COMMERCIALIZING IDEAS • Taming atoms • **OPEN INNOVATION**
World's first all-electric mine • **METAL POWDERS FOR 3D PRINTING**
DEEP BRAIN STIMULATION • Wilhelm Haglund award 30 years

MEET SANDVIK

#3 -2016

SANDVIK GROUP MAGAZINE

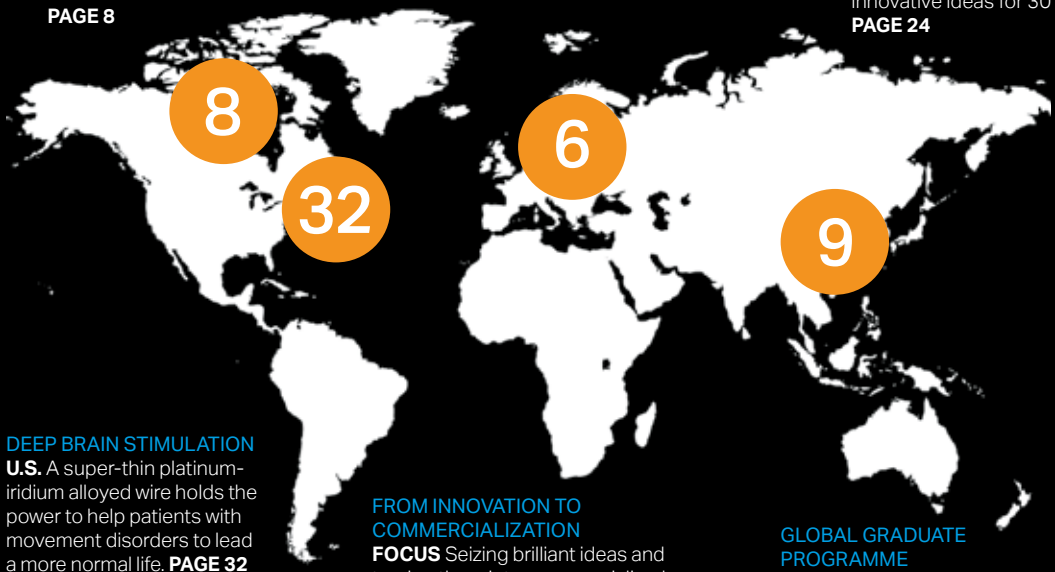
FROM IDEA TO **CUSTOMER VALUE**

Seizing brilliant ideas and turning them into commercialized products and services is the criteria for Sandvik's Wilhelm Haglund Medal for the Product Developer of the Year, which now celebrates its 30th anniversary. **PAGE 10**

MINE WITH ZERO EMISSIONS
CANADA Joining efforts with Goldcorp to turn the Borden Lake project into one of the world's first all-electric mines. **PAGE 8**

HYDROGEN FILLING STATION
SWEDEN Sandvik opens up a hydrogen filling station, in partnership with the municipality of Sandviken and AGA Gas. **PAGE 6**

30 YEARS OF INNOVATION
THE WILHELM HAGLUND medal has celebrated innovative ideas for 30 years. **PAGE 24**



DEEP BRAIN STIMULATION
U.S. A super-thin platinum-iridium alloyed wire holds the power to help patients with movement disorders to lead a more normal life. **PAGE 32**

FROM INNOVATION TO COMMERCIALIZATION
FOCUS Seizing brilliant ideas and turning them into commercialized products and services is a survival skill for all companies. **PAGE 10**

GLOBAL GRADUATE PROGRAMME
ASIA, EUROPE & U.S. Trainees from all over the world get extensive Sandvik education and job rotation. **PAGE 9**

CONTENT #3-2016

Follow us in social media and find more stories at: home.sandvik/sandvikstories

SANDVIK

MEET SANDVIK: The Sandvik Group magazine
PUBLISHER RESPONSIBLE UNDER SWEDISH PRESS LAW: Pär Altan
EDITOR-IN-CHIEF: Sophie Öberg **PRODUCTION:** Spoon Publishing AB
PRINT: Falk Graphic **DATE OF PRINT:** November 2016
Published in Swedish and English, in printed form and at our website home.sandvik
EMAIL: info.group@sandvik.com .

DEAR READER,

AS YOU READ this edition of Meet Sandvik, it is a little more than a year since I started at Sandvik. These approximately 400 days have been eventful, insightful and rewarding. I have got to know the company and experienced the expertise and dedication of the colleagues I have met in many of the countries in which we operate. I have come to greatly respect what Sandvik stands for – and what Sandvik can make possible. It instills me with optimism and confidence.

IN THE MIDST OF a challenging business environment, we have established a new strategic direction that will enable us to strengthen and develop our leading position. Through increasing decentralization, our business decisions are made closer to our customers. This will enable us to respond more quickly to customer requests. Within the business areas, each product area will have total ownership of, and responsibility for, its respective businesses, providing even better transparency.

One of our strategic areas is technology and innovation, which are key to achieving our vision, "We set the industry standard". Innovation and entrepreneurship have always been at the core of Sandvik's operations and corporate culture. This was recognized already 30 years ago, when the product developer of the year was given the Wilhelm Haglund Medal for the very first time. The award draws attention to important industrial innovations that provide both significant customer benefits and a proven commercial value for the group.

IN THIS EDITION of Meet Sandvik, we highlight some of the group's most successful innovations since 1986, such as the modular tooling system Coromant Capto®, umbilical tubes in Sandvik SAF 2507™ super duplex stainless steel and modular trucks for underground mines.

I am also extremely pleased that this year we have launched what we believe will be fantastic products for the future, in the form of the first intelligent tools CoroPlus®, a new platform with connected tools and software, and the first battery-powered automated equipment for mines.

OUR STRENGTH is that we have always been able to change with the world around us and, above all, with our customers. I think this flexibility is very positive and has led us to market-leading positions in many areas.

Björn Rosengren, President and CEO

THE SKY IS THE LIMIT

Ever-growing demand in the aerospace industry for safer, lighter and stronger materials is opening up exciting new possibilities. Reduced fuel consumption, flawless operation under higher pressures and reduced costs through smarter designs are some of the opportunities.

For more than 50 years, Sandvik's materials technology has supported leading engineering companies in developing next-generation aviation, spaceships and satellites.

Sandvik offers a broad range of advanced stainless steel, nickel alloy and titanium aerospace tubular products that are used by leading original equipment manufacturers for fuel lines, hydraulic lines, instrumentation systems, pressure gauging and more. The sky truly is the limit.

Sandvik also offers complete machining solutions for the manufacturing of aerospace components. ■

NEWS

READER SURVEY MEET SANDVIK
Your input into the reader survey for Meet Sandvik was very valuable in further developing this magazine. For information regarding the result or any questions, please contact us.

9,000

The Sandvik Turku plant in Finland recently celebrated rolling out its 9,000th manufactured machine, Sandvik TH663 dump truck.

"We are really satisfied with the quality and performance of Sandvik's trucks and their support services," says Pat Boniwell, Managing Director of Australian mining contractor Byrnecut. "They have proven to be reliable and productive machines."

CLEAN CARS ARE COMING TO TOWN

In partnership with the municipality of Sandviken, Sweden, and AGA Gas, Sandvik will open up a permanent hydrogen filling station in Sandviken in December. On completion of the fueling station, Sandvik will also exchange three diesel cars for fuel cell cars.

A fuel cell is an energy converter that produces electricity and heat from hydrogen. Sandvik has developed strip steel with functional coating to be used in the so-called "fuel cell stacks" to gain a higher voltage. The energy conversion takes place without any combustion, and the only emission is pure water.

SANDVIK PARTNERS UP WITH HEAVY VEHICLES APPLICATION LAB

SANDVIK COROMANT has joined as an industrial partner at a new research center called the Powertrain Manufacturing for Heavy Vehicles Application Lab. Research will focus primarily on improving the powertrain production process – involving, for example, material selection and the machining of camshafts and engines.

Camilla Engbrink, Vice President Product Management and R&D at Sandvik Coromant spoke at the opening of the Heavy Vehicles Application Lab, together with Henrik Henriksson, CEO of Scania and Jan Ohlsson, Executive Vice President Group Trucks Operations at Volvo.

CONNECTED SOLUTION FOR DIGITAL MACHINING

COROBORE® +, THE NEW SOLUTION FROM SANDVIK COROMANT is planned to be released in 2017. The solution is part of the newly introduced platform CoroPlus® for digital solutions.

The increased level of automation that CoroBore® + can give will make it easy to accurately adjust the tool in the machine or in pre-setting for precision boring, leading to less manning, higher efficiency and better production economy.

Adjusting the cutting diameters has previously required hands-on operator involvement. With this embedded system, the operator can remotely adjust the insert position using a digital interface. CoroBore® + is prepared for connection to machine controllers.

There are considerable time savings in being able to use the same finish boring tool for different hole sizes due to the large adjustment range of each tool, and wear compensation adjustments will also be easier, quicker and more repeatable.

Automating these steps reduces the risk of errors, thereby providing a more reliable and stable process.

LARGE ADJUSTMENT RANGE
CoroBore® + tools have an adjustment range of around 30 percent of the tool diameter. The new tool is designed with the aim of managing adjustments with 1 micrometer accuracy, which should meet even the toughest demands.

Read more about CoroPlus® on pages 14-15.

Sandvik DD422iE produces zero emissions.

SANDVIK AND GOLDCORP WORK TOGETHER ON ONE OF THE WORLD'S FIRST ALL-ELECTRIC MINES

SANDVIK AND THE leading gold producer Goldcorp are joining efforts to make the Borden Lake project into one of the world's first all-electric mines. Located in Ontario, Canada, Borden Lake is part of a series of growth projects. Sandvik will provide a complete electrical solution, including development equipment for the mine.

"Thanks to our broad offer, we are able to provide a full solution of development equipment for the mine," says Dale Rakochy, Business Line Manager, Underground Drilling at business area Sandvik Mining and Rock Technology. "It's a fully integrated battery technology where you don't have to remove, handle or swap batteries underground, providing improved safety for operators and maintenance crews."

Mining companies and equipment manufacturers such as Sandvik are striving to develop a better standard of health and safety, as well as reducing environmental impact. One major step is to reduce the use of diesel-powered equipment underground, thereby having a positive impact on environment, health and safety and also helping to reduce the need for ventilation.

GOLDCORP HAS ORDERED Sandvik DD422iE development jumbo, which produces zero emissions while maneuvering between headings. Using the mine's existing electric infrastructure, the Sandvik driveline technology enables the battery to recharge during the drilling cycle. Thanks to diesel-free drilling, reduced diesel usage in the mine eases ventilation requirements, and also leads to reduced diesel logistics and maintenance expenses.

The start of the mine is scheduled to begin early 2017. ■

"It's a fully integrated battery technology where you don't have to remove, handle or swap batteries underground."

Dale Rakochy, Business Line Manager, Underground Drilling at Sandvik Mining and Rock Technology

BRINGING CONNECTIVITY TO MANUFACTURING PLANTS

SANDVIK COROMANT HAS presented CoroPlus®, a new platform of connected tools, software solutions and IoT (Internet of Things) devices. The concept makes it possible to reduce data waste and improve manufacturing processes through the use of connected technology and machining knowledge. The solution is aimed at helping manufacturers prepare for manufacturing of the future and Industry 4.0.

SANDVIK STAINLESS STEEL IN PROTOTYPE VESSEL

Swedish Steel Yacht AB (SSY) is building an innovative prototype boat using Sandvik's advanced stainless steel as a base for the construction. The Project P16 Prototype is expected to be used by the Swedish Coast Guard, military and sea-rescue services or as a civilian transport boat. The material selected is Sandvik SAF 2507® super-duplex stainless steel, used in industries such as oil and gas.

"This is a very exciting evaluation project, which could solve key challenges in the boatbuilding industry by providing more efficient, safer and greener boats in the future," says Björn Mogard, Global Product Manager, Strip, Wire and Heating Technology at business area Sandvik Materials Technology.

NEXT GENERATION **OF LEADERS**

THE ONGOING SANDVIK Global Graduate program includes participants from China, India, South Africa, Sweden and the United States. The program lasts 18 months and includes extensive Sandvik education and job rotation, where graduates get acquainted with different businesses within Sandvik. Participants have master's degrees in Engineering or Business Administration. A new recruitment phase started in October 2016, looking for master's graduates with the appropriate passion and drive from China, India, Finland, Sweden and the United States for the next program, which will start in September 2017.

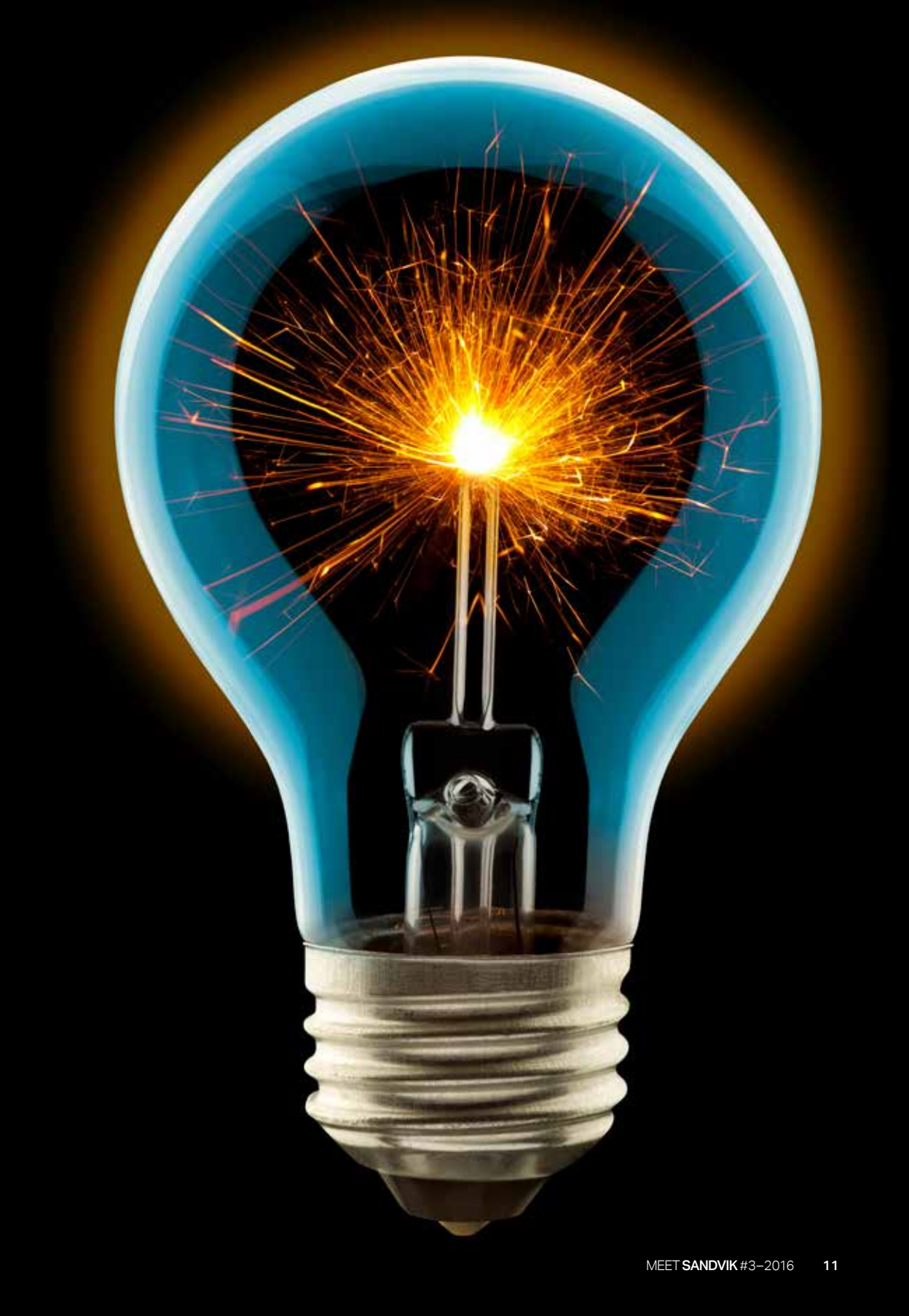
Trainees from all over the world get extensive Sandvik education and job rotation.

FOCUS

FROM INNOVATION TO COMMERCIALIZATION

Seizing brilliant ideas and turning them into commercialized products and services is a survival skill for all companies. This is also the criteria for the Wilhelm Haglund Medal for the Product Developer of the Year, which now celebrates its 30th anniversary. Being able to respond to both present and future customer needs is an art. How is it done?

TEXT: ÅSA BACKMAN



The milling tool M5B90 from Sandvik Coromant is an example of a successful result of an innovative idea for more effective cylinder head production. As with many great ideas, the process started with a need at a customer's facility and went from handmade sketches, teamwork and prototypes and then thorough testing before it could be put into production. The result: better surface finish, fewer tool changes and triple the tool life. The product is not featured in the text below.

THE SANDVIK COROMANT RECEPTION AREA in Sandviken, Sweden, is crowded this September day. Colleagues from all over the world are gathered to learn more about a completely new turning concept – a concept with the potential to turn the whole turning industry upside down. Again.

CONTINUOUS DEVELOPMENT, along with pioneering innovations, is crucial for the survival of any business. But what is it that empowers a company to maintain an innovative environment? Pasi Kangas, Vice President and Head of R&D at business area Sandvik Materials Technology, says that one of the keys is the long history of close cooperation with customers. "Sandvik is a technology-driven company that has always been passionate about collaboration with customers, academia and partners," he says. "It enables us to understand the needs of the customers, but also to see beyond the obvious answers."

"An innovative environment requires a certain leadership, built on engagement, trust, curiosity and patience."

TAINA HEIMONEN, Automation Development Manager at business area Sandvik Mining and Rock Technology, agrees and points to an oft-quoted Henry Ford saying: "If I had asked my customers what they really needed, they would have said a faster horse." She explains: "If you ask what people need, they will give you an answer based on what's possible just now. A true understanding of the core need will open up new opportunities. Sometimes that understanding, along with a technical curiosity, will lead to real innovations."

Mia Pålsson, Product Manager, Turning at product area Sandvik Coromant in Sandviken, Sweden, emphasizes the importance of leadership. "An innovative environment requires a certain leadership, built on engagement, trust, curiosity and patience," she says. "A team that *wants* to innovate is so much more efficient and open-minded than a team that *has* to."

THE SANDVIK LEADERSHIP model is created to build engaged leaders who encourage their teams to develop an innovative mindset – one that comes from inner drive rather than from demands.

Pålsson tries to practice what she preaches. When two of her colleagues asked her to "hear them out" two and a half years ago, she had no idea what was coming. The two engineers had been thinking for a while, and they wanted to present their idea. "I told them that I didn't understand half of what they were saying, but that it sounded fantastic," she recalls. "So I gave them a budget and time to try it out."

She says she didn't fully understand the potential then, but she trusted her talented colleagues and gave them room.

"Sometimes an idea turns out not to be as great as you'd hoped," Pålsson says. "But sometimes it turns into a success. It's just a matter of trust, patience and a true passion for solving customer challenges. This time, the idea turned out to work better than anyone had imagined."

IN THE RECEPTION AREA, the mood amongst the large team of colleagues has changed from one of confusion to one of inspiration. "If this is possible, anything is," says one. So far, the idea is just an embryo, filled with potential and hope, but also with question marks that have to be straightened out. When it reaches the market, we will get to know if the idea turns out to be an innovation, or merely a good idea.

On the following pages, we will revisit some of these groundbreaking innovations through the years. ■

The combination of Silent Tools™ + and CoroPlus® has been very well received.

SILENT TOOLS™ + BOOSTED WITH INTELLIGENCE

Anders Digernes was awarded the Wilhelm Haglund award in 2015 for a new generation of Silent Tools™, dampened tool holders for turning, milling and boring. This year, Sandvik Coromant presented Silent Tools™ + with sensor-based intelligence – CoroPlus®.

"IMAGINE THAT YOU are machining deep inside a really large component," says Anders Digernes, R&D Manager at product area Sandvik Coromant in Norway. "With traditional machining, it's impossible to know what's happening during machining. CoroPlus® enables valuable data before, during and after the machining process through embedded sensors. It definitely provides added value for many of our customers."

Dampened tools have been developed, designed and produced in Norway since the beginning of the 1970s, so it's a proven technology that has demonstrated exceptional productivity improvements for customers over many years.

"When machining with long and slender tools, vibration is a very common issue," Anders Digernes explains. "Silent Tools™ are designed with a damper inside the tool body, minimizing or even completely avoiding vibrations."

MANY INDUSTRIES are today producing extremely large and high-priced components. Aerospace is one example, and offshore oil and gas exploration is another, where the components typically get bigger and are made of material that is more difficult to machine. Silent Tools™ + products, however, are used in all industry segments.

"For long overhangs, Silent Tools™ + will provide you with a safe and predictable machining process," Anders Digernes says. "For shorter overhangs, they work perfectly as productivity boosters, as you can increase the cutting data without the risk of vibration."

ANDERS DIGERNES and his team work closely with their customers to really understand the underlying needs. "We strive to lead the way and provide true value to our customers," he says. "They are experts in their industry and know their machining challenges, but it's up to us to find the best solution for them. We have the technological know-how when it comes to cutting processes and tools, and we can use that to translate a need into a solution. Often that solution requires substantial research and development. It might not be possible today, but we always aim at being proactive. That's innovation."

The combination of Silent Tools™ + and CoroPlus® was very well received among visitors to the international manufacturing exhibitions, IMTS and AMB, where CoroPlus® was presented this year. More things can be controlled and analyzed today than was the case just a couple of months ago. Development is rapid and furious, and the team for Silent Tools™ + is aiming to bring as much value to their customers as possible with the available technology. So how large can components be to still be machined in a safe way?

"We haven't seen the limit yet," he says. "At IMTS we showed a boring bar that can machine at 18 times its own diameter, but we've produced one that can handle 20 X D. Silent Tools™ + in combination with CoroPlus® confirms our commitment to driving technology developments in our industry." ■

CoroPlus® is a new platform of connected tools and software, essentially comprising technologies that can send and receive data. The system gives insights into the machining environment that can be used to plan and optimize production.

"For long overhangs, Silent Tools™ + will provide you with a safe and predictable machining process."

INSERTS, ANALYZED **DOWN TO THE ATOM**

Compared with rock tools and haulers for mining and construction, or tubes for subsea oil and gas exploration, the inserts made for metal cutting are extremely small – but crucial.

IN 1942, WILHELM HAGLUND was entrusted with the task of investing time and money in a production unit for cemented-carbide tools. The result transformed the metal-cutting industry. Since then, Sandvik Coromant has developed several generations of inserts, coatings and geometries.

The very first Wilhelm Haglund medal was awarded to Lars Pettersson and Jörgen Wiman in 1986. Their invention was a new insert geometry with an unusually wide application area, yet with a high performance.

"THE QM GEOMETRY is still a very popular geometry," says Mia Pålsson, Product Manager, Turning, at product area Sandvik Coromant. "If you don't know what geometry to use, you can always rely on this one."

Other groundbreaking Sandvik Coromant innovations from the past include the wiper geometry and the indexable insert plunge drill Coromant-U™. "When all your competitors want to market their own wiper or U-drill, you know that you've succeeded with an invention," she says.

TODAY, SANDVIK COROMANT is taming atoms. With the new technology Inveio®, Sandvik Coromant can actually force the crystals in the coating to line up uniformly. By optimizing their strength, the wear-resistant insert will provide customers with reliable production, less variance and longer insert tool life.

"Some might argue that it's counterproductive to offer a solution where our customers buy fewer inserts, but that's a defensive way of thinking," says Pålsson. "We are there for our customers. Helping them to succeed must always be our goal." ■

DID YOU KNOW ...

... that if you dressed up a full-grown male African elephant in really high stiletto heels, and then asked him to stand on one leg with as much weight as possible on his seven-millimeter heel – you would get the pressure that a cutting edge is exposed to in machining. Add some heat, and you have the equivalent of what the cutting edge of an insert has to withstand.

MINE AUTOMATION – A FAST ROUTE FROM IDEA TO MARKET

FOR SANDVIK, the mine automation story took off in the late 1990s, when a team of mining and automation engineers in Finland decided to solve two of the mining challenges faced by their customers. Today, automation is a hot topic for both mining companies and their partners.

Automation solutions significantly increase productivity as well as safety.

ENSURING SAFETY WITHIN mines is both demanding and time-consuming, and it affects the productivity of the mine. In 1999 Sandvik embarked on a project to address these issues through automation and, five years later, AutoMine®, the first loading system, was installed at the Codelco copper mine El Teniente in Chile.

Automation might seem like an obvious thing to develop, but the technology wasn't there at that time, explains Taina Heimonen, Automation Development Manager, at business area Sandvik Mining and Rock Technology. "Remote control was considered 'high-tech' in those days and Wi-Fi didn't even exist," she says. "The team took on a huge task, but looked way beyond the technological limitations. There were only a handful of customers at that time who were thinking along these lines, so we really were pioneers."

HEIMONEN REFLECTS on what makes the inventive environment so fertile at the Tampere site in Finland. "The Sandvik way of working is to stay close to the customers at all times," she says. "Spending time with them in production gives a good understanding of their actual needs. Cross-functional teams are also key. When our competent mining engineers and software teams understand each other, that's when the magic happens."

THE TEST MINE close to the production site in Tampere is also unique. Heimonen emphasizes that the opportunity to test prototypes in the backyard really does enable a faster route from idea to market. ■

Raised front is key in our design of the new Sandvik top center drill bit, giving room for more gauge buttons and improves rock breaking.

CHALLENGING STANDARDS WITH MODERN ROCK TOOLS

A Sandvik rock drill bit typically lasts for several hundred meters of drilling before it's time to exchange it. But when a mining company in northern Sweden started mining for gold, the drill bit more or less exploded after just a few decimeters. The rock was extremely hard and abrasive – a true challenge for any tool on the market.

"THE CUSTOMER ASKED for a drill bit that could drill one rod length, which is four meters – more than ten times the length it was capable of when they came to us," says Christer Lundberg, Product Manager Rock Tools Tunneling, at business area Sandvik Mining and Rock Technology.

Producing a drill bit that can last for four meters is not usually a demanding task, but in this instance the R&D team at Sandvik Mining and Rock Technology

"These threads really improved productivity in the mines and later became industry standards."

Christer Lundberg, Product Manager Rock Tools Tunneling,
Sandvik Mining and Rock Technology

had to develop something extraordinary, both tough and extremely wear-resistant. A new bit design and Sandvik's unique cemented carbide DP 65 solved the problem. The customer was satisfied.

THE R&D TEAM continued to develop the drill bit and a completely new product, the top center drill bit, was recently launched, based on the lessons learned from the project in northern Sweden. The top center drill bit is now a standard product that can be used by all customers facing tool life challenges.

SANDVIK HAS A proud history of providing rock drilling solutions to customers around the world, making drilling safer and more efficient. Christer Lundberg mentions the R- and T-threads developed respectively in the 1950s and 1970s. These innovations made it possible to connect rods to each other and to drill more than one rod length at a time. "These threads really improved productivity in the mines and later became industry standards," he explains.

Modern rock drills are becoming more and more powerful. For Sandvik, this means that tools for these drills have to follow that development. Sandvik Alpha 330™ tool system is a further development of the R32 thread that meets the increased energy output, delivering straighter holes, higher penetration rates and longer rod life.

"THE R32 STANDARD restricted us to designing tools that could withstand the high impact power, so we developed Sandvik Alpha 330™," says Christer Lundberg. "Last year, we sold more Sandvik Alpha 330™ than the R32 standard."

Setting industry standards and continuously challenging them is the recipe for Sandvik's success. The competition is tough, so Christer Lundberg and his colleagues are constantly trying to find new solutions to make rock drilling more efficient and safer for Sandvik customers. "With full control over the whole raw material and production chain, we are in a unique position," he says. "Our customers can always rely on the quality of our tools and know that we will go the extra mile to improve their productivity with new tools and standards." ■

DID YOU KNOW...

... that a modern drill rig strikes with a force of 50 metric tons, 50 times per second?

CRAFTING THE FUTURE
WITH ADVANCED METAL POWDER

Imagine a world where almost anything can be 3D printed – from spare parts in a mine and comfortable tailored shoes, to a replacement tooth – in a fraction of the time it takes today with conventional methods. Does that sound like science fiction? Just a few years ago it was.

HOW WILL 3D PRINTING, known also as additive manufacturing, change the world? Answers to this question stir some controversy, but digitalization in itself, along with additive manufacturing as a complementary process, are already offering new opportunities within the industry.

Additive manufacturing gives designers freedom to create complex components in one piece, such as this swirl nozzle from MBFZ Toolcraft GmbH.

"The quest for lighter and stronger materials is driving the world's finest scientists and engineers," says Richard J. Park, Managing Director for Sandvik Osprey Ltd in Wales. "The aerospace industry is one example where weight greatly affects emissions and fuel efficiency. Automotive is another sector where this is important. Additive manufacturing is quickly transitioning from being a prototyping tool to a serious production process," Park says.

"With additive manufacturing, it's also possible to produce shapes that are impossible through traditional manufacturing methods", Park explains. "Joints and welds make every application weaker and more prone to failure. With additive manufacturing, you can create exactly the shape you want without either joints or welds. These are game-changing capabilities."

FOR SANDVIK and Osprey™ products, this development is very welcome. More than twelve years ago, before it was even called 3D printing, Sandvik started working on the production of Osprey™ metal powders specifically for

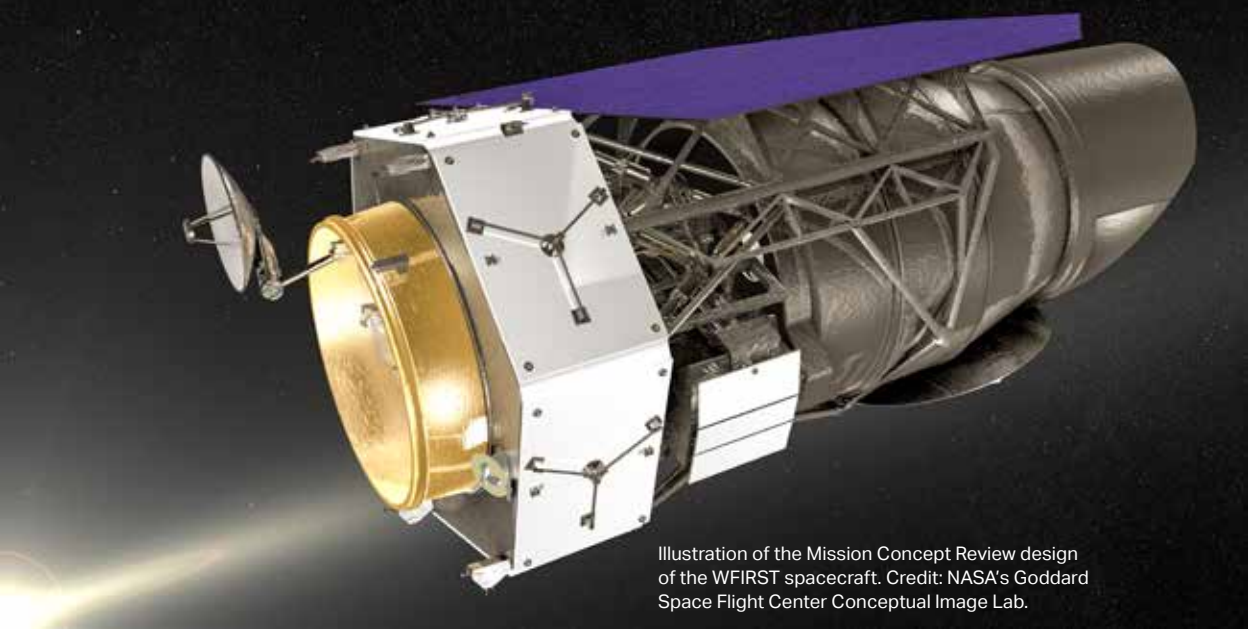


Illustration of the Mission Concept Review design of the WFIRST spacecraft. Credit: NASA's Goddard Space Flight Center Conceptual Image Lab.

this application. The phenomenon was then called "rapid prototyping" and was considered far too slow and expensive for full-scale production. Today, Sandvik is one of the largest producers of metal powders for additive manufacturing in the world and is considered by many to be the industry leader. Demand is continuously growing and the future looks very bright.

PARK SAYS THAT the secret behind the company's success is curiosity. "We have a hunger for new, exciting solutions," he says. "We want to understand things and ask a lot of questions. We deliberately don't sell our products through distribution in order to maintain close and direct contact with customers. In doing so, we can ensure that we understand their real needs and identify what gaps we can fill with new products and innovations."

To say that Sandvik is driving the industry with its offering of Osprey™ products is no exaggeration when it comes to both metal powder and the company's second product range – controlled expansion (CE) alloys. As an example, NASA recently visited the plant to discuss a new project, WFIRST (Wide Field Infrared Survey Telescope). It's the second time NASA has asked Sandvik for support. Four large telescopes are already in place in the Atacama Desert in South America to resolve the origins of the universe.

"This time, NASA is sending a satellite telescope far out into space," Park says. "With extreme temperatures, enormous distances, zero gravity and total vacuum, there is just no room for material failure out there."

And that's where Sandvik comes into the picture. Using Osprey™ CE alloys, the crucial detectors in the satellite telescope are protected and supported so that they can perform in the most demanding of environments. ■

INVITING THE WORLD TO INNOVATE

Crowdsourcing for ideas is becoming increasingly popular as more and more companies seek to tap into the global brain network.

BY MATTIAS KARÉN

INNOVATION IS ENTERING a new era. Companies are increasingly turning to a global pool of problem-solvers to help find new business solutions, as digitalization opens opportunities for the crowdsourcing of ideas.

From government agencies such as NASA to major conglomerates like General Electric (GE), organizations are using "open innovation" to hunt for the latest cutting-edge solutions to keep them ahead of the competition. Sandvik is moving in the same direction, with open innovation as a clear part of the company's strategy.

Pasi Kangas
Vice President and Head of R&D, Sandvik Materials Technology

"This is something we have experimented with as a concept for the past three years," says Pasi Kangas, Vice President and Head of R&D at business area Sandvik Materials Technology. "Today we work mainly with a more traditional model and conduct projects together with research institutes and universities. With open innovation, the whole world can help us do research. Everyone is invited."

The idea behind open innovation is simple. When a company faces a problem it can't solve in-house, it issues a public challenge for a specific solution. Anyone can then submit a proposal, and the company only needs to pay for the ones it wants to use.

For businesses and problem-solvers alike, it's a win-win model. The company can tap into expertise and knowledge its own R&D department may not possess, while innovators get a chance to showcase their ideas – and get paid for them.

Just as mathematicians sometimes use a network of computers that are all crunching numbers to solve difficult problems, companies can use a global network of brains working in a similar manner.

OFTEN SEEN as a leader in open innovation, GE has used crowdsourced ideas to produce everything from lighter jet engine parts to a smart air conditioner. The company's manifesto on open innovation calls it "a fundamental shift in the way we do business."

Websites such as Innocentive have popped up, serving as marketplaces where companies post challenges and problem-solvers can sign up to submit solutions. NASA has used Innocentive for challenges ranging from creating an algorithm to predict solar flares to soliciting ideas for how to colonize Mars.

Cash prizes for winning submissions on the site can range

Up until now, we have mainly worked with a more traditional model for research and development and conducted projects together with research institutes and universities. With open innovation, the whole world can help us do research. Everyone is invited..

from 5,000 US dollars to as much as 40,000 US dollars.

SANDVIK HAS recently completed several open innovation projects as well. One was the Brilliant Brains program, where students were asked to find ways to track materials through the entire production process.

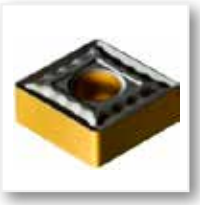
A similar mindset has been used when it comes to seeking out specific partners who can create custom-made solutions. For instance, Sandvik recently collaborated with a local Swedish company to develop a solution for tracking the location of a certain material, so it could easily be found for pickup and delivery. "It would have taken us a long time to build that system on our own," says Pasi Kangas. "For them it took six months."

The use of open innovation methods is expected to grow over the coming years, but for Sandvik, that doesn't mean that internal research is any less important.

"The core parts of our business, such as product development, will be kept in-house," Pasi Kangas explains. "But we could submit challenges for finding new applications for our materials or finding solutions where we don't have the expertise ourselves. When it comes to new technology and the Internet of Things, people will have to collaborate. The traditional way of only using your own resources will not work." ■

WILHELM HAGLUND MEDAL

The Wilhelm Haglund Medal for the Product Developer of the Year is celebrating its 30th anniversary. The award acknowledges innovative ideas that demonstrate significant customer benefits and a proven commercial value for Sandvik.



1986 Q INSERTS

The Q-geometry provided the metal-cutting industry with an insert that could be used in a variety of applications and conditions. The geometry also delivered high performance. One of the winners, Lars Pettersson, was appointed CEO of the Sandvik Group in 2002.

Award winners: Lars Pettersson and Jörgen Wiman

1989 SANDVIK SAF 2304® LEAN DUPLEX STAINLESS STEEL

Sandvik SAF 2304® lean duplex stainless steel is characterized by high resistance to stress corrosion cracking, general corrosion and pitting. The material provides good weldability and a strength that is twice as great as that of austenitic stainless steel.

Award winners: Sven Bernhardsson

1994 COROMANT CAPTO® MODULAR TOOLING CONCEPT

Coromant Capto® modular quick-change tooling concept with exceptional stability. This flexible system substantially reduces set-up and tool change time, leading to increased machine utilization.

Award winners: Ken Anderson, Sven Engstrand and Lars Åsberg

2002 WIPER INSERTS FOR TURNING

The geometry of wiper insert provides metal-cutting manufacturers with the opportunity to double feed rates without losing the required surface finish or to obtain a surface finish that is twice as fine with a maintained feed rate.

Award winners: Jan Lundström and Jörgen Wiman

2005 SAFUREX® DUPLEX STAINLESS STEEL

Safurex® highly corrosion-resistant duplex stainless steel is designed for the urea industry. The material is suitable for the severe conditions found in the production of nitrogen-based fertilizers. It enables a safe, oxygen-free process with high output.
Award winners: Pasi Kangas and Ad Raatgeep

2007 AUTOMINE® LOADING AND HAULING SYSTEM

This automated system enables remote management and monitoring of loading and hauling operations in underground mining. The system contributes to a safer, more productive mining process.
Award winners: Brett Cook, Riku Pulli and Timo Soikkeli

2010 COROTHREAD® 266 THREAD TURNING SYSTEM

CoroThread® 266 ultra-rigid system for all types of threads is designed with a rigid rail interface between the insert and tip seat. The system provides an accurate and repeatable thread profile and contributes to excellent component quality and consistency.
Award winners: Claes Andersson and Gunnar Jansson

2016 MODULAR DESIGN UNDERGROUND TRUCKS

The modular design allows for a new family of underground trucks to be manufactured in different sizes. The trucks have many new features that enhance safety, maintainability and driveability, including enhanced driver comfort and reduced exposure to vibration.
Award winners: Hannu Helen, Minna Pirkkanen and Jouni Teppo

WILHELM HAGLUND MEDAL

Björn Jonson and Carl Lindberg established the award in 1986 to honor innovations. Each year, the business areas nominate candidates (maximum of three). A jury of internal and external members selects the winner, based on the level of innovation, sales figures and long-term competitiveness. The medal is named after the legendary Managing Director Wilhelm Haglund, who laid the foundation for the Group's successes in the cemented-carbide field. Haglund insisted the medal should be made of solid gold, and that one of the criteria would be a proven commercial value for Sandvik.

THREE WINNING IDEAS AND THEIR WAY TO MARKET

Many companies give awards in recognition of innovative ideas, and Sandvik is no exception. However, the Wilhelm Haglund Medal is unique within the industry.

Sandvik has two major innovation awards. While the Sandvik innovation prize rewards a pioneering product or process developed during the year, the Wilhelm Haglund award is more like a Nobel Prize – the customer value and commercial success must be confirmed before a person or team is awarded. Most of the winning ideas are also based on a patent, but technical excellence is not enough.

TRUST, SWEAT AND SOLID CONFIDENCE BEHIND THE UMBILICAL SUCCESS

An umbilical is a cable that remotely supplies power and provides a conduit for chemical injection into the well, in addition to providing hydraulic control of subsea oil and gas equipment. In the 1980's the umbilical tubes were made of plastic, which suffered leakage problems with methanol injected into the well to give flow assurance. Leakages presented a dangerous fire risk on the host platform so the oil and gas industry looked for an alternative.

At that time, Sandvik was marketing a newly patented material, Sandvik SAF 2507™, designed for subsea applications. A team at business area Sandvik Materials Technology decided to develop tubes in this material for umbilical applications and take them to market. Does it sound easy and straightforward? It wasn't.

"It was a complex manufacturing process that resulted in unexpected problems," says Bertil Waldén, R&D Engineer at Sandvik Materials Technology.

A true passion for the customer, a strong belief in the power of the material and the solid confidence of the management made it a success, however. Lars Östlund, former Oil and Gas Manager at Sandvik Materials Technology, also emphasizes the confidence of the customers.

"We were dedicated to solving our customers' problems, and they understood our ambitions. That's why they were patient and allowed us to develop the solution and rectify any deviations along the way." ■

Ivan Macháček, Bertil Waldén and Lars Östlund, Sandvik Materials Technology. Awarded for Umbilical tubing in Sandvik SAF 2507™ super-duplex stainless steel, 2012. *See product below.*

Tubes in Sandvik SAF 2507™ super-duplex stainless steels for umbilicals.

POWER, PERFORMANCE AND PRODUCTIVITY IN MINES

The mining industry is very competitive, not the least in the 50-ton truck segment. Still, the market greeted the new modular design underground truck from Sandvik with enthusiasm when it was launched in 2013.

Hannu Helen, Minna Pirkkanen and Jouni Teppo, Sandvik Mining and Rock Technology. Awarded for development of a new modular family of trucks for underground mining, 2016. *See product on page 23.*

Increased power, performance and productivity are the secrets behind the successful introduction. The truck also brings many new features with regards to safety, maintainability and driveability, including enhanced driver comfort and reduced exposure to vibration. In addition, the modular design makes it possible to manufacture the trucks in different sizes.

Time from product launch to market leader was exceptionally short, which was emphasized when the winning team was announced at the Sandvik's Annual General Meeting in 2016.

"An achievement like this always involves a lot of people," says Minna Pirkkanen, Product Line Manager, Mass Mining Loaders. "The whole project team in Turku really did a good job turning a customer challenge into a product that more customers can benefit from." ■

MODULAR TOOLING CONCEPT – CLOSE COLLABORATION MADE IT POSSIBLE

In 1990, product area Sandvik Coromant introduced a new machine interface at major manufacturing exhibitions in the United States and Europe. Today, 26 years later, nobody has managed to invent anything better. As with all bright ideas, Coromant Capto® was simple. A tapered polygon transmits torque better than a round coupling. It's a fact. Combine it with a face-contact clamping and the result will be exceptional, bending stiffness in the machining process. In addition to modularity, the system provides fast tool change and set-up times, leading to increased machine utilization.

"We've always been close to our customers and know their machining challenges," says Ronald Schreiber, Coromant Capto® Manager at Sandvik Coromant. "That's really important. Another secret behind the idea of Coromant Capto® is our close collaboration with machine tool builders around the world. They saw the opportunity to produce something extraordinary that made their machines better." ■

Ken Anderson, Sven Engstrand and Lars Åsberg, Sandvik Coromant, within business area Sandvik Machining Solutions. Awarded for modular tooling system,1994. *See product on page 22.*

STRONGER RESULT FROM STRUCTURAL IMPROVEMENTS

HOW WOULD YOU DESCRIBE SANDVIK'S THIRD QUARTER 2016?

I am pleased about us delivering both earnings growth as well as a – for a third quarter – record high cash flow. Despite a generally subdued market situation we achieved earnings growth of 13% and improved the operating margin to 13.3% (11.2%, 3rd quarter 2015), as we reap the rewards from ongoing efficiency programs as well as strict cost control. Organic order intake remained stable – the first quarter in two years without negative growth. This was primarily supported by good development for mining equipment and we also received a large order for tubular products to the oil and gas industry. During the quarter we saw initial signs of improving customer activity in the mining exploration segment. However, demand in the cutting tool industry remained muted, implying negative growth for our largest business area, Sandvik Machining Solutions. In total, we saw demand in Asia improve, while Europe remained stable and North America declined slightly.

CAN YOU OUTLINE THE STRUCTURAL CHANGES DURING THE QUARTER?

We have now consolidated Sandvik to three business areas which are aligned with the three major industries we are active in – metal cutting, mining and construction and advanced stainless steels and special alloys. It is important to us that Sandvik is focused on its core operations, where we have key competences to grow a large scale profitable business. While Sandvik Hyperion and Sandvik Process Systems are high-quality businesses, it is our view that these are not core to Sandvik long term and they will be divested in due course. We have come far in the process of implementing a decentralized business model, moving the decision making closer to the customers and we are convinced this will increase transparency, accountability and speed in Sandvik, improving the long-term performance and returns. ■

Tomas Eliasson, CFO

THIRD QUARTER 2016 *

REVENUES BY BUSINESS AREA

MSEK	Q3 2016	Q3 2015	Change %	Change % [1]
Continuing operations				
Sandvik Machining Solutions	7,859	8,159	–4	–4
Sandvik Mining and Rock Technology	7,791	8,270	–6	–5
Sandvik Materials Technology	2,945	3,161	–7	–7
Other operations	1,113	1,151	–3	–6
Group activities	7	4		
Continuing operations	19,715	20,745	–5	–5
Discontinued operations	724	1,347	–46	–47
Group total	20,439	22,092	–7	–7

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

OPERATING PROFIT BY BUSINESS AREA

MSEK	Q3 2016	Q3 2015	Change %
Continuing operations			
Sandvik Machining Solutions	1,650	1,481	+11
Sandvik Mining and Rock Technology	817	907	–10
Sandvik Materials Technology	197	49	N/M
Other operations	113	108	+5
Group activities	–154	–220	+30
Continuing operations	2,623	2,325	+13
Discontinued operations [1]	–1,012	–1,004	–1
Group total [2]	1,611	1,321	+22

1) Operating profit impacted by items affecting comparability of -998 million SEK in Q3 2015 and -847 million SEK in Q3 2016.
2) Internal transactions had negligible effect on business area profits.
N/M = non-meaningful

OPERATING MARGIN BY BUSINESS AREA

%	Q3 2016	Q3 2015
Continuing operations		
Sandvik Machining Solutions	21.0	18.1
Sandvik Mining and Rock Technology	10.5	11.0
Sandvik Materials Technology	6.7	1.5
Other operations	10.2	9.4
Continuing operations	13.3	11.2
Discontinued operations	–139.8	–74.6
Group total	7.9	6.0

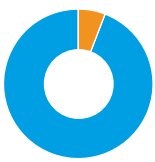
* Comments and numbers in the report relate to continuing operations, unless otherwise stated.

REVENUES Business area share of Group's total revenues

40%
Sandvik Machining Solutions

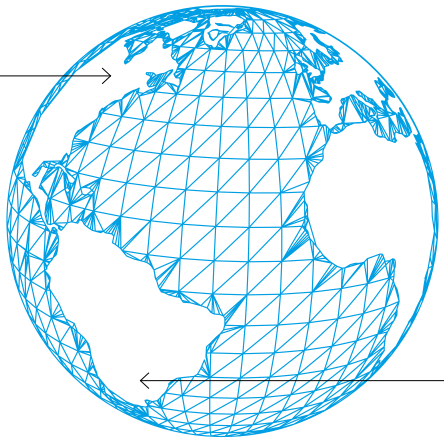
39%
Sandvik Mining and Rock Technology

15%
Sandvik Materials Technology



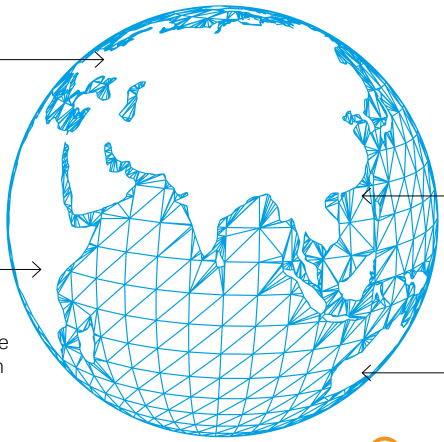
6%
Other operations

REVENUES DEVELOPMENT by geographical area



NORTH AMERICA
The invoiced sales for the North America region were 4,015 MSEK, a –8% change.
21% share *

SOUTH AMERICA
The invoiced sales for the South America region were 1,052 MSEK, a –8% change.
6% share *



EUROPE
The invoiced sales for the Europe region were 7,666 MSEK, a –2% change.
39% share *

AFRICA/ MIDDLE EAST
The invoiced sales for the Africa/Middle East region were 1,830 MSEK, a –13% change.
10% share *

ASIA
The invoiced sales for the Asia region were 3,989 MSEK, a –7% change.
20% share *

AUSTRALIA
The invoiced sales for the Australia region were 1,163 MSEK, a +23% change.
4% share *

→ Change Q3 2016 – Q3 2015
* Share of the Group's 2015 total revenues

REVENUES by customer segment *

28% MINING
24% ENGINEERING
13% ENERGY
12% AUTOMOTIVE
11% CONSTRUCTION
6% AEROSPACE

* Share of the Group's 2015 total revenues excl. Mining Systems; consumer goods, chemicals and miscellaneous total 6%.

TWO SHAREHOLDER VOICES

Industrivärden and Göranssonska Foundations are two of Sandvik's 10 largest owner groups (1st and 8th respectively per 30 September 2016).

Helena Stjernholm
CEO Industrivärden

HOW DO YOU PERCEIVE SANDVIK AS A COMPANY?

Sandvik is a global company with a long and successful history, which, thanks to outstanding research, close cooperation with customers and competent employees, has managed to achieve leading positions in a number of interesting growth areas. There is a strong and friendly corporate culture that I believe is important for Sandvik's success.

WHAT ARE YOUR EXPECTATIONS?

We live in a global and fast-changing world, where many companies are challenged by increasing requirements in regard to productivity, safety and other sustainability issues – areas in which Sandvik offers leading solutions. Sandvik is well positioned, very knowledgeable and highly innovative while, at the same time, answering to the increased demands for efficiency and flexibility. I think that over time Sandvik has every chance of providing competitive value for its shareholders. ■

WHAT IS YOUR OPINION OF SANDVIK?

Henning Eneström
Chairman of the foundation In memory of Albert and Anna Göransson, one of the three foundations within Göranssonska Foundations.

I see Sandvik as a long success story – a company that built Sandviken, Sweden, 150 years ago and then conquered the world. I have very high expectations, both on a technical level and in terms of business morals. It's important to hold on to the company's proud history and not lose it along the way.

WHAT ARE THE SUCCESS FACTORS?

Times of change often mean times of uncertainty, which takes a lot of power from people and slows productivity down. All companies must be careful with change and reorganization. Sandvik is no exception. Persistence is a necessity. ■

ANALYST: GOOD POTENTIAL FOR INCREASED VALUE

YOUR EXPECTATIONS ON THE SANDVIK SHARE?

Generally speaking, the valuation of manufacturing companies has increased over the past few years. We're close to an all-time high. A few companies, Sandvik included, have not quite lived up to investors' expectations and have a good potential to increase further in value. My expectations are high. When Sandvik starts to deliver, it will show on the share price.

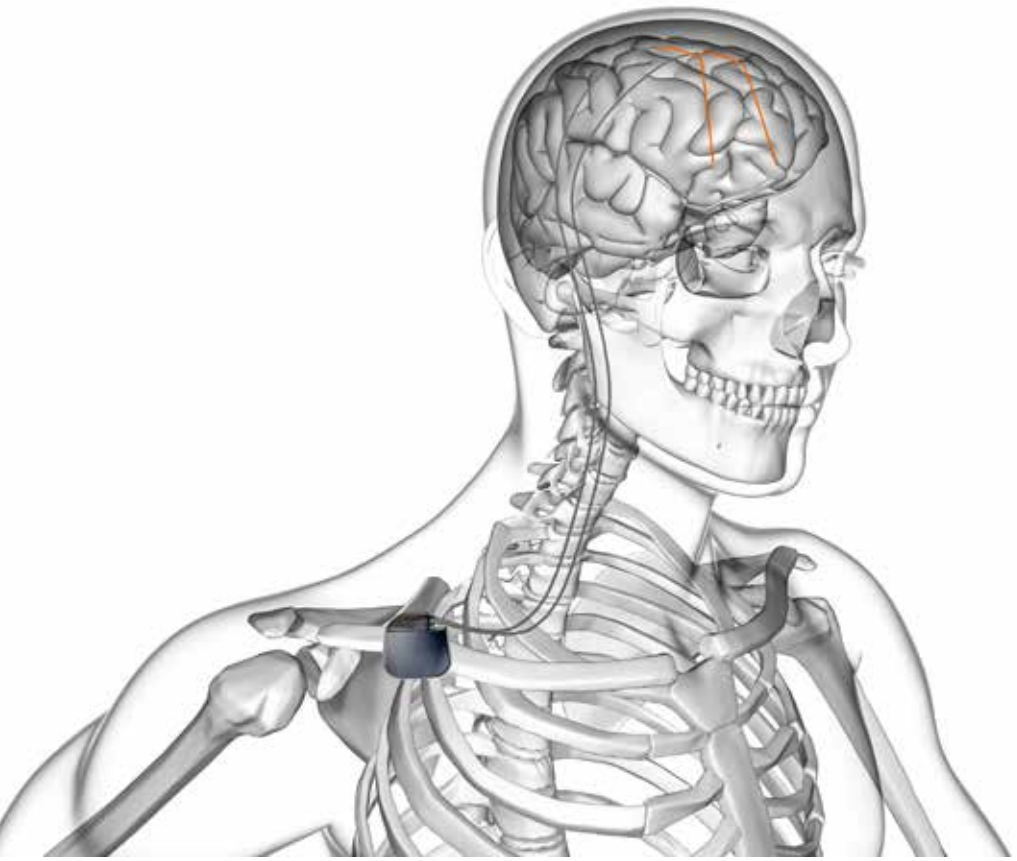
Johan Wettergren
Analyst, Carnegie

WHAT DOES SANDVIK NEED TO DO?

There is still good potential for internal improvement, both on the cost side and in terms of structure. Some elements have already been managed, but there is still more to be done to make Sandvik a company with a higher and more stable profitability. I also think the ongoing decentralization work is positive. When all of this is finalized, there is good potential for growth in several areas.

AND THE MOST IMPORTANT SUCCESS FACTORS?

Sandvik is an innovation-driven company with world-leading positions in many areas worldwide. Without successful product development of new, innovative products that truly help customers to improve their productivity, Chinese and other more agile manufacturers will outrun Sandvik. ■



THE OBJECT | Conductive wire for deep brain stimulation

A super-thin platinum-iridium alloyed wire of 0.1 mm holds the power to help Parkinson patients to live a more normal life. Deep brain stimulation is used to treat people with neurological treatment resistant disorders, such as Parkinson's disease, OCD (Obsessive Compulsive Disorder) and Dystonia. Electrodes are implanted in the brain to deliver impulses to the nerves, and an electrical pulse generator produces stimulation impulses. The electrodes and the pulse generator are connected by minute conductive wires, supplied by Sandvik. This treatment has proven to be very effective in controlling movement disorders, with a success rate exceeding 97 percent.