SANDVIK REDEFINES TURNING • Powder solution for marine engines
Collaborative safety solutions • SOFTWARE SALES SHOW POTENTIAL
EFFICIENT CRUSHER • Strong leadership • SALT MINING

MEET SANDVIK

#1 -2017

SANDVIK GROUP MAGAZINE

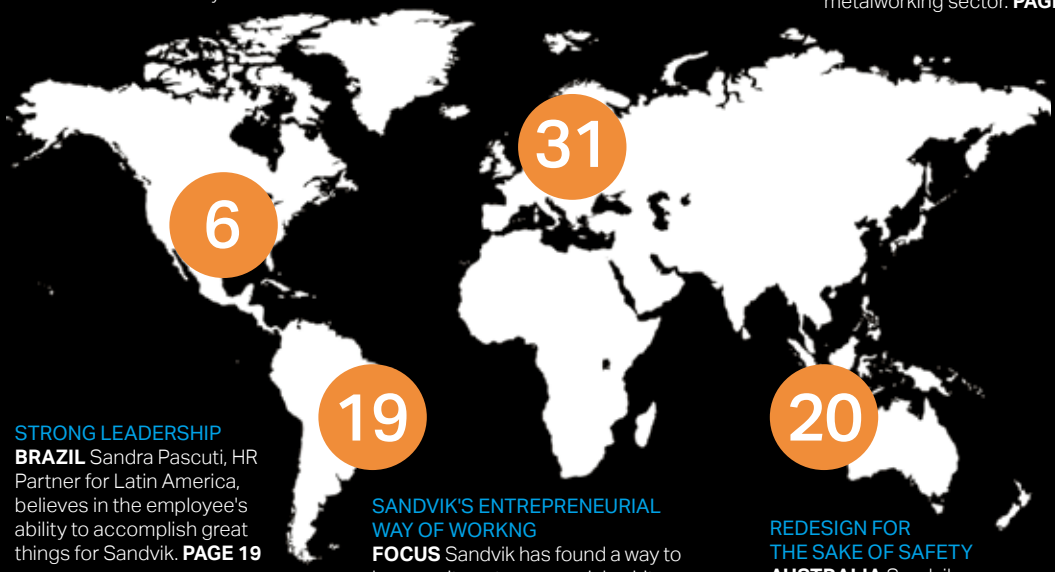
ROOTS OF ENTREPRENEURSHIP THRIVE IN SANDVIK

The ideas, the passion, the action – the entrepreneurial spirit is alive in Sandvik employees. Never before has it been so important for Sandvik to honor its roots of entrepreneurship and embrace an entrepreneurial way of working. **PAGE 10**

8,000 PERCENT IMPROVEMENT
U.S. Better tooling boosted productivity for Knust-Godwin when manufacturing parts for the wristwatch industry. **PAGE 6**

NEW PRODUCT AREA
SWEDEN Sandviken is home to Additive Manufacturing, a new product area within Sandvik Machining Solutions. **PAGE 31**

SOFTWARE OPPORTUNITIES
SANDVIK PREPARES for a rise in software services sales to the metalworking sector. **PAGE 26**



STRONG LEADERSHIP
BRAZIL Sandra Pascuti, HR Partner for Latin America, believes in the employee's ability to accomplish great things for Sandvik. **PAGE 19**

SANDVIK'S ENTREPRENEURIAL WAY OF WORKNG
FOCUS Sandvik has found a way to harness its entrepreneurial spirit, which is more important than ever to stay competitive. **PAGE 10**

REDESIGN FOR THE SAKE OF SAFETY
AUSTRALIA Sandvik employees turned a near-accident into safer rod racks. **PAGE 20**

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SANDVIK

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DEAR READER,

WE HAVE PUT 2016 behind us – the first full year for me as CEO at Sandvik. It was an eventful year with many changes, all of which were designed to improve the performance of our company in a challenging market environment.

A new strategic agenda was formed, including consolidating operations to make a more decentralized business model. New financial targets suggested improved operating profit and higher returns. We ended the year with a strong fourth quarter, and I was very pleased to see our plans being realized and all business areas showing profit improvements.

OUR STRATEGY EMBRACES an entrepreneurial way of working within a culture of accountability. I strongly believe that a high level of responsibility close to business together with transparency and speed contributes to our continued success. We need to be flexible and fast in responding to changing customer demands. We constantly face our customers' challenges, and we must understand their needs – sometimes even better than they do themselves. This requires a company culture that motivates innovation and entrepreneurial behavior.

In this issue, we give you examples of colleagues who are true Sandvik entrepreneurs and have contributed some of our most valuable solutions and innovations for our customers (page 10).

The entrepreneurial approach is important for our continuous improvement, to seize business opportunities and continue to develop our offerings. New technologies create new possibilities, and new digital solutions will be launched at an accelerated pace. We are already proud of our digital offering, including automation, intelligent tools and commercialized additive manufacturing.

MOVING FORWARD we will continue to respond quickly to our customers' requirements. It is important that we follow the strategic steps: stability, profitability and growth.

We are on the right track and now we need to keep focus on small improvements, day by day and week by week, with high commitment on delivering a strong value to customers and shareholders.

Someone who has delivered commitments to Sandvik for 25 years is Klas Forsström, who up until now has carried out ambitious strategies for Sandvik Coromant. As of April 1, he was appointed President of business area Sandvik Machining Solutions, and I am very pleased to welcome him to the Group Executive Management team.

With a strong strategy that supports us, we are committed to delivering good results ahead. We hope you enjoy this new issue of *Meet Sandvik*.

Björn Rosengren, President and CEO

SALTY BUSINESS

Salt mining is an ancient process; the deposits themselves can be several hundred million years old. Such is the case at the Bernburg mine in Germany, where esco (european salt company) extracts rock salt from a 250-million-year-old underground deposit.

Salt production here dates back to the Middle Ages, when brine was evaporated from open pans. Today esco relies on modern mining equipment to produce roughly 2 million tons of salt each year, offering its customers a wide range of high-quality salt products, including salt for chemical and industrial use as well as pharma and food-grade salts and de-icing salt.

Bernburg recently bought two new Sandvik LH621 underground loaders, which have a high power-to-weight ratio that ensures faster cycle times. An efficient Tier 4 diesel engine helps to minimize emissions underground.

NEWS

BEHIND THE SCENES
Get an exclusive look into the world of Sandvik. In Sandvik's blog, co-workers in different roles and from different parts of the world share their reflections about their daily work. Look for it at home.sandvik.com/blog.

No. 1

For the third consecutive year, Sandvik Group's website home.sandvik ranks No. 1 in the category "Best Corporate Website" in the E-Space survey.

Visitors have judged appearance, structure, information and ease of use as well as how well the website meets their expectations.

FUEL NOZZLES PART OF **SUSTAINABILITY STRATEGY**

One of the cornerstones in Sandvik's sustainable business strategy is to develop customer solutions that contribute to a more sustainable future.

One example is fuel nozzles based on powder technology, a critical component in fuel injection systems in marine diesel engines. The use of powder technology means reduced emissions, improved fuel efficiency and an extended service life.

SANDVIK HELPS WRISTWATCH PARTS MANUFACTURER BOOST PRODUCTIVITY BY 8,000 PERCENT

A long slowdown in the oil industry prompted Texas-based Knust-Godwin to diversify its customer base. From specializing in large parts for oilfield instrumentation, the company decided to begin manufacturing wristwatch parts for VERO Watches.

Knust-Godwin realized that the stainless steel in the watch bodies was quickly wearing out tools. Sandvik Coromant recommended replacing tool holders with the high-precision hydraulic chuck CoroChuck® 930 and doing the roughing with the milling cutter CoroMill® 390-07.

"It came out to an 8,000 percent productivity increase per tool," says Chris Hurst, a programmer at Knust-Godwin. "We'd long suspected that better tooling would make a difference but never had this sort of head-to-head comparison."

Read more at home.sandvik.com.

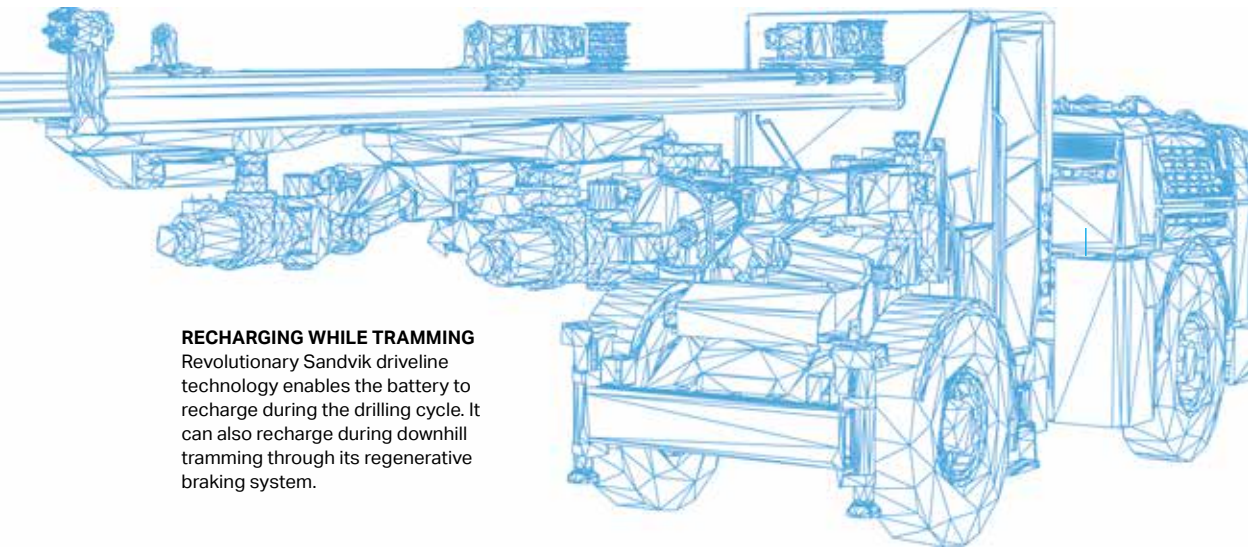
Knust-Godwin makes watch bodies in stainless steel.

DRILLING
WITHOUT DIESEL

The new Sandvik DD422iE is the industry's first jumbo that completely relies on electrical power. It uses the mine's electricity network to power its drilling; it has no diesel engine. While tramming, the Sandvik DD422iE takes its power from an onboard battery. This eliminates exhaust emissions completely, resulting in a safer and healthier working environment for operators.

Innovations in the jumbo also include 3D-scanning navigation and an improved boom option. These functions shorten setup time, increase accuracy and reduce cycle times as well as drilling costs.

55 PERCENT LESS HOSING
By implementing common rail hydraulics, Sandvik's boom option reduces the length of hosing from 240 to 110 meters. This means a reduction of exposure to potential damage and fewer hours spent on maintenance.



RECHARGING WHILE TRAMMING
Revolutionary Sandvik driveline technology enables the battery to recharge during the drilling cycle. It can also recharge during downhill tramming through its regenerative braking system.

3D SCANNING SAVES METERS
Sandvik 3D scanning uses a set of data points – or point cloud – to automatically and instantly inform the drill of its exact position, making it possible to optimize the drill pattern. The device comes fully integrated with iSURE, Sandvik's industry-leading drill planning and analysis tool.

AUTOMATED CONE CRUSHER BOOSTS PRODUCTIVITY

Sandvik's new cone crusher CS550 is a powerful secondary stage crusher for 700- to 750-ton applications, designed with the key goal of accomplishing more work at each crushing stage while maintaining overall efficiency.

The newcomer's high intake capacity increases productivity by allowing the crusher to process more material in the primary stage, while the advanced automation optimizes capacity, reduction and process security. Compared with similar types of crushers, Sandvik CS550 achieves up to 25 percent higher reduction ratios.

While nothing prevents Sandvik CS550 from being used in mining applications, its primary mission is stationary construction use. From a practical standpoint this means aggregate quarries, although contractors looking for mobile solutions may also benefit.

"When it comes to closed side settings, the wide range, together with more and bigger throws, gives extreme flexibility, as Sandvik CS550 can be set to fit a huge variety of application needs," says Martin Johansson, Life-Cycle Manager, Cones and Gyratory Crushers, at Sandvik Mining and Rock Technology.

CHILDREN DRAW FRIDGES OF THE FUTURE

Food that teleports itself into your hands and refrigerators that tell you what you need to eat are part of what 7- and 8-year-old children at the British International School of Stockholm are picturing for their future homes.

Their ideas are part of Sandvik's campaign to put the spotlight on compressor valve steel and its importance for the further development of appliances such as refrigerators.

"We want to show that we are forward-thinking and a vital part of our current and future customers' teams," says Patrik Johansson, Project Manager, Sandvik Materials Technology.

Visit the campaign site for more information: smt.sandvik.com/fridgeofthefuture.

NEW MATERIALS CAMPAIGN **SPURS FUTURISTIC INNOVATION**

NADIA AYAD, a 23-year-old material engineering student from Brazil, won the Graphene Challenge, a competition held by Sandvik Coromant to promote its expertise within new materials.

Ayad designed a filtration and desalination device that would make use of graphene to recycle water in households around the world. This solution aims to cut energy costs while reducing the strain on water supplies that are already running scarce.

The Graphene Challenge was part of the Sandvik campaign Looking Ahead 4: Tomorrow's Materials, which in turn was awarded a gold medal in the Pearl Awards, a prestigious content-marketing awards program in the U.S.

Nadia Ayad

SANDVIK IN INTERNATIONAL PARTNERSHIP FOR EFFICIENT WATER MANAGEMENT

Sandvik is participating in Inspirewater, an EU project that aims to increase water and raw material efficiency in the process industry.

The Sandvik project is a case study within the stainless steel production industry, which demonstrates acid and water recovery, reducing total water requirements and increasing process and material recovery efficiency.

For Sandvik, this is an important step toward the Swedish steel industry's vision for 2050, where only products of value to the community will leave the plants.

More information at: spire2030.eu/inspirewater.

FOCUS

TIME TO EMBRACE THE ENTREPRENEURIAL SPIRIT

Innovation and entrepreneurship go hand in hand. In an era when successful innovation is a prerequisite for success, it is more crucial than ever for companies to learn to harness their entrepreneurial spirit. This applies to all businesses, including established industrial giants such as Sandvik.

William R. Kerr is a professor at Harvard Business School. His research focuses on how companies and economies explore new opportunities and generate growth.

NEVER BEFORE HAS it been more important for Sandvik to nurture its entrepreneurial roots. As digitalization makes it possible to generate more information about products and services and speed up processes, manufacturers need to respond with shorter product life cycles and rapid decision-making.

Professor William Kerr, a specialist in new business opportunities and corporate growth at the Harvard Business School in the United States, argues that large engineering companies have an opportunity to set themselves apart from the competition by applying a startup mentality to their business. Startups have less overhead and they are nimbler, more flexible and, typically, more innovative.

"Entrepreneurship is not specific to company size," Kerr says. "You don't have to go back to being ten employees to create a startup mentality. Incumbent corporations have the power to enable these transformations."

HE SAYS ONE way to enable this transformation is to treat a new venture or project like a startup with limited resources.

"Compared with startups, established companies can ironically invest too much money in exploring new ventures, when they actually need to learn to spend less and instead test the new venture concepts using cheaper and more effective techniques," says Kerr.

He says the crucial steps in the right direction involve the use of methodologies such as lean testing and seeking early resolution of core risks that will determine

"There's no one-size-fits-all solution, and each corporation has to adapt to their unique environment and business setting."

viability in the market, such as depth of customer interest and effective unit economics for production.

"One of the first things to work on is staging," he continues. "This means not putting all your resources into something at once but, instead, identifying the key milestones that confirm if a venture is worth pursuing. If your company had been a startup, you would never have been given all the money you needed from the outset."

The challenge that corporations like Sandvik need to address, he says, is how to take the best management practices and methodologies that have already transformed the software and e-commerce sectors – such as virtual testing, lean startup, agile ways of working, approaches that focus on obtaining rapid feedback from customers and effective use of trials – and apply them to their world.

Sandvik has made it a central part of its strategic agenda to adopt an entrepreneurial way of working. Here is Julio Corona, Technician, Sandvik Coromant Center.

SANDVIK HAS ALREADY taken some of these practices to heart and made the entrepreneurial way of working a central part of its strategic agenda. To Sandvik, this means becoming more efficient, continually making improvements, taking decisions closer to the customer and acting in a flexible and agile manner.

"There's no one-size-fits-all solution, and each corporation has to adapt to their unique environment and business setting," says Kerr. "But for those companies that are able to make that adaption and thoroughly apply the frontier insights towards experimentation and growth, now is the best time to put yourself ahead of the game." ■

Sandvik's Tomas Berglund and Martin Östlund successfully managed to design a dream component for a MAN dual-fuel marine engine.

SMART POWDER SOLUTIONS HELP REDUCE MARINE EMISSIONS

Independence and flexibility, both hallmarks of a strong project team, were on full display when Sandvik and MAN Diesel & Turbo collaborated to develop a solution that reduces emissions from large cargo vessels.

MARINE SHIPPING HAS a great advantage in that it can transport large volumes of freight with a relatively small input of energy. Still, emissions of sulfur, nitrogen oxide and carbon dioxide are highly problematic for marine life. Tougher marine regulations are driving the development of more efficient engines.

With the recently finalized EU-funded Helios project, the EU supported the development of a two-stroke, low-speed, marine diesel engine that operates on direct injection of compressed natural gas (CNG). Sandvik's part of the project was to develop the critical exhaust valve spindle.

"MAN has an overwhelming portion of the market share for two-stroke marine diesel engines, so a reduction of emissions in their engines makes a significant change for the environment," says Martin Östlund, Senior R&D Professional, Sandvik Materials Technology R&D.

"With powder technology, we designed a component with four different materials, each with its specific properties."

By replacing a number of key components, MAN aimed to develop a dual-fuel marine engine that runs on both diesel and natural gas. One of these components was the valve spindle, which had to be able to withstand increased corrosion and higher temperatures, while being exposed to different types of wear. Whereas the whole component had to withstand high temperatures, the bottom part would be exposed to the most severe corrosion. Although the upper part would be subjected to lower corrosion, it would also be subjected to wear.

"MAN came to us with their dream component in terms of cost and endurance," says Tomas Berglund, Technical Marketing, Sandvik Powder Solutions and project manager for Sandvik's part of the Helios project. "Our task was to find a solution that was as close to this vision as possible."

ÖSTLUND, BERGLUND AND their colleagues took on the challenge with an open mind and Berglund soon came up with an idea, based on a previous experience. Each valve weighs about 50 kilograms, and a single material that meets all requirements does not exist today. Development of such a material would be too expensive.

"With powder technology, we designed a component with four different materials, each with its specific properties, positioned in specific areas of the valve," Östlund says. "It is a very cost-efficient solution based on a basic and inexpensive foundation, reinforced partially with advanced material."

The Helios project is now finalized, and Sandvik's manufacturing technology has already been winning awards. To further develop production economy, the team is now looking into using additive manufacturing in parts of the manufacturing process.

ONE SUCCESS FACTOR of the project is that Sandvik has all the resources in-house, from comprehensive R&D to full-scale production. Added to that, say Berglund and Östlund, is the relatively small size of Sandvik Powder Solutions, which gives each project team a high level of independence and flexibility. Finally, the customer has been closely involved from day one.

"MAN, with their application knowledge, combined with Sandvik's unique material, manufacturing know-how and extensive resources, was crucial for the final solution," Berglund says. "We succeeded where others have tried and failed." ■

Component: Valve spindle for two-stroke marine diesel engines, operating on compressed natural gas
Customer: MAN
Challenge: Meeting cost and endurance requirements for a component that is exposed to extreme corrosion, high temperatures and abrasive wear
Solution: Partial powder reinforcement on a basic foundation using advanced powder technology
Project team: Martin Östlund and Tomas Berglund.

SANDVIK TEAM **REDEFINES TURNING**

True innovations don't often come along, and when they do they're usually the result of hard work, knowledge and dedication. The new turning method PrimeTurning™ is one such innovation, and it has the potential to redefine the art of turning completely.

THE LAUNCH OF PRIMETURNING™ AND COROTURN® PRIME

In April 2017, Sandvik Coromant is introducing a turning revolution. It consists of a new turning method, software and new turning tools.

- The new method, PrimeTurning™, provides unmatched productivity, close tolerances and excellent chip control.
- To benefit from the method, dedicated CoroTurn® Prime turning tools are required. The first launch consists of two concepts, nine non-ISO inserts for ISO P, S and M materials, and 52 holders, including Coromant Capto®, CoroTurn® QS and shanks.
- A PrimeTurning™ code generator provides the programmer with instant machining codes.

A DESCRIPTION OF TURNING typically includes a non-rotary tool removing material as it moves from the end of a rotating component toward the chuck. Skilled turners know that the smaller the lead angle between the cutting edge and the feed direction, the greater the opportunity to increase feed, which translates into higher productivity. However, a small lead angle prevents the cutting edge from reaching the shoulder and will provide long, curved chips that are difficult to control.

The relationship between lead angle and productivity has been an established fact. Until now, that is.

When Adam Johansson took his first engineering job in the Sandvik Coromant R&D department in 2012, Ronnie Löf had already worked for the company for almost 20 years. Although the two differed widely in age, expertise and experience, they shared a strong sense of curiosity and the courage to challenge accepted truths.

THE TWO ENGINEERS started discussing the lead angle-reach dilemma in late 2012. Before long, a small, far-fetched seed started to germinate, and the discussions became more intense. Their idea was simply to turn backward, from chuck to the end of the component. It would immediately solve the challenge of reaching the shoulder with a small lead angle. Sounds simple? In theory, yes.

"The metalcutting industry has been removing metal from end to shoulder for centuries," Johansson says. "Every turning expert can line up impressive amounts of arguments to why the opposite is completely unrealistic."

Krister Wikblad, Ronnie Löf, Joe Truong and Adam Johansson at Sandvik Coromant have redefined the art of turning by questioning established facts and acting on their innovative ideas.

The method PrimeTurning™ allows turning in all directions, which eliminates a problem that has haunted the manufacturing industry for years.

Chip control is the leading argument, as the small lead angle still provides long, curved chips, regardless of the turning direction. Löf and Johansson set out to solve the issue and succeeded, together with two open-minded and dedicated designers, Joe Truong and Krister Wikblad. When product manager Håkan Ericksson joined the group in 2015, the team members intensified their discussions with colleagues, key customers and other stakeholders to start testing the concept on a larger scale.

TESTS HAVE SHOWN THAT large-scale production of compact components that are securely fastened gives the best results. However, the PrimeTurning™ method allows turning in all directions. This means that vibration-prone parts of a slender component can be turned conventionally, with conventional productivity results – while backward turning is used on stable parts to achieve extraordinary productivity results.

"With productivity improvements of more than 50 percent, better machine utilization and substantially longer tool life, the method PrimeTurning™ has a huge potential," Löf says. "We still don't know where this will take us, but after all our tests and customer reactions, I have a really good gut feeling." ■

"We still don't know where this will take us, but after all our tests and customer reactions, I have a really good gut feeling."

WE NEED TO GO **THE EXTRA MILE**

SANDRA PASCUTI, Human Resources Business Partner (HRBP) for Latin America, has been recognized for her strong leadership ability in challenging situations and her skills and efforts in communicating with both heart and mind. She contributes to creating a culture and an environment that inspires Sandvik employees to shine.

"I believe in our people and their ability to accomplish great things for Sandvik," Pascuti says. "If we give our leaders the prerequisites they need to plan for the long term and to maximize their performance in the short term, we can help them motivate their teams and increase the engagement level of employees to go the extra mile.

"Our role from an HR perspective is to create inspiring environments and clear scenarios for our leaders and people," she says. "We have tools to do that, such as clear core values, performance management and the Sandvik Leadership Model. We just need to work with these tools and strengthen our leaders, in both good and difficult times."

PASCUTI'S OWN PASSION and devotion were put to the test when Sandvik Coromant communicated a closure of the production plant for inserts and tools in Brazil in September 2015. The closure, which affected 133 people, was necessary to maintain the company's competitiveness. But cutbacks are always painful, both for the employees effected and for the messenger.

"Personally, I try really hard to understand the rationale behind each strategic decision and translate it to the organization," Pascuti says. "If I don't understand or believe in it, I will never be able to convince anyone else. Therefore, I spend a lot of time informing, explaining and listening. If people understand why, how and when, the objectives will be met."

Pascuti normally travels between Argentina, Brazil, Chile and Mexico. "But when the

Sandra Pascuti
Position: HRBP for Argentina, Brazil, Chile and Mexico
Works from: Brazil
Years with Sandvik: 32
Motto: To be happy, do your best in everything you do.

closure was communicated, I devoted 100 percent of my time to my colleagues in Brazil," she says.

"It was a hard period for everyone involved, and from an organizational point of view, we also needed to retain valuable competence and experience," she explains. "There were many worries, questions and discomforts, but in my eyes, management dealt with it with a lot of presence, fair play and heart, following the Sandvik values. As a company, our vision is to be as transparent and as respectful as possible to people, and I would say that we managed well."

RIGHT NOW, PASCUTI supports the Sandvik Coromant team in Mexico after a number of organizational changes, including moving the office from Mexico City to Queretaro and the inauguration of the Sandvik Coromant Center.

"It's a different situation," she says. "We are investing in Mexico right now, so the atmosphere is very positive. However, times of change will always require strong leadership and communication." ■

"Our role from an HR perspective is to create inspiring environments and clear scenarios for our leaders and people."

APT REDESIGN OF A DRILL ROD RACK IMPROVES SAFETY

BYRNECUT AUSTRALIA IS one of Australia's leading underground mining contractors. The company's promise to its customers reads "The safest future in contract mining," and to that end every incident is investigated seriously. When a drill rod came loose from a Sandvik mining vehicle in a deep underground gold mine, Darren Male and Mark Bannister, both from Sandvik, promptly began work to find a solution.

WHAT HAPPENED?

Bannister: The bolt that holds the drill rod in the rack came loose. The drill rod then moved forward and dislodged from the rack and smashed the windscreen. Nobody was hurt, but it was a near miss. The incident made us realize a weakness in the design. The customer immediately initiated an investigation that we were part of, but we also had to find a fast and safe solution to make sure this did not happen again. We solved the immediate standstill within 48 hours but also started to create a more robust, long-term solution.

Sandvik's new rack design enables personnel to safely and securely transport drill rods without their sliding around or falling off the vehicle.

HOW DID YOU COME UP WITH THE FINAL SOLUTION?

Male: We basically started from scratch. Mark and I spent quite a lot of time in front of the whiteboard tossing ideas back and forth and talked to a lot of people, both on site and among our colleagues. We also engaged an engineer and a safety professional and finally, together with them, developed a solution. It took about five months from the incident until we had a complete solution.

WHAT WERE THE SUCCESS FACTORS?

Bannister: We worked very closely with the customer, and they really wanted us to find a solution. In addition, our manager, Craig Johnston, supported us 100 percent with all the time and resources we needed.

IS THE CUSTOMER SATISFIED?

Male: Yes! They were concerned when it happened but have been really supportive during the process. Right now, we are replacing the rod holders on all of our vehicles. We are also getting requests from other markets that are interested in the new design. ■

Darren Male
Title: Operations Manager, Rock Tools, Sandvik Mining and Rock Technology, West Australia
Location: Adelaide, Australia
Years with Sandvik: 20

Mark Bannister
Title: Tools Sales and Support Representative, Sandvik Mining and Rock Technology, East Australia
Location: Broken Hill, New South Wales, Australia
Years with Sandvik: 25

In cooperation, Sandvik and Prime Solutions found a way to let mine personnel carry out chute maintenance in a safer environment.

SUCCESSFUL COLLABORATION CHALLENGED THE NORM

Making a radical change often requires challenging boundaries. This is exactly what happened when Sandvik and Prime Solutions teamed up to help a Swedish mine find a completely new way of working. The result: improved around-the-clock productivity and safety.

A COMMON CHALLENGE in almost all mines is abrasion in the chutes used to transport the rock both from the crushing stage to the long belt conveyors and between the conveyors. Frequent maintenance stops are common, due to the extreme wear of the equipment. For one large mine in northern Sweden with a production rate of some 8,000 tons of rock per hour, every hour of standstill costs the company about SEK 1 million (USD 112,000). Keeping the mine running is critical.

A first reduction of unplanned stops was accomplished in 2009, when Sandvik implemented its HX900 cast in carbide in the mine chutes.

"Sandvik's HX900 composite lasts 15 to 20 times longer than any other material on the market," says Oskar Larsson, Product Manager Wear Protection & Screening Media at Sandvik Mining and Rock Technology. "It's absolutely unparalleled."

However, the new carbide casts could not solve the safety problems. The risk of falling rocks combined with dust, cold and high noise levels made maintenance

"We've created a solution that no one else can provide, thanks to Sandvik's unique material knowledge and Prime Solutions' system engineering competence."

work in the chutes unattractive and insecure.

In 2012, Håkan Zaar of Prime Solutions was invited to the mine to discuss the working conditions. His first idea was based on a previous solution he had created for a steel company. "My idea wasn't restricted by conventional mining boundaries, which was a bit surprising for the customer at first," Zaar says.

THE CUSTOMER ACCEPTED his initial idea, and Zaar contacted Oskar Larsson at Sandvik to discuss a solution. Zaar says he has appreciated working with Sandvik ever since he was 16 years old and the company sponsored him with material to renovate a steam locomotive.

"We wanted to get the maintenance work out from the chute itself," Zaar says. "It wasn't designed for such work, so neither safety nor the work environment were optimal. In addition, the crushers had to be stopped for each maintenance session, which was very costly."

Since HX900 allows for longer time in operation, maintenance can be planned when crushers or conveyors are standing still for other reasons. In addition, the work could be moved from the mine to a separate workshop onsite.

"The chute can be replaced during regular maintenance," Zaar says. "It saves valuable production time, reduces stress and increases both safety and the work environment."

BOTH MINE MANAGEMENT and employees are satisfied. They estimate that some 300 hours of interruptions can be avoided yearly, thanks to the new solution. The heavy and demanding job of maintaining chutes inside the dark and dusty mine has been replaced with a job that employees gladly sign up for.

Larsson is optimistic that the modular system will be of interest to other mine operators around the world.

"We've created a solution that no one else can provide, thanks to Sandvik's unique material knowledge and Prime Solutions' system engineering competence," he says. "It's a perfect match." ■

Oskar Larsson
Title: Product Manager Wear Protection & Screening Media, Sandvik Mining and Rock Technology
Location: Järfälla, Sweden
Years with Sandvik: 10

GE EMBRACES SPIRIT **OF ENTREPRENEURSHIP**

Speed has given General Electric a competitive edge. Inspired by today's business climate, in which small innovators and entrepreneurs race ahead, the industrial giant has found a way to adapt the startup mentality to its development processes and way of working – and it is already seeing positive changes as a result.

SANDVIK IS ALWAYS LOOKING at other successful companies for inspiration and lessons to be learned. General Electric is a Sandvik customer and is setting an example to other industrial giants by proving that it is possible to modify the company culture in an organization that has been doing things the same way for generations. On its website it boldly states: "GE is transforming itself to become the world's premier digital industrial company."

To operate more like a startup, with short product life cycles and rapid decision-making processes, GE has used aspects of the "Lean Startup" approach for new product introduction and process improvement. This approach includes "sprints," or quick deliverables, along with rapid learning, to speed up the development process and mitigate threats. The thinking behind it is that rapid learning cycles with customers reduce the risk of building something that will ultimately not solve customers' needs.

AT GE, A VERSION of Lean Startup known as "FastWorks" was introduced in 2012, testing a customer-first approach that would help cut development costs and increase GE's competitive edge. The FastWorks framework seeks to get new products in front of the customer as quickly as possible. Instead of waiting for perfection, developers are encouraged to obtain early feedback from customers and act quickly and

"This helped GE to deliver the most efficient, low-cost energy solution to our customers."

decisively if it points them in a different direction than what they expected.

The objectives of FastWorks include getting closer to the customer, which increases the likelihood of success and the speed to market, both of which make it easier to get things done. Process complexity is rejected in favor of simplicity, with dedicated teams and a clear focus on specific tasks.

FastWorks already has numerous success stories under its belt. For example, GE used it to develop and launch a new engine that complied with new environmental regulatory requirements.

"By using the FastWorks approach, we're able to get the product to the market two years ahead of our competition with significant cost savings to the company," Janice Semper, Leader of GE Culture and co-founder of GE FastWorks, told Lean Startup Co. in 2015. "It also helped us to exceed the mandatory regulations that were there and get to an even better solution that was being regulated for our customers."

SEMPER EXPLAINED THAT these principles of FastWorks were used in the development of a new gas turbine. "This helped GE to deliver the most efficient, low-cost energy solution to our customers, and essentially our development costs were reduced by 60 percent," she said. In the meantime, GE has also successfully reduced the cost of earning customer validation by a massive 80 percent, according to Semper.

In the past, GE had tended to revise its products every five years, and, like most traditional manufacturers, it kept its new products strictly under wraps until they were unveiled.

In a case study from the *Harvard Business Review*, GE Lighting's Vice President of Technology Kevin Nolan said speed has replaced confidentiality as a key success factor. "With FastWorks we're learning that speed is our competitive advantage," he said. "How do we become much more open and collaborative with the customer base? You can't do that if you want to be secretive." ■

SANDVIK PREPARES FOR GROWTH IN SOFTWARE SERVICES SALES

Software services in the metalworking sector are expected to quadruple by 2025, making the business potential for software just as big as for tools. That's good news for Sandvik, which is among the first to introduce a series of connected tools to the market.

PROPELLED BY WHAT many call Industry 4.0, or the "fourth industrial revolution," Sandvik has for the past years been developing and expanding its digital tools offering to the metalworking industry. In 2016 it proudly introduced the CoroPlus® software solutions to the market.

The software solutions are basically a digitalization of tools and knowledge within Sandvik Coromant, involving tool data, sensors, algorithms, the cloud and data analysis to give manufacturers a greater understanding of the entire manufacturing process – from the designing of the component to the production process.

AMONG THE LATEST products to be added to this concept of software solutions are CoroPlus® ToolLibrary and CoroPlus® ToolGuide. The library is a catalog of digital tools that manufacturers can browse through and pick from to build assemblies and do simulations in their computer-aided manufacturing (CAM); the tool guide gives recommendations on how to use the tools and what tool is best suited for the task at hand.

PERNILLA LINDBERG, Global Product Manager Business Software, Digital Machining, who is responsible for the development of CoroPlus® ToolLibrary and CoroPlus® ToolGuide, says the immediate benefit from using these software solutions is a dramatic reduction in manual work and time spent browsing and looking up information on the internet.

"Our partners integrate these solutions into the systems used in their customers' production environments, which means that our tool data and recommendations are just one click away," she says. "Previously, this work had to be done manually, with our customers going to our website and looking up our product information there."

AND THE BENEFITS don't stop there. Lindberg says the software solutions allow manufacturers to reduce energy waste and optimize the utilization of their machines. "The digital tools give you accurate data and the possibility of making simulations, which means customers can do simulations with very accurate tool data before installing them in their machines," she says.

The products are new on the market, but Lindberg and her team have already received a lot of positive feedback from the first users. "They're very positive about the fact that they now get access to Sandvik's tool data in an easy way," she says. ■

Pernilla Lindberg
Title: Global Product Manager Business Software, Digital Machining
Location: Sandviken, Sweden
Years with Sandvik: 17

IMPORTANT STEPS TOWARD **HIGHER ACCOUNTABILITY, TRANSPARENCY AND SPEED**

HOW WOULD YOU SUMMARIZE 2016?

2016 was an eventful year as we made several changes to become leaner and faster to respond to changes in customer requirements. Accountability was increased as we moved responsibility for operational decisions deeper into the operations. The decentralized business model combined with an improved process for performance reviews enhanced transparency. The ambition is that the pace and accuracy of Sandvik's decision-making going forward will be increased as a result of higher accountability and transparency.

The market situation improved as the year progressed, particularly in the mining industry. The energy segment stabilized, albeit at a low level. Despite negative organic growth we improved operating earnings by 4 percent, supported by internal efficiency measures. In addition, we reported strong cash flow and strengthened the balance sheet, which supported the proposal of increasing the dividend to 2.75 SEK for 2016 (2.50 SEK).

WHAT IS IN FOCUS FOR 2017?

We will continue to focus our R&D efforts on core segments and applications to support additional sustainable productivity gains for our customers. The next step toward a decentralized business model is to transfer the cost responsibility for some of the resources in central functions into the business areas. It will be a gradual implementation during the year, targeting additional efficiencies for the Group. We will complete the ongoing supply chain optimization program, targeting a run-rate in savings of 2.1 billion SEK by the end of the year. In summary, we will work toward our financial target for 2018 of generating 7 percent EBIT CAGR (compound annual growth rate) and improving ROCE by 3 percentage points, as well as strengthening our balance sheet while maintaining a generous dividend.

I am very pleased that we are delivering according to our plans. So far so good! ■

Tomas Eliasson, CFO

FULL YEAR 2016

REVENUES BY BUSINESS AREA

MSEK	FY 2016	FY 2015	Change %	Change % [1]
Continuing operations				
Sandvik Machining Solutions	32,852	33,809	–3	–2
Sandvik Mining and Rock Technology	31,093	33,131	–6	–3
Sandvik Materials Technology	12,931	13,909	–7	–7
Other operations	4,655	4,976	–6	–8
Group activities	22	20		
Continuing operations	81,553	85,845	–5	–4
Discontinued operations	2,877	4,977	–42	–40
Group total	84,430	90,822	–7	–6

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

OPERATING PROFIT BY BUSINESS AREA

MSEK	FY 2016	FY 2015	Change %
Continuing operations			
Sandvik Machining Solutions	6,970	5,504	27
Sandvik Mining and Rock Technology	3,206	2,417	33
Sandvik Materials Technology	1,115	8	N/M
Other operations	545	489	11
Group activities	–818	–1,147	–29
Continuing operations [1]	11,018	7,271	52
Discontinued operations [2]	–1,361	–1,209	–13
Group total [3]	9,657	6 062	59

1) Operating profit impacted by items affecting comparability of –3.3 billion SEK for the full year 2015.
2) Operating profit impacted by items affecting comparability of –1.1 billion SEK for the full year 2015.
3) Internal transactions had negligible effect on business area profits.
N/M = non-meaningful

OPERATING MARGIN BY BUSINESS AREA

%	FY 2016	FY 2015
Continuing operations		
Sandvik Machining Solutions	21.2	16.3
Sandvik Mining and Rock Technology	10.3	7.3
Sandvik Materials Technology	8.6	0.1
Other operations	11.7	9.8
Continuing operations	13.5	8.5
Discontinued operations	–47.3	–24.3
Group total	11.4	6.7

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

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

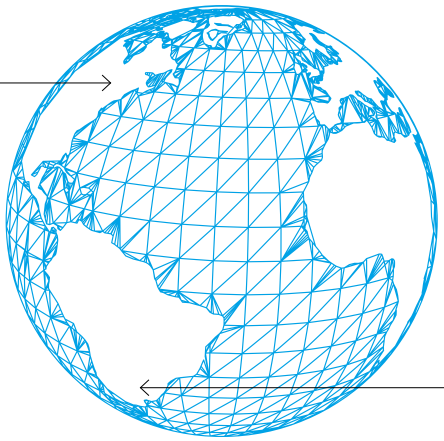
40%
Sandvik Machining Solutions

38%
Sandvik Mining and Rock Technology

16%
Sandvik Materials Technology

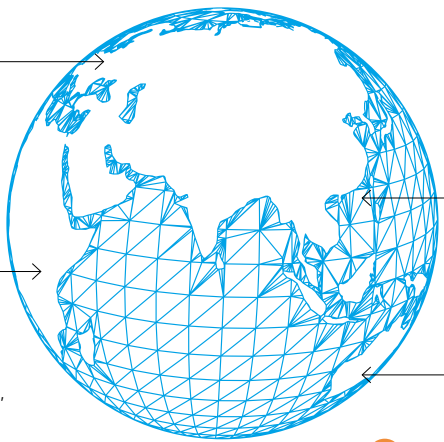
6%
Other operations

REVENUES DEVELOPMENT by market area



NORTH AMERICA ↘
The invoiced sales for the North America region were 16,520 MSEK, a –8% change.
20% share *

SOUTH AMERICA ↘
The invoiced sales for the South America region were 4,140 MSEK, a –10% change.
5% share *



EUROPE →
The invoiced sales for the Europe region were 32,803 MSEK, a –2% change.
40% share *

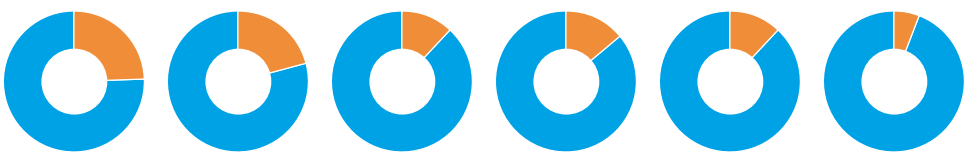
ASIA ↘
The invoiced sales for the Asia region were 16,544 MSEK, a –3% change.
20% share *

AUSTRALIA ↗
The invoiced sales for the Australia region were 4,429 MSEK, a +17% change.
6% share *

AFRICA/ MIDDLE EAST ↘
The invoiced sales for the Africa/Middle East region were 7,118 MSEK, a –9% change.
9% share *

→ Change FY 2015 – FY 2016
* Share of the Group's 2016 revenues for continuing operations

REVENUES by segment *



27% MINING
23% ENGINEERING
12% ENERGY
14% CONSTRUCTION
12% AUTOMOTIVE
6% AEROSPACE

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

ADDITIVE MANUFACTURING – A NEW PRODUCT AREA

ADDITIVE MANUFACTURING is a new product area within Sandvik Machining Solutions. As of January 1, 2017, Additive Manufacturing has moved from a mainly internal role into the external business of metal additive manufacturing.

Increasingly, metal additive manufacturing is gaining status as an established production method – a response to market demands for lower costs, shorter lead times and greater efficiency as well as for lighter, stronger and higher-performance products.

The new product area will have a full profit-and-loss responsibility and gradually take position in the market through organic growth and through acquisitions. Additive manufacturing and development performed for internal purposes will continue as well.

Completed components using additive manufacturing, the industrial version of 3D printing.

POSITIVE RATING FOR SANDVIK

ON FEBRUARY 16, 2017, Standard & Poor's Global Ratings revised its outlook on Sandvik AB to positive from negative and affirmed a BBB credit rating on Sandvik, a result of the Sandvik's recognized improvements in 2016, i.e., strong cash flow, profitability above previous expectations and a strengthened balance sheet.

KLAS FORSSTRÖM IS NEW HEAD OF SANDVIK MACHINING SOLUTIONS

As of April 1, 2017, Klas Forsström is the new President of Sandvik's business area Sandvik Machining Solutions and member of the Group Executive Management.

Forsström has been with the Sandvik group for about 25 years, and was previously the President of Sandvik Coromant, where he worked most of his career. He has also held managerial positions within other product areas, such as Dormer and Sandvik Hard Materials (today Sandvik Hyperion). His work has included leading positions within R&D, marketing, business development and sales.

"I am pleased that Klas Forsström takes on this new role since he is a very skilled and experienced business leader, which he has proved during many successful years with, among others, Sandvik Coromant," says Björn Rosengren, Sandvik's President and CEO.

THE OBJECT | Connected tool for reducing vibrations

Vibration is a common cause of interruptions in manufacturing. With the long, slender tools used in internal turning, this challenge is amplified. The connected tool Silent Tools™ + has been developed to reduce vibration with damping technology and in addition to provide insights from inside the component. Sensors give real-time access to information from the machining such as vibration levels, the load on the tool and whether or not the tool is in cut. By combining damping technology with connectivity, the solution holds the potential to overcome vibration challenges and keep production running uninterrupted. The connected tool is part of CoroPlus®, the Sandvik Coromant offering of connected solutions that is in keeping with Industry 4.0.