

MEET #2-2021 SANDVIK

A NEW SPARK IN MINING

The electrification of mining is one of the biggest technology shifts in history, says Henrik Ager, President of Sandvik Mining and Rock Solutions.

PAGE 26

FOCUS: SEAMLESS FLOW A string of acquisitions
Tomorrow's materials – today **FOSSIL-FREE STEEL**
A SHIFT TOWARD SHIFTS Clean electricity

SAFETY

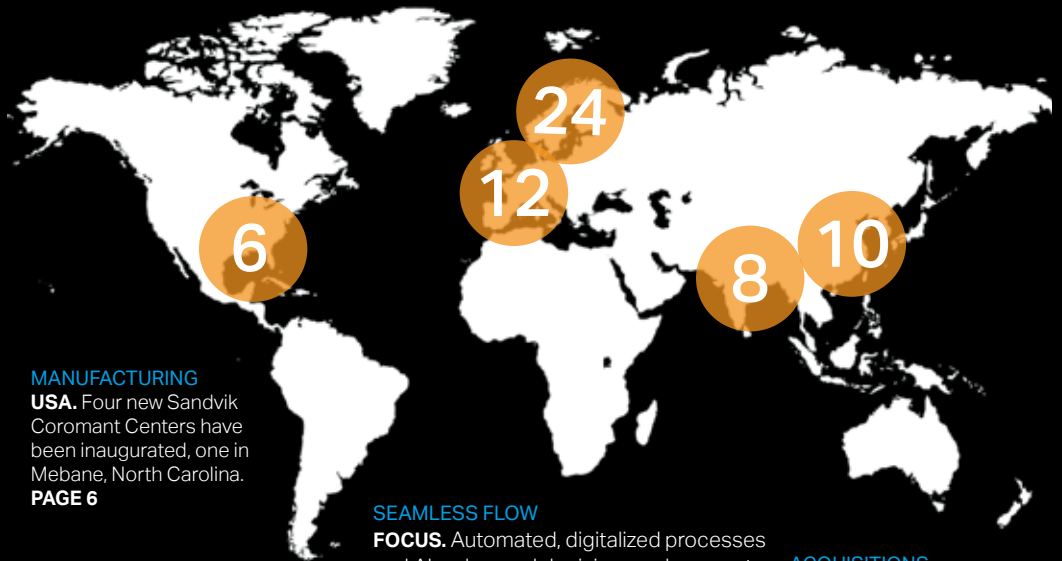
GERMANY. DSI Underground is one of the largest acquisitions in the history of Sandvik.
PAGE 12

SUSTAINABILITY

SWEDEN. Sandvik delivers an electric heating solution that allows for fossil-free production of steel.
PAGE 24

DIVERSITY AND INCLUSION

INDIA. Meet Sayali Patil in Pune, India, one of a group of women now working night shifts.
PAGE 8



MANUFACTURING

USA. Four new Sandvik Coromant Centers have been inaugurated, one in Mebane, North Carolina.
PAGE 6

SEAMLESS FLOW

FOCUS. Automated, digitalized processes and AI-enhanced decisions reduce costs and free up time to spend on adding real customer value.
PAGE 16

ACQUISITIONS

CHINA. Round tools maker Chuzhou Yongpu Carbide Tools is one of a number of companies Sandvik has signed agreements to acquire.
PAGE 10

CONTENT #2-2021



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HIGH AMBITIONS FOR GROWTH

EARLIER THIS YEAR, we updated our strategy and put a stronger focus on growth. We are pursuing an active acquisition agenda, and we have announced eight acquisitions since May. To this we can add the acquisition of DSI Underground, which was completed in July. DSI Underground is a leading company in underground safety solutions and one of our largest acquisitions ever. All acquired companies operate in strategic areas, such as software solutions, round tools and mining equipment. Read about these acquisitions on pages 10–13.

WE ARE WORKING intensively to broaden our digital offering and have high ambitions for growth in this area. Acquisitions, in combination with expected organic growth, have

led us to increase our 2025 revenue target for our digital business area segment Sandvik Manufacturing Solutions from SEK 4 billion to SEK 6 billion.

IN THIS ISSUE of *Meet Sandvik* you can also read about a growth area where Sandvik is a world leader – the electrification of underground mining equipment. No other company has such an extensive offering; there are 600 electrical units from Sandvik that work in mines around the world, which is unique. Read more about this in the interview with Henrik Ager on page 26. Happy reading!

Stefan Widing,
President and CEO



THE FUTURE IS ELECTRIC

THE BENEFITS OF ELECTRIFICATION

in mining are numerous. First and foremost are the benefits to workers' health: reduced noise, heat and exposure to diesel particulates. Then there are the benefits to the environment; electric machines, apart from being more productive and powerful, significantly reduce greenhouse gas emissions. On top of this, electrification has proven to be a strong business case.

The image here is from a Sandvik branding campaign film depicting the benefits of electrification in mining. In the old days canaries were used to detect carbon monoxide in coal mines. With electric equipment, the air is so fresh the canary gladly spends time in the mine. In the film Johann Sebastian Bach's "Air" goes electronic, surrounded by giant machines and a flashing light show. ■

home.sandvik/electric



100

Number of years Sandvik has been manufacturing stainless steel. After the first melting in 1921, Sandvik began regular tube production, followed by wire and strip.



CARPOOLING FOR THE PEOPLE

SANDVIK IN SWEDEN is collaborating with carpool company Kinto to reduce emissions resulting from employees traveling to and from work, offering them carpooling alternatives in both hybrid vehicles and the fuel cell model Mirai from Toyota. In the future, the Sandvik/Kinto carpool is expected to be made available to the public.

"It's beneficial to use the cars as much as possible," says Mats W. Lundberg, Sandvik Head of Sustainability. "Furthermore, it will be nice to be able to offer the opportunity to experience the benefits of fuel cell and hybrid cars to non-Sandvik employees too." ■



The Sandvik Coromant Center in Mebane, North Carolina, USA.

4 x NEW SANDVIK COROMANT CENTERS

FOUR NEW Sandvik Coromant Centers have been inaugurated this year: in Milan, Italy; Istanbul, Turkey; Renningen, Germany; and Mebane, North Carolina, USA, to a total of 15 centers around the globe. The centers offer customers the opportunity to work with the company's

manufacturing specialists, process engineers and CAM programmers to develop new ways of overcoming machining challenges. In addition to these four centers, a new innovation center is being built in Halesowen, UK. ■

CLEAN ELECTRICITY AT INDIA FACILITY

Sandvik has set a sustainability goal to halve its CO₂ impact and increase the use of green energy by 2030. At the site in Pune, India, steps have been taken to minimize use of coal-powered electricity and generate

electricity using rooftop solar power. In addition, the company is compensating for the facility's CO₂ emissions by purchasing renewable energy certificates equivalent to its emissions. ■



Several battery-electric vehicles were introduced at MINExpo.

BATTERY-POWERED PRODUCTS LAUNCHED AT MINEXPO

At this year's MINExpo International in Las Vegas, Nevada, USA, Sandvik launched several new products, headlined by a new battery-electric truck, TH550B, accompanied by a new highly automated battery-electric-rock bolter, DS412iE, and a battery-assisted loader, LH518B.

Learn more about Sandvik at MINExpo 2021 at rocktechnology.sandvik.com.



STORM AID IN GERMANY

Storms and heavy rainfall in the summer of 2021 led to the worst natural disaster in Germany in nearly 60 years. Extensive clean-up activities were required and aid organizations joined up to provide swift, efficient and much-needed support. The local Sandvik Mining and Rock Solutions and Sandvik Rock Processing organization in Essen donated emergency workwear to assist in the disaster area.

NEW MEMBER OF THE MANAGEMENT

Sandvik has appointed Christophe Sut as President of the Sandvik Manufacturing Solutions Business Area Segment. He has also been appointed as a member of the Sandvik Group Executive Management. Sut previously worked at Assa Abloy, where he was Executive Vice President and Head of Assa Abloy Global Solutions since 2016.



Christophe Sut

FLEXING MUSCLES

Sandvik has launched a campaign for Freeflex™, its next generation of compressor valve steel. In literally billions of appliances there's a compressor that depends on the valve steel it's made of. An improvement here has a direct effect on the compressor's carbon footprint.





Sayali Patil can now work the night shift at the facility in Pune, India.

SHIFT TOWARD SHIFTS

In India, Sandvik has taken multiple steps to increase diversity and enable more female engineers in its workshops. Sayali Patil is one of the pioneers taking advantage of the new safety measures in place that allow her to work nights.

WOMEN WORKING NIGHT shifts might not sound like big news, but in India it marks a significant change. In 1948 the country put into effect the Factories Act, which states that women factory workers can only work day shifts – between 6 am and 7 pm. However, as society has

changed and demand for gender equality has grown, the regulations have been amended. Now it is easier for companies to employ women to work night shifts, which in turn has opened up opportunities for a more diverse workforce.

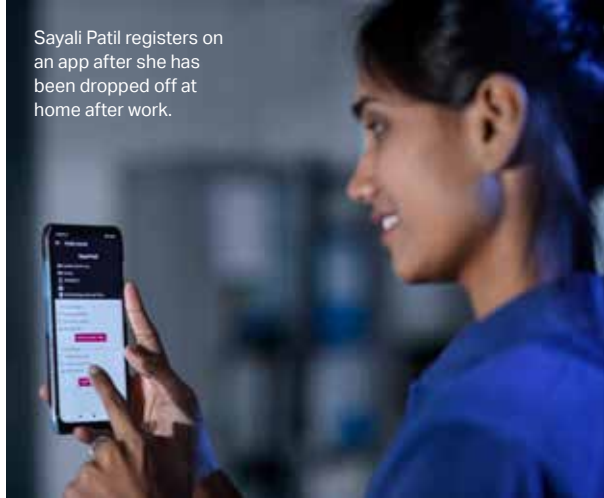
“More equal opportunities are of great

benefit for us as a company," says Kiran Acharya, Managing Director at Sandvik Coromant in Pune. "A mixed-gender workforce brings in new perspectives on creativity, innovation and problem solving."

Sandvik has run its operations in Pune since 1960. To date about 6 percent of the staff is female, but most of them have traditional desk jobs in finance, sales support, HR and IT. However, that is changing. "The new generation of women is moving away from the traditional parental and cultural constraints," Acharya says. "The millennials have a new mobility, and we see more women studying engineering, which is very positive."

TO COMPLY WITH the regulations for shift work there needs to be female supervision as well as female security present on site. If work finishes after 7 pm or starts before 6 am, the employer must organize transportation to and from work. Sayali Patil started as a trainee at Sandvik in December 2020 as one of 17 women employed at the same time. When Patil and her female colleagues finish their shift at 11 pm they are picked up by a specially hired bus equipped with GPS as well as a CCTV camera. As an extra precaution the bus is trailed by a security guard who follows the women to the door to make sure they are dropped off safely at home. "I also have an app on my phone where I register that I am at home, which makes me feel safe, and that is very important," says Patil, who shares an apartment with some of her new friends from work.

Patil earned a diploma in mechanical engineering at a technical institute in Satara, about 100 kilometers south of Pune. She sees her internship at Sandvik as a great opportunity to develop her skills and career path. "I really love working here,"



Sayali Patil registers on an app after she has been dropped off at home after work.

she says. "I like the work culture where everyone is treated the same. As a trainee I am also part of a cross-functional team where we focus a lot on problem solving. I like that too."

There's also a big personal reward that comes with women now being able to work shifts: "It gives a proud feeling challenging the orthodox thinking," she says. "It sends a good message to society."

THE CORPORATE TARGET within Sandvik is to achieve 25 percent female managers by the end of 2025.

"Our ambition is to add employees who can climb the ladder," says Amurt Bertole, HR country coordinator. "Working shifts allows our trainees to get the full experience of every part of the manufacturing process, and it is important to offer everyone the same opportunities."

The diversity initiative in Pune has generated a lot of interest. Other units have already seen the benefits, and Bertole predicts that several of the company's seven other production units in India will soon follow. ■

A STRING OF ACQUISITIONS

Sandvik has signed agreements in the past few months to acquire several companies in strategic growth areas such as software, round tools and mining equipment.

May 7 Kwatani

Where: South Africa. **What:** A leading supplier of screens and feeders for the mining industry. Kwatani reported about 150 employees and revenue of USD 20 million in 2020.

“ Kwatani offers of large vibrating screens and feeders for the mining industry is in line with our strategy to strengthen our capabilities in comminution and will further accelerate our growth within rock processing.”

Anders Svensson, President of Sandvik Rock Processing Solutions.

June 23

Tricon Drilling Solutions

Where: Australia. **What:** A privately owned supplier of rock tools for the mining industry. Tricon is based in Perth and has 24 employees.

“ I'm pleased that we continue to deliver on our active acquisition agenda, and I look forward to welcoming Tricon to Sandvik.”

Henrik Ager, President of Sandvik Mining and Rock Solutions.

July 7 DSI Underground,

one of the biggest acquisitions in the history of Sandvik, was completed. Read more about it on page 12.

“ With the world's most extensive choice of ground support products and systems, DSI Underground's offering is highly complementary and enables us to deliver greater value and safety to our customers.” *Henrik Ager, President of Sandvik Mining and Rock Solutions*

July 1, completed October 18 Cambrio

Where: USA. **What:** A leading company within CAD/CAM software for manufacturing industries. Cambrio is headquartered in Ohio and has 375 employees. In 2020 the company reported revenue of USD 68 million.

“ Cambrio will enable a broadened customer offering, covering more of the total manufacturing value chain.”

Stefan Widing, President and CEO of Sandvik.

July 12, completed October 4

DWFritz Automation

Where: USA. **What:** A leading global provider of precision metrology, inspection and assembly solutions for advanced manufacturing. Headquartered in Oregon with offices in France and China. In 2020 the company reported 560 employees and revenue of USD 78 million.

“This acquisition will not only strengthen our position but will also enable us to offer full metrology solutions to our customers, which will reduce costs and improve quality significantly in their broader value chain.”

Kim Hansen, President of the Metrology division in Sandvik Manufacturing Solutions.

July 15 Fanar

Where: Poland. **What:** Manufacturer of round tools. Headquartered outside Warsaw, the company has 230 employees and reported revenue of USD 20 million in 2020.

“I am very pleased that we have reached an agreement to acquire Fanar. It will enhance our presence in the important Polish market and strengthen our exposure to our focused segments.” Nadine Crauwels, President of Sandvik Machining Solutions.

July 28, completed August 20

Chuzhou Yongpu Carbide Tools

Where: China. **What:** A premium solid round tools company. Sandvik has acquired 67 percent of Chuzhou Yongpu, with an option to buy the remainder in three years. The company has revenue of USD 46 million.

“We continue to execute our growth strategy, and this acquisition is an additional step to strengthen our round tools offering.”

Stefan Widing, President and CEO of Sandvik.

October 5

Accuratech Group

Where: Switzerland.

What: A niched medical wire forming and component manufacturer. Accuratech has around 50 employees and reported revenue of USD 8.7 million in 2020.

“The medical sector is one of Sandvik Materials Technology’s defined areas of growth, and through this acquisition we are strengthening our position by adding wire forming and component manufacturing capabilities.”

Göran Björkman, President of Sandvik Materials Technology.

August 25, completed September 30

CNC Software Inc. (Mastercam)

Where: USA. **What:** A leading provider of CAD/CAM software solutions for manufacturing industries and the company behind Mastercam. An independent family-owned company with 220 employees and revenue of USD 60 million in 2020.

“CNC Software Inc. and Mastercam will be the cornerstone in our CAM portfolio.”

Mathias Johansson, President of the Design & Planning Automation Division at Sandvik.

August 3

Rocbolt Technologies

A DSI Underground joint venture.

Where: China, South Africa and Mongolia.

What: Agreements to acquire Jenmar’s joint-venture share of Rocbolt Technologies in China, South Africa and Mongolia. Jenmar will continue to be a joint-venture partner in Australia. The three joint ventures had reported revenues of USD 95 million in 2020.

Read more about DSI Underground



DSI Underground's main expertise is in reinforcing mines, tunnels and underground structures.



DRIVING SAFETY UNDERGROUND

With the acquisition of DSI Underground, Sandvik will continue to work toward increasing safety in underground mining and tunnel construction environments.

KEEPING MINERS AND tunneling workers safe has always been a top priority for the mining industry. Despite mining and construction companies implementing systems and processes to support a "zero harm" approach, incidents and injuries still occur.

In December 2020, Sandvik announced that it would acquire DSI Underground, a world-leading supplier of ground support products, systems and solutions for the underground mining and tunneling industry. The company provides a wide range

of ground support and reinforcement products, systems and solutions. The acquisition, one of the largest in the history of Sandvik, was finalized in July 2021.

"Safe and reliable ground support products and services are essential for the mining and tunneling industries," says Derek Hird, CEO for DSI Underground's Asia Pacific region. "DSI Underground's products are critical to productivity and a safe working environment by supporting the roof underground."

DSI Underground has an established

history of focusing on technical innovation. "We have a long pipeline of technical developments, ranging from product enhancements through to next-generation products such as self-drilling injectable bolts," Hird says. "As mines go deeper and the need for higher capacity support increases, our R&D team can assist with the design and testing."

As well as focusing on product development, DSI Underground focuses on manufacturing improvement and capital investments in its factories to ensure they drive internal efficiencies in manufacturing.

DIGITALIZATION AND automation will be increasingly essential in making underground mining safer, more efficient and sustainable. However, ground support installation lags behind other processes in the underground excavation cycle in these areas.

"This is where DSI Underground becoming part of Sandvik will make a difference," says Michael Reich, President of the

new ground support division at Sandvik Mining and Rock Solutions, formed out of DSI Underground. "Together we will be a full-service provider to the underground excavation process," he says. "We will leverage a combination of equipment, drilling technology and ground support to improve the safety and speed of ground support installation, unlocking value for our customers." ■

DSI UNDERGROUND

DSI Underground is the world's leading supplier of ground support products, systems and solutions for the underground mining and tunneling industry. With market-leading bolting systems, injection chemicals and resin capsules, DSI Underground's main expertise is in reinforcing mines, tunnels and underground structures, ensuring that customers stay safe underground while advancing toward their objectives faster and more efficiently.



When mines go deeper, the need for high-capacity support increases.

Osprey® 2507 super-duplex alloy has excellent corrosion resistance and outstanding mechanical strength, produced and optimized for 3D printing.



SUPER DUPLEX STARS IN AN INDUSTRY FIRST

Sandvik is the first company to successfully 3D-print components in super-duplex stainless steel. The innovation opens up exciting opportunities for offshore industrial segments.

THE USE OF IRON-BASED and highly corrosion-resistant materials in additive manufacturing (AM) has seen significant growth in interest during the past few years. This is largely due to the needs of demanding industries such as the offshore and marine segments, where challenging environments call not only for advanced materials but also for on-demand produc-



Mikael Schuisky

tion of spare parts to minimize stock and reduce material waste.

However, the complexity of the two different phases in super duplex, austenite and ferrite, makes it difficult to 3D-print without cracks. In addition, the heat treatment must be controlled afterward to obtain a 50-50 percent microstructure.

"We are proud to say that

“We are proud to say that Sandvik is the first to offer 3D-printed super-duplex components to the market.”

Sandvik is the first to offer 3D-printed super-duplex components to the market,” says Mikael Schuisky, VP and Business Unit Manager at Sandvik Additive Manufacturing.

NIKHIL DIXIT IS AN Application Engineer at Sandvik Additive Manufacturing. He has been heavily involved with the development of process parameters and material qualifications for the 3D printing of super-duplex stainless steels.

“There’s more to additive manufacturing than printing alone,” says Dixit. “We take pride in using and manifesting our ‘plan it, print it, perfect it’ approach, stating that printing is just one of several steps you need to master in order to succeed in the industrialization of additive manufacturing. This philosophy has been ever-present in this process. Using premium raw materials is essential in order to obtain a high-quality printed component. And the super-duplex metal powder produced and optimized for 3D printing definitely stands out in terms of powder characteristics and low oxygen levels.”

IN TERMS OF tensile impact and corrosion properties, additively manufactured super-duplex stainless steel doesn’t just meet the performance of conventionally manufactured components but actually exceeds it. Dixit says he has observed components that are near fully dense (>99.9%) and crack free – even before post processing.

The industries where super-duplex stainless steel is the material of choice, such as the offshore industry where corro-

sion-resistant properties are required, will also enjoy the benefits of implementing additive manufacturing.

Says Johan Wallin, Product Manager Additive Manufacturing:

“Since the biggest cost in the offshore industry is a standstill, they need to have huge stocks of spare parts. If you can produce the spare parts by additive manufacturing when you need them, you will reduce stock, reduce the net working capital and save a lot of energy.”

Will offshore companies be able to print the spare parts themselves on the platform?

“One of the biggest aspects out on the platforms is to save weight, and the machines that 3D-print metal are very large and heavy with a lot of side equipment. You also need a couple of experts to run the machine. So eventually – but that lies a couple of years ahead.” ■



The super-duplex metal powder is produced and optimized for 3D printing.

THE FUTURE IS SEAMLESS

Seamless Flow, or hyperautomation, is transforming industries and societies across the world. Automated, digitalized processes and AI-enhanced decisions reduce costs and free up time to spend on adding real customer value. At Sandvik, Seamless Flow is a big step forward in the digitalization journey, says CEO Stefan Widing.

SEAMLESS FLOW IS a concept that usually refers to a production process where information flows automatically across the value chain, producing the desired product or service without human intervention.

Normally applied to industrial processes, the concept is tried elsewhere too. At Fiumicino Airport in Rome, for example, the Seamless Flow One-ID platform uses facial recognition technology to reduce the amount of time travelers need to move through the airport. The opt-in self-service solution covers every step of the passenger journey, from check-in all the way to boarding. Those who choose to use it must submit to a facial recognition scan, which is compared to the photo on their official travel document. The traveler's facial biometrics will be linked to their passport and travel information, allowing them to move through security checkpoints and board the plane without needing to show their boarding pass or any additional documents.

If that sounds like a traveler's dream, Seamless Flow conjures up "manufacturing Nirvana." Is it true? "Hyperautomation is irreversible and inevitable," states leading technology research and

advisory company Gartner in *Top Strategic Tech Trends for 2021*. "Everything that can be automated will be automated." The report describes how hyperautomation has been trending over the past few years, mainly because of the pent-up demand for operationally resilient business processes. Competitive pressures for efficiency, efficacy and business agility are forcing organizations to address it, and those who don't will struggle to remain competitive or to differentiate.

SEAMLESS FLOW IS not a new phenomenon, but factory shutdowns and disrupted supply chains in the wake of Covid-19 have sped up its deployment. In addition, rapid developments within the IT landscape during the past decade have enabled significant efficiency improvements in internal processes. Within most organizations, enterprise resource planning (ERP) systems now support many of the tasks that previously needed to be done manually.

Hyperautomation does not necessarily render human employees redundant, but rather they are granted more time to spend on activities that really result in customer value, such as advice



Fiumicino airport in Rome uses facial recognition to create a seamless flow for passengers.

and guidance (few customers view the manual key punching of routine orders as adding value). Business magazine *Forbes* notes that until a few years ago, most organizations wrestled with many simple, repetitive and rules-based tasks and processes. People could have been deployed to do something more productive and worthwhile had there been a choice.

"Everything changed," *Forbes* adds, "when robotic process automation (RPA) came into the picture. Dull and repetitive tasks could now be assigned to automation robots. They completed tasks faster and with near precision. RPA increased operational efficiency, accuracy and error reduction. All in all, it improved employee productivity and helped accomplish business goals faster."

At Sandvik, CEO Stefan Widing says: "Seamless

"I am a strong believer in Seamless Flow and see it as a fundamental for Sandvik."

Flow is an important part of our strategy in the coming years. We have seen great results within other companies that are perhaps a little further ahead in their journey. Automation of tasks and processes frees up time that can then be used in more truly value-added work and help to reduce lead times. I am a strong believer in Seamless Flow and see it as a fundamental for Sandvik." ■



SEAMLESS SANDVIK

An increase in the automated flow of information across the whole value chain is key to the digitalization journey within Sandvik. Many activities are underway across the organization to create Seamless Flow to facilitate automated transactions that do not require any manual intervention.

FROM AUTOMATED mines with self-driving machines to factories where tool data and machining instructions are updated from the cloud, Sandvik enables companies in many industries to make the most of digitalization to boost productivity and become more sustainable.

The same kind of forward thinking applies within Sandvik, where Seamless Flow is a key enabler of increased productivity, higher efficiency and the shift of resources away from repetitive tasks toward spending time on creating value for customers.

All journeys begin at home. For Sandvik the journey toward Seamless Flow began in 2018, driven by IT advances as well as customer expectations, according to Andreas Burman, Vice President Strategic Projects and a true Seamless Flow champion: "The more efficient our flow is, the better it becomes for our customers in terms of predictability, efficiency, transparency and stability,"

he says. "The digital shift is a part of our strategy, and we have to practice what we preach. Seamless Flow is also a vital component in realizing the strategy."

TO BE less volatile and more agile through a business cycle is also part of the strategy where Seamless Flow fits in, as it increases flexibility in handling ups and downs in demand without hiring or laying off staff.

Burman explains that there is still a relatively high proportion of work tasks that require manual handling, thereby increasing the risk of error and delay. "Some improvements can come about by changing the way we do things," he says. "Others are dependent on the introduction of new IT and ERP systems."

ERP stands for enterprise resource planning and is the foundation of Seamless Flow. Since different Sandvik products are very different in terms of how standardized they are and what the

buying process looks like, there is no single ERP system that fits all. But the goal is to streamline the previously wide array of business systems and for each division to implement the one decided on.

What does Seamless Flow mean at Sandvik? Picture a customer placing an order electronically. The end-to-end process, from the customer ordering to Sandvik receiving the payment, is fully automated. Information flows seamlessly between the different process steps and subsystems. The same goes for the production process, the procurement process, the product management process and automated service tasks.

WHEN IT COMES to the actual production of physical products, however, that is still to be automated. But so-called ghost factories, or closed-loop production facilities, are on the long-term road map, says Dan Ekholm, CIO at the business area segment Sandvik Machining Solutions. "The production stage is trickier to fully automate for customized and more complex products," he says.

Data is obviously at the heart of Seamless Flow, and the improved quality and availability of data is a key enabler, Ekholm points out. "We used to spend a lot of time verifying that the data we use as input in our decision-making was correct," he says. "Data has become much more accurate, which makes it easier to hand over decision-making to machines and systems using advanced algorithms as support.

"In addition," he says, "different part-



Andreas Burman, Vice President Strategic Projects.

ners in our ecosystems are increasingly demanding access to data, and Seamless Flow really helps us deliver on this. A growing number of users in the organization are able to benefit from new technology and apply change management to introduce new ways of working."

THE GOAL OF Seamless Flow is not to remove people but rather to use their time and skills in creating customer value instead of doing repetitive and monotonous key punching, says Burman. "We can spend more time





Dan Ekholm, CIO
Sandvik Machining
Solutions.

on making sure that our customers realize the full value of our products," he says. "The tasks that are automated do not in themselves create value for the customer." Burman points out that the pace of change is increasing all the time. "If we keep devoting resources to tasks that don't contribute to customer value, we'll be left behind eventually," he says. "A stronger Sandvik will be able to develop into areas that matter tomorrow and satisfy the needs of the future."

One example of changing needs among customers is the fact that they want to be able to interact with Sandvik on as many channels as possible 24/7 and, if possible, place their orders and ask questions. "For that to work," says Burman, "our underlying systems need to be in perfect order and fully harmonized." ■

SEAMLESS FLOW TO ENSURE EFFICIENCY



The cross-functional project team has analyzed activities and key processes all across Sandvik, and a comprehensive set of key performance indicators (KPIs) has been established to measure end-to-end processes in the following areas:

- Units on target ERP (i.e., units in a division using the decided/targeted ERP system for that division)
- Order to cash – standard products
- Order to cash – made-to-order products
- Production
- Procurement
- Product management
- Automated service tasks (additional KPIs, primarily for Sandvik Mining and Rock Solutions and Sandvik Rock Processing Solutions)



Advanced tooling solutions are critical to the success of aerospace companies as they apply new materials to build airplanes.

NEW HEIGHTS FOR NEW MATERIALS

In developing advanced tools for machining aerospace components, sometimes all you need is a simple microscope to understand how a material interacts with the cutting tool.

Advances in the aerospace industry are often linked to advances in materials – specifically the strength-to-weight ratio and the temperature resistance of new materials.

The materials of choice these days for aerospace engines are heat-resistant super alloys, or HRSA, a complex cocktail of specialty metals – nickel, cobalt, iron and some

TiAl (titanium aluminide)-based alloys – that provide crucial advantages such as allowing high working temperatures. Many of these components have complex forms and can be 3D-printed. That in turn creates new manufacturing opportunities and challenges for machine tool manufacturers such as Sandvik Coromant. →



Senior R&D Engineer Stina Odelros with her premium tool: the microscope.

Since the beginning of manned flight using airplanes made of wood and fabric, the name of the game for manufacturers has been to lower the weight of the aircraft. Over the years, aluminum and titanium alloy constructions replaced the wood and fabric, and eventually carbon fiber and composites entered the mix.

Compared with standard materials such as iron, today's HRSA materials, in all their chemical and physical permutations, have fickle properties. More advanced tools are required to cut and finish aerospace components in batches that make financial and engineering sense for manufacturers.

"The trick in designing cutting tools has always been to increase the tool life by decreasing wear, while at the same time achieving higher cutting speeds," says Stina Odelros, Senior R&D Engineer at Sandvik Coromant. "But the aerospace industry requires extremely high

component tolerances, and sometimes there is no opportunity for a tool change in a process, so we are constantly developing new tools that perform better. We need to know what our customers struggle with, and then we try to solve their problems."

ODELROS EXPLAINS that airplane manufacturers and suppliers are constantly tweaking materials such as HRSA and other alloy mixes to achieve these goals. Besides the weight constraints, an engine component also needs to be able to withstand outside air temperatures as low as minus 60 degrees Celsius as well as internal engine temperatures of some 2,000 degrees Celsius.

Developing tools for this demanding industry is tricky. The only method to see how a tool is functioning is to look at the used inserts under a microscope to

see how they wear.

"We can't access all of these materials on the market, so we depend on collaborations with key customers to tell us how our inserts are doing," says Odelros.

As Odelros explains it, a 3D-printed, forged or cast airplane component cannot be lathed, milled, finished or drilled with a previously used tool. Sometimes machining a large and expensive engine

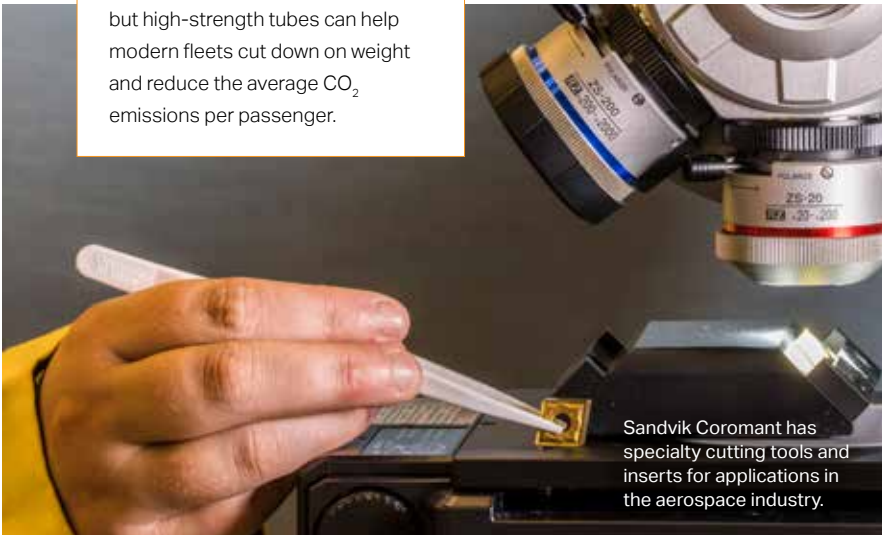
component can take a week or two, and each machining pass must be continuous to avoid any structural deficiency. A tool breakdown halfway through this process is not acceptable as it could lead to a part failure. And a part failure in an engine could be catastrophic if it occurred in midair.

WHAT ODELROS looks for under the microscope then, besides controlled wear and tear, is the size of the wear and if more unpredictable types of wear such as chipping or fracture are present, which in a worst-case scenario could lead to costly production failures.

This is the crux of the R&D work. While a carbide insert is no bigger than an average fingernail, the permutations of its construction – the angles, substrates, coatings, material constitution, crystalline structure and treatments such as chemical or physical vapor deposition – are almost infinite. The right combination and mix can yield tailored results for specific customer uses. ■

OUR INDUSTRY OFFERING

Advanced tooling solutions are critical to the success of aerospace companies as they apply new materials to build airplanes that are lighter, safer and more fuel efficient. We are providing the tools and processes for machining titanium and heat-resistant alloys as well as composites required for aircraft body structures and new-generation jet engines. We are also a market-leading supplier of titanium tubes for aircraft hydraulic systems. Our extremely lightweight but high-strength tubes can help modern fleets cut down on weight and reduce the average CO₂ emissions per passenger.



Sandvik Coromant has specialty cutting tools and inserts for applications in the aerospace industry.



COUNTDOWN TO ZERO

The Swedish steel industry's quest for fossil-free production has made electric heating solutions hotter than ever. In a strategic partnership, Kanthal is designing and providing groundbreaking heating technology that will enable the world's first fossil-free ore-based steel.

STEEL IS ONE of the world's most versatile and recyclable materials. At the same time, steel production accounts for 7 percent of global CO₂ emissions, making it one of the highest carbon dioxide-emitting industries. Hence, the decarbonization of the steel industry would have a huge impact on the environment and enable other carbon-intensive industries world-wide to follow suit. Sweden, where the steel industry accounts for

as much as 10 percent of the country's CO₂ emissions, has already taken the first steps toward a fossil-free value chain from mine to steel. Sandvik is responsible for supplying the electric heating solution, a core element in the new, more sustainable technology under development.

The Swedish target of reaching zero emissions by 2045 has challenged the industry. Hybrit, which stands for "hydrogen breakthrough ironmaking technolo-

gy," is a joint venture between the steel company SSAB, the mining company LKAB and the power company Vattenfall. The goal is to replace the coal used in the traditional furnace heating process with a direct reduction process based on hydrogen produced with fossil-free electricity.

The road map that has been set up is tight and involves the SSAB offer of fossil-free steel on the market by 2026.



Dilip Chandrasekaran

"To succeed, the project requires an efficient and fossil-free process to heat the hydrogen, and this is where we enter the

picture," says Dilip Chandrasekaran, Head of Research and Development at Sandvik Division Kanthal, a world leader in the area of industrial heating technology and resistance materials.

Chandrasekaran says he finds it satisfying to be able to use the Kanthal application know-how in an environmental game changer such as the Hybrit project. "We have the full range of materials to heat entire processes up to 2,000 degrees Celsius," he says. "The Hybrit challenge is to make a large-scale heater that is a thousand times more powerful than the 50- to 100-kilowatt heaters we normally make."

AT A NEWS conference at the company's Oxelösund site in Sweden, where the first delivery of fossil-free steel was presented, SSAB CEO Martin Lindqvist commented: "When we started Hybrit five years ago, a lot of people didn't believe in the idea, which requires that you replace a production method that has worked for a thousand years. Now we have proved that it's possible."

Hybrit currently operates a pilot plant in northern Sweden, where the first

Kanthal® heater is ready for testing. The heater is in the 250-kilowatt range, and if it proves successful it will be upgraded to a 1-megawatt version. The goal is to develop a large-scale heating solution that could heat high volumes of hydrogen up to 1,000°C (1,832°F).

"This is a unique project where we develop new groundbreaking technology in collaboration with the customer," says Chandrasekaran. "The knowledge we acquire in the process has the potential to make an even bigger difference and on a global scale, as there is a huge interest in making a changeover to fossil-free processes in the cement and petrochemical industries as well."

Says Lindqvist, "The interest in fossil-free steel is bigger than the supply, and we will have competition ahead. But while they are planning and discussing, we deliver." ■

THIS IS HYBRIT

Hybrit is an initiative, funded in part by the Swedish National Energy Agency, to bring fossil-free steel to the market. The most significant step toward reducing CO₂ emissions in the steelmaking process is to replace the traditional blast furnaces with hydrogen-based direct reduction plants, where hydrogen replaces coke as the main reductant. Instead of hot metal, the end product is sponge iron. The sponge iron is melted in an electric arc furnace for further processing to produce steel. Kanthal develops the electric gas heating solution for the hydrogen-based direct reduction plant.

Sandvik uses a different process for its production of steel and is thus not part of Hybrit.



THE MINE OF THE FUTURE IS HERE: "ONE OF THE BIGGEST TECHNOLOGY SHIFTS"

The electrification of mining is good news – not just for the climate but also for miners and operators. Reduced emissions and heat, more productive vehicles and improved working conditions are reasons why, says Henrik Ager, President of Sandvik Mining and Rock Solutions.

Why is the electrification of mining important?

Electrification will be one of the biggest technology shifts that we see in mining, together with digitalization and automation. It has gained a lot of momentum over the last 18 months, and there is a lot of activity in the market. Our customers are very, very interested.

How does electrification make mining more sustainable?

Mining is a carbon-intensive industry that uses a lot of energy and leaves a big carbon footprint. Electrifying underground mining is a great way of reducing that footprint.

By using electric equipment underground, you eliminate the emissions from the equipment and eliminate 87 percent of the heat generated by traditional diesel equipment. This reduces the need for cooling and ventilation in mining, improving the work environment for the operators and also saving quite a bit of money in the process.

How do electric fleets improve the economy of deep mining?

When you undertake a mine expansion and proceed further underground, you need more ventilation and cooling because the deeper you go, the hotter it gets. If you use electric equipment, however, that need is reduced and you save on the cost of investing in ventilation shafts and equipment.

Is it more expensive to buy electric equipment than diesel equipment?

Looking at the total cost of ownership in buying and running traditional diesel equipment, electric and diesel are on par. Electric equipment is more expensive, but the operating costs, fuel and maintenance, are lower. Factor in the savings on ventilation and cooling and you have a really strong business case.



HENRIK AGER

Born: 1969

Lives: Stockholm, Sweden

Title: President of the Sandvik Mining and Rock Solutions business area.

Background: M.Sc. Accounting and Finance. Various positions within Sandvik since 2014. Previously leading positions at McKinsey, Ericsson and several high-tech start-ups.

Interest: Tennis, skiing and American football.



How about the productivity and efficiency compared with traditional equipment?

Electric equipment has the potential of being more productive than traditional equipment. You get a fantastic torque out of these machines, so they can load faster and move quicker up and down the ramp. Another benefit that we don't communicate enough is that electric equipment is smaller, given a certain capacity. A 50-ton-capacity electric truck, for example, is the size of a 40-ton traditional truck. This means that for the same amount of output you can have smaller tunnels in an underground mine. Smaller tunnels means moving less waste as you build the mine.

Some say that battery-electric equipment is only beneficial at greenfield operations. How can it make a contribution at existing sites?

Whether it's greenfield or brownfield doesn't matter. It's beneficial, for example, when developing a new section of an existing mine, due to the capex savings from fewer ventilation shafts and less ventilation and cooling equipment.

How much of the equipment Sandvik sells today is electric?

About 1 percent. That's a small part indeed, but a large share of the contracts we are negotiating today do include electric equipment as a natural

part. Many customers want to try, and some have decided, to build all-electric mines. In a couple of years, electric equipment will be part of pretty much every contract.

What makes Sandvik world-leading in the electrification of mining?

First, we've been active in electric equipment for a very long time. We sold our first electric loader in the early 1980s, and we have delivered more than 600 units of electric equipment up until now. In addition, in 2019 we acquired Artisan, which has developed the self-swapping battery technology and designed a solution for trucks and loaders around that capability. When a machine can swap a battery by itself, that makes it very agile. It makes it easy to introduce it in an existing mine, because you don't need to build infrastructures such as cranes, and there's no need to put in fast charging, which puts an enormous burden on your electric infrastructure. You can just plug and play, more or less.

Your vision about the mine of the future?

My vision is for it to be automated, with equipment that is connected and intelligent enough to make its own choices on when to stop and where to go. And it's 100 percent electric. ■

AGILE AND HIGH-PERFORMING

3 QUESTIONS to Louise Tjeder, Head of Investor Relations at Sandvik.

What are the main takeaways from the third quarter?

One major takeaway is how well we are executing on our shift to a growth strategy. We closed seven strategic acquisitions in and after the quarter and signed one more, and we have now added more than 8 billion SEK in annual revenue through our M&A activities this year. It is particularly exciting that this has come through acquisitions across most business areas, and since the summer we have established a leading position within computer-aided manufacturing, expanded within solid round tools and metrology, made important additions to our mining business and strengthened our position in the medical segment. Meanwhile, we keep on showing healthy underlying growth in the business with



organic orders up 21 percent in the third quarter year-on-year and also notable contributions from acquisitions.

In the third quarter we updated our 2025 revenue target for Sandvik Manufacturing Solutions to 6 billion SEK from 4 billion previously, with an EBITA margin target of at least 20 percent.

How did demand develop during the quarter?

The underlying demand for our solutions is solid. Mining and infrastructure continued at the high levels seen earlier in the year. The demand in automotive and general engineering was robust, although the impact of component shortages on global

automotive production was noted in the business. It was also positive to see an improving sentiment within oil and gas, and a positive development in aerospace.

Sandvik showed resilience in the downturn of 2020. How have you managed the recovery this year?

In 2020, we showed that Sandvik has become a more resilient, agile and high-performing company. This year we have seen a demand recovery, but also pressure on the global supply chain, with cost inflation, component shortages and imbalances when it comes to freight and logistics. Also, in this situation it is clear that our agility has improved, and we have managed the challenges in the supply chain in a good way throughout the year. In the third quarter, our adjusted EBITA margin was 19.1 percent, up from 17.7 percent a year earlier, while the adjusted EBIT margin rose to 17.6 percent from 17.3 percent. ■

NEW REVENUE TARGET FOR BUSINESS AREA SEGMENT

SANDVIK IS UPDATING the revenue target for the business area segment Sandvik Manufacturing Solutions for 2025 to SEK 6 billion from SEK 4 billion previously. With

the recently announced acquisitions of Cambrio, DWFritz Automation and CNC Software (see page 10), Sandvik Manufacturing Solutions will establish a platform

that, combined with the organic growth of the current business, is expected to exceed the earlier communicated revenue objectives. ■

SANDVIK AT A GLANCE

Sandvik is a high-tech, global engineering group offering products and services that enhance customer productivity, profitability and safety. In 2020, the Group had approximately 37,000 employees and sales of SEK 86 billion in more than 160 countries.

BUSINESS AREAS



SANDVIK MINING AND ROCK SOLUTIONS

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

SHARE OF REVENUE 39%

SHARE OF ADJUSTED OPERATING PROFIT 46%



SANDVIK MANUFACTURING AND MACHINING SOLUTIONS

A market-leading manufacturer of tools and tooling systems for advanced metal cutting, expanding into digital and additive manufacturing.

SHARE OF REVENUE 38%

SHARE OF ADJUSTED OPERATING PROFIT 41%



SANDVIK MATERIALS TECHNOLOGY

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

SHARE OF REVENUE 16%

SHARE OF ADJUSTED OPERATING PROFIT 7%



SANDVIK ROCK PROCESSING SOLUTIONS

A leading supplier of equipment, service and technical solutions for processing rock and minerals in the mining and construction industries.

SHARE OF REVENUE 7%

SHARE OF ADJUSTED OPERATING PROFIT 7%

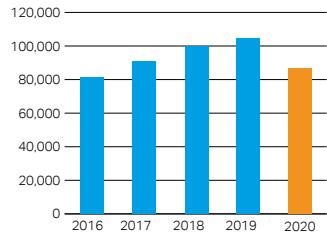
INDICES AND MEMBERSHIPS

MEMBER OF
Dow Jones Sustainability Indices
In Collaboration with RobecoSAM

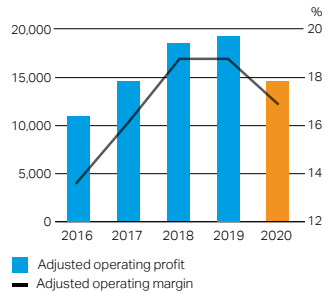


THE GROUP

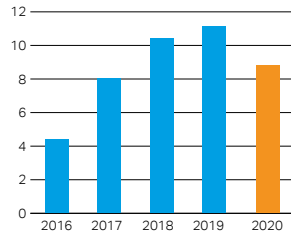
Revenue, MSEK



Adjusted operating profit, MSEK and adjusted operating margin, %¹



Adjusted earnings per share, SEK¹



¹) Adjusted for items affecting comparability

MAIN CUSTOMER SEGMENTS**MINING**

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

SHARE OF REVENUE 40%

**ENGINEERING**

Our tools and tooling systems for metal cutting as well as advanced materials and components are used in engineering industries worldwide, improving productivity, profitability, quality and safety as well as reducing environmental impact. We are also a global leader in high-alloy metal powder.

SHARE OF REVENUE 23%

**AUTOMOTIVE**

Our tools and tooling systems for turning, milling and drilling in metals increase productivity when manufacturing, for example, engines and transmissions. Our stainless and high-alloy products are found in air conditioning and air bags, among other things.

SHARE OF REVENUE 11%

**ENERGY**

We offer solutions for all forms of energy production, including clean and renewable energy. We supply high-alloy products, such as stainless steel tubes, for selected niches in the most demanding industries as well as tools and tooling systems to satisfy the industry's metal-cutting needs.

SHARE OF REVENUE 10%

**CONSTRUCTION**

We offer products and services that increase safety and customer productivity in breaking, drilling, crushing and screening within the construction industry. Application areas include tunneling, quarrying, civil engineering, demolition and recycling.

SHARE OF REVENUE 8%

**AEROSPACE**

We work closely with the world's aerospace companies. As they apply new materials to manufacture airplanes that are lighter, safer and more fuel efficient, advanced tooling solutions and lightweight materials are critical.

SHARE OF REVENUE 5%



THE OBJECT | Doing a bit to help the rhino

Zimbabwe is a “rhino range state,” and like the other African countries that encompass rhinoceros habitat, it has been facing a rhino poaching crisis. Over the past five years more than 150 rhinos have been poached in the country. To help reduce poaching losses, the Lowveld Rhino Trust (LRT), a conservation organization operating primarily in the southeastern lowveld region of Zimbabwe, intensively tracks and monitors rhinos to confirm their ongoing well-being.

Sandvik brand Dormer Pramet is contributing in a small but crucial way to this effort, manufacturing A125 HSS Extra Length Drill bits. With this drill bit a small hole can be drilled into the horn of a sedated rhino and a tracking device inserted. Each animal can then be tracked from the air, on the ground or via satellite GPS.