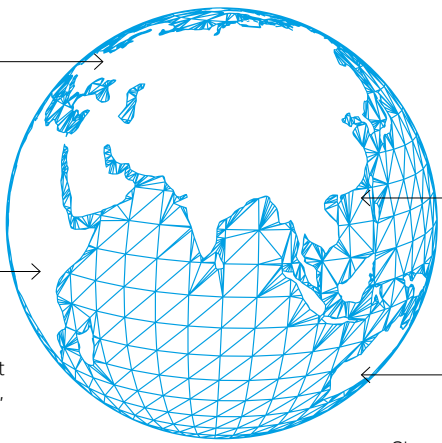
Internally, too, Brodin notices an increased sense of pride among a workforce numbering many thousands. "Two examples of the comments we have received are 'This program is what we need to make our service business progress to the level of greatness' and 'It's what we have been looking for, and now we have it'." ■

INVOICED SALES BY MARKET AREA Share of Group invoicing



NORTH AMERICA
21% SHARE
The invoiced sales for the North America region were 4,441 MSEK, a -12 percent change.

SOUTH AMERICA
5% SHARE
The invoiced sales for the South America region were 1,124 MSEK, a -12 percent change.



EUROPE
39% SHARE
The invoiced sales for the Europe region were 7,838 MSEK, a -4 percent change.

AFRICA/MIDDLE EAST
10% SHARE
The invoiced sales for the Africa/Middle East region were 2,178 MSEK, up by 13 percent.

ASIA
21% SHARE
The invoiced sales for the Asia region were 4,268 MSEK, a -5 percent change.

AUSTRALIA
4% SHARE
The invoiced sales for the Australia region were 896 MSEK, a -12 percent change.

Share of the Group % → Change

INVOICED SALES by segment

32% **MINING**

22% **ENGINEERING**

14% **ENERGY**

11% **CONSTRUCTION**

11% **AUTOMOTIVE**

10% **OTHER**
Aerospace, consumer related, miscellaneous.

DIVESTMENT OF MINING SYSTEMS

Sandvik has initiated the divestment of Mining Systems, a supplier of design and engineering of material handling systems for the mining industry. In 2014, annual sales amounted to 6.3 billion SEK, representing 7 percent of Sandvik Group invoicing, reporting a small operating loss.

"Divestment of Mining Systems will make Sandvik Mining more focused on its core operations, mining equipment and aftermarket offerings for both underground and surface mines, which Sandvik will continue to develop to ensure long-term value creation," says Mats Backman, CFO and at the time, acting President and CEO of Sandvik.

SANDVIK ACQUIRES SGL TECHNOLOGY

Sandvik has acquired SGL Technology B.V., a provider of food processing equipment. Based in Breda in the Netherlands, SGL Technology has more than 30 years of experience in design, manufacturing and installation of customized machinery and equipment in the food sector, especially in the chocolate segment. In 2014, the company had sales of about 6 million euros and around 20 employees.

TUNNELING IN BHUTAN

On the banks of the Punatsanchhu River in Bhutan, Sandvik's jumbos and drill rigs are used in the Punatsanchhu-II hydropower run-of-the-river project. Among the requirements were outstanding performance, on-time completion of the project and equipment reliability, due to the hazardous and long road connection.

0.20

Earnings per share, SEK

Order intake **20,192 MSEK** / Invoiced sales **22,092 MSEK** / Operating profit **1,321 MSEK**
Profit after financial items **1,871 MSEK**
Cash flow from operations **+3,568 MSEK**

BJÖRN ROSENGREN
CAREER: 30 years in leading positions in the industry, for example Atlas Copco and Wärtsilä.
FAMILY: Married to Cecilia, with three children and a dog named Pommac.
INTERESTS: Skiing in winter (cross-country as well as downhill) and sailing in summer.

WELCOME TO SANDVIK

Björn Rosengren is Sandvik's new President and Chief Executive Officer as of 1 November. Prior to Sandvik, he held the equivalent position at the Finnish power systems corporation Wärtsilä.

COULD YOU TELL US ABOUT THE EXPERIENCE YOU BRING TO SANDVIK?

I have 30 years of industry experience from different markets and in several management positions – 13 years at Atlas Copco, for example. For the past four and a half years I have been head of Wärtsilä, one of Finland's largest industrial companies, offering power solutions for the marine and energy markets.

WHAT IS YOUR FIRST PRIORITY WHEN YOU ENTER YOUR NEW POSITION?

My first priority is to learn more about Sandvik, both the business and the culture, and to meet as many colleagues as possible. I will visit Sandvik sites as well as customers.

WHAT DO YOU HOPE TO ACHIEVE AS SANDVIK'S CEO?

The highest priority is to ensure that the group delivers sustainable results. In order to bring continuous results, we have to create winning teams and make sure people enjoy working in the company.

WHAT MAKES A GOOD LEADER, IN YOUR OPINION?

A good leader delivers sustainable results. To be able to do that you need the right, motivated people in the right place. You must create a working environment that inspires the employees to deliver extraordinary achievements and give credit to the team when reaching results.

MOST IMPORTANT INDUSTRY CHALLENGES AHEAD?

It is clear that the world economy is stagnating at the moment and that we are facing difficulties in several areas. For example, low mineral prices and falling oil prices are affecting the entire oil and gas industry. We are dramatically affected, and I do not see any short-term improvement. However, we must be ready to explore opportunities in these challenges. There will always be business opportunities, and we need to seize them. It is even more crucial to step up now and show our customers and the industry what we are capable of.

WHAT ARE SANDVIK'S STRENGTHS?

We have leading positions in several markets, and we have great people who develop fantastic products and technologies. This is all a basis for a successful company.

MOST IMPORTANT LESSONS YOU'VE LEARNED?

I have learned that you have to give business leaders both full responsibility and accountability in order to achieve goals and succeed in big companies. I've also learned the importance of speed. You have to be faster than your competitors.

WE WRITE ABOUT HOW DIGITALIZATION AND "INDUSTRY 4.0" CAN IMPROVE FUTURE PRODUCTIVITY. WHAT ARE YOUR REFLECTIONS?

It is very exciting to see the whole world changing before our eyes, making life easier and simpler through digitalization. I see future possibilities with the new technologies for Sandvik.

ANYTHING ELSE YOU WOULD LIKE TO SHARE?

I am both proud and happy to be part of Sandvik's exciting future. We have the necessary foundation for success with our technical expertise and know-how tailored for our customers' needs. I recognize the responsibility I have been given. There's going to be a lot of hard work as well as rewarding times along the way. ■

THE OBJECT | 3D-printed shoe

Additive manufacturing allows you to produce items that cannot be manufactured using traditional techniques. These couture shoes were created with Swedish fashion designer Naim Josefi and then 3D-printed by Sandvik. The aim was to showcase the potential and the vast possibilities of additive manufacturing. Read more about Sandvik's new Additive Manufacturing Center on page 19.