Digital Transformation — Smart Options for Open-pit Mining

Underground Equipment Advances

New Processing Technology

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BEST OF GERMANY
2021

A supplement to E&MJ, Coal Age, Equipo Minero, E&MJ/Coal Age Russia, E&MJ/Coal Age China and E&MJ/Coal Age India

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FOREWORD:

Dear reader,

You are presently holding in your hands the 2021 edition of Best of Germany. We are all hoping that this year, the COVID-19 pandemic will come to an end. Even if we all adhere to the guidelines and protective measures that will hopefully keep the infection rate down, it is not only in our hands to resolve the issue of the coronavirus. There are too many variables at play.

Therefore, it is important to stay COVID-negative and mentally positive.

In accordance with this maxim, we present to you the current overview of mining technology either engineered in Germany or engineered by Germans. The upheaval in mechanical engineering in general and mining machinery in particular is already in full swing — from extraction operations to the processing and enrichment of valuable minerals.

The prerequisites for this are currently being created: new drives for mobile machines, automation technology, machine-to-machine communication or autonomous operations. Those are the benchmarks for mining machines. Some has already been done, more work is still in progress. Occupational health and safety, environmental aspects, the concerns of civil society, and the interests of investors must not be forgotten.

Once we have completed these tasks, we hope for suitable political framework conditions. Since our industry has an export quota of around 90%, it is highly dependent on the barrier-free movement of goods and services. The COVID pandemic has also turned many things upside down in regard to this. Supply chains have been torn apart, borders have been closed, and countries have completely isolated themselves. At this point, we have also had to invest a lot of work in order to supply our customers worldwide with the quality, reliability and speed they are used to.

With this brochure, we underline our strong commitment to provide all of our customers with custom-fit, advanced, reliable, and safe mining technology and accessories. We hope you find the information interesting and enjoy reading it!

Glückauf!

Dr. Michael Schulte Strathaus
President
VDMA Mining

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German Mining Suppliers in Transition

2020 was a challenging year, and 2021 will not be much easier, writes Klaus Stöckmann, VDMA Mining’s deputy managing director

With regard to geopolitical developments, in terms of both trade and environmental policies, we didn’t expect an easy 2020, but it was worse than anticipated. After order intakes had already slowed at the end of 2019, the economy was then overshadowed by coronavirus-related disruptions, causing a sharp decline in the mining machinery business.

Travel restrictions, limited contact and activities, online meetings, remote services, working from home and more have thrown our everyday working lives off. When looking back, however, we can claim to have mastered the challenges of this year well, also thanks to loyal customers.

At the beginning of 2021, we see weak business on the one hand and lively innovation activities on the other. Just like back in 2015-2016, mining companies worldwide are hesitating to greenlight new large-scale projects. Orders have declined and the decrease was stronger than initially expected; exports of German mining technology also dropped from 1.93 billion euros for 2019 to 1.56 billion euros in 2020.

The same can be said for other manufacturers of mining equipment in Europe. And the only encouraging signals came from Poland, Switzerland, Central America (especially Mexico) and from Australia.

Further Digital Developments Inspire the Industry

Today, interoperability and the digitalization of processes and autonomous systems are driving the industry. Buzzwords such as cyber-physical systems (CPS), networking, cloud solutions, Industry 4.0 or smart mining have reached the mining industry, and manufacturers are creating specific solutions for this.

Against this backdrop, the 145, mostly small and medium-sized companies organized in VDMA Mining have focused on the further development of digital approaches in mining. Knowing that the most sophisticated digital equipment is worthless if upstream and downstream machines cannot communicate with one another, German mining machinery manufacturers have begun to define the interfaces necessary for machine-to-machine communication.

The Open Platform Communication Unified Architecture (OPC UA) is the preferred interface standard. It meets the requirements of mechanical engineering and offers benefits for both the mechanical engineering and process industries.

We, as VDMA Mining, have started an extensive discussion with our members on the development of an OPC UA Companion Specification for mining and have created various international working groups to advance this effort. The specification contains a basic description of mining machinery and equipment, and the main intention is to support machine-to-machine communication in mining processes and vertically into higher-level mine operating systems for control, information and diagnostic purposes as well.

The basic description of mining machines and equipment is supplemented by selected applications, e.g., longwall mining, conveying, mobile mining machines and mine operation. More than 32 companies, including the Global Mining Guidelines (GMG) Group and other organizations are active in an international working group to develop a common language for data exchange in mining.

The overall aim is for international as well as European implementation of the OPC UA Companion Specification. In more than 17 VDMA branches, 38 working groups are engaged on this project.

Collaborating for a Better Future

We are once again cooperating with universities, especially with the Institute for Advanced Mining Technologies at Aachen University RWTH. The institute, together with the mining faculties of the University of Clausthal in the Harz mountains, the University of Bochum in the Ruhr area, and Freiberg University in the Ore Mountains, belongs to the network of the German mining equipment manufacturers branch. They should be mentioned in this context, too.

Finally, part of our network is the German Mining Network (http://germanmining.net). Seven international Competence Centers for Mining and Mineral Resources are located within the respective bilateral German Chambers (AHKs) in the most important commodity producing countries (Australia, Brazil, Canada, Chile, Ghana, Peru and Southern Africa). The German Mining Network informs German companies about the raw materials situation in the countries concerned, as well as the local raw materials industry of supply opportunities for mining technology from Germany.

Promoting German Expertise and Quality

To better serve our clients in the future, the performance of suppliers from Germany must be known worldwide. This is why VDMA Mining organizes joint booths at the most important mining trade fairs worldwide, including (hopefully) MINExpo 2021 in Las Vegas, U.S.

For the year that has just begun, we hope that the supplement, Best of Germany, inspires many readers to learn more about modern, efficient, reliable and safe technologies from German suppliers.

Read more: https://mining.vdma.org/en/
THE FUTURE OF MINING IS SMART

Aarti Sörensen and Elisabeth Clausen of RWTH Aachen unravel the meaning of the term ‘smart mining’ and explain its potential impact on the industry’s future

Digital technologies have the potential to deliver significant improvements in mining by boosting the quality and availability of information, which, in turn, can lead to productivity gains. In addition, meaningful digital technologies can help reduce the environmental impact. It is therefore assumed that they will be key to the sustainability of the mining industry or, at least, to enable significant improvements.

It is widely accepted that the future of mining is “smart.” However, as is often the case with popular slogans, the exact meaning is becoming increasingly fuzzy. This article provides an overview of smart mining as a term, concept and global trend.

Defining Smart Mining

Although the term “smart mining” is now widely used, there is not yet an established definition.

Some sources say that “smart” refers to the use of digital technologies to make mining more specific, measurable, accepted, realistic and timed, while others, like Hexagon Mining, point out that the term “smart” began as an abbreviation for self-monitoring analysis and reporting technologies.

As a starting point, it can be stated that “smart” has to do with the digitally enabled processing of data, which is derived from the evaluation of data and information from connected machines, devices and plant components. This data and information flow back into the organization to make better decisions in real time. The successful implementation of an ecosystem of IoT-enabled devices, which enables plant managers and operators to make better and anticipatory decisions, makes a mine “intelligent.”

At RWTH Aachen University’s Institute for Advanced Mining Technologies (AMT), we define Smart Mining as the intelligent connection and integration of mining machines (physical components) using information and communication technologies (cyber-systems) to form so-called cyber-physical systems, where the exchange and transmission of data and information takes place via a platform, the Industrial IoT (Internet of Things).

The intelligent mine of the future thus represents the long-term vision of a digitally connected, autonomous mine in which the connected systems are able to reduce the ever-increasing complexity to such an extent that improved decision-making can be realized in real time. Future mines will therefore not only be digitally integrated, but also flexible and selective as well as dynamically adaptable, robust and reliable.

Components of a ‘Smart’ Operation

In terms of infrastructure, the main components of an intelligent mine include:

• Automated equipment. For instance, excavators and dump trucks, shearsers and conveyors, drilling equipment, crushers, bunkers, skips, etc.;
• Hardware, such as sensors, RFID tags, wireless infrastructure, drones, embedded systems; and
• Software, such as cloud and platform solutions, data analysis solutions, 3D imaging and modeling software, and remote management solutions.

In addition, new technologies such as modular mobile machines and battery-powered electric vehicles (BEVs), the integration of renewable energy sources or even on-site 3D printing can help to make the operation of a mine smarter.

Aside from the often-discussed reluctance to implement new (risky) digital technologies, the two biggest challenges when it comes to the implementation of these components seem to be what and how?

Deciding which technologies should be used in a particular operation, requires a solid analysis of the existing problems as well as tailor-made solutions based on the results of the evaluation. In addition, a robust and functioning IT infrastructure is an important basis for ensuring secure communication between different systems and types of equipment.

In this context, ensuring the interoperability of systems in particular is the key to integrating machines and processes throughout the mine and the entire value chain. At present, however, this is still difficult to implement due to a lack of standardization. One contribution to solving this problem is, for example, the Open Platform Communications Unified Architecture (OPC UA).

In order to bring about a fundamental change in this context, the IT components must be adapted to each mine site and implemented there. However, this is exactly where many companies have problems. Although they have taken individual measures, be it condition monitoring or the location of people using sensors, they do not implement them at every mine site.
How to introduce technologies refers to the entire process of implementation and integration, often into an ongoing operation. This includes personnel management, the adaptation of management systems and changes in corporate culture, as well as a proactive approach to the changing work requirements and the changing qualification needs of the workforce and the new employees to be recruited. Great importance must therefore be placed on their training and to ensure long-term loyalty and retainment to the company.

**The Role of Research and Innovation**

Although much progress has been made over the last decade and a wide range of “smart” technologies are now widely available, there are still challenges that need to be addressed through research, innovation and cooperation.

One area that can help to further develop digitally supported autonomous systems will be the increasing use of artificial intelligence (AI), machine learning, robotics-based process automation, sophisticated system analysis and modelling. This will enable us to understand the data and thus develop a situation awareness, and to gain insights into the overall processes in near real-time (in time) and determine which possible courses of action need to be considered.

The complexity and harsh conditions, especially in underground mining, require technological developments, supported by additional research, especially with regard to the development of autonomous systems underground. While the location of personnel and equipment in some mines has been realized with the help of Wi-Fi networks, the underground autonomous localization, positioning and navigation of machines as well as machine-to-machine communication systems still requires research and innovation.

The AMT is one of the few research institutes worldwide that conducts applied research on alternative sensor technologies, such as ultra-wideband technology (UWB) and sensor fusion to further advance the development of automated and autonomous machines for use in the demanding conditions of raw material extraction.

Another important aspect is the further development of an interoperability standard for safe and reliable data exchange between machines through OPC standards for mining machines. The OPC UA is a manufacturer and platform-independent, service-oriented communication standard that will play an important role in promoting autonomous developments in mining.

VDMA Mining is taking a leading role in the development of OPC UA CS Mining, the adapted OPC UA standard for the mining industry. VDMA Mining cooperates with a number of companies that are actively involved in the development of the OPC UA CS Mining. The AMT supports VDMA Mining in this process, and representatives of the existing International Rock Excavation Data Exchange Standard (IREDES) also participate in the process.

In addition, VDMA Mining is in contact with the Global Mining Guidelines Group (GMG) to ensure the standards are globally compatible and are disseminated at international level.

Another area in which forward-looking research into new methods and technologies can contribute is the further development of selective and low-impact mining methods in order to increase resource efficiency and safety while reducing the amount of overburden or waste material produced during production.

Much progress has been made in primary processing with the aim of consuming less energy, water and chemicals while at the same time increasing the proportion of valuable rock extracted. In terms of selective extraction, advances in real-time material detection (e.g., during the conveying process and/or prior to processing) can further contribute to reducing the amount of waste material to be processed, thereby further optimizing resource efficiency and energy consumption. In this area, AMT is pioneering the use of infrared thermography as an imaging method and acoustic emission technology for process-integrated material characterization.

**Time to Get Smart**

While research and innovation play an important role in making the mining industry fit for the future, if the benefits of smart mining are to be fully realized, they must be accompanied by a clear vision for reducing the environmental impact of operations while improving productivity and safety.

The AMT, in cooperation with VDMA Mining and DMT GmbH & Co KG, organizes the Smart Mining Conference every two years to promote cooperation within the industry and provide a platform where new technological advances can be presented and discussed with an international audience. The next event will take place in November, and will provide industry experts, startups and technology providers with an opportunity to present new solutions and promote cooperation at national and international levels.

*Read more at www.amt.rwth-aachen.de/en/conferences.html.*

An extended version of this article first appeared in Mining Report magazine.

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**VDMA MINING SUPPLEMENT**

AMT together with AMR wins the raw materials efficiency award 2020 for demonstrating an online material recognition application in an industrial environment using acoustic emission technology — digitalizing material information along the way.
SMART OPTIONS FOR OPEN-PIT MINING

The mindset that relied on economies of scale has now shifted to mining smarter

Most mined commodities are recovered using open-pit mining methods. Oftentimes, these activities take place in remote locations in extreme conditions that could range from high-altitude arctic to high-temperature arid deserts. To mine year-around in these conditions requires dedication and robust equipment that operates for extended periods of time.

More recently, mining operations in general have been moving toward automated and operator-assisted systems that improve the loading and cycling of haul trucks as well as the productivity of the primary excavation tools.

**Liebherr Looks to the Future With Intelligent, Integrated Technologies**

Dr. Jörg Lukowski, vice president at Liebherr Mining, shared his observations on the global mining market. “Some mining operations were placed on hold due to COVID-19 in the first and second quarter of 2020, particularly in the African and South American markets, while other markets like Oceania and Asia have come through the crisis surprisingly well,” Lukowski said. “Following some supplier lockdowns and logistic restrictions, we took appropriate measures and were able to keep the incoming supply chain and factory production capacities stable with only some small adjustments. Thanks to our service support network of Liebherr-owned affiliates and third-party service providers, we were able to continue providing a very high level of service support throughout the year.”

In 2020, Liebherr successfully commissioned and handed over several ultra-class units — both hydraulic excavators and trucks — in Australia and South America, as well as a considerable number of midsized machines in West Africa and Asia.

Liebherr recently launched its large D98 diesel engine, which can be used to power its mining equipment. “To further integrate our engines and mining products, Liebherr is offering in-house designed and manufactured engines for two-thirds of its mining machine portfolio,” Lukowski said. “Liebherr has two engine manufacturing facilities, one in Bulle, Switzerland, developing and manufacturing the D95 and D96 series engines, and the other one in Colmar, France, where we develop and manufacture the D98 series engines.”

The D95 series engines have a long history and are used in many different Liebherr products (excavators, dozers, wheel loaders, cranes, etc.) and applications (marine, power generation, etc.). Liebherr D95 engines meet the different requirements for exhaust emission regulations across the globe — “stage” for Europe, “tier” for the U.S./EPA and “IMO” for marine installations.

“The D98 series engines have been launched in recent years in power generation applications. Currently, we are integrating the D98 engine into our mining machine portfolio steadily and strategically,” Lukowski said. “We are planning to have the Liebherr D98 available until 2025 for the majority, if not all of our ultra-class trucks, and large and ultra-class hydraulic excavators.”

Liebherr is well-known for its cranes and the company recently added the HS 8300.1 dragline to its line of mining equipment. It is a small mining dragline — one that is easy to mobilize and relocate, due to a fast-track installation process. “Thanks to our standardized production process, the HS 8300.1 has much shorter delivery times than the larger draglines in our industry, with easy and quick maintenance,” Lukowski said. “We currently have a test unit in operation in a bauxite mine in Brazil. The machine has shown some promising results and the potential to reduce the total operating cost for the mine.”

Liebherr celebrated the delivery of the 100th PR 776 dozer last summer. The PR 776 is the flagship of the Liebherr dozer factory, Lukowski explained. “Beyond the performance parameters, customers are very excited about the operator comfort and safety features the dozer delivers thanks to its 360° visibility with the rear-view camera, and ROPS/FOPS integrated in the cabin structure.”

The environmental requirements of North America (Tier 4) and Europe (Stage V) were crucial considerations for the PR 776. This 70-metric-ton (mt) dozer uses the proven Liebherr selective catalytic reduction (SCR) system for exhaust-gas treatment, and the machine relies upon the extreme efficiency of the hydrostatic transmission (as compared to traditional mechanical drive).

“This technology reduces the fuel burn rates and carbon footprint by 20% — a fact we have proven by testing it side-by-side with competitor machines in various operations and in a wide range of conditions,” Lukowski said.

Today, Liebherr Mining is the OEM that offers the largest range of electric-driven excavators on the market. Ranging from 130 metric tons (mt) to 800 mt, the R 9150 B, R 9200, R 9250, R 9350, R 9400 and R 9800 are all available as electric-driven versions.

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Dr. Jörg Lukowski, Vice President, Liebherr Mining.

Dr. Jörg Lukowski, Vice President, Liebherr Mining.
Experience the Progress.

Liebherr’s Innovative Mining Solutions

- Integrated smart technologies to lower the total cost per tonne
- Strategic design to increase uptime and reliability
- Highest productivity and efficiency through intelligent energy management
- Ergonomic design for safe and user-friendly operation and maintenance
- Customer-focused support throughout the entire equipment lifecycle
- Liebherr’s commitment to reduce environmental footprint across all machines
Electric drive does not only apply to the range of Liebherr hydraulic excavators, but also the off-highway trucks. In fact, Liebherr was the first to develop a 100-mt diesel-electric mining truck with a four-corner oil-immersed braking system and active front-end technology. This truck is operating today in Austria and South Africa, reducing the costs per ton of these mining operations.

To further reduce operating costs, Liebherr offers a trolley-assist solution for its truck range. Using onboard pantographs to connect the truck’s drive system to overhead power lines on uphill haulage segments, the Liebherr Trolley Assist System improves efficiency and productivity. When connected to the overhead power lines in trolley mode, the full power capacity of the electric wheel motors can be translated into speed on grade while the diesel engine idles, reducing emissions and fuel consumption.

Since signing the development contract for the trolley system at bauma 2019, VA Erzberg has been testing the modified T 236 diesel-electric truck in its siderite iron-ore mine in Eisenerz, Austria. The tests were conducted on a 500-meters (m)-long test segment that is now being extended to 5 km with the upper section at around 1,055 m above sea level. The benefit of this system is that it allows the truck to navigate around corners with a radius of only 12 m.

“We are also continuing our development of integrated mine automation solutions,” Lukowski said. “Our automation strategy is focused on providing our customers with flexible scope of supply solutions. Liebherr will provide a series of product offerings, capable of integrating at multiple levels to enable next generation mine automation. We’re looking forward to making some exciting announcements in that regard during the course of 2021.”

A major mining-related focus for Liebherr in 2021 will be the marketing and sales of its digital products and services. “We have developed some new innovative products, especially in the area of Assistance Systems — truck leading assistant, performance monitoring, application severity, bucket filling assistant — to support the overall operator performance and achieve a significant increase in productivity,” Lukowski said.


**RWE: The Carbon Footprint Reduction Experts**

By Arie-Johann Heiertz, head of mining and materials handling at RWE Technology International GmbH

Carbon footprint reduction is a major task for mining operators worldwide. RWE Technology International GmbH (RWE TI) is an international mining and power consulting firm that is looking especially for these companies. We have extensive experience both in operating low-carbon emitting equipment in large mining operations and in training others to achieve the same.

With more than 120 years of successful company history behind us, RWE TI has undergone fundamental changes and is now a leading supplier of renewable energy worldwide. In addition, we are the largest mine operator in Europe. With this unique combination, we operate large-scale, open-pit mines in Germany and run wind farms, solar power and battery-storage facilities in many countries around the world.

It is our philosophy to continuously improve. For instance, we are investing €5 billion in renewable energy by 2022 and are developing our hydrogen production projects at full speed, to name just a few activities. As a team, we have achieved a lot and we will continue on our path to create a sustainable future with climate neutrality by 2040; to be the best energy company we can possibly be.

**Harnessing Electrification and Automation**

RWE believes that major strides in carbon footprint reduction in mining can be achieved by the electrification of mining operations. In this respect, the use of continuous mining equipment like in-pit crushing and conveying (IPCC) technology is now proven under strict environmental and economic boundary conditions. This technology is an effective alternative mining solution when mass handling requirements become too expensive or environmentally unattractive for conventional transportation methods.

RWE TI itself has extensive experience with this technology as it operates three large open-cast mines in Germany — successfully and very economically, solely employing conveyor-based continuous mining and transport technology.

In total, our three operations boast the largest belt conveyor systems in the world with more than 250 km of mobile belt conveyors installed in rough mining terrain. More than 1.3 billion metric tons (mt) of product and overburden is handled annually, operating 24/7.

Industry leading planning, operation and maintenance know-how has been collected more than 70 years and can be made available to customers via our consulting and engineering services. And an additional benefit worth mentioning is that continuous mining also allows for a very high degree of automation.

Within the mining industry, RWE TI’s consulting and engineering services are well known. The first in-pit crusher was planned and installed at our client Vale’s northern iron-ore mine more than 30 years ago, shortening the trucking distance and haulage height significantly. Since then, a large number of clients — among them BHP, Antofagasta Minerals and Anglo American — rely on the planning, operation and maintenance experience and know-how derived from our German large-scale mines.

Another example of RWE TI’s engineering capabilities are the world’s strongest conveyors, which transport copper ore downhill in the Chilean Andes, producing surplus electricity as a byproduct.

Being an engineering consultant with real operator’s experience puts us in the position to provide tailor-made customer training in our own operations. This unique benefit was recognized by Vale, which asked us to train more than 80 of its managers, engineers and operators in RWE mines for multiple weeks each, enabling a common understanding of the differences between discontinuous truck and shovel mining and fully continuous mining.

The sustainable success of these training sessions can be seen at Vale’s flagship project S11D in Brazil, where the first fleet of fully mobile crushing units, connected to a network of mining conveyors, has been operating successfully for five years.

Nowadays, we are using our unique position as an international mining company fully integrated into a global leader for renewable energies to transfer this combined knowledge to our clients in the mining industry. Helping them to also be green, efficient and highly cost competitive.

To determine the feasibility and potential benefits of implementing an IPCC system at your operation, a number of key drivers need to be investigated, understood and interpreted correctly. A short questionnaire is available on the RWE TI website for download.

We are keen to assess the carbon reduction potential of your mine. The question is: are you ready to go for it?

Read more: www.group.rwe/en/bespoke-solutions/solutions-for-mining
Surface Miner Maximizes Output for Indian Coal Mine

India has extensive coal reserves and uses them as the country’s most important source of energy, covering about half of its primary energy needs with coal. One of the country’s largest coal operations, the Bhubaneswari coal mine, is located near the town of Talcher in the eastern Indian state of Odisha, where coal has been mined since the 1990s. The Indian company Bhubaneswari Coal Mines Ltd. (BCML) has operated the open-cast mine since 2011 and successfully uses Wirtgen surface miners.

Mining operations at the Bhubaneswari coal mine are conducted 24 hours a day to continually supply the nearby coal-fired power plants with the raw materials they need to generate electricity. As a result, the company mines more than 25 million metric tons per year (mt/y). The material is relatively soft with a compressive strength of up to 35 MPa. Instead of drilling and blasting, BCML uses Wirtgen surface miners to cut the soft rock.

Bairagi Sahu, associated vice president, BCML, commented on the fleet of seven Wirtgen 220 SM 3.8 surface miners that the mine employs. “When it comes to performance, the Wirtgen surface miners are simply the best on the market,” he said. “At our mine, we sometimes cut up to 1,800 mt/h of coal with one surface miner.”

The use of surface mining technology has a number of operational benefits. Firstly, it eliminates the need to store and handle explosives. The highwall provides enhanced slope stability and therefore fewer rockfalls. Surface miner technology eliminates the need to close the mine for blasting, which delays production. And, in addition, mine operators no longer need to spend time obtaining the required permits, hiring certified blasters or compiling the associated documentation.

Mining with Wirtgen surface miners also offers financial benefits. The flat surfaces created during the mining process serve as stable roadways that facilitate fast truck haulage. This increases the transport capacity of the entire truck fleet, and the quality of the road surface even reduces wear and tear to each truck’s tires, frame and suspension, allowing the operators to use standard trucks rather than off-the-road models. The resulting reduction in transport costs helps mining companies lower production costs per ton of material.

The only requirement for companies to fully leverage the benefits of surface mining is to use intelligent machines. The 220 SM 3.8, with an operating weight of 58 mt, is propelled by a robust Cummins diesel engine with an output of 708 kW. Thanks to high-pressure injection and intelligent engine management, the engine is extremely fuel-efficient.

At the same time, the diesel tank with a capacity of 2,300 l makes it possible to operate the machine around the clock with only one stop to refuel per day, resulting in high productivity. A cooling system with a demand-driven fan speed also helps to reduce fuel consumption and at the same time reduces noise emissions.

The 220 SM 3.8 is designed for mining all types of soft rock. The 3.8-meter-wide cutting drum features tall, narrow holder bases that ensure that the material flows smoothly while requiring minimal energy. In addition, the shape of the holders in combination with the arrangement of the cutting tools minimize the amount of fine material generated. The material is continuously deposited in a windrow directly behind the machine.

“With this mining method, we can clearly see the quality of the coal due to the difference in color between the coal and the light-colored overburden, allowing us to mine the material cost-effectively,” Om Prakash, chief operating officer at BCML, explained.
In open-pit mining, reliability and availability are key. All of the 220 SM 3.8’s components are designed for extremely demanding open-cast mining applications. For example, additional filters in all of the machine’s circuits and a pressurized hydraulic reservoir ensure maximum purity in the hydraulic system for smooth operations. The clean oil in turn extends the service life of the downstream components, which also contributes to higher machine availability. The components’ long service life and the miner’s minimal downtime ultimately result in greater productivity and cost-effectiveness.

The 220 SM 3.8’s standard ROPS-FOPS operator’s cabin features additional soundproofing and vibration isolation, allowing the operator to work with maximum focus for many hours without the risk of fatigue. The ergonomically designed and clearly arranged controls are integrated into the armrests of the driver’s seat, and all of the machine’s key functions are logically incorporated into the multifunctional joysticks. This means the operator can operate the machine intuitively in just a few steps and fully concentrate on high-precision mining.

For optimum visibility, the fully air-conditioned, spacious cabin features generously sized windows and is positioned so that the operator always has a clear view of the cutting edge. An optional camera system also gives the operator an excellent overview of the work area, even behind the machine. In short, ideal conditions for productive operations.

The 220 SM 3.8 is also designed to be easy to service and maintain. All of the maintenance and service points are easily accessible from the ground or inside. The walk-in engine compartment makes it possible to quickly and easily inspect the engine, and the machine’s air, fuel and hydraulic oil filters are also directly accessible. Ultimately, the intelligent maintenance concept also results in higher machine availability.

ENSURING EXCELLENCE UNDERGROUND

As more mining operations, both new and established, head deeper underground, the need for safe, proven and digitally enabled technologies continues to grow.

Underground mining requires specialized equipment. Beyond being robust enough to handle the difficult day-to-day working conditions, the equipment needs to operate safely, sometimes in a gaseous environment. Today, more underground operations are moving toward remote operations and that requires digitally enabled equipment. For many years, the VDMA Mining members have supplied specialized equipment and services for underground miners, so it should come as no surprise they are leading the way now in some of these areas.

PAUS: New Year, New Solutions

Last year was challenging for all in the mining sector. However, family-owned, Embsbüren-based manufacturer Hermann Paus Maschinenfabrik GmbH (PAUS) has weathered the storm and emerged even stronger with a host of new projects and solutions on the cards for 2021.

“2020 started off normal, until COVID-19 hit,” managing director, Franz-Josef Paus, said. “But still, we managed well. While in some regions, activities were delayed, in others, we were more active than anticipated and we have not experienced any order cancellations. Our highlight truly was the introduction of our new Scaler PScale 8-T, although we could not launch it at MINExpo in Las Vegas as planned.”

The PScale 8-T is the successor to the well-known Scaler 853 S8. It’s a compact model specifically designed for work in tight tunnels and galleries, and the first units have already proven themselves at high-altitude mines in Peru and Chile.

The PScale 8-T is 8-m long, 2-m wide and 2.5 m high with a reach of 8 m. It has an internal turning radius of 2.5 m, and an external radius of 4.6 m; dimensions that allow it to operate in galleries less than 3 m in width.

It is also a precision scaler and features technology that minimizes energy transfer from the pick into the sidewalls and roof. This helps to preserve the rock’s natural structure and integrity while removing only the loose fragments.

Paus continued: “We had to cancel our annual dealer meeting in March, but we quickly shifted it to an online format and, as a result, we saw more participants from different parts of the world than would have been here during a live event. Although no personal visits were possible during 2020, we still met many customers virtually, offered virtual factory visits and, in many cases, the exchange was probably even more intense and regular — which we enjoyed as “the people who care.”

“Internally, we have used the time (and presence) of everybody to enhance our processes and productivity, and definitely prepare for new developments to be launched later this year.”

Heading into 2021, mining companies are still, understandably, keeping a close eye on their capital expenditure. “On the technology side, we clearly see demand for anything that saves costs,” Paus said. “Mines are therefore looking for good quality machines and smart solutions that increase productivity, which fit perfectly with the machines we offer.

“With no traveling possible, demand for remote services has grown significantly and we have really benefitted from our digital platforms that we installed pre-COVID. For instance, our individual online parts catalogue, PAUS Connect Cloud and of course online communication platforms. The new situation gave a real boost to these features.”

In 2016, the team at PAUS launched a mine rescue vehicle in collaboration with fellow German supplier, Dräger. The MRV 9000 mine rescue vehicle was specifically developed to deliver rescue teams to and from emergency incidents in a self-contained, mine-proven vehicle. It combines the basic-chassis type MinCa 18A from PAUS with life support systems and safety technologies from Dräger to provide safe, clean breathable air in a controlled environment.

The first unit was designed for use at a Goldcorp operation, although the model is now available to all PAUS customers.

Franz-Josef Paus said collaborative projects like this are vital in solving some of the bigger challenges that the mining industry now faces.

“If you want smart new ideas, then sometimes we have to join forces to create the optimum solution,” he said. “Projects like these are always beneficial for all parties. In the case of the MRV, we took the best of two worlds: Dräger for life saving equipment and PAUS for the heavy-duty carrier. The result is unmatched.

“We are a relatively small, but very flexible company that can quickly adapt to new challenges and ideas. Besides other industry partners, we also cooperate closely with universities. Currently, we are working with academic partners in the fields of autonomous operation, electrification and hydrogen drives. With RWTH Aachen, we are working on a sensor-based detection system for loose rock while scaling.”

Following the success of the MRV 9000, PAUS is now working on a new mine rescue solution that is due to be released later this year.

“There will also be a couple of new and updated machines, such as a new 16-ton dump truck and a new 7-m³ concrete mixer that features full-suspension on the front axle for better comfort,” according to Paus. “And there will be more announcements within the next couple of months.”
Eickhoff Flexes Global Supply Chain

Despite the trials and tribulations of the past 12 months, Eickhoff Bergbautechnik has successfully manufactured and delivered yet another fleet of underground mining machines across the world for coal and potash extraction.

Eickhoff has a large stable of quality solutions, from the Eickhoff SL 1000 — designed to mine seams 8-meter in height — to the Eickhoff SL 300 L for seams 1-m in height, and the midseam range comprising the SL 300, SL 500, SL 750 and SL 900 in between. The company also offers continuous miners for room-and-pillar operations and has enhanced developments in the field of autonomous operation, which it said have generated a healthy demand for the 2021 year ahead.

The Eickhoff SL 900, which helped SUEK’s Yaleyevsky mine in Russia to achieve three world records with 1.627 million metric tons (mt) produced in August 2018 alone, cemented the machine’s global reputation, and the model has proven to be the machine of choice during 2020 with new deliveries into Russia, China and Australia.

Several of the Eickhoff SL 900s that were delivered to Australia and China incorporate high-tech solutions such as anti-collision radar as well as infrared seam detection and acoustic monitoring. These elements will be incorporated into the mine’s autonomous technologies employed on the shearsers to collate and analyze the data.

Another new application for Eickhoff is a collaborative project to install LiDAR (Light Detection and Ranging) sensor technology on longwall shearsers. LiDAR will be used to locate, steer and navigate equipment to the richest part of the coal seam with the highest accuracy, while avoiding potential danger hotspots.

The first of the new 130-mt Eickhoff SL 900 shearer loaders delivered to Australia in 2020 has now been put through its paces at the Eickhoff Australia Life Cycle Management Centre located in New South Wales, where a repeat of the German-based design and manufacturing acceptance testing was completed prior to forwarding the machine on to the mine’s compatibility site.

Another first for the Eickhoff continuous miner as a result of its continued success in South Africa, was a delivery into India during 2020.

The machine, on receipt at the Singareni PKW5 site, was reassembled and “no-load” commissioned on the surface by Eickhoff Bochum technicians and the owner operators. The work was completed shortly before COVID-19 travel restrictions came into force, and the machine is now installed and ramping up to full production underground in the PKW5 coal mine.

Eickhoff said the step-by-step approach that leading longwall coal miners around the world are using to get them closer to the point of fully autonomous operations is delivering results in the form of consistent operation and production.

While the company is not yet offering all of the sophisticated technologies realized in Australia and China to its clients in the Balkan, eastern European, or Russian markets, there is no doubt that these markets will follow shortly. And, in the meantime, it offers plenty of easy-to-implement safety technologies that lead to better performance monitoring, more consistent production and safer operations.

Additionally, the continued investments made within Eickhoff’s Bochum headquarters and its global subsidiaries allow the company to offer the highest level of life cycle management support for its installed base.

Eickhoff subsidiaries with their purpose-built load and function testing equipment provide the chance to put new and overhauled equipment through its paces ahead of installation. This allows mining customers to be confident that their choice of machine is fit for purpose for the full life of the product, and Eickhoff said this is one of the major pillars of its quality and reputation.

Read more: www.eickhoff-bochum.de/

Becker Embraces Industry 4.0

Becker Mining Systems is a worldwide supplier of complete energy, automation, communication, transportation and infrastructure technology for the mining industry. In 2020, the company’s most important product launches were ENDIS4.0, Promos4.0 and the WRAP260 — the latest additions to Becker Mining’s 4.0 series of digital solutions.

“The ‘4.0’ series is essentially the evolution of our long-standing product lines with the idea of interconnecting them altogether, as defined by the term Industry 4.0,” explained Jonas Maximilian Becker, engineering manager for Becker Mining Europe. “The goal is to be able to transfer and integrate data from different systems into the central database of a mining operation. Mines can then visualize the data and, if desired, analyze it to provide projections, to optimize processes and, ultimately, raise their productivity.”

In modern operations, the requirements for reliable high-speed data communication underground are becoming ever more demanding. Powerful communication solutions enable operations not only to raise safety standards but also to simplify and accelerate processes. All of these applications require a fast, reliable data network infrastructure at the core to avoid bottlenecks.

Read more: www.becker-mine.com
The WRAP260 product series consists of intrinsically safe fibre optic network switches and wireless LAN routers that support the Gigabit bandwidth standard. These allow mining operations to adopt the 1 Gigabit per second standard for fibre-optic networks, even in explosive areas. All products have been ATEX and IECEx certified for category M1 and level of protection “ia,” respectively.

“The switches and routers fulfill the highest standards for operation in explosive atmospheres,” Becker said. “They can also be combined with a battery backup power supply for continued network support even if the mine power network fails or is shut down due to gas detection.”

Collecting data underground to enhance process visualization in mining operations requires a capable communication backbone. WRAP260 Switches are designed to allow a fast data connection to and from production areas. They are certified for operation in gaseous atmospheres and designed with robustness in mind: IP65 or IP67 ingress protection guarantees no dust or water ingress.

Inside, all electronics are securely positioned and the devices have been vibration tested. In addition, Becker Mining has made sure that devices can operate normally under specified temperatures.

WRAP260 Switches include three different models: the WRAP260.3 Single Switch; the WRAP260.4 Double Switch; and the WRAP260.5 Gateway Switch.

The WRAP260.3 Single Switch comes with 5 x 1 Gbit/s ethernet ports for regular applications. The WRAP260.4 Double Switch accommodates 10 x 1 Gbit/s ethernet ports and is designed for larger networks with many branches. The WRAP260.5 Gateway Switch has been engineered for older data networks with a 100-Mbit/s bandwidth to be able to transition to 1 Gbit/s networks.

The WRAP260 Routers come in two variants: the WRAP260.1 Double Router is Becker’s entry level product with two WLAN modules, two available fibre ethernet ports and four available antenna connections. The WRAP260.2 Triple Router comes with three WLAN modules. It features four available fibre ethernet ports and six antenna connections.

Both routers come with an optional tagging and tracking function for real-time location applications. This allows them to act as tag readers for ultra-high frequency (UHF) or RFID personnel and vehicle tags. This function can also be integrated into Becker Mining’s CAS (Collision Awareness) and PDS (Proximity Detection) system solutions.

Also new in 2020 was the Promos4.0 fieldbus automation system.

“We have taken the time to listen closely to our customers, to integrate new technologies and to develop unique solutions in order to come up with a state-of-the-art automation system for underground mining applications,” according to Becker.

Becker Mining’s Mincos Automation systems Promos and Betacontrol have been deployed in underground mines around the world for many decades. Promos4.0 incorporates all the advantages of PromosPlus and Betacontrol into one comprehensive fieldbus system. It adds new connectivity features and enhanced overall performance for growing data requirements.

Becker explained: “We’ve internalized the idea of Industry 4.0 and added superior connectivity to our Promos4.0 automation system.”

With Promos4.0, data is transferred more than 20 times faster than before. With a data rate of 500 kBit/s, more automation tasks can be fulfilled with one system. The Mining Master Smart 4.0 controller can handle two separate fieldbus lines with lengths of up to 4,000 m and up to 96 devices each.

“We’ve also added Bluetooth connectivity to every intercom station, so diagnostics and parametrization can be executed underground via an intuitive interface with a mobile device,” Becker added.

Digital inputs and outputs are now easier to connect. Every emergency stop and intercom station can optionally be equipped with two M12 digital I/O connections. With a patent-pending cable pull switch design, operators can reliably switch off conveyors and machines when required. The system also has a number of in-built safety features, including cable break detection and self diagnostics.

“With specifically designed speakers, we’ve managed to increase the sound pressure level on our intercom stations by 14 dB compared to the PromosPlus speakers to generate the much-requested sound levels of 110 dB,” Becker said. “That is enough for even the toughest and loudest environments. One can also communicate from one bus line to another or call the dispatcher on surface via the phone button.

“Likewise, the dispatcher can communicate into any fieldbus line underground. The speakers are protected from dust and water and have been IP66 certified. As speakers on the outside tend to be a weak point for many operators, we made them easily exchangeable.”

For more than 50 years, the Becker Mining Systems Group is setting worldwide standards in technological innovation for the mining industry. We offer solutions that maximize production, increase efficiency and improve safety while reducing the environmental footprint.

With our latest automation and energy distribution systems PROMOS 4.0 and ENDIS 4.0, we offer modular and fully integrated solutions for a faster and smarter operation.

Be ready for the challenges of the future!
The PF1010 and PF1020 human-machine interface (HMI) panels present two solutions for controlling the fieldbus connections away from the head unit. The PF1010 is a small HMI panel with ten configurable illuminated buttons and an emergency stop, whereas the PF1020 is a full-control HMI panel with a 7-in. touchscreen display, 20 configurable illuminated buttons, an integrated intercom and emergency stop.

The third product new in 2020 was, what Becker Mining terms, "the world’s most controllable underground power distribution solution" — the ENDIS-Compact Station series CS40**. This is a switching device that can be used at different voltage levels. ENDIS4.0 compact stations feature a modular design and can be configured according to customer requirements and adapted to future needs.

The contactors are installed in a configurable frame and can be electrically retracted and extended. Other key features include automatic separation of the contactors; automatic recognition of the plug-in unit with no coding; power contacts for 1000 A; a circuit-breaker for up to 1000 A can be integrated; embedded arc protection; universal slots for single contactors; double contactors or a lighting plug-in unit; interchangeable energy contacts; and an integrated reversing switch for the contactor.

As an optional extra, a PLC unit can be integrated into the switching device to allow for external sensors/actuators to be processed via fieldbus interfaces like Promos4.0.

Scheduled for release in 2021 is the updated version of the Becker Underground Collision Avoidance System (UCAS), which will be named PDS4.0.

“PDS4.0, as with all other ‘4.0’ products, will be able to share its data in a wireless LAN network and integrate into our SCADA software, MineView,” Becker said. “The PDS4.0 will also satisfy the requirements of the EMESRT Level 9 standard and thus automatically prevent collisions between any moving assets inside an underground operation. It has been developed to comply with ISO 21815 and our goal was to make it as intuitive and easy to use as possible.”

The PDS4.0 is scheduled for release in the third quarter of 2021, and Becker hinted that there are other 4.0 products under development, too.

“We have conducted an in-depth analysis of our entire product range and there are a number of other systems that will follow suit,” he said. “Also, we have identified niches in this new system environment where we don’t currently have any product offering.”

Read more: www.becker-mining.com

KAMAT Keeps Mines Productive and Safe With New Pumps and Valves

KAMAT GmbH & Co. KG is active in high-pressure cleaning for a variety of applications, including the steel industry with descaling installations for hot rolling mills and also installations for hydrostatic bearings.

“We supply process pumps to oil and gas operators and to the chemical industry and, besides these business areas, we are a proud supplier of reliable hydraulic power to longwall mining systems all over the world,” Andreas Wahl, KAMAT’s managing director, explained.
“Our main longwall mining markets are Australia, China, Russia and the U.S. All these markets were strong and reliable during 2020 despite all the uncertainty.”

KAMAT is supported in the U.S. by its partner Morgantown Machine & Hydraulics (part of Swanson Industries) and, in Australia by Longwall Hydraulics. Having a local presence in those markets has proven invaluable as pandemic-related travel restrictions have tightened, and the highlight of 2020 for KAMAT was the delivery of 21 units of 800 kW pumps on base frames for a descaling installation in the U.S.

Overall, despite the onset of COVID and the global economic slowdown, which postponed many key investments in the mining sector, Wahl said KAMAT’s 2020 sales figures turned out better than expected.

“We are satisfied with the outcome, and the outlook into 2021 is moderate but confident,” he said. “Given the situation, a number of internal projects, which were on our to-do-list for a while, became possible, resulting in a variety of technical developments, improvements and modernizations.”

Wahl said China and Russia remained key markets during 2020 as well.

“In both countries, we see the trend for bigger units and wider usage of variable speed driven (VSD) pumps, especially as they are standard in the U.S.,” he explained. “Many Chinese clients are also asking for systems with higher hydraulic power installed and larger flows per pump, so this is the main market for our biggest units.”

Opting for fewer, larger pumps leads to less complexity and, when combined with VSDs, can lead to an unparalleled level of control.

“We at KAMAT are pleased with this development and we have been successfully operating such systems for many years,” Wahl explained. “The power density (ratio of power input to the weight) of our pumps and systems is unique. Nevertheless, new engineering possibilities and new materials allow for an even increased power density and results in pumps that give even more power, pressure, and flow at the same size and weight.”

With this in mind, KAMAT launched a range of new safety valves for its plunger pumps in November. These feature modern spring technology for precise setting and release of the response pressure. The new valves are also more secure, as setting and adjustment is now only possible with special tools.

Wahl explained: “First of all, there was nothing wrong with our previous generation of safety valves. They were available in different sizes for different pressures and flows and they still are reliable and safe.

“However, with another next step ahead toward higher flows and pressures, it became evident that we needed to extend our range.

KAMAT announces its new family of safety valves in November 2020. (Photo: KAMAT)

During this project, we decided to re-engineer the whole range of safety valves and include new possibilities in terms of design and materials used.

“The result is a whole new line of safety valves in different sizes and configurations, covering any possible pressure and flow configuration.

“The new valves are equipped with internal parts made from a high-tech material. They offer improved sensitivity as well as a smart solution for comfortable liquid release when they do their job.

“They can be set more precisely and allow for a smaller hysteresis. And they are just as safe as the old ones are.”

KAMAT is currently undertaking the final optimization steps for the new valve family.

“We did also extensive pump performance tests during 2020 after re-engineering of some key components,” Wahl said. “The pumps performed very well and even beat our expectations as we intentionally overpowered them.

“The result is that we are able to further improve the power-density of our pumps. As a consequence, the market can expect a familiar looking range of pumps in the near future but with improved power inputs as there will be 450 kW, 550 kW, 1,000 kW and 1,500 kW models available soon. The new pumps will be able to work harder, but their physical shape remains the same.

“Further improvements are in the pipeline and these focus on the pumps heads with the aim to reduce complexity and improve the liquid’s flow dynamics through valves and head. It is still too early to present the final results, but we expect to be able to share more details later in the year.”

Read more: www.kamat.de/en/sectors/mining.html
The CFH Group: Strength in Numbers
Based in Gladbeck in northwest Germany, the CFH Group supplies a range of ventilation equipment for clients in the mining and tunneling industries and in other sectors. The COVID-19 crisis posed a major challenge for the group, as it has done for many globally active mid-sized companies. But despite everything, the group remains active and continues to develop its operations and business activities in all aspects of air technology, focusing in particular on dust extraction, gas purification, ventilation, and air heating and cooling.

And already there are new developments in the pipeline. The supply and circulation of ventilating air plays a key role in mining and redevelopment work, and is essential for carrying out mechanized road heading, drilling and blasting, and tunnel stabilization. For projects of this kind, the CFH Group can provide ventilation equipment such as radial and axial fans, along with silencers and other accessories.

The axial fans produced by CFH portfolio company Korfmann Lufttechnik have impellers measuring 300 to more than 3,700 mm in diameter. All fans undergo careful inspection prior to dispatch and each unit is fully approved for use in the national and international mining and tunneling sector.

On October 1, 2020, the CFH Group increased its stake in Korfmann Lufttechnik to 100%. As of January 1, 2021, all sales and marketing activities relating to ventilation equipment are to be handled by CFT Compact Filter Technic, thereby further strengthening the partnership that already existed between the two companies.

CFT, which celebrated its 20th anniversary in 2019, has been exclusively producing fans and silencers for Korfmann since 2001, and both companies have been successfully involved in a number of joint projects, with a special focus on main ventilation equipment for the mining industry.

Another key focus of the CFH Group has been strengthening its presence in China, Australia and Russia and, in doing so, the group has consolidated its existing position in the market. The newly created CFH (Shanxi) Technology Co. Ltd., with its head office in Taiyuan, China, began trading at the beginning of the year, while CFH Airtechnic Australia Pty Ltd., which started up in early 2020, operates out of Sydney, Australia; a country where the CFH Group has successfully completed many projects.

Finally, with CFT Sibir already established in Novokuznetsk, Russian operations have now been expanded with the launch of the new Moscow-based 000 CFH RUS company, which has now begun trading in the Russian and Belarusian markets for mining and tunneling equipment as well as for general industry. These three subsidiaries can each supply the entire product portfolio of the CFH Group and fully support the group’s service commitments. Additionally, CFH Australia can provide local repair facilities and, for example, can refurbish dust extraction equipment and fan systems.

Given the unforeseen restrictions that have been imposed on international travel recently, these new subsidiary companies are making an important contribution to the group’s ability to continue to serve its various markets.

CST Customer Savings Technology, a subsidiary of the CFH Group, specializes in field-tested, reconditioned plant and equipment for companies and suppliers operating in the mining and tunneling sectors. CST carries out complete overhauls on pre-used, high-quality dust extraction units, fans, cooling plant, road headers, dinter loaders and others. An online catalogue was established in mid-2020 to provide interested parties with an update on plant and machinery availability.

The company’s fully refurbished equipment is basically equivalent in performance to new items of the same type. As well as requiring a much lower capital outlay, pre-used equipment also offers another important advantage; it is available at much shorter notice than its brand-new equivalent.

Read more: https://cfh-group.info
Moving More Mined Materials to Market

Smart high capacity conveyor systems push capacity limits

The mineral extraction process, which could take place by underground or open-pit mining methods, is only the beginning of the supply chain. Once the mined ore or coal reaches the primary crusher, the operation relies on a network of material handling systems, most often conveyors, to move materials from one location to another.

Today, more sophisticated drive systems are increasing capacities while reducing energy consumption per ton moved. Engineers are working wonders with conveyor systems that allow them to traverse all types of terrain. A better understanding of data is allowing designers to model and evaluate modern material handling systems.

The Digital Transformation of Mining

COVID-19 and its impacts significantly accelerated the acceptance of digital tools and work practices across the mining industry during 2020. While travel restrictions and safety concerns may eventually abate thanks to an influx of vaccines, the realization of new, more efficient ways of working, along with better process control and the possibility for more productive operations mean that this trend has likely changed the way businesses in the sector operate forever.

ChristianDirscherl, vice president for mining, excavation and transport at Siemens, discussed some of the changes that Siemens has seen. “In the last 12 months, we have faced COVID challenges, like everyone else, but we achieved our targets nevertheless,” Dirscerl said. “We did see impacts on plant setups, but we’ve been very successful with remote commissioning, for example, for autonomous stockyards and gearless mill drives. With a lot of these projects, we had planned commissioning pre-COVID and there was no way we could have foreseen that happening, so we had to adapt quickly. Most of our teams work remotely now, and commissioning and supervision services for all drives, electrification and digitalization projects are carried out remotely.”

According to a study published in October 2020 by McKinsey & Co, the COVID crisis has accelerated the digitalization of most companies’ customer and supply-chain interactions and of their internal operations by three to four years. And the share of digital or digitally enabled products in their portfolios has accelerated by seven years.

“I absolutely see that in the mining industry,” Dirscerl said. “Mining companies are still very conservative when it comes to innovation and digitalization, but they are becoming more open. That’s partly because of how remote most mine sites are; with current travel restrictions, there’s just no way of bringing technology specialists safely to site for commissioning or troubleshooting.

“And it’s not just a challenge for mining companies, safety is the most important area for Siemens. We can’t send someone to a site if we don’t know what the local situation is, and we want to know that, should that person fall ill during the trip, they will receive the best medical care. There is a lot of risk management involved.

“Also, to travel to different countries often requires a quarantine period when you arrive and when you return. Suddenly, two weeks of commissioning work requires four weeks of quarantining, too. That has to be factored in.

“We’re doing as much as possible remotely across all our divisions, including drives, digital, electrification,” Dirscerl explained. “For instance, we’re commissioning systems via VPN access, and even supervising people on site using augmented reality glasses, or using video communication systems to do consulting jobs from home.”

In line with this shift and, as mining companies also try to minimize their own number of staff on site, Siemens has seen increased interest in its autonomous mine management solutions, asset health analytics (AHA) — particularly for mission critical pieces of equipment like grinding mills, conveyors, and mine hoists — and in manufacturing execution system (MES) inquiries.

“Digitalization has been key in all industries over the past five years, but it requires more than just IT and automation,” Dirscerl said. “It also requires commitment and strategy, and what we’ve seen recently is more mining companies making that investment to truly become part of Industry 4.0.

“Solutions like our material tracking and management (MAQ) for autonomous stockyards deliver more than just process improvements. By removing people from harm’s way, they also improve safety on-site and eliminate the possibility for human error; machines and algorithms can fail, but human failures happen much more frequently.

“They also provide the chance to improve the quality of the product. For example, we’re now looking at using MAQ to blend copper ore; that wasn’t a discussion before.”

AHAs are also becoming more important. The unexpected failure of a critical piece of equipment like a hoist or mill, can, in some cases, cause hundreds of millions of dollars of damage through down time and lost product.

With many experts unable to travel to sites for repairs or troubleshooting, it’s more important than ever to prevent failures, schedule shutdowns well in advance and put proper planning around them.

“Overall, there are still new projects popping up and we see a positive impact on inquiries at the moment, especially for copper and gold projects,” Dirscerl said. “We’ve recently added another reference for our MAQ solution in Europe (autonomous stockyard management), a larger digitalization and automation project in Europe, and a large electrification project in North America.

“Everyone’s talking about becoming carbon neutral, from companies to governments. To make that happen and to meet the targets that many European countries have set around electric vehicles, will require a lot of new infrastructure.

Even large gearless drives for mills are now commissioned remotely. (Photo: Siemens)
“There is a lot of uncertainty at the moment with COVID but, on the whole, the future looks very promising.”


**Perfecting Storage and Stockpiles**

At hard coal operations, material is temporarily stored in stockpiles and then continuously fed to be processed, as needed. The design of the depositories must therefore ensure constant filling and reliable emptying. The required capacity is determined based on the incoming and outgoing conveying flow. Different stacking and reclaiming options as well as various layouts for the stockpiles are also needed.

BEUMER Group offers a comprehensive product and system solutions portfolio to customers in the coal mining industry, including engineering expertise for stockpiles as well as the required components, such as stackers and reclaimers.

The company’s conveying technology includes closed pipe conveyors and open troughed belt conveyors that can be adjusted to the respective situation.

Drone technology is also being used more frequently during project planning, implementation and documentation to optimize the design phase. The recorded aerial photos are rectified with regard to their perspective and evaluated photogrammetrically. The software calculates a point cloud in order to generate 3D models from the 2D views, i.e., digital terrain models. Stockpiles can now be greenfield and brownfield developments.

Andrea Prevedello, system technology global sales director at BEUMER Group, explained: “We have some major customers with interesting projects in this sector including the Prairie Eagle mine in Illinois, the largest coal mine of Knight Hawk Coal. The company produces approximately 5 million tons of coal annually, of which more than 80% is processed and delivered in Prairie Eagle.”

The Prairie Eagle mine in Illinois is the largest coal mine of Knight Hawk Coal. (Photo: BEUMER Group)

The management team at Prairie Eagle was looking for a more sustainable operating solution and turned to BEUMER Group for help. “We provided an overland conveyor that transports the coal from the mine to the main processing plant,” Prevedello said. “Our conveyor helps the company to considerably reduce its ecological footprint. With this technology, Knight Hawk can significantly reduce its long-term environmental impact compared to using truck transportation.”

BEUMER not only supplied the conveying solution but also supported the mining group in building a stockpile for hard coal. “The requirements for storing coal are obviously very different from other materials,” Prevedello explained. “Some of the important requirements change if the stockpile is covered and if explosion-proof equipment is needed. Hard coal is very susceptible to spontaneous combustion, which is why the height of the stockpile must be in certain cases limited.”

Depending upon the customer, stockpile dimensions and design can vary. Two layouts are generally available: circular and longitudinal. “The dimension and design depend upon the purpose of the stockpile,” Prevedello said. “Space availability and possible future expansions are also critical factors.”

The application must also be considered: does the customer want to store the bulk material temporarily, then continuously feed it for further processing, like Knight Hawk? If so, then longitudinal
stockpiles are often the best choice. The irregular flow of bulk material arrives at the stockpile and can then be continuously introduced to the process. The stockpiles can also be extended, if necessary.

Once the layout of a coal stockpile has been decided, the next task is to stack the bulk material efficiently. For this, BEUMER Group provides components such as stackers.

“Depending upon their mobility, systems can be categorized into three groups,” Prevedello said. “The stacker can be stationary, travel on rails or be circular with endless movement. If the machine is circular with endless movement, it is positioned on a column in the center of the stockpile. On a conveyor bridge installed above the stockpile, the material is transported directly into the axis of rotation of the stacker and from there distributed centrally. Depending on the stacking method, the boom conveyor can be fixed, or it can be lifted and tilted.”

The stacking method of choice depends on whether the bulk material is only temporarily stored or if it also needs to be blended.

“For simple stockpiling without blending, we can use the ‘cone shell method’ where the stacker only moves up and down, without slewing,” Prevedello said. “The stacker design can therefore be much simpler.”

This method works for longitudinal as well as circular stockpiles. However, for blending bulk material, the chevron method is more suitable. In this case, the boom of the stacker starts in its lowest position. The first row of material is deposited in the center of the stockpile with the following rows layered on top of it. In longitudinal stockpiles, the stacker usually moves in a tilting and slewing motion, whereas in circular stockpiles, the stacker moves in a circulating and luffing motion.

Prevedello explained that the perfect system solution requires holistic optimization of the stacker and reclaimer. Reclaimers, such as side reclaimers or bucketwheels, remove the material as necessary and the best option for the customer again depends upon the stockpiling task at the end.

Side reclaimers work for both types of stockpiles — longitudinal or circular — because the bulk material can be reclaimed from the front or the side. When reclaiming from the side, scraper chains move the material on to a scraper chain using small side-to-side movements before it is transported further to the conveyor.

The advantage of front reclaiming is that material is reclaimed from the entire cross-sectional area. Bucketwheels are mainly used when the bulk material, especially in large quantities, needs to be blended.

Each operator has their own very specific requirements for stockpiling and stockyard machines. For instance, BEUMER engineers recently delivered a solution for a customer in the energy industry, which included several pipe conveyors and a ship loader. The system was tailor-made to withstand the violent gusts of wind that are often experienced at the site, and the steel structure was specially dimensioned.

Read more: www.beumergroup.com

A Digital Vision for the Entire System
Digitalization and electrification have been a key part of Voith Turbo’s growth and development strategy for some time, and 2021 will be no different.

“Concerning the range of products at Voith, we have years of experience when it comes to drive technology for various mining applications, including conveyors, crushers, armored face conveyors, bucket elevators, bucketwheel excavators, fans and blowers, mills, and stacker and reclaimers,” said Sebastian Steck, vice president for product management. Hydrodynamic Couplings at Voith Turbo. “Since Voith Turbo acquired ELIN Motoren, we now are able to even offer a bigger range of drive packages for mining.” Voith Turbo acquired ELIN Motoren GmbH, an Austrian manufacturer in the field of electric motors and generators, in April 2020. ELIN is active worldwide and supplies individualized solutions for various industrial applications, including mining.

In August, Voith Turbo also announced two new additions to its TurboBelt TPXL series of fill-controlled couplings. The range, which included 500 kW, 800 kW and 1,250 kW models, now boasts 315 kW and 2,500 kW versions, too. These combine hydrodynamics with intelligent control technology to further optimize the performance spectrum in challenging mining conditions.

“2020 saw further successful TurboBelt TPXL installations in Australia,” Steck added. “We further developed our CPC couplings for AFC’s for longwall mining in China, and Voith received the first order for BeltGenius. The technical acceptance on that is now closed.”

Voith’s BeltGenius product family is used for monitoring, benchmarking, and optimizing belt conveyors and conveyor systems. A key part of this is BeltGenius ERIC, which provides a digital twin of customer’s conveyor belts. The program processes sensor data in real time to calculate and com-
BeltGenius is used for monitoring, benchmarking and optimizing belt conveyors and conveyor systems. (Photo: Voith Turbo)

Voith Turbo has been successfully running a prototype of BeltGenius ERIC at a European mine for some time and, in September 2020, the project reached a milestone, by achieving all of its target metrics.

While 2020 was not without its challenges, Voith used the situation to further develop its remote training and support offering for customers in the mining space.

“The COVID-19 pandemic had impacts on our business, but due to our broad sectoral and geographical positioning as well as regional supply chains we have been able to endure the crisis relatively well,” Steck said. “We also saw some issues on the customer side e.g., delayed projects and limited travel activities, so we developed an online training.”

“Overall, in mining, we see a trend toward ‘man-less operations’ and therefore we need to collect and analyze data about each application. We see a gap for trained staff for maintenance and troubleshooting, so digital diagnostic capabilities are really important. The early detection of anomalies where operators can still intervene without unplanned downtime leads to higher productivity, and monitoring of safety factors can be used to optimize belt operation and avoid stoppages.

“Our vision is to become the ‘master of the drivetrain,’ so in addition to our core competence in hydrodynamics, we are developing further solutions to help them keep an eye on other conveyor system components.”

In line with this ambition, Voith Turbo is working hard on new digital solutions for mining applications. One example is the TurboGuide online app.

“The TurboGuide development started after receiving feedback from a customer survey,” Steck explained. “We saw the following pain points from customer side: manuals were not available or too complicated to understand, technical data about optimal operation of constant-fill coupling T type were not available, complicated spare parts buying processes, fewer trained personnel for maintenance and troubleshooting.

“With the TurboGuide smartphone app, the customer can scan the QR-code on their couplings and receive information about the coupling directly, as well as the relevant manuals and further details concerning trouble-shooting, animations and a Voith service contact.

“Voith Turbo will continue developing digital products for the mining industry, especially for belt conveyor applications,” Steck said. “For sure, we will release further products to support our customers in terms of conveyor performance and energy efficiency, too.”

Read more: https://voith.com/uk-en/industry-solutions/mining.html
**Taking Mineral Processing to the Next Level**

*Future requirements for improved recovery while simultaneously minimizing waste, emissions and energy consumption require a new generation of technologies*

Extracting metals from mined ores requires robust equipment, energy and water. Today, German suppliers are looking at ways to reduce those inputs through advanced separation techniques and machines that produce a finer grind with less energy. The ideal mineral processing plant of the future will use less energy and water. By better recovering metals from a preconcentrated feed, it will generate less waste.

**German-Russian Duo Harness HPGRs for Process Efficiency**

Over the past 40 years, the technology for processing ore using high-pressure grinding rolls (HPGRs) has steadily developed. After the successful introduction of HPGRs into the cement industry, this technology has also taken on an important role in the mining industry.

Köppern has played a key role in this. The group, which is headquartered in Hattingen, Germany, has more than 120 years of experience in manufacturing and operating roller presses for briquetting and compacting processes, as well as mineral and cement applications.

In May 2016, Köppern joined forces with JSC Stoilensky GOK (S-GOK), a subsidiary of the NLMK Group based in Novolipetsk, Russia, to commission the first HPGR for the crushing of ferruginous quartzite in Russia. The project was so successful that seven more machines were implemented over the following 18 months.

S-GOK uses HPGR technology alongside traditional cone crushers, upstream of its ball mills. As a result, the company has been able to increase the output of its plant by 12%-15%. This has boosted the production of iron-ore concentrate by 1 million metric tons (mt), to 16.6 million mt/y. In addition, S-GOK has seen significant reductions in its energy consumption and consumption of grinding media.

As a follow-up project, two more HPGRs are currently being installed at S-GOK for the regrinding of iron-ore concentrate. This will increase the productivity of the existing pelletizing plant, while at the same time improving the quality of the pellets produced.

Together, S-GOK and Köppern have applied state-of-the-art technology to an existing flowsheet and demonstrated a prime example of Russian-German cooperation on a complex project.

Read more: www.koeppern-international.com

**EnviroChemie Group’s Treatment Methods Improved by a Unique Add-on**

On a global scale, dwindling easy-to-mine gold deposits demand a change in technical solutions when it comes to marrying economical gold extraction with as little ecological impact as possible.

In addition to the risks associated with tailing dams, the management of cyanide, soluble cyanide complexes and thiocyanates, especially related to the impact sulphide minerals have on the consumption of reagents, is increasing in significance.

EnviroChemie Group’s plant engineering has more than 40 years of experience in designing treatment plants for industrial water and wastewater treatment as well as water recycling in the mining sector. The range of treatment methods includes oxidation, with ozone being a major part of the oxidation processes.

Ozone, in combination with classical gas dissolution techniques, is known to be effective for many applications, but is often still perceived as an expensive treatment process. However, ozone generators have improved a lot over the last 10 years, making ozone economically feasible for many different water and wastewater applications.

What if it were possible to make ozone even more effective and more economically feasible by adding a component that increases the gas mass transfer and enhances reaction rates?

EnviroChemie Group, with its group member up2e!, offers such a solution either as a retrofit or as a full-scale treatment. With the Roturi, up2e! extends the product portfolio of the EnviroChemie Group in all ozone applications. The Roturi offers a unique and highly efficient way of gaseous mass transfer, making ozone treatment the perfect answer for many challenges in the mining industry.

One example is the pre-oxidation of refractory ores with ozone for lowering cyanide consumption in the process and increasing the gold recovery rate. Another example is the oxidation of thiocyanate for the regeneration of cyanide.

Studies show an increase in gold recovery of 25% and 70%, and that ozone is an effective oxidant for cyanide and soluble cyanide complexes.

Tailored and ready to operate full-treatment plants as well as pilot plants for pre-evaluation are available for client’s looking for the best available oxidation technology in the mining sector.

Read more: www.envirochemie.com/en/sectors/mining-ore-processing/

**Steinert Supports Southern Africa With New Test Plant**

In October 2020, Steinert, a global leader in separation technologies for the mining and metals industries, established a new test center in Namibia to service its southern African client base. Area manag-

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Read more: www.envirochemie.com/en/sectors/mining-ore-processing/

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Read more: www.envirochemie.com/en/sectors/mining-ore-processing/
er, John Knouwds, discussed the new facility and the role ore sorting technology could play in the future of the mining industry.

“We needed to re-establish our test center in Africa,” Knouwds explained. “We were looking for a place to establish a plant, and one of our clients who we have a long relation with,” said ‘bring your machine so we can do tests and use the site to carry out tests for the rest of your clients in southern Africa.’

“So, we installed the plant at the Navachab Gold mine in Namibia, which is owned by QKR Namibia. The plant can test anything from 5 to 100 metric tons per hour (mt/h) depending upon the nature of the material. We’ve completed quite a few tests for various clients, and we’re also working to upgrade the mine’s ore sorting equipment based on their own test results.”

Steinert installed Navachab’s first two XRT sorters in 2016. Combined, they have a throughput of 200 mt/h and, having seen the benefit of the technology, Navachab is now working to expand its production.

When asked if the test facility would become a permanent arrangement, Knouwds said it would run until it is needed.

The plant features Steinert’s latest KSS XT I CLI 100 ore sorter. This includes an X-ray transmission (XRT) sensor, a color sensor, a laser sensor and an inductive sensor. The rocks run through the machine in a mono layer on a 1-meter-wide conveyor belt, and each particle is detected and analyzed individually by each sensor. The data generated is then processed, integrated and each rock is classified by the software. The inbuilt algorithms decide whether a rock should be ejected or sent for further processing based on its mineral content.

“Some applications require two or three sensors to get really accurate results and some only need to use one. This plant is set up to give us flexibility and to see which combination works best depending upon the geology and lithology of the rocks,” Knouwds said.

The beauty of the STEINERT KSS XT CLI 100 having four sensors is that it combines both penetrative and non-penetrative sensing technologies to create exceptional accuracy and flexibility. The XRT unit (penetrative technology) remains the primary sensor, analyzing the full composition of the rocks, while the laser, color and inductive sensors analyze their surface qualities.

Of course, this also cuts down operating costs (energy, water, reagents, etc.) significantly and allows the mine to run a completely dry process. Something that is hugely valuable in a water-scarce environment.

“There are several software programs you can set up with the sensors as well,” Knouwds said. “A client with a gold mine operation in Tanzania can call us to report that they’ve encountered a new challenge or technical problem. Provided they have internet connection, our engineers in Germany can immediately access their sorter data and develop new programs to help.

“The sensors can also be adjusted based on the data retrieved from the rocks. We’re running the same sorter, exactly the same unit, at both gold mines and coal mines. But we develop a different software programs for each application and teach the machine, which rocks are valuable to that operation and which are not.”

Because so much is dependent upon the software programs, Steinert’s data scientists play a key role; not only do they develop and train the necessary algorithms, but they also further develop the sensors to generate different quantities and types of data that might be helpful in interpretation.

Steinert is developing a new final-stage sorting algorithm for Navachab to increase the plant’s capacity and help reduce its losses.

“One of our client’s is of the opinion that ore sorting technology will become part of processing in every mine over the next 20 years,” said Knouwds confidently. “And seeing how fast the technology grows and the capabilities it delivers, I think it might even be faster than that.”

Read more: https://steinertglobal.com/mining/

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Köppern roller presses have been proven successful throughout the world in plants specializing in the cost-saving high pressure comminution of various ores like iron, copper, gold, diamond, molybdenum and lithium ore. The Köppern Hybridur® tires feature an extremely wear-resistant surface that provides enhanced roller protection when grinding abrasive ores.

Köppern – Quality made in Germany.

» State of the art HPGRs and wear protection
» Process technology know-how
» High plant availability
» Low maintenance cost

Pilot HPGR testing capabilities in Australia, Canada, Germany and Russia

For further information please contact
sales@koeppern.de

www.koeppern.de
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| **VDMA MINING SUPPLEMENT** |
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| **VDMA MINING SUPPLEMENT** |
| **2021** |

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* indicates full range of products.

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<th>Roadway driving/Heading</th>
<th>Roof support/Shaft &amp; roadways</th>
<th>Extraction (longwall)</th>
<th>Extraction (vein, room &amp; pillar mining)</th>
<th>Ventilation &amp; air-conditioning</th>
<th>Stowing</th>
<th>Extraction in open pits (continuous)</th>
<th>Extraction in open pits (truck/shovel)</th>
<th>Special equipment for open pits</th>
<th>Dewatering (underground &amp; open pit)</th>
<th>Blasting equipment</th>
<th>Conveying &amp; haulage underground</th>
<th>Shaft winding equipment</th>
<th>Winches &amp; hoists</th>
<th>Trackless underground vehicles</th>
<th>Control equipment</th>
<th>Power supply</th>
<th>Communication, navigation</th>
<th>Pneumatic &amp; hydraulic tools</th>
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### GERMAN VENDOR MATRIX

#### Shaft sinking
- Sandvik

#### Deep well drilling equipment
- Schmersal

#### Roadway driving/Heading
- Schäfer Technologie

#### Roof support/Shaft & roadways
- Schäfer Pumpen

#### Extraction (longwall)
- Schulte Strathaus

#### Extraction (vein, room & pillar mining)
- Schenck

#### Ventilation & air-conditioning
- Technik

#### Stowing
- Tüschen & Zimmermann

#### Extraction in open pits (continuous)
- Urao

#### Extraction in open pits (truck/shovel)
- Velco

#### Special equipment for open pits
- Voith

#### Dewatering (underground & open pit)
- WiB

#### Blasting equipment
- WIL GmbH

#### Conveying & haulage underground
- Wirosse

#### Shaft winding equipment
- Wienecke

#### Winches & hoists
- WGW

#### Trackless underground vehicles
- Willenbrock

#### Preparation plants
- Wittenberg

#### Crushers & mills
- Wippermann

#### Sizing equipment
- Würth

#### Sorting equipment
- Zettler

#### Dewatering, proportioning, mixing eq.
- Zollner

#### Briquetting & granulation equipment
- ZT

#### Dedusting, water treatment
- ZTV

#### Dewatering plant
- ZVIE

#### Coke oven plant equipment
- ZWIG

#### Continuous conveyor & components
- ZWIG

#### Feeding & withdrawal equipment
- Zwickenberg

#### Stockpile equipment
- Zwickel

#### Driving aggregates
- Züblin

#### Control equipment
- Züblin

#### Power supply
- Zeppelin

#### Communication, navigation
- Zeppelin

#### Pneumatic & hydraulic tools
- Zeppelin

#### Compressors
- Zeppelin

#### Accessories, wear parts
- Zeppelin

#### Mine safety
- Zeppelin

#### Services
- Zeppelin

#### Consulting/Engineering
- Zeppelin

#### Software
- Zeppelin
oddesse Pumpen- und Motorenfabrik GmbH
Am Pappelwald 12
39387 Oschersleben
Web: www.oddesse.de

Hermann Paus
Maschinenfabrik GmbH
Siemensstr. 1 - 9
48488 Emsbüren
Web: www.paus.de

PFISTER WAAGEN BILANCIAI GMBH
Linker Kreuthweg 9
86444 Affing-Mühlhausen
Web: www.pfisterwaagen.de

PFREUNDT GmbH
Robert-Bosch-Str. 5
46354 Südlohn
Web: www.pfreundt.de

PLARAD Maschinenfabrik Wagner GmbH & Co. KG
Birrenbachhöhe 17
53804 Much
Web: www.plarad.de

Pumpentechnik Erkrath GmbH + Co KG
Max-Planck-Str. 28
40699 Erkrath
Web: www.pumpentechnik-erkrath.de

Sandvik Mining and Construction Crushing Technology GmbH
Friedrich-Ebert-Str. 75
51429 Bergisch Gladbach
Web: www.sandvik.com

SCHADE Lagertechnik GmbH
Bruchstraße 1
45883 Gelsenkirchen
Web: www.schade-lager-technik.com

Schäfer Pumpen & Hydraulik GmbH
Henrichs-Allee 8
45527 Hattingen
Web: www.schaefer-ph.com

RWE Technology International GmbH
Stüttenweg 2
50935 Köln
Web: www.rweti.com

Schulte Strathaus GmbH & Co. KG
Fördertechnik - Dichtungssysteme
Runtestr. 42
59457 Werl
Web: www.schulte-strathaus.de

SEKA Umwelttechnik GmbH
Nordparkstr. 12
76829 Landau
Web: www.seka.gmbh

Schaeffler Technologies AG & CO. KG
Georg-Schäfer-Straße 30
97421 Schweinfurt
Web: www.schaeffler.de/rohstoffgewinnung_verarbeitung

SCHIENLE MAGNETTECHNIK
Schienle Magnettechnik GmbH
In Oberwiesen 3
88682 Salem-Neufrach
Web: www.schienle.de

SCHINTER GmbH
Widdersdorfer Str. 329 - 331
50933 Köln
Web: www.steinert.de

SCHULTE STRATHAUS LÜFT UND DICHTE
Schulte Strathaus GmbH & Co. KG
Fördertechnik - Dichtungssysteme
Runtestr. 42
59457 Werl
Web: www.schulte-strathaus.de

SEKA Umwelttechnik GmbH
Nordparkstr. 12
76829 Landau
Web: www.seka.gmbh

SCHMIDTMAUERS GAFA UND GEBÄUDEBAU
Schmidtmauer GmbH
Stückstraße 1
12569 Berlin
Web: www.schmidtmauer.de

SCHNITZER KÜHNL DMM
Schnitzer Kühl DMM GmbH
Bachmannstr. 1
33609 Lemgo
Web: www.schnitzer-kuehl-dmm.de

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