

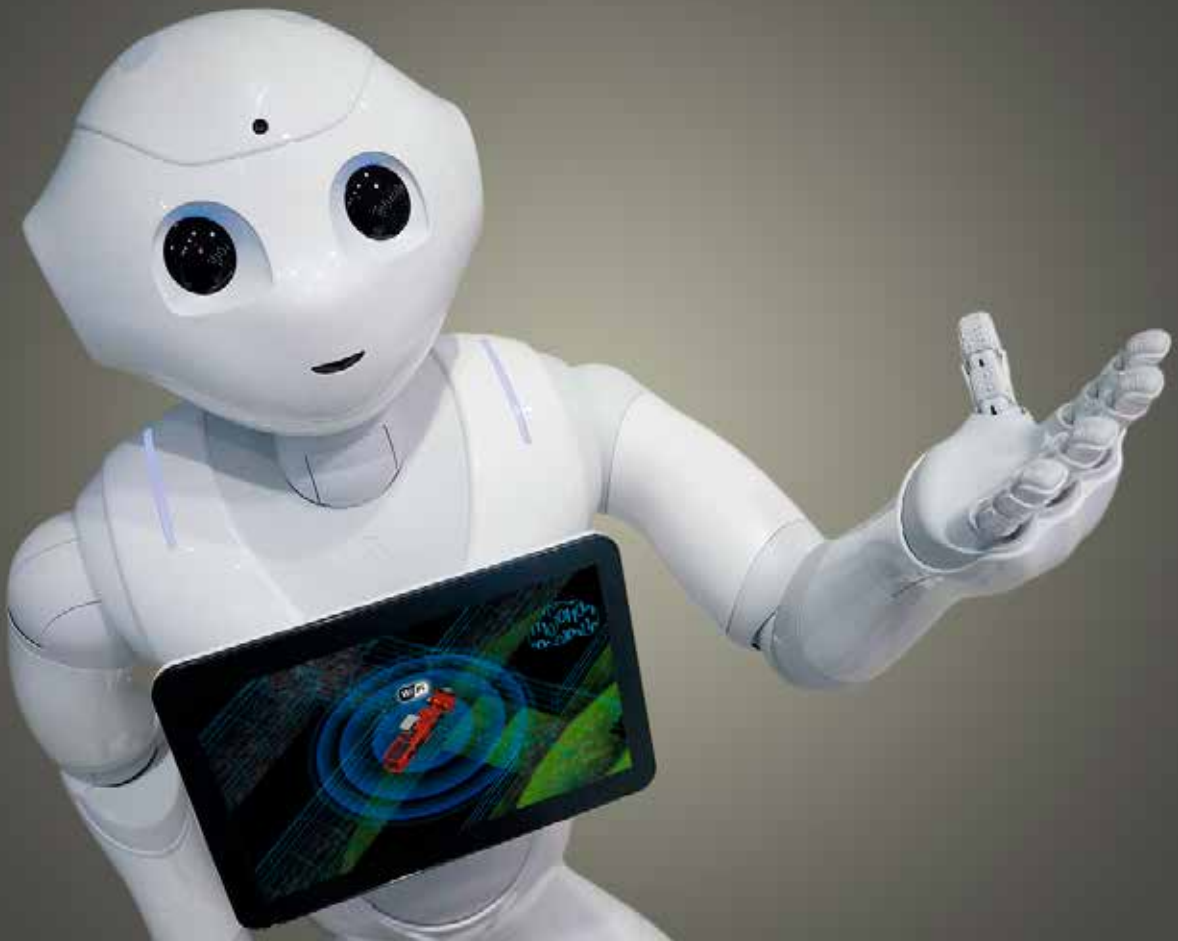
POWDER POWER • Innovation awarded • **NEW TOOLS IN MINING**
Emergency training saves lives • **AUTO INDUSTRY TRANSITION**

MEET #3-2017 SANDVIK

WELCOME TO A DIGITALIZED WORLD

How new technology reduces cost and boosts productivity in industries across the world.

PAGE 10



DIGITALIZATION DRIVES BUSINESS

FOCUS. Advances in technology from robotics to artificial intelligence are transforming industries across the world.
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MEET SANDVIK: The Sandvik Group magazine

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COVER: The tablet displays AutoMine™ from Sandvik, a system that automates the mining processes and makes the machines operate unmanned,



DEAR READER,

WE'RE IN THE midst of one of the industry's biggest transformations of all time. It's called Industry 4.0, a concept that includes the transition to digitalization and automation currently in progress in the manufacturing industry. Industry 4.0 entails good growth opportunities for companies at the forefront of development, whereas companies that don't adapt to the new conditions will lose out to the competition.

At Sandvik, we're constantly working on adjusting our business to these new conditions. Development is taking place increasingly rapidly, meaning that we also need to up the pace in many areas. We have a great deal of knowledge, but we also need to look to the future and see which skills we'll be needing going forward.

SANDVIK'S CORE BUSINESS includes coming up with new, innovative cutting-edge solutions that streamline customers' production processes while reducing their environmental impact, and we're at the forefront of development. We're investing considerable resources in growth areas such as automation, including in the mining industry and our own production, and additive manufacturing (3D printing). We're involved in the transformation of the automotive industry and are making use of the opportunities inherent in the transition to hybrid and electric vehicles while also helping to develop hydrogen gas vehicles. We're building up a solid base of expertise in digitalization that we're spreading throughout the Group. In this issue of *Meet Sandvik* we'll be looking at these issues, along with a few others that describe the opportunities presented by digitalization in our businesses. I wish you pleasant reading.

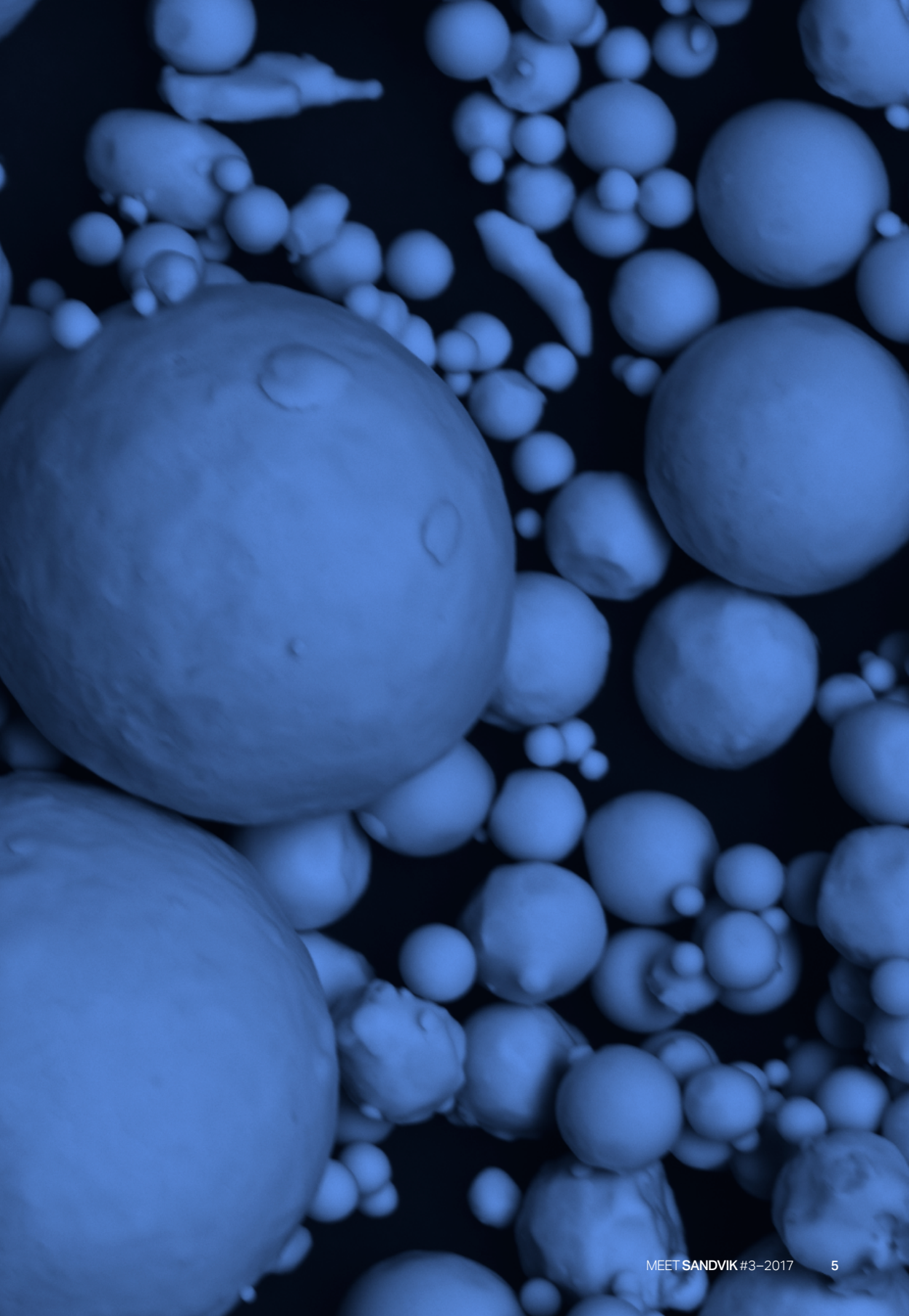
Björn Rosengren, President and CEO

SMALL IS BEAUTIFUL

At the leading edge of fine, gas atomizing technology: Sandvik manufactures gas atomized metal powder in more than 3000 different grades, from low-alloy steels to stainless steels and special alloys like nickel, cobalt and copper.

The powder can be used as raw material in different applications with high demand on hardness, strength or the ability to transfer electricity and heat. Gas atomized metal powder can be consolidated into solid material via processes like additive manufacturing (also known as 3D printing), hot isostatic pressing or metal injection moulding.

One of the advantages of using these processes is that the final product receives a shape that closely resembles the desired geometry, unlike traditional manufacturing that starts off with a chunk of metal from which material is removed using, for example, milling or turning in order to achieve the final shape. Consolidation processes based on the use of metal powder reduces the amount of raw material needed in production, which contributes to a more efficient resource utilization and, ultimately, a lower environmental impact.



NEWS



LISTEN TO HEAVY METAL

Sandvik has launched a mini-podcast series, "The Sandvik Materials Pod."

To listen to the podcasts and access the articles, visit materials.sandvik/materials-pod. You can also subscribe and download the podcast on iTunes, SoundCloud, Stitcher and TuneIn.

75 This year Sandvik Coromant is celebrating **75 years**. Since 1942, it has been leading in the metal manufacturing world, driving progress through innovative solutions.

The name is a combination of *corona* – the aura of light that surrounds the Sun and other stars and *diamant* – the Swedish word for diamond.

CAPITAL MARKETS DAY IN GERMANY



The Technology Center in Tübingen.

ON NOVEMBER 21, 2017, Sandvik is hosting its Capital Markets Day in Tübingen, Germany. The event offers institutional investors, financial analysts and financial media an opportunity to get an update on Sandvik's strategy and development. The focus will be on Sandvik's strategy for

stable and profitable growth.

Presentations are held by Björn Rosengren, President and CEO, and Tomas Eliasson, CFO, as well as by management from the business operations. Participants will also get a guided tour of the Technology Center and in the tool manufacturing.

PRIMETURNING™ WINS INNOVATION AWARD

PrimeTurning™, the revolutionary turning methodology developed by Sandvik Coromant, won the sixth MaschineMarkt Innovation Award as the most innovative exhibit in the world of metalworking at the 2017 EMO exhibition in Hannover, Germany, in September.

Designed to set new industry standards in turning and delivering unmatched machining productivity, PrimeTurning™ is a new methodology that enables turning in all directions. It is extremely fast and provides very close tolerances and excellent chip control.



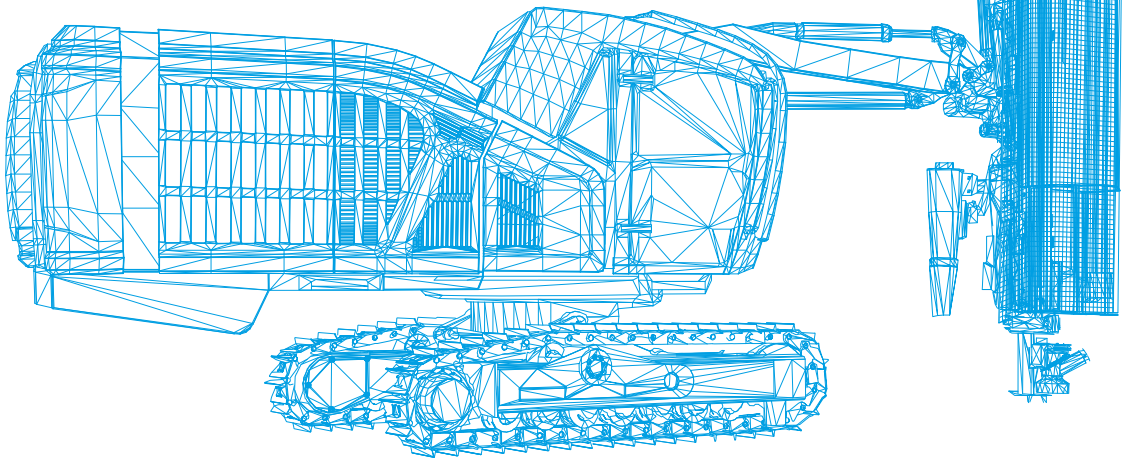
Sandvik Coromant President Nadine Crauwels, with Jörg Hesse, Sales Director.

TAKE A BIGGER PIECE OF THE PIE

Ranger™ DX900i, the new top hammer surface drill rig has a 290-degree reach, enabling drilling coverage of 55 square meters. This saves man-hours and minimizes the need to reposition the rig. Despite the rig's ability to rotate, its counterweight structure ensures stability by maintaining weight opposite the boom. All Ranger DXi-series rigs feature a revolving superstructure and are extremely mobile, thanks to a low center of gravity and high tramping power.

Sandvik GT 60 tools enable higher productivity with straighter 92-127mm holes

290 degrees revolving upper structure



New iCab with extremely low noise level

The iTorque control system beats difficult rock



SANDVIK PARTICIPATES IN UNDERWATER MINING PROJECT

Sandvik is participating in the EU-funded underwater mining project iVAMOS! (Viable Alternative Mine Operating System). The project aims to find new ways to get access to unexploited European mineral resources hidden at a depth of 500 to 1,000 meters.

Coordinated by the marine surveying company BMT, the project involves a consortium of 17 partners from nine European countries. The objective is to build a life-size prototype robotic underwater mining machine, and to prove that

the concept of mining in open-cast, water-filled and land-based mines is viable and economically possible.

Sandvik has provided the cutting equipment and the frame for the underwater mining vehicle.

"As Sandvik wants to keep a foot in the door for the future submerged mining market, we were keen to participate in iVAMOS! as this is a project that pushes for further innovation in the mining equipment sector," says Uwe Restner, product and commercial manager at Sandvik.

ROCKATHON FUELS CO-CREATION

IN SEPTEMBER IN Tampere, Finland, Sandvik arranged Rockathon, a co-creation and open innovation event. The event was hosted in cooperation with EIT RawMaterials consortium, funded by the European Commission.

During Rockathon, technology and software development companies collaborated intensively in brainstorming, ideation exercises and co-creation design thinking. The challenge was to create and design a workable and compatible real-time system for onboard ore analysis for moving mining equipment.



Spectral Industries was crowned challenge champs for its cross-disciplinary idea of onboard analysis for mining equipment.

A collaboration agreement with Sandvik was awarded to the winning team.

The analyzing system should “see” inside the rock, providing mining equipment with a new

intelligent rock mass analyzer. It should also measure ore grade to define ore boundaries and avoid mining and processing of waste material.



A CUT ABOVE THE REST

DO YOU LIKE slicing lemons with a knife you made yourself? Sandvik 14C28N is the latest development in Sandvik’s range of knife steels. Optimized chemistry provides a top-grade knife steel with a unique combination of excellent edge performance, high hardness and good corrosion resistance. Sandvik 14C28N knife steel samples are now available for sale to consumers who are over 18 in North America and the EU, and business customers worldwide at sandvikstainlesswebshop.com

TOP ACHIEVER IN SUSTAINABILITY

SANDVIK HAS ONCE again been selected as a member of the prestigious Dow Jones Sustainability Index, which assesses the world’s 2,500 largest companies and includes the top 10 percent most sustainable companies in each respective industry.

“Sustainability is key to our ability to create increased customer value, enabling us to help our customers become safer, more efficient and more productive,” says Björn Rosengren, President and CEO of Sandvik.

Sandvik has a percentile ranking of 97, which means the company performs better than 97 percent of the assessed companies in its industry.

MEMBER OF

**Dow Jones
Sustainability Indices**

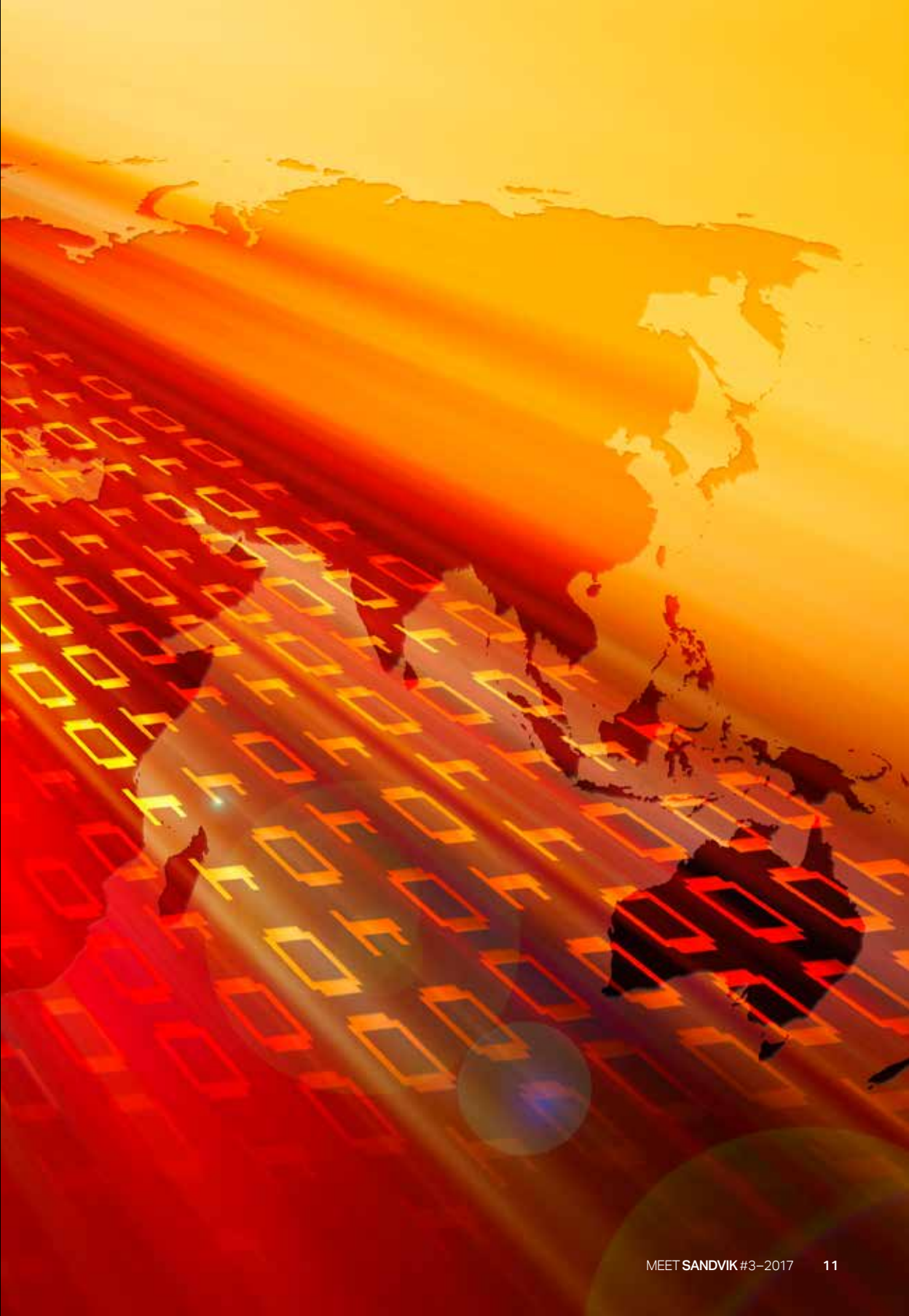
In Collaboration with RobecoSAM

FOCUS



DATA: THE NEXT GREAT RESOURCE

Forget oil, gas or rare-earth elements. In coming years data is set to become the world's most valuable resource. Advances in technology, from robotics to artificial intelligence, are transforming industries across the world.



INDUSTRY 4.0 IS THE NEXT phase in digitalization. It is driven by a sharp rise in data volumes, computational power and connectivity, the emergence of analytics and business-intelligence capabilities, new forms of human-machine interaction and improvements in transferring digital instructions to the physical world, such as advanced robotics and 3D printing, according to consulting company McKinsey.

Emerging digital technologies from big data analytics to automation have the potential to reduce costs, enhance productivity and better manage variability in heavy industries across the world. The cost of such devices and storage is plummeting as economies of scale kick in.

For example, the rapid pace of digitalization is transforming the component-driven automotive sector into one more focused on software and services. Cars are more connected than ever, and self-driving vehicles are almost upon us, but it's in the factories and supply chain that digital innovation has already made a difference.

THE EFFICIENCY OF supply chain management can be greatly increased with the help of big data. Accurate predictions can be made as to when a special component should be in stock in a warehouse or production plant, for example, while smarter decisions on future production can be made based on economic factors that may impact future demand.

With the help of advanced artificial intelligence platforms, such as IBM's Watson, companies across industries can use insights from data in one field to apply best practice elsewhere. Power companies, for example, can use Watson to predict demand on the basis of historic data and real-time weather forecasts.

"IBM's report Business Insights report that 90 percent of the world's data has been generated in the past two years," says Manish Chawla, General Manager of Global Industrial Products for IBM. "The clear majority of this data is not used to make business decisions, so just imagine what can be achieved once that hidden value is unlocked.

While there is much to gain from digital developments such as artificial intelligence and automation, a major concern is that most jobs are at risk of being replaced by digital intelligence. However, World Bank research point out that face-to-face interactions can't be easily replaced. Overall, the researchers found that on average only 9 percent of jobs in OECD countries were automatable.



“Change management is absolutely critical for this to work.”



MINING IS ONE industry where automation will have an impact.

“I don’t think we’ll see a huge reduction in jobs, at least not in the short to medium term, but job roles will change,” says Neil Moloney, Senior Consultant at Goldcorp.

“We are already seeing the job of general managers change, as automated reporting solutions allow them to focus on other things. Operators are still necessary, but the definition of what an operator does will change. Some of our operators don’t even own a mobile phone, so suddenly filling their cabin with automated tools is a scary proposition for them. Change management is absolutely critical for this to work.”

THE DIGITALIZATION BOOM is also keeping lawmakers and regulators busy as they struggle to keep pace. In 2018, the EU’s General Data Protection Regulation (EU GDPR) will have an impact as the biggest change to data privacy regulation in 20 years.

Designed to deal with the way that the likes of Google and Facebook manage user data, the regulations will force companies to reshape the way they approach the collection and management of personal data, something that could create a few headaches within industry. While position tracking and monitoring of automated equipment and individual workers can drive productivity and improve safety, it can also fall foul of the new regulations.

“You need a specified, explicit and legitimate purpose for collecting information relating to an identifiable person, and a legal basis for collecting and processing it,” explains Manny Maloney, General Counsel for the business area Sandvik Mining and Rock Technology. While there can be no doubts about the positive impact on safety, some labor unions have expressed concerns about such constant monitoring of employees. ■



INSIDE THE AUTOMATED MINE

Fully automated mines are not as far away as you might think. One company hopes its African gold mine will set a precedent for the industry.

THE OPPORTUNITY TO drive productivity and safety benefits through the automation of equipment and the more efficient use of machinery is a benefit that any mining company could use. Some see automated mines as a far-flung fantasy, but John Welborn, CEO of the mining company Resolute Mining, believes such a future is nearly here.

"I hope that we don't have to look ten or 20 years into the future to see a mine that is operated mostly without people," he says. "At Syama, our gold mine in the south of Mali, we are pushing to be the first to operate a fully automated mine. That's everything from the drilling all the way through to the haulage."

FOR RESOLUTE MINING, the safety benefits are just as important, if not more so, than any increase in productivity. "When we talk about automation as a driver of safety outcomes, usually we're talking about the direct danger that mine workers face in relation to heavy equipment and unstable rocks, smoke, fire and all the other dangers that exist in mining, but there are also security concerns in remote parts of the world. Automation creates an opportunity where key workers don't actually have to be in the mine zone or even in the same country."

Although some industry observers see automation as a risk to employment, Welborn provides an alternate perspective. "We see automation as an opportunity to provide direct training pathways in emerging economies for people who haven't had the opportunity of formal education. We can help them develop into technically skilled operators to hold key roles in what

will become a very high-tech mining operation."

Resolute Mining has chosen Sandvik to support its journey toward automation. Sandvik's new 'i'-series is designed with digital systems and automation firmly in mind. "We are rolling out the 'i'-series across the fleet," says Riku Pulli, Vice President Automation at Sandvik. "Crushers, screening, underground and surface rock drills, loaders and trucks will all come with digital features, enabling operators to work more efficiently.

"Some of these machines don't require an operator in the cabin," he says. "Instead, they sit in a control room that could be located elsewhere, which creates a possibility for them to supervise a fleet of machines, rather than operate just one."

A THREE-PRONGED approach gives Sandvik customers flexibility and choice when building their own digital strategy. AutoMine™ is a system that automates the mining processes and makes the machines operate unmanned, on their own. The My Sandvik web portal gives customers online access to data and information about their fleet, while OptiMine™ is a system that includes scheduling, location tracking, data analytics and overall digital tools for optimization of mining processes. ■



Riku Pulli



John Welborn

SENTUSYS™ MAKES TUBES SMARTER

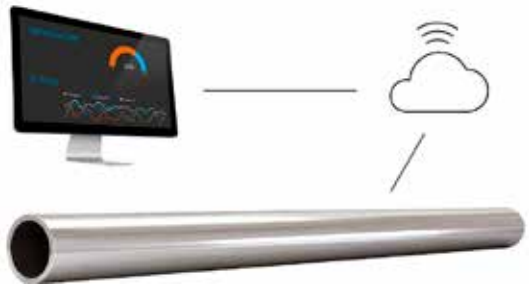
One newly formed group within Sandvik is redefining customer value with intelligent tubes.

SIMPLY ADDING SENSORS to industrial equipment is nothing new, but the harsh environment of process tubes presents a big challenge to achieving the potential advantages of the industrial internet. The intelligent tube system helps customers control the status of the tubes inside their processes.

“The true innovation lies in the combination of metallurgical knowledge and the sensor technology,” explains Erika Hedblom, Manager, Intelligent Tube System. She leads a team with competences in sensor technology, electronics, project management, metrology and production development.

“With our unique material competence, we can utilize the data and make reliable predictions on how the material reacts to extreme heat, dry runs and other forces. Our recommendations allow the customer to run a safe plant and plan for maintenance instead of irregular and expensive downtimes.”

TUBES USED IN the process industry are constantly exposed to variations in strain, vibration and temperature. These intelligent tubes help customers to perform monitoring using data collection, even in places where sensors normally don't survive. The target group is customers with a high requirement for safety and reliability in the energy sector, urea plants and the petro-



The Intelligent tube system Sentusys™ helps customers control the status of the tubes inside their processes with the help of cloud-based computing.

chemical industry, among others.

Erika Hedblom has a clear vision: every plant with stainless steel tubes in their equipment will have intelligent tubes from Sandvik installed in the future. Big data will allow for self-learning systems that will act autonomously, initiating maintenance when the tubes have reached the end of their life span.

The story of Sandvik's intelligent tubes is an example of how digitalization can add serious value to customers, helping them to achieve safe, cost-efficient and productive operations. ■



Erika Hedblom
Manager, Intelligent Tube System at Sandvik.



The ancient Chinese strategy board game Go is more complex than chess, with supposedly more possibilities than the total number of atoms in the visible universe, but still no match for Artificial Intelligence.

ARTIFICIAL INTELLIGENCE - A GAME CHANGER

Digital assistants can filter out irrelevant information, manage multiple connections and interfaces, and perform tasks autonomously, says an expert who predicts an “Internet of Minds”.

SCIENCE FICTION MOVIES sell artificial intelligence in the form of smart droids capable of running and jumping. Harri Valpola, founder and CEO of The Curious AI Company, predicts the first practical applications of artificial intelligence will be in the form of a digital assistant rather than hardware, as software is so much cheaper to develop.

To get there, however, several roadblocks must be overcome. “The computers of today can make decisions based on learning, but only when their worldview is pre-programmed,” says Valpola. “That’s how a computer program was able to beat the world champion of Go, an ancient Chinese strategy game said to be more complex than chess. But in the real world, computers cannot yet distinguish between non-programmed features and objects, nor can they reason.”

TO FUNCTION EFFECTIVELY in a mine, for example, artificial intelligence would need to learn how a loader interacts with different sizes, shapes and types of rock. That’s not something that can be fully programmed, so the team at The Curious AI Company is taking inspiration from how the human brain is wired.

A future industrial AI will create an “Internet of Minds,” says Valpola. “A digital co-worker can filter out irrelevant information, manage multiple connections and interfaces and do some tasks autonomously,” he says. “Such a system could handle all the different knowledge within an organization, removing the problem of hidden knowledge once and for all.” ■



At the center of attention: Anders Lindh

SIMPLE DIGITAL TOOLS WILL MAKE THE BIGGEST DIFFERENCE

Far from making things more complex, digital solutions should simplify the working environment for all of us, says Anders Lindh, Head of the Center of Digital Excellence at Sandvik Machining Solutions.

DESCRIBE YOUR APPROACH TO DESIGNING DIGITAL SOLUTIONS.

"We have a close relationship with our core customers, so we understand what it is they are trying to achieve with digitalization. It's our job to help them navigate through the multitude of available options. By creating value together with customers, we can share in that value."

WHERE IN THE PROCESS CAN DIGITAL TOOLS MAKE THE BIGGEST DIFFERENCE?

"Manufacturing is essentially made up of four steps: design and planning, preparation, machining, and evaluation. Today this is a linear and fragmented process. With digital tools we can tie the steps together, creating a learning cycle. Across SMS and the wider

Sandvik Group, there is so much knowledge that we can put into the design of these tools to simplify the process for our customers and ourselves. The tools become platforms to deliver knowledge in a very efficient way."

CAN YOU GIVE AN EXAMPLE OF HOW SMS IS SUPPORTING ITS CUSTOMERS ON THIS JOURNEY?

"We approach customers in a very pragmatic way, establishing together what is needed for them to get moving and achieve results quickly. They tell us that digitalization of the tool inventory is critical, so this is where we have decided to focus our attention initially with the launch of TDM Cloud Line, a solution developed by Sandvik-owned company TDM Systems" (read more on the next page). ■

A DIGITAL TOOL PLATFORM FOR CUSTOMERS

Sandvik is assuming a leading role in the digital transformation of tooling with the introduction of TDM Cloud Line, a brand-new cloud-based solution for tool management. Hugo Nordell, Director Digital Solutions, Sandvik Machining Solutions, tells us more.

WHAT DOES TDM CLOUD LINE DO?

"TDM Cloud Line allows customers to take control of their tool management through an intuitive, web-based application that helps them build digital tool inventories that replicate the ones they have on their shop floors. These digital twins can then be used to simulate and optimize production, as well as improve planning. TDM Cloud Line manages hundreds of thousands of tools, so customers always have access to the most up-to-date tools offered by suppliers."

WHAT ARE THE BENEFITS FOR THE CUSTOMER?

"Current data from tool manufacturers varies in quality and detail. By offering an intuitive way to showcase which tools customers have and what data is missing, they can fill these gaps and significantly reduce the amount of scrap and rework that follows from

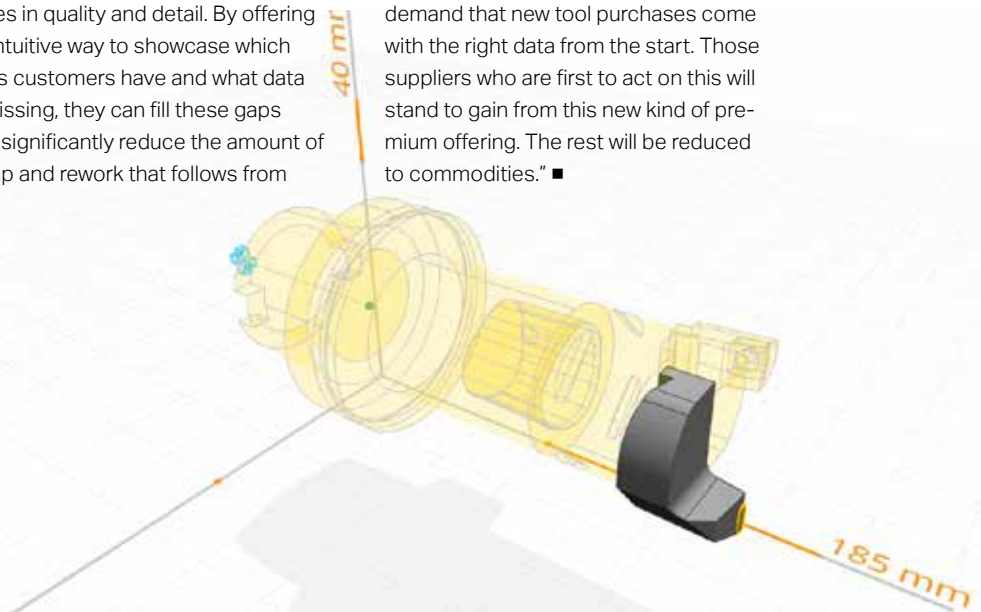
the current lack of information transparency."

HOW HAS THE MARKET RESPONDED?

"Feedback during the beta-testing phase has been overwhelmingly positive. The service has been designed in cooperation with customers from the very beginning, so we know we are solving a genuine problem in a way our customers want."

WHAT DOES THE FUTURE HOLD?

"As customers gain access to up-to-date and accurate tool data through TDM Cloud Line, they will begin to demand that new tool purchases come with the right data from the start. Those suppliers who are first to act on this will stand to gain from this new kind of premium offering. The rest will be reduced to commodities." ■



MEETING THE COMPETENCE CHALLENGE

Sandvik is expanding its digital offering, thus triggering a need for new competencies from both existing and future employees. “We must work together to realize the full potential of every individual,” says Sandvik’s Magnus Ekbäck.

HOW DOES THE DIGITALIZATION EXPANSION CHANGE THE COMPETENCE REQUIREMENTS AMONG SANDVIK EMPLOYEES?

“New competencies will be required from all employees if we are to keep up with the digital transformation, which affects internal processes as well as customer interactions. Learning how to adopt new tools and finding new ways of working when it comes to personal efficiency requires collaboration and knowledge sharing across teams.

“When it comes to how we digitize our interaction with customers, new competencies are required to develop areas such as marketing automation. We are looking both internally, to develop existing competencies, and externally, to recruit people with new experiences and competencies.

“The expansion of Sandvik’s offering in the digital area triggers a need for additional competencies. The Internet of Things is one example where we need to

combine external skills with our existing competencies in manufacturing and machining.”

HOW DOES SANDVIK WORK TO ATTRACT, RECRUIT AND RETAIN EMPLOYEES WITH THE REQUIRED COMPETENCIES?

“We are constantly developing our ability to find and attract people with competencies necessary for the future. Our experience so far is that we are in fact more attractive to the target group than we previously believed. The challenge lies in integrating these new employees, whose knowledge and experience may be very different from more traditional employee profiles in the company.

“There is much to gain, though, as we learn from each other and enhance how we work together to realize the full potential of every individual. In addition to working with new employees, we are also working with existing employees to develop their competencies, awareness and

“As Sandvik’s offering is diversifying into the digital area to include, for example, electronics and computing, we are recruiting for new job roles.”

ability to adapt as the new platforms are implemented, helping them to develop ways of working to keep up with the constantly changing world.”

WHAT FUTURE JOBS MIGHT WE SEE AT SANDVIK AS A RESULT OF THE DIGITALIZATION?

As Sandvik’s offering is diversifying into the digital area to include, for example, electronics and computing, we are recruiting for new job roles. Recent examples include data scientists, electronic engineers and firmware and software developers.”

HOW DOES SANDVIK CREATE AN ENTREPRENEURIAL ORGANIZATION?

“Most industries are faced with the challenge of supporting the design, launch and operation of a new business, offering or service. To me, much of this can be summarized in two words: accountability and mandate.

“Firstly, management must believe in and put in place as many of the characteristics that underpin entrepreneurial setups as possible. Secondly, we must give the organization and the people in it the authority to take the actions required. We are testing this in different scales all the time, especially in the digital area, and we’re learning as we go forward.”

HOW DO YOU ENCOURAGE NEW IDEAS AND STIMULATE INNOVATION INTERNALLY?

“Sandvik has a long history of innovation and innovators, mostly in the field of technology and products. This has

been part of our business success and has become integral in our way of working. Lately, Sandvik Coromant has launched a more organized approach to innovation, which we term ‘idea management’; the goal is to expand innovation throughout the entire operation.

“We have an active Innovation group with a core team that is coordinating an internal network presently of eleven idea ambassadors. They assist the organization in formulating problems and needs, generating ideas and development and the evaluation of these ideas. Our vision for idea management is that all employees should be active and contribute to finding new inspiration and challenges in order to seize new opportunities. Managers and employees should feel that they have support when it comes to realizing ideas. We collaborate in an open and enjoyable working climate, where there is much room for creativity.”



Magnus Ekbäck is Vice President and Head of Business Development and Digital Machining at Sandvik Coromant.



Volkswagen has committed to electrifying its entire lineup by 2030.

ELECTRIFYING OPPORTUNITY FOR THE AUTO INDUSTRY

The automotive industry is facing a transition, where electric vehicles are predicted to take a major market share. "It will definitely happen, but not overnight," says Sandvik's Eduardo Debone, who argues that the rise of electric and, more importantly, hybrid technology represents a huge opportunity for suppliers to the automotive industry.

EARLIER IN 2017, the global financial services firm Morgan Stanley predicted that there will be 1 billion electric vehicles on the roads by 2050, with a market share that will grow steadily from around 2020. The report suggested that electric vehicles would account for 16 percent of car sales by 2030, and would become market leading with up to a 69 percent share by 2050.

This growth will primarily be driven by government legislation, with more

countries incentivizing the use of future technologies such as electric vehicles. These moves have become more widespread since the 2015 Paris Agreement, which seeks to "pursue efforts to limit the temperature increase to 1.5 °C above pre-industrial levels."

In 2016, the German Bundesrat (Federal Council) passed a resolution to ban new gasoline- or diesel-powered vehicles from EU roads, starting in 2030. Only zero-emission vehicles

“Right now, there’s lower-hanging fruit in the form of the hybrid vehicles, which have huge potential to deliver CO₂ savings without requiring a total paradigm shift in terms of technology and infrastructure.”

would be allowed on the market after that time. The resolution is a clear statement of intent, even though it is non-binding and subject to approval by the European Council.

IN JULY 2017, Emmanuel Macron’s new French government announced its own plans to ban all gasoline and diesel vehicles by 2040 in line with the Paris Agreement. The French statement came the day after Volvo announced that it would make only fully electric or hybrid cars from 2019 onwards.

In the meantime, governments of countries ranging from China, India and Japan, to the Netherlands and Norway, have announced similar plans.

For suppliers to the conventional automotive industry, such as Sandvik, this trend would decrease the demand for products and services connected to internal combustion engines (ICEs).

However, Eduardo Debone, Automotive Business Segment Manager at Sandvik Coromant, says this outlook could in fact be positive.

“Every week I meet people who

ask if electric cars are a threat to our businesses, and I reply that in the short to medium term these new platforms actually represent an opportunity for Sandvik,” he comments.

SANDVIK IS CARRYING out an in-depth analysis of the effects of electrification, and the findings confirm that electrification will create significant new opportunities in the coming years. “Right now, there’s lower-hanging fruit in the form of the hybrid vehicles, which have huge potential to deliver CO₂ savings without requiring a total paradigm shift in terms of technology and infrastructure,” Debone says.

Although electric vehicles are



Volvo will release only fully electric or hybrid cars from 2019 onwards. The “twin-engine” 2018 XC60 T8 plug-in hybrid fits into the new strategy.



Battery technology is evolving. For example, the 2018 Nissan Leaf's battery is more powerful than its predecessor,

doubtedly on the rise, some obstacles still need to be overcome before traditional cars have been outmaneuvered. Price is still a concern for many consumers, they take time to charge – around 30 minutes – and the drive range varies. Also, today's power grid lacks the capacity to support a mass market for electric cars.

"Norway is one of the most developed markets in the world for electric vehicles, and with a stable power grid

supporting only 5 million inhabitants it makes sense," says Debone. "In cities like São Paulo or New Delhi, both with some 20 million people in the metropolitan area, where the power grids are barely able to support the day-to-day needs of their populations, it's a different challenge."

FOR THE NEXT five to ten years, Debone believes that the growing trend of hybrid cars will enable automotive suppliers to continue to deliver the parts, technologies and components they currently make, in addition to some new ones. "Hybrids require the same components as ICE vehicles, plus some new parts to support the hybrid technology," he says.

As for Sandvik, an electrified future is a bright future.

"When pure electric cars do become reality on a larger scale, we will have a mature offering for many areas, such as digital manufacturing, additive manufacturing and others," Debone says.

"Ultimately, I think the long-term

TIMELINE OF A GREENER AUTO INDUSTRY

1970

The European Community issues its first directive (Directive 70/220/EEC) to limit emissions of carbon monoxide and hydrocarbons from gasoline engines.

1987

The Luxembourg Agreement sets down limits for gaseous and particulate emissions from diesel vehicles.

1993

The EU requires catalytic converters as a result of the Euro I regulation.

2009

The Euro V standard requires introduction of closed particulate filters.



Nissan Motor helps electrifying the European automotive sector with its next-generation battery-powered Leaf sedan.

solution may include fuel cell technologies, as a complement to batteries and internal combustion engines," he says. "Before then, the technologies need to mature. For now, we still don't have a unique alternative to fossil fuels." ■



Eduardo Debone
Automotive Business
Segment Manager at
Sandvik Coromant

2015

EU legislation limits CO₂ emissions to 130g/km for all passenger cars.

2016

In October 2016 The German Bundesrat passes a resolution to ban new gasoline- or diesel-powered vehicles from roads in the European Union starting in 2030.

2017

In July 2017 France's Environment Minister Nicolas Hulot announces France's five-year plan to ban all gasoline and diesel vehicles by 2040.

2021

The next major legislative milestone will limit CO₂ emissions in the EU to 95g/km, requiring manufacturers to deliver a 27 percent reduction compared with current levels, according to consulting company IHS.

BRIGHT FUTURE FOR FUEL CELLS

Batteries are not the only way to power electric vehicles. Another option is fuel cells. Ulf Nilsson and Håkan Holmberg, both responsible for Sandvik's fuel cell offering, share their view on the future of the technology.

WHY ARE FUEL CELLS SUCH A PROMISING SOLUTION?

Fuel cells and batteries are two sides of the electrification coin. Both options can be used to convert chemical energy into electricity in an electric vehicle. The advantage of fuel cells is that they provide faster fueling and a longer driving range. The fuel source is hydrogen, which emits only clean water when transformed into electricity.



Fuel cells deliver faster fueling and a longer driving range than batteries.

WHAT OBSTACLES NEED TO BE OVERCOME FOR FUEL CELLS TO BECOME A COMMERCIAL REALITY?

It's important to remember that this technology is already here, but before it can become more broadly available, the cost of the fuel cell systems needs to decrease. Sandvik can support this paradigm shift by offering an industrial concept. Moreover, as fuel cell cars are refueled in a way similar to internal combustion engine cars, an infrastructure of filling stations also needs to be developed.

HOW WILL FUEL CELL TECHNOLOGY FIT INTO THE FUTURE FUEL MIX?

The automotive powertrain of the future will probably be a mix of different solutions. Fuel cell cars have a long driving range (500-plus kilometers) and can be refilled in a few minutes. This makes them as flexible as internal combustion engines. Meanwhile, battery cars will probably play a larger part in driving shorter distances.



Ulf Nilsson and Håkan Holmberg are responsible for Sandvik's fuel cell offering.

WHAT IS SANDVIK'S ROLE IN THE FUEL CELL BUSINESS?

Sandvik has developed the Sandvik Sanergy™ product platform, which consists of a coated strip for one of the most critical components in the fuel cell stack. We're working with various customers, but focusing on the automotive industry, where suppliers to that industry are currently specifying their solutions for next generation of vehicles. With our large-scale production line, Sandvik has a key part to play in future supply chains as mass production needs to grow. ■



Accident simulations provide training for mining emergency response crews.

TRAINING TO SAVE LIVES

Sandvik contributes to the Mining Emergency Response Competition, an annual contest aimed at improving the skills of emergency response crews working at Australian mine sites.

WITH REMOTE Australian mine sites often long distances from professional emergency services, on-site emergency response crews need to feel confident handling just about any type of crisis. The Mining Emergency Response Competition (MERC) held annually in Perth helps them hone their skills and get prepared for a range of scenarios.

“We try to make the scenarios as realistic as possible,” says Jen Pearce, one of the founders of the competition.

The MERC competition, started in 2010, has grown to host 300 participants annually, including competitors, volunteers and sponsors.

The 2016 MERC event was the first to feature mining equipment, as Sandvik contributed a

mining truck, an underground drill and a loader to be used in the simulations. A number of Sandvik employees also volunteered to attend the event to answer any questions from the public.

WHILE SANDVIK focuses on using safety to prevent accidents and MERC focuses on what to do if an accident does occur, both organizations take the issue extremely seriously, says Malcolm Mauger, Business Line Manager at Sandvik.

“All the simulations at MERC are meticulously planned months in advance by experts up until the simulations are carried out on the day,” he says. “Even after the simulations are carried out, they are reviewed to see what learning can be taken.”■

STRONG MARKETS IN THE THIRD QUARTER

Order growth was buoyant at 13 percent, with positive development in all geographical regions. All three business areas contributed to the strong growth in order intake, with flat to positive demand development in all customer segments. Large orders were received by Sandvik Mining and Rock Technology and Sandvik Materials Technology at a total value of 500 million SEK.

SIGNIFICANT GROWTH IN OPERATING PROFIT

We achieved an operating margin of 15.4 percent and operating profit increased by 28 percent. Performance was supported by organic growth and previously implemented efficiency measures. This more than offset the adverse impact from changes in exchange rates as well as the weak performance of Sandvik Materials Technology. Excluding the adverse impact from changed exchange rates, operating profit increased

by 37 percent. The earnings growth in the quarter was driven by Sandvik Machining Solutions and Sandvik Mining and Rock Technology, while the performance of Sandvik Materials Technology was unsatisfactory. We are implementing the cost initiatives announced earlier that are aimed at gradually restoring profitability from early next year.

HEADROOM FOR M&A

The strong growth in operating profit supported cash flow, and the balance sheet was strengthened with net gearing reduced to 0.62. As the balance sheet strengthens it allows for increased focus on growth through acquisitions going forward, most likely within Sandvik Machining Solutions in the near-term.

SUSTAINABILITY RECOGNITION

Sandvik was once again selected as a member of the Dow Jones Sus-

tainability Index which only includes companies ranked in the top 10 percent of each industry in terms of sustainability performance. We scored with a percentile ranking of 97, meaning our performance was better than 97 percent of the assessed companies in our industry. Sustainability is key to our ability to create increased customer value, enabling us to help our customers become safer, more efficient and more productive. ■



Tomas Eliasson, CFO

Q3 2017

REVENUES BY BUSINESS AREA

MSEK	Q3 2017	Q3 2016	Change %	Change % ¹⁾
<i>Continuing operations</i>				
Sandvik Machining Solutions	8,488	7,859	8	10
Sandvik Mining and Rock Technology	8,987	7,791	15	17
Sandvik Materials Technology	2,980	2,945	1	3
Other operations	1,194	1,113	7	10
Group activities	-1	7		
Continuing operations	21,648	19,715	10	12
Discontinued operations	964	724	33	33
Group total	22,612	20,439	11	13

1) Change compared with the same quarter last year at fixed exchange rates for comparable units.

OPERATING PROFIT BY BUSINESS AREA

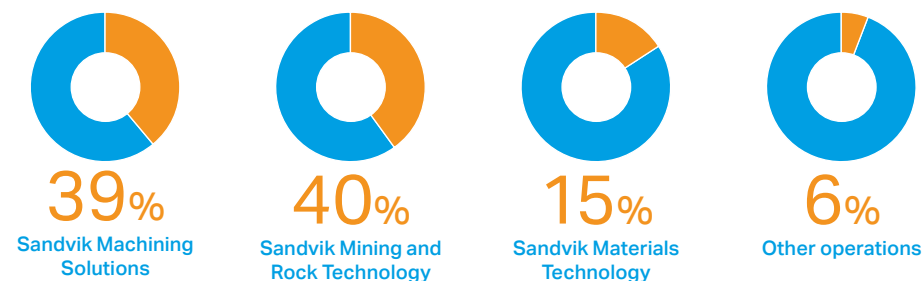
MSEK	Q3 2017	Q3 2016	Change %
<i>Continuing operations</i>			
Sandvik Machining Solutions	1,949	1,650	18
Sandvik Mining and Rock Technology	1,472	817	80
Sandvik Materials Technology	-57	197	N/M
Other operations	123	113	8
Group activities	-143	-154	8
Continuing operations ¹⁾	3,344	2,623	28
Discontinued operations	33	-1,012	N/M
Group total ¹⁾	3,377	1,611	N/M

1) Internal transaction had negligible effect on business area profits.
N/M = non-meaningful

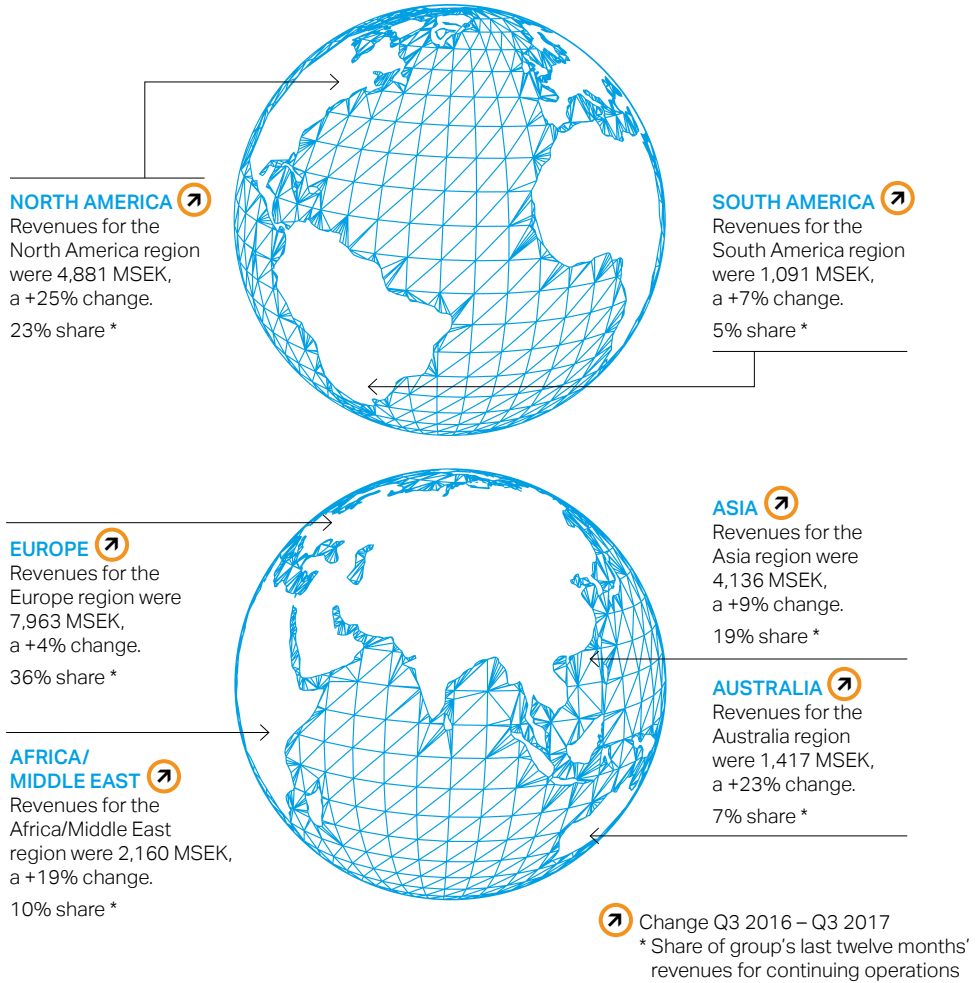
OPERATING MARGIN BY BUSINESS AREA

%	Q3 2017	Q3 2016
<i>Continuing operations</i>		
Sandvik Machining Solutions	23.0	21.0
Sandvik Mining and Rock Technology	16.4	10.5
Sandvik Materials Technology	-1.9	6.7
Other operations	10.3	10.2
Continuing operations	15.4	13.3
Discontinued operations	3.4	-139.8
Group total	14.9	7.9

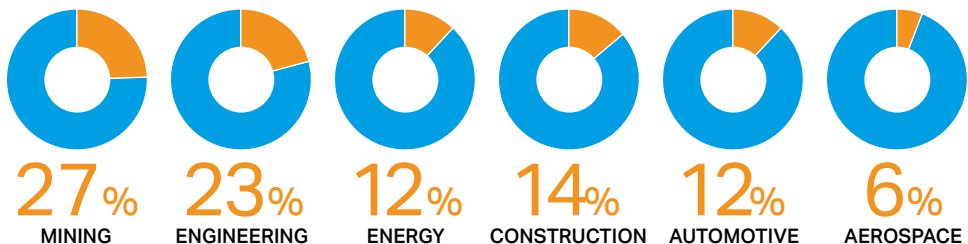
REVENUES Business area share of Group's revenues for continuing operations



REVENUES DEVELOPMENT by market area



REVENUES by segment **



** Share of the Group's 2016 total revenues; consumer goods, chemicals and miscellaneous total 6%.



FAMILY DAY AT THE MUSEUM

IN OCTOBER, Sandvik invited Swedish employees and their families to a Family Day at the National Museum of Science and Technology in Stockholm. Over 600 visitors of all ages explored the exhibitions, joined guided tours and learned more about science and engineering.

“Our ambition is to inspire and to show that technology is exciting, challenging and fun,” says Elja Nordlöf at Sandvik, who is responsible for arranging the event.

Earlier this year, Sandvik became the museum’s first official Innovation Partner by signing a three-year agreement. Promoting an interest in technology among youngsters and increasing the attractiveness of technical education are important objectives to the company.

NEW PRODUCTION UNIT IN SOUTH AFRICA

WITH A 70-YEAR history in South Africa, Sandvik has become well acquainted with the challenges facing the country’s mining industry, and it understands the important role that private investment and local manufacturing can play in extending mine life, skills development and employment.

To support local industry, Sandvik has decided to establish its own local manufacturing facility for the production of a new low-profile loader, Sandvik LH115L, which will be launched for the African market.

“This local manufacturing facility represents an exciting new chapter in the company’s development and underscores our desire to play a part in the skills development and local manufacturing capabilities,” says Simon Andrews, Vice President, Sales Area Southern Africa, at Sandvik.

NEW PRESIDENT OF SANDVIK MATERIALS TECHNOLOGY

As of November 1, Göran Björkman is new President of business area Sandvik Materials Technology and member of the Sandvik Group Executive Management Team.

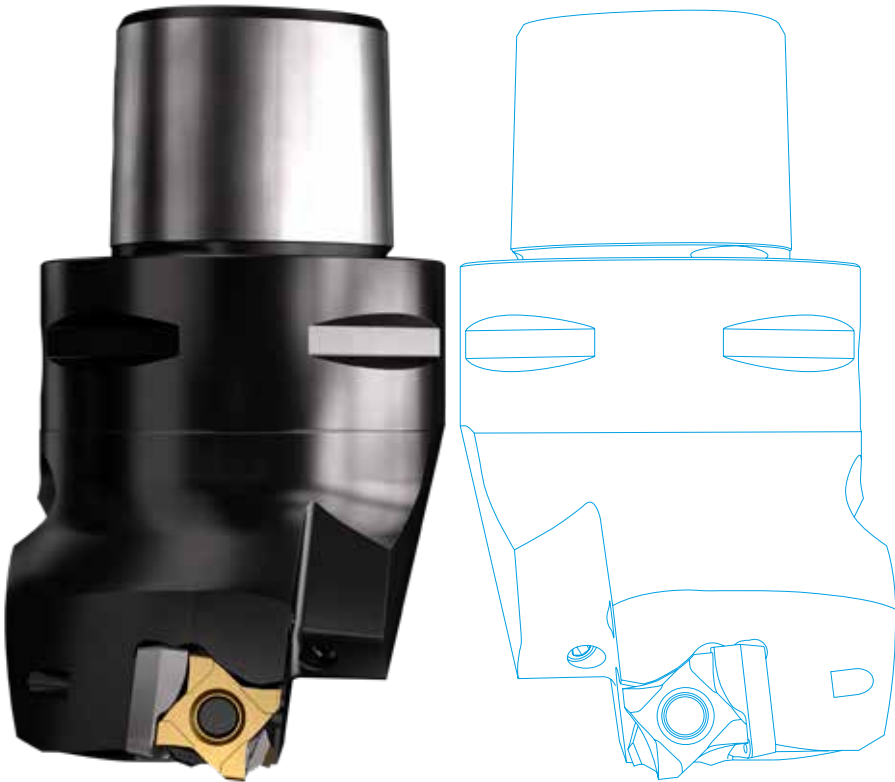
“Göran Björkman has with his extensive experience the right capabilities to lead Sandvik Materials Technology going forward. As we all know, this business area is experiencing a challenging situation. I am convinced that Göran Björkman will add the strategic, business

oriented focus that the business area now requires”, says Sandvik’s CEO and President, Björn Rosengren.

Göran Björkman, age 51, has been with the company since 1990 of which almost 20 years at the materials technology operations. Currently he has the position as Vice President Production at Sandvik Coromant and Vice President Production Strategy, Sandvik Machining Solutions.



Göran Björkman is new President of business area Sandvik Materials Technology.



THE OBJECT | Digital twins

A digital twin is a digital real-time copy that perfectly emulates the properties and behavior of the physical object or process it mirrors. In machining, digital twins of physical tools are used in the simulation and optimization of a production process without requiring expensive machine time or risking costly downtime.

Information about how the tool is best used in terms of which feeds and speeds are optimal for different materials can be added to the twin's description, which greatly facilitates rapid knowledge and best-practice sharing between Sandvik and its customers.