

ahead

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MAGAZINE FOR INDUSTRIAL AUTOMATION



INSIDE:

Metris technology

The ultimate enabler for operational success

ANDRITZ

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Double your plant insights

AUGMENTED REALITY CONTENT

To view videos in a more direct and lively way, we added augmented reality to several articles! **Download our ANDRITZ AR APP** on our website or in the AppStore/PlayStore!

SCAN THE MARKED PAGES AND EXPERIENCE THE ENHANCED CONTENT.





**METRIS technology,
the ultimate enabler
for operational
success.**

Welcome to the second edition of AHEAD Magazine for industrial automation.

The ANDRITZ GROUP has been known for many decades as a global machine manufacturing company with excellent process know-how for various industries, such as pulp and paper, power, hydro, metals, and separation. The combination of long-term domain knowledge with ANDRITZ's own automation technologies is the foundation on which we enhance all ANDRITZ deliveries with state-of-the-art automation solutions.

Solutions for distributed control systems, production optimization, autonomous operation, asset and maintenance management, simulation and digital twins, and cyber security are being delivered within one ANDRITZ digital platform – Metris UX.

ANDRITZ Automation is bundling its own Metris technologies and decades of experience in classic Automation, Electrification and Instrumentation (AEI). We serve our customers with 2000 automation experts globally.

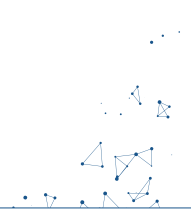
In our magazine, we will show you the main benefits of the combination of "classic" automation solutions with the latest IIoT Metris technology developments. Typical machine automation has focused for decades on classic DCS solutions. The Metris digitalization platform – Metris UX – expands the well-known DCS scope with technologies and solutions for production optimization, autonomous production, cyber security, process and product simulation as well as asset and maintenance management, all from a single source.

In this edition of AHEAD magazine, you'll find a fine selection of use cases and inspirations for your own machinery and production equipment – up to complete enterprise solutions.

Let's make the digitalization journey together!

Best regards,

A handwritten signature in black ink that reads "W. Sempur". The signature is written in a cursive, slightly slanted style.



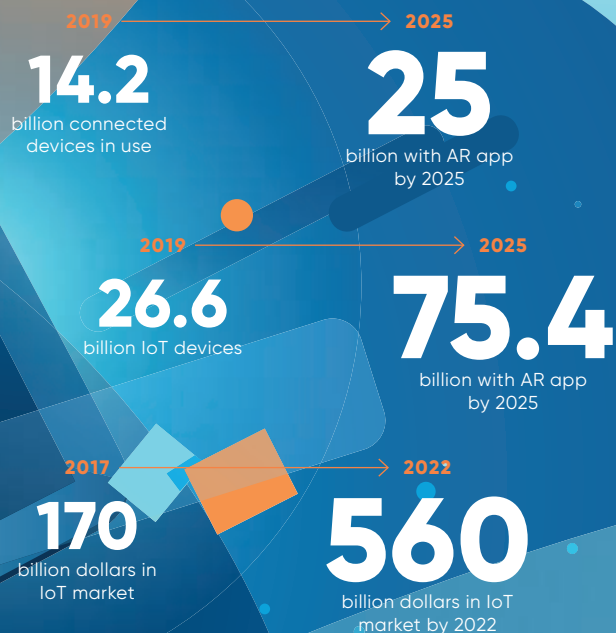
Planning ahead with Industry 4.0

It is all about the data

The fourth industrial revolution has nothing to do with the steam that powered machines in the first industrial revolution, nor the mass production that characterized the second one. But there is a connection to the computer-driven changes of the third revolution we have been part of in recent decades. And now, the fourth industrial revolution is building upon this with topics like connectivity, big data, artificial intelligence and a blurring of the boundaries between the physical, digital and biological worlds. As well as having a significant impact on our personal lives, it will transform production processes as smart factories improve efficiency and open up a range of exciting new possibilities.

PLANTING THE SEEDS OF INNOVATION

By embracing this revolution, or Industry 4.0 as it is also known, industry is reacting to customers' needs that call for new manufacturing processes within a smart interconnected environment – the Industrial Internet of Things (IIoT). Those who want to stay ahead must proactively integrate developments across the organization while simultaneously working closely with customers and suppliers. A clear strategic vision driven by performance helps to manage the huge disruption that goes hand in hand with digitalization. Seeing it as an opportunity for growth, progress and innovation will show how smart products and processes can be developed. Addressing Industry 4.0 will raise awareness of many crucial topics for sustainable and profitable, long-term operation.





The potential of Industry 4.0 and IIoT is monumental; it will redefine how we work and operate over the coming decades. It is re-inventing industry thanks to a huge array of innovations, including sensors, big data, digital twins, augmented reality, artificial intelligence, machine learning, 3D printing, and robotics. Underpinning it all is the crucial aspect of cybersecurity. Address that from the beginning and the future of IIoT promises to be a bright one.

FACTS

- 127 new IoT devices connect to the Internet every second
- 75% of organizations do not use the full potential of their IoT technology due to the lack of data scientists
- Digital transformation is a top strategic objective for 94% of executives
- Companies expect IoT and other digital technologies to improve efficiency by 12%
- In Germany, 91% of industrial/manufacturing businesses invest in "digital factories" that include IoT solutions
- IoT in manufacturing grew by 84% between 2016 and 2017, the highest increase in any industry

DIGITALIZATION

Digitalization means using digital technologies and digitized data to improve or transform business operations and/or business functions. It is the process of moving towards digital business by grasping value-producing opportunities that use digital technologies. In smart manufacturing, this can be achieved with a mix of autonomous, semi-autonomous and manual operations.

IIOT (INDUSTRIAL INTERNET OF THINGS)

Rapid innovation has led to increasing connections between the physical and the digital world. In manufacturing, instrumentation, sensors and other devices are being used in machinery and vehicles. In comparison with standard IoT solutions, industrial uses place greater focus on precise sensors and location-aware technologies with advanced controls and analytics. IIoT can massively improve connectivity, efficiency and scalability as well as saving time and costs for industrial organizations. And it will enable more efficient management of the entire supply chain as smart manufacturing is characterized by a high level of adaptability, intelligent automation, in-depth cybersecurity, and advanced human-machine interaction. The automotive segment and branches of industry like manufacturing and the energy sector are currently the biggest users of IIoT technologies, followed by the retail sector and health care.

BIG DATA

IIoT is creating and collecting more data than ever before. But data has no value unless it is structured in a way that enables it to be analyzed. Analyzing the data generates deeper insights into operating processes. Feeding larger and larger amounts of data to machine-learning models enables them to make increasingly more accurate predictions. In medicine for example, supercomputers draw upon millions of data points and studies to identify algorithms. Amongst other uses, machine learning helps to detect malignant tumors. A similar theory can be applied in manufacturing – potential malfunctions that could impact the profitability of an entire plant are identified, analyzed and optimized.

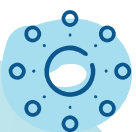


In 2020, each person will generate

1.7 megabytes of data per second



97.2% of organizations are investing in big data and AI



90% of digital data was created in the past two years

MACHINE LEARNING

Humans have trained machines to learn from the past by remembering data, studying it and identifying algorithms. By remembering patterns and repetitive data, the machine knows how to perform a specific task without the need for any explicit instructions. Machine learning algorithms are capable of resolving many everyday issues or specific problems, for example in manufacturing and engineering. Training the neural network is the key to machine learning, which is why data scientists take care of choosing suitable features to put the machine learning algorithms into productive use. Smart machines are not only faster, but they can also become smarter over time.

ARTIFICIAL INTELLIGENCE (AI)

Digitalization combined with artificial intelligence opens up enormous and exciting possibilities in many industries. The pace of the progress made is strong and this will lead to major changes in the interaction between human beings and machines in the next few years. This combination is becoming ever more present in our everyday lives – just think of using Alexa, reading about self-driving cars or knowing that AI makes the world more inclusive, e.g. with solutions that help blind people to identify groceries by scanning the bar code with an app. We are even able to beat a grandmaster at chess using an AI program. AI is part of our everyday lives in things that are commonly incorporated in various tools, like

e-mail spam filters, predictive Google search suggestions or finding the fastest way from A to B with the help of Google Maps. In manufacturing, digital twins – virtual copies of physical assets or products – use AI technology to collect real-time data from sensors in order to evaluate this data and simulate it in a virtual copy of the asset.

VIRTUAL REALITY AND AUGMENTED REALITY

Virtual reality (VR) has its origins in 1960s film making, but was first brought to the mass consumer market by the gaming industry before entering other areas like real estate and medicine. Unlike VR, the aim of augmented reality (AR) – also called mixed reality – is to bring the virtual object to the real world and integrate it. If you have already used face filters on Instagram, then you have experience of a very basic form of AR. In manufacturing and engineering, there are several AR approaches along the value chain. AR can assist with instructions for maintenance, training sessions or a simple display of relevant data to improve productivity, processes and operations, creating an end-to-end experience between the user and the machine or product.

Technology helps us make progress. But we need to ensure that we adopt the best of IIoT technologies to achieve positive changes, such as more efficient operations, time savings, innovative solutions and ways of making our everyday lives simpler. •

POSITIVE CHANGES WITH IIOT

- Connectivity and communication
- Fewer errors in operation
- Automation and control
- Predictive maintenance
- Time and cost savings
- Data collection and monitoring
- Greater efficiency and new capacities
- Cross-facility operations analysis
- Supply chain visibility
- Plant safety



Foresee Digitally

**How does ANDRITZ integrate the exciting
new possibilities that come with Industry 4.0?**

As a technology leader with extensive and long-term experience in supplying industrial measurement, control, and optimization solutions for various industries, ANDRITZ is combining its process and equipment expertise with the latest advancements in the digital era. The result of this powerful combination is Metris: a portfolio of ANDRITZ Digital Solutions.

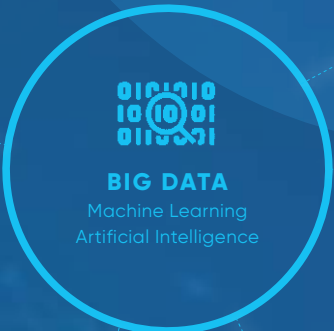


Metris

ANDRITZ Digital Solutions

Digitalization landscape united under Metris

For a number of years now, ANDRITZ has been helping customers by providing tailored and fully integrated digital solutions from a single source. This portfolio is extended and reinforced on a continuous basis, addressing the market's need for innovation and smart technology.



SINCE 2007

SINCE 2013

SINCE 2016

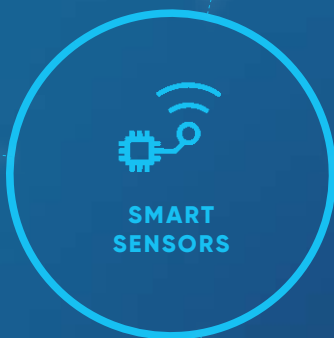
SINCE 2017

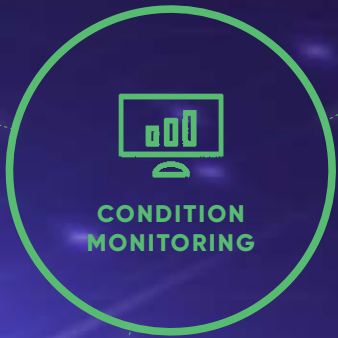
OPP
(Optimization of Process Performance)

Metris technology developments (e.g. LogScan)

Smart Service initiative

Metris brand





SINCE 2017

SINCE 2017

SINCE 2018

Ongoing collaboration with research institutes and universities

Scouting and investment in various startups and internal startup contests

Interdisciplinary co-development of IT & OT (Automation)



- TECHNOLOGIES
- SERVICES
- ENABLERS

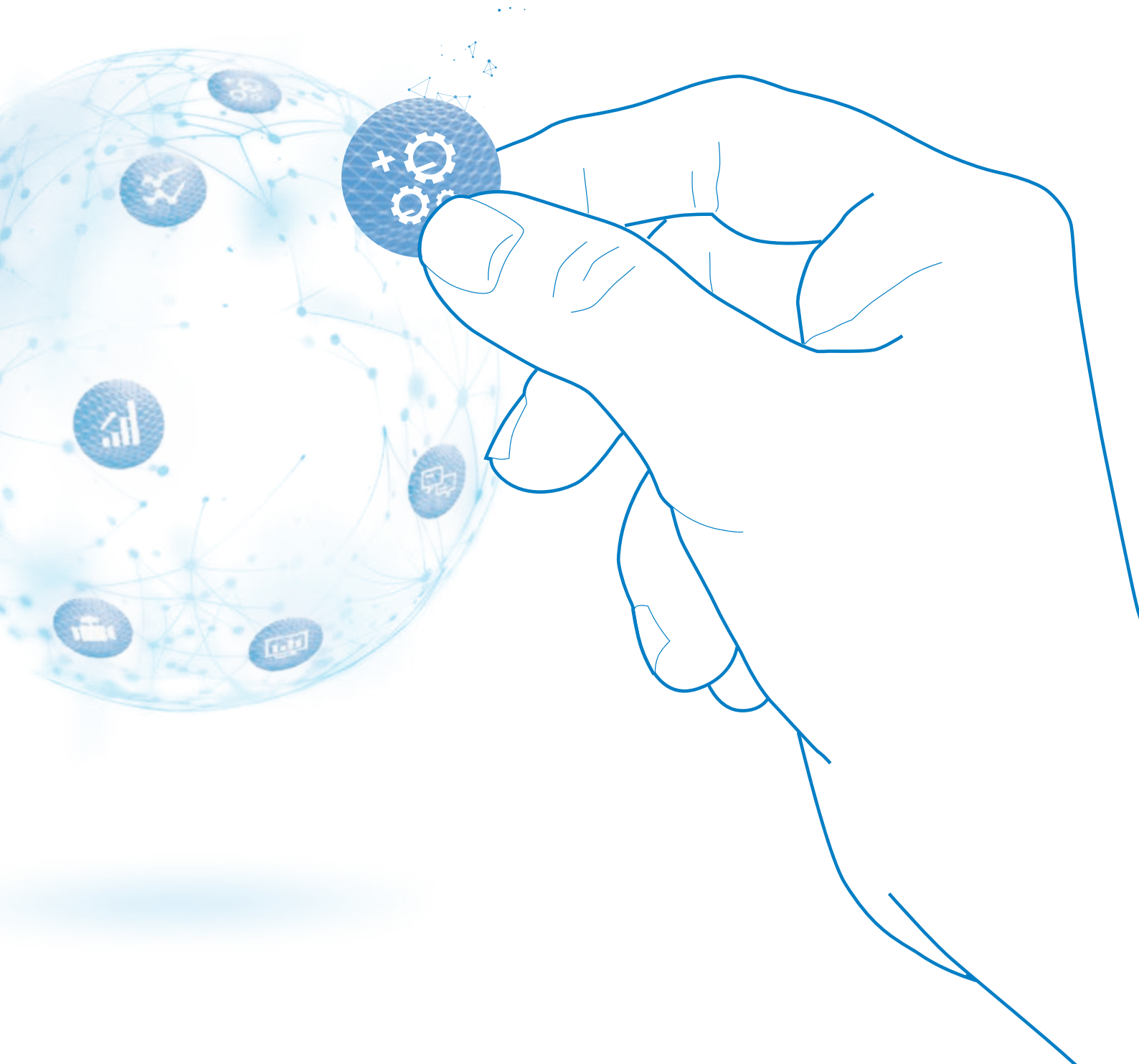
Metris

Plug-and-play digitalization platform for greater productivity

Metris UX is a cutting-edge solution for today's real world and tomorrow's ideal world that helps reduce costly downtime. It delivers vendor-independent automation for plants across their entire lifecycle.

In 1983, a young Steve Jobs took to the stage at a conference in the United States. The first Macintosh was due to be launched six months later and Jobs spoke with typical enthusiasm about the attributes of his new machine. But he also outlined a broader vision, one involving a digital distribution system; a record store for downloading software. It took another ten years for this vision to first be realized, and another 25 for it to reach the general public, but this was the dawn of the app store. **What does this have to do with engineering, you might be wondering? >**

UX



Well, a major source of frustration for plant operators is being locked into a single automation supplier with a control system that is difficult to upgrade. Customers want supplier standards and open platforms to make it easy to plug and play. They want to be able to quickly download new applications, like you do with a smartphone.

We understand. That is why we have developed the Metris UX Platform, a state-of-the-art digitalization platform that enables full functionality and support for industrial plants throughout their entire life cycle via a suite of applications. That support begins with concept development and definition of the system solution for the specific use case; then it moves into engineering, manufacturing, installation and commissioning, and continues with operation, maintenance and regular optimization. The result is greater productivity and a significant reduction in downtime.

METRIS UX: HOW IT WORKS

The Metris UX Platform combines artificial intelligence (AI) with smart-sensor condition monitoring, edge computing and cloud technologies. At its heart is an all-in-one database with enhanced AI capabilities. Traditionally, mills use a patchwork of protocols and independent databases for engineering, process con-

trol and maintenance that can often be incompatible. Metris UX focuses on integration and scalability, from single machines to entire factories. Complete data sets are stored either on the premises or in a cloud solution enabling full functionality.

With everything stored in a single database, the platform's AI can shine. It continually learns what questions are being asked, what information is needed (and when), and what actions are being taken to respond to changing process conditions. By recognizing patterns and identifying disruptions, it learns to predict future occurrences.

With Metris UX, the ultimate goal is to put around 80% of standard interactions on "autopilot" and provide expert guidance to less experienced operators and maintenance staff for the remaining 20%. The platform even offers 24/7 support in the form of Metris UX's virtual assistant, Sophia.

METRIS UX: WHAT IT DOES

There are currently more than 60 apps available within the Metris UX Platform. They cover a broad spectrum of tasks such as asset performance and management, maintenance, process analytics and optimization. Some of the key functionalities are explained beside. >





Easy-to-use Metris UX apps.

METRIS UX: THE ADVANTAGES

Besides delivering a host of technically advanced services, one of the most important assets of Metris UX is its intuitive usability. A highly graphical interface lets users quickly link sub-systems and functions. Simple, powerful Metris block language (MBL) enables mill staff to add or change functions easily without extensive programming expertise. And with Metris UX as the digital backbone, applications for plant performance and maintenance management form an integrated part to allow a quick and scalable solution, from single machines to entire smart factories.

This unique blend of flexibility, usability and technical ingenuity ultimately enables users to make their plant more productive, with a significant reduction in costly downtime.

RISK-BASED MAINTENANCE

Condition monitoring systems keep an eye on the machines within a plant. As well as monitoring real-time performance, they can learn about different operating patterns, enabling them to provide advanced fault detection and mill-wide predictive maintenance.

PRODUCTION AND PROCESS OPTIMIZATION

Metris OPP (Optimization of Process Performance) is a service that improves production systems. By analyzing huge amounts of data, potential is identified for optimization, and this data can also be used to predict economic impact.

CYBERSECURITY

An intuitive user interface reduces system integration and operational complexities. A strategic risk assessment advisory service is available to evaluate the effectiveness of organizational production, Industry 4.0 benefits and cyber resilience.

SIMULATION AND DIGITAL TWINS

ANDRITZ provides a true digital twin solution for various industries with its Metris Digital Twin solution. A unique feature is this solution's ability to combine continuous processes with discrete events (human characteristics and interventions). In this way, processes spanning the entire life cycle of a plant can be simulated.





Additional Q&A

Three questions for Gerhard Schiefer, Vice President of Global ANDRITZ Automation

What was the inspiration behind development of the Metris UX Platform?

Metris UX was developed for today's real world and tomorrow's ideal world. The real world recognizes that you already have sensors, field devices, PLCs, and a DCS in place and you can not afford to scrap them.

The ideal world opens the gateway to the new or improved functionality your mill needs that is totally vendor-independent. Metris UX plugs and plays in an open platform environment very easily.

What enables it to do this?

Metris UX can do this because of its software-based structure. In designing it, we were able to look forward instead of back at all the compatibility issues with legacy systems installed over the past 20 years.

We started afresh by choosing from the latest, most powerful and proven IT solutions.

What feedback have you had so far?

Extremely positive. Customers are screaming for supplier standards and open platforms – to tear down the legacy walls and make it easy to plug and play. There is a clear need in the pulp, paper and power industries for vendor-independent automation solutions that will help mills/plants to foresee digitally. ANDRITZ Automation is delivering these solutions from a single source.



Metris X

A key part of the Metris UX Platform is Metris X – the distributed control system developed by ANDRITZ to simplify operational complexity, lower project risk and improve plant performance. It integrates seamlessly with the platform's other apps available for production management and real-time plant simulation, condition monitoring, process optimization and life cycle management.

HOW DOES METRIS X WORK?

For classic plant automation applications, Metris X can be activated by simply adding two optional apps to the Metris UX Platform. This gives customers the freedom to select their preferred input/output module (I/O) and edge device supplier or, in brownfield renewable projects, the existing I/O modules that can be reused by Metris X.

“We took the opportunity to develop a new DCS virtually from scratch, free of legacy systems,” says Hermann Obermair, Senior Vice President at ANDRITZ Automation.

“Our DCS runs on any hardware, making us independent of large manufacturers and opening new doors for local sourcing in global business.”

Invisible threat

Increasingly sophisticated attacks mean no business can underestimate the importance of cybersecurity. Complex industrial control systems are no exception.

What are your company's most important assets? Data, whether it concerns employees, operations or suppliers, is undoubtedly among the most crucial. Which makes protecting that data an integral part of any business. By accessing valuable data, cyber criminals can threaten operations and steal valuable information. And in the age of big data, cloud storage, mobile devices and the Internet of Things, the sheer number of access points to safeguard can be overwhelming.

The complexity of the machinery and processes involved can make industrial plants a vulnerable target, particularly as they progress along the path of digital transformation, connecting information technology (IT) with operational technology (OT). Evaluating the risks for the many devices and then securing these systems can be a complex process. And as processes become increasingly inter-linked, businesses also need to be aware of the precautions taken by suppliers and customers. You are only as strong as your weakest link.

DISASTROUS CONSEQUENCES

The effects of a data breach can be disastrous. In 2014, hackers gained access to the industrial control system of a steel mill in Germany. They prevented the shutdown of a blast furnace, resulting in major damage to

the plant. And it is not just isolated incidents that pose a threat: In 2017, the WannaCry virus disrupted information systems at hospitals, banks, railways and car manufacturers in more than 100 countries.

Cybercrime can take many different forms, leading to manipulation or loss of data that can affect production and damage a company's performance and reputation. Cybersecurity seeks to protect the confidentiality, integrity and availability of data.

ANDRITZ UNDERSTANDS CYBERSECURITY

ANDRITZ knows about the importance of secure industrial operations and is constantly looking to enhance its growing cybersecurity solutions. "It means a lot to us to ensure reliable and safe growth of digital productivity," says Klaus Glatz, ANDRITZ Chief Digital Officer.

In December 2017, the company began a partnership with OTORIO, a leading cybersecurity provider for digital transformation. "As well as using their expertise to protect our own operations, we are also offering it to our customers and new customer groups," says Glatz.

CUSTOMIZED SOLUTIONS TO SUPPORT DIGITIZATION

Generic solutions have limited ability to prevent cyberattacks affecting the production

FACTS ABOUT CYBERCRIME

\$1.5 trillion

Cyberattacks cost businesses at least US\$1.5 trillion per year

67% increase

Attacks have increased by 67% in the past five years

floor. This is due to the inherent uniqueness of the OT environment. ANDRITZ is embedding OTORIO's innovative solutions in its market-leading products and services, ensuring every machine meets the highest standard of cybersecurity. Safe digitalization requires a holistic end-to-end approach, from the development phase to ongoing operations, which is why ANDRITZ and OTORIO have developed an extensive cybersecurity program ranging from advanced assessments and consulting services to the implementation of proven cybersecurity and risk management technologies.

OTORIO – WHAT YOU NEED TO KNOW

- **Founded in December 2017 as a partnership between the OTORIO management and ANDRITZ AG (majority share)**
- **Location: Tel Aviv, Israel**
- **Employees: 50+**
- **Business: Cybersecurity solutions for industrial manufacturing companies**



"The main challenge for the industries is to understand that

cybersecurity is not a purely technical issue. Although it has technical aspects, it should be treated as any other business risk – it should be identified, monitored, quantified, and continuously managed."

Daniel Bren, CEO OTORIO



"In a constantly changing threat environment, customized operational technology cybersecurity measures are an essential part of the automation development process,"

adds Klaus Glatz.

The advanced services ensure continuous, efficient and effective production alongside proprietary commercial data security. Ongoing risk monitoring and management is enabled by security orchestration, automation, and response (SOAR) machine power. Valuable additional tools are also provided, including a platform to coordinate all IT/OT security tasks, an offline platform that uncovers cyber risks resulting from the supply chain, and an encrypted and secure communication channel for accessing the OT network. •

43%

...of these attacks are targeted at middle-sized companies

14 seconds

On average, there is a ransomware attack every 14 seconds

Turning a shutdown into a pitstop

Like a finely tuned Formula One pit stop crew, ANDRITZ's Metris UX Platform helps industrial plant operators minimize shutdown times.

A key part of the platform is the Metris Planning App, which is already achieving remarkable shutdown efficiency results.



Every sport has a defining moment that can shape a match or a championship, and Formula One is no exception. In fact, in every race, a team knows there will be several of these moments: the pit stop. The faster and more efficient the stop, the greater the chance of success for the driver and his team. What used to be long and chaotic is now performed in just a couple of seconds – in finely tuned harmony between man and machine. Just like Formula One racing, continuous process mills face the same challenges year after year – how best to combine people and technologies, making stops quicker and more efficient to meet increasingly ambitious goals.

THE SHUTDOWN CHALLENGE

A plant shutdown may involve 25% of the annual maintenance budget over a period of eight to ten days. The number of tasks to be performed when processing more than 1,000 service orders is huge and will be executed by up to 1,500 people.

In Formula One, the pit stop crew trains relentlessly for those few seconds per race. Each member knows his/her job – and the car – inside out. For a mill, that might not be the case, as many of the team performing shutdown activities may not know the mill very well. Resuming production after a shutdown, and quickly ramping up to maximum performance, is a major challenge.

Like a Formula One pit stop, choosing the right moment to stop and shut down a plant for the best result is crucial. In addition, the intervals between shutdowns are changing. What was often 12 months in some regions now extends to 18 months. A further complicating factor is the increase in production volume in a single production line, which can now reach as much as two million t/a.

Consequently, each shutdown must be performed to a standard that will guarantee uninterrupted operation for the next cycle – revenue loss per day for a mill that has halted production can reach \$5 million. Progress visibility of a shutdown must be fast and accurate. Taking a day to compile the progress data of a shutdown is risky but, unfortunately, remains the reality for many mills.

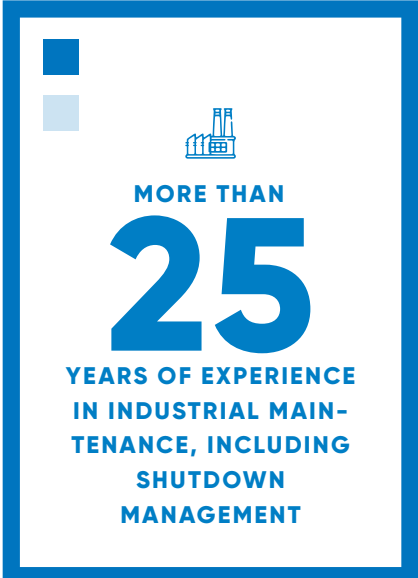
THE SOLUTION

In response to these challenges, ANDRITZ has developed a new application as part of its Metris UX Platform, which allows on-line monitoring of shutdown activities as a whole – the Metris Planning App.

The application combines the expertise of two divisions. One has more than 25 years of experience in industrial maintenance, including shutdown management; the other is responsible for optimizing pulp and paper mill processes and has more than 50 contracts in 15 countries – some operating for more than 12 years. This division is responsible for process optimization for over 34 million tons of annual production.

Luis Binotto, Senior Vice President of ANDRITZ Process Optimization, says,

“With regard to shutdowns, it is always important to ask yourself: ‘Do you measure your stop in days or in total loss of production? Is meeting the deadlines and budget enough to be successful?’ ANDRITZ’s expertise in shutdown management, combined with the Metris Planning App, sheds light upon these issues as it enables real-time process management such as mill monitoring during the distribution period.”



MORE THAN
25
YEARS OF EXPERIENCE
IN INDUSTRIAL MAINTENANCE,
INCLUDING
SHUTDOWN
MANAGEMENT



The Metris Planning App in use.



**PULP AND PAPER
MILL PROCESSES:
MORE THAN
50
CONTRACTS IN
15 COUNTRIES – SOME
OPERATING FOR MORE
THAN 12 YEARS**



**PROCESS
OPTIMIZATION
FOR OVER
34
MILLION
TONS OF
ANNUAL
PRODUCTION**



**Watch the Metris
Planning video.**
For further information
about the ANDRITZ
AR App see page 2.



HOW DOES IT WORK?

With the Metris Planning App, maintenance staff can go into the field with mobile devices that already contain a list of tasks to complete and equipment to check.

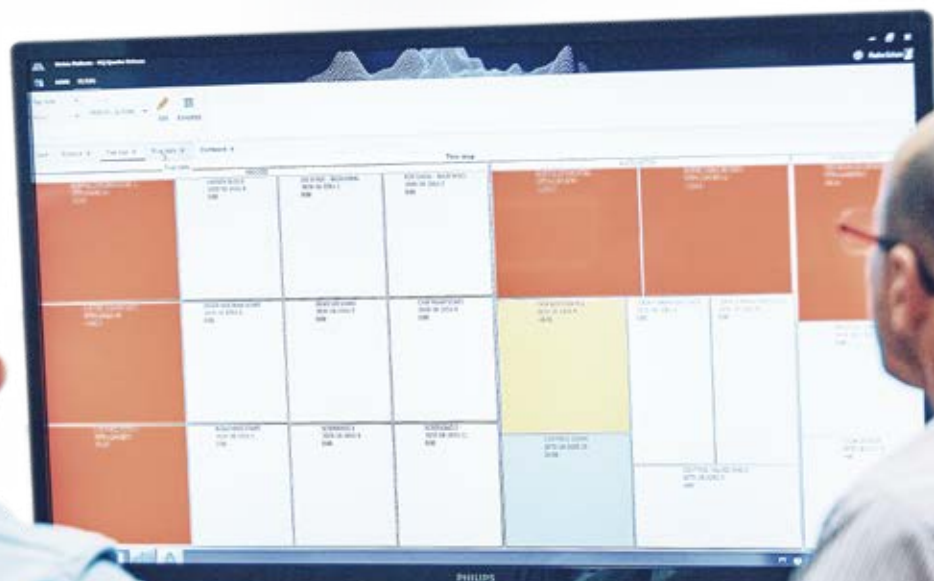
“These tasks can be completely personalized and dedicated to each area of the mill, such as the woodyard, fiberline or recovery boiler,” explains Cleiton Oliveira, ANDRITZ OPP Technology Coordinator. “When each piece of equipment is checked – a chip pump, for example – the dedicated box is ticked and the action uploaded. If the maintenance worker spots a problem or needs to add a comment, there is a facility to do this, including adding photos or even videos illustrating the status of the equipment. This information is then added to the Metris Planning App, giving a real-time report of exactly what is taking place around the mill.”

Tree map information about shutdown critically activities status.

The planning tool reduces the chance of making duplications or errors as well as eliminating the need for reams of paper and time spent manually inputting information into computers. It also allows real-time management of maintenance while the mill is running as well as during shutdowns. •

BENEFITS OF THIS SERVICE

- Proactive and anticipated action in case of deviations between planned and completed activities
- Online monitoring of the entire shutdown process
- Visualization of the factory as a whole, by area or discipline, allowing those responsible to act immediately
- Integration into other applications via the Metris UX Platform focused on asset performance, e.g. motors, valves, which enables faster diagnostics
- Reporting of problems by text, photo or video
- Specialized support from the Metris team



Metris Vibe – a health check for your plant

Metris Vibe – an
ANDRITZ sensor for
systematic con-
dition monitoring
of vibration and
temperature



To avoid unplanned plant shutdowns, it is important to know at an early stage when vital components need to be replaced or maintained. Condition monitoring enables operators to work proactively and keep shutdown time to a minimum.

Helping maximize productivity, efficiency and availability

Today's technology knows a lot about us – where we are, what we might be doing, how long we have been asleep, what we are watching and listening to. When this data is fed to a digital assistant, it can offer us a range of helpful functions and tips designed to make our lives easier, more efficient or healthier. The same goes for industry. Tracking devices can monitor and control a company's assets and plants, helping to improve performance with cyber secure processes.

This condition monitoring is comparable to a preventive medical check for human beings. Instead of a stethoscope, a sensor is used to feel and hear what a machine is doing. With

the aid of sensors and microphones, continuous vibrations and noises can be measured to detect anomalies. This constant monitoring of critical components enables proactive measures to be taken where necessary. The result: increased plant availability and cost savings in the long term.

All relevant information is displayed in a transparent way, helping maximize productivity, efficiency and availability. Even shutdowns can be planned more efficiently. Maintenance work that is planned and performed accordingly increases the service life of plant components, thus reducing the overall investment. The objective is to keep the plant healthy and performing well.



Small, wireless, and energy self-sufficient

Solution architecture: from the Metris Vibe sensor to the Metris UX Platform or the Metris Vibe App. The user can also, as an option, connect to the Metris Vibe Dashboard.



METRIS VIBE – THE ANDRITZ STETHOSCOPE

The new sensors that ANDRITZ has developed form the basis of effective and low-cost condition monitoring. Small, wireless, and energy self-sufficient with a service life of up to three years, the Metris Vibe sensors can be installed easily in large numbers at all the relevant points, providing a continual data stream on vibrations and temperature. The wireless capability enables this data to be captured at difficult-to-access machine parts.

With energy-saving Bluetooth technology, the data gathered is transferred to a gateway that sends the relevant information securely to the Metris server's condition monitoring app.

This data is then used to detect operational anomalies. The rotation frequency signals are analyzed with regard to their relative change in relation to each other and over time. The parameters are then evaluated and determined if they are in a normal or abnormal range. The user is able to recall the measuring results and status analyses using the condition monitoring app in the Metris UX Platform. Data can also be shared with other ANDRITZ solutions and applications within the Metris UX Platform to improve plant performance even further.

Additionally, the Metris Vibe App was released at the end of 2019. The customer can connect his or her smartphone to the sensor, display the data measured and export it to other applications. This makes it easy to keep an eye on the status of the machine at any time and react immediately in case there are any changes in the measurements.

THE VALUE OF PREDICTIVE MAINTENANCE

ANDRITZ has been offering a mill-wide risk-based maintenance forecast as part of process optimization contracts for some time. Integrating process and operating data, this forecast uses statistical methods to calculate the probability of a component malfunction – valuable information for maintenance planning.

In conjunction with the Metris Vibe sensors and the opportunities offered by machine learning, condition monitoring helps provide a holistic view of machine health. The integrative strategy of Metris products as part of ANDRITZ Digital Solutions enables seamless collaboration, helping to increase overall performance and achieve maximum plant availability. •

Patterns are detected and anomalies highlighted with an algorithm developed by ANDRITZ that uses the data measured; status analyses can be retrieved from the Metris UX Platform.



Digitalization is starting to change the industrial world



Intelligent Filter Press

From higher plant efficiency to preventive maintenance and increased profitability, digital innovation is bringing a variety of benefits to industrial operations. ANDRITZ has combined the power of smart sensors, big data analytics, and virtual and augmented reality to create Metris, a portfolio of digital industrial solutions. Within this portfolio, Metris addIQ control systems offer cutting-edge machine and process control for solid/liquid separation equipment and systems.

Metris technologies can be fully tailored to individual requirements and unite the physical and digital worlds, giving plant operators virtual access to ANDRITZ experts whenever they need them. Its automation solutions range from basic automated movement to enabling machines to recognize changes and imbalances within the process, which can help operators to then optimize operations.



Intelligent packages to improve the filter press – freely configurable to the customer's need.

- 1 METRIS addIQ LOAD CELLS
- 2 METRIS addIQ ACE FOR FILTER PRESSES



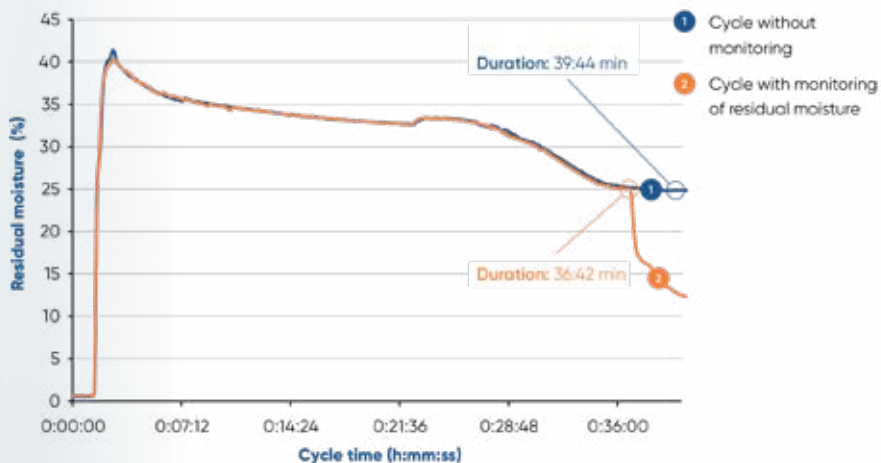
Watch the video. For further information about the ANDRITZ AR App see page 2.

By combining cutting-edge automation solutions with digitalization, Metris addIQ control systems are able to enhance availability, minimize production costs, increase overall equipment efficiency, and reduce the risk of operating errors, resulting in a high level of reliability.

COMBINING IIOT APPROACHES FOR AN INTELLIGENT FILTER PRESS

This innovative filtration solution – the ANDRITZ intelligent filter press – offers a wide range of benefits to plant operators. In many processes, the filter cake has to reach a certain defined residual moisture content. This is where the intelligence of the filter press and its Metris addIQ control system comes into play. A sensor embedded into the filter plates enables the moisture content in the cake to

be measured throughout the filtration cycle. This means that filtration can be stopped when the desired residual moisture level is reached, saving valuable cycle time and thus increasing production capacity. As a result, the plant can provide a more consistent residual moisture content in the filter cake.



Graphic illustrating cycle time reduction for an application in the mining and minerals industry



- 3 HYDRAULIC CLOSURE MONITORING
- 4 HYDRAULIC OIL QUALITY MONITORING
- 5 METRIS addIQ PISTON STROKE CONTROL
- 6 INTELLIGENT CLOTH WASHING
- 7 FILTRATE QUALITY MONITORING
- 8 FEED MONITORING
- 9 LENSER FILTER ELEMENT
- 10 METRIS SmartFILTERCLOTH

For example, by monitoring the relevant parameters, sensors connected to the Metris addIQ control system can determine when a cloth washing cycle should be triggered.

For an application in the mining and minerals industry, this already meant a cycle time reduction of 8%, as shown in the graph above. This combination of sensors and application-specific control algorithms embedded in the PLC logic is the key to reliable and optimized filter press operation in demanding applications. A sophisticated data analytics tool turns this into information that is relevant during operation. Furthermore, the intelligent filter press monitors the contamination in the filtrate or the hydraulic oil. Besides that, hydraulic and feed pressure as well as the feed temperature are measured and adjustments made where needed. Other values measured are provided by Metris addIQ Monitoring. Trends are collected and alerts issued when deviations from the ideal conditions are detected. Plant operators are informed 24/7 on the status of the filter press and on the key performance indicators.

HIGHEST PERFORMANCE – ALSO FOR MULTIPLE FILTER PRESS LINES

Maintaining an overview of the entire operation becomes a complex task when there are more than four filter presses in a plant. Metris addIQ ACE for filter presses is powered by artificial intelligence (AI) technology so that each machine in the plant is aware of what is happening throughout the entire operation. Metris addIQ ACE looks at operational management of the filter presses as a complete system and is thereby able to optimize ancillary equipment like feed pumps in order to avoid excess power consumption. It is also smart enough to make intelligent trade-offs between availability, filtration efficiency, and throughput. The efficiency of each fil-

ter press is taken into account, information from upstream tank and downstream operations are collected, and intelligent decisions are made automatically to maximize production throughput, minimize water consumption, and increase overall filtration efficiency. •

METRIS addIQ ACE BENEFITS

- Automated filter operation for several filter presses
- Maximized filtration throughput and plant efficiency
- Intelligent decision-making for water and power consumption
- Intelligent trade-offs between availability, filtration efficiency, and throughput



IDEAS Intelligent Control: prize-winning innovation

Following several rounds of intense assessment, including a “shark-tank”-style judgment panel, ANDRITZ’s **IDEAS Intelligent Control** was named winner of the Newmont Goldcorp #DisruptMining competition in March 2019, earning a \$1 million contract with the Canadian company. This came several months after ANDRITZ Automation’s Director of Innovation, Arthur Gooch, won ANDRITZ’s internal entrepreneurial Ventures competition with the innovative technology. ANDRITZ Ventures helps to fast-track and fund the development and commercialization of industry-leading innovations.

IDEAS Intelligent Control was developed with the assistance of entrepreneurial consultants, the ANDRITZ board, and CEO Wolfgang Leitner. It is engineered to create tangible value for ANDRITZ customers using reinforcement-learning artificial intelligence technology. The backbone of its success are three industry-proven components:

The \$1 million prize from the #DisruptMining competition is being used to fund two proof-of-concept projects for IDEAS Intelligent Control: one at a (currently confidential) pulp mill and the other at Newmont Goldcorp’s Pensaquito mine in Mexico. •



Left to right: David Garofalo, President and CEO, Goldcorp; Arthur Gooch, Director of Innovation, ANDRITZ; Sohail Nazari, Director of Digital Transformation, ANDRITZ; Rick Mercer, Master of Ceremonies

- 1. Artificial intelligence (AI) controller.** As used in many business and consumer applications such as Google, stock exchange trading, and inventory management. ANDRITZ partners with AI specialist PSIORI for this technology.
- 2. Reinforcement Learning.** The AI controller is trained by being rewarded for the right action or penalized for heading in the wrong direction.
- 3. IDEAS simulation models.** Pulp and paper and mineral processing companies have been using the IDEAS high-fidelity dynamic process simulation models for over 15 years in various applications, including piping and instrumentation validation, dynamic control system check-out, and operator training simulators.

Largest-ever automation order for ANDRITZ Hydro

Major modernization project for pump-generating plant at Washington's Grand Coulee Dam

On April 12, 2019, the United States Bureau of Reclamation awarded ANDRITZ the Grand Coulee John W. Keys III major automation modernization contract. The deal is a further vote of confidence for ANDRITZ, which has successfully been carrying out turbine and generator rehabilitations at the Grand Coulee Dam for over 20 years.

Located on the Columbia River in Washington, Grand Coulee Dam is the largest hydropower facility in the United States with 36 units in four powerhouses and a total capacity of 6,809 MW. The facility also supplies irrigation water to 2,700 km² of farmland.

Under this new contract, ANDRITZ will modernize the entire automation systems at the John W. Keys III pump-generating plant with new digital excitation systems, protection relays, unit controls and turbine governor systems for all six pumping units and pump-generating units. The new systems will enable completely automated control and monitoring processes.

ANDRITZ will also remove the existing systems including the cable and cable tray/raceways, as well as install, commission and test the new systems. The first outage will start in November 2020 and the last two units will be completed in March 2026.



This order is the largest ever automation order for ANDRITZ Hydro and represents the culmination of considerable work and cooperation between many areas within the company.

IMPORTANT TURBINE UPGRADE ORDER AT THIRD POWER PLANT

Currently, ANDRITZ Hydro USA is overhauling units G22, G23 and G24 at Grand Coulee's third power plant. The components are huge: The G22, G23 and G24

rotors are 18.74 meters in diameter and weigh 1,480 tons each, while the Francis runners are 9.9 meters in diameter, 5.5 meters high and weigh 430 tons. The output of each unit is 805 MW.

ANDRITZ has completed the rehabilitation of two units (PAC) ahead of schedule, achieving early completion bonuses, and is in the process of disassembling the last unit for its rehabilitation. •

GRAND COULEE DAM TECHNICAL DATA:

Total output: **6,809 MW**
Output scope: **623 MW**
Head: **90 m**
Speed: **200 rpm**
Voltage: **13.8**

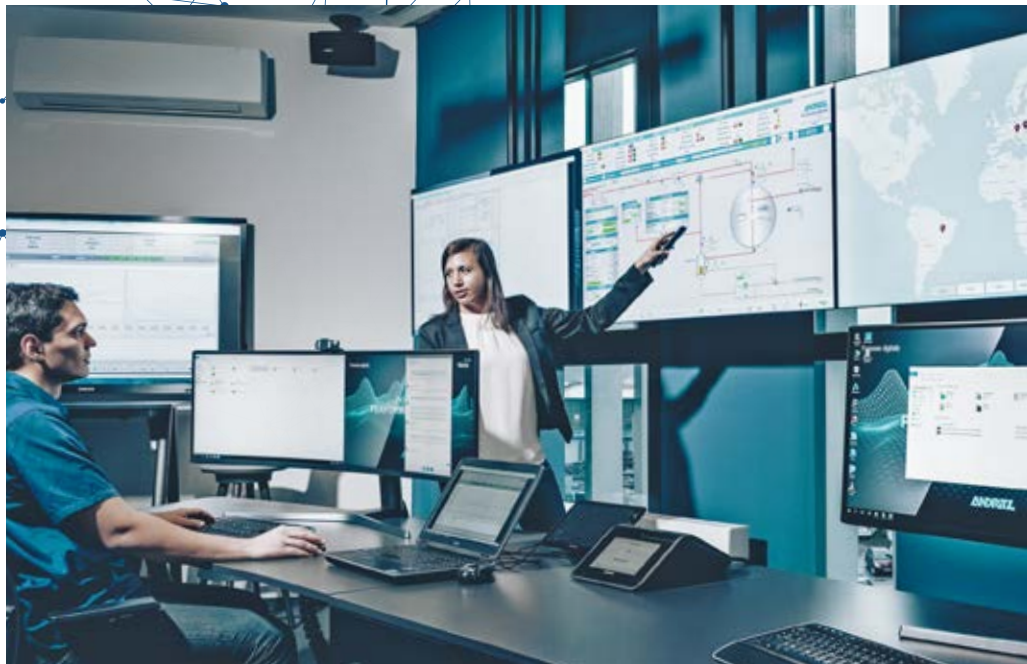


Grand Coulee,
Washington, USA



Experts on demand

The new Metris Performance Center now offers its remote support service to any industry, giving plant operators virtual access to ANDRITZ experts whenever they need it.



Real-time communication, using the latest online and AR tools, enables fast support by ANDRITZ experts.

Teleportation has not been invented yet. But modern IT technology does make it possible to have a virtual presence almost anywhere in the world, an ability ANDRITZ has leveraged for its new Metris Performance Center. "This is a step beyond a simple hotline or service line as we can now digitally connect our experts all over the world with the operators working at plant," says Gerhard Schiefer, Vice President of Global Automation at ANDRITZ. "With remote support we can see in real time what an operator sees on the dis-

tributed control system screen. By collaborating via this fast connection, we can troubleshoot, answer urgent questions on processes or equipment, or even make process adjustments on the fly."

And there is more. Combining remote support with augmented reality and decision wall tools enables Metris Performance Center experts to be virtually inside the plant; close communication and interaction can take place as if the different parties were in the same room. The Metris Performance Center uses secure remote access to connect directly to a plant's distributed control system (DCS) at one end and a Metris server at the other.

The Metris UX Platform is ANDRITZ's solution for optimization and decision support. It collects data in a secure way from the mill, analyzes it and converts it into useful information.

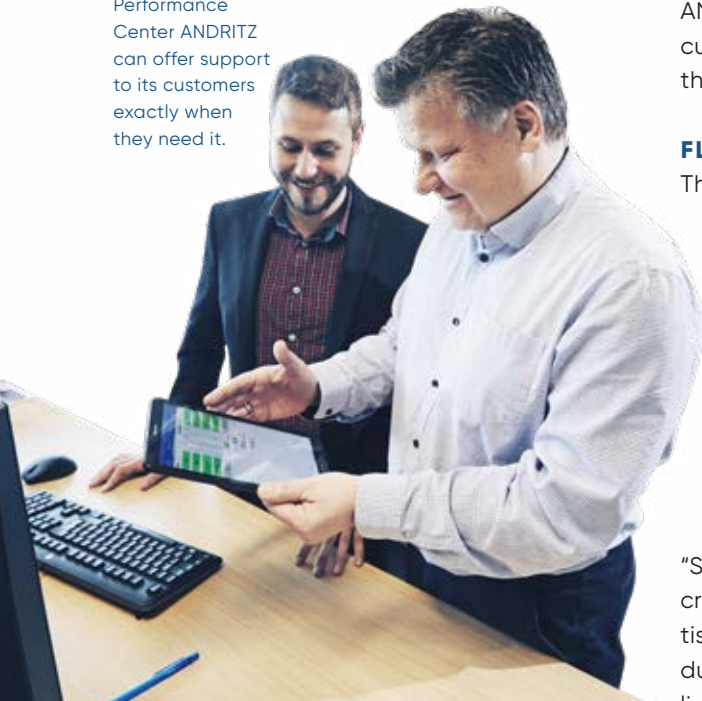


Visualizing this data then enables equipment and process experts to perform troubleshooting, optimization or upgrades so that a plant can operate more efficiently and profitably.

SAVING TIME AND MONEY

ANDRITZ wants to save customers time and money, although Gerhard Schiefer acknowledges that not everything is best handled remotely. "It is not our goal to replace the face-to-face relationship with each customer. But once the initial relationship is established, there are many occasions on which it makes sense to communicate remotely via a camera and shared visualization screens."

With the Metris Performance Center ANDRITZ can offer support to its customers exactly when they need it.



BENEFITS OF THE METRIS PERFORMANCE CENTER

- Direct and secure customer contact using the latest communication and augmented reality tools
- Optimization of Process Performance (Metris OPP) for process and loop tuning, big data analysis, and machine learning applications
- Start-up support
- Support in implementing new control strategies
- Remote assistance in resolving process or equipment issues
- Training for mill specialists

Plant personnel such as operators, supervisors, or maintenance and technical workers can communicate directly with ANDRITZ experts at the Metris Performance Center. Many times, especially during a start-up, ANDRITZ start-up engineers on site can rely on technical backup from specialists at the Performance Center.

Klaus Blechinger, Vice President of the Tissue Group at ANDRITZ, cites a recent example during a tissue machine start-up at Vajda Papír in Hungary. "Following a question about drying performance, Performance Center personnel quickly located an ANDRITZ Yankee specialist at the company headquarters. Within a few minutes, the ANDRITZ start-up engineer on site was discussing data over a shared DCS screen with the in-house ANDRITZ process expert."

FLEXIBILITY AS A SERVICE

This flexibility is a real benefit for both sides, as Mikhael Iaronka Menezes, a member of the Metris OPP team that provides process optimization for complete plants, explains. "Our experts can assist in starting up a new installation in China, for example, and diagnose a stock-on, stock-off guiding issue with a mill in Brazil at the same time. All from a central location."

"Strong service and customer support are critical," adds Klaus Blechinger. "Paper and tissue mills are actively optimizing while reducing costs, which is a key benefit of digitalization. By providing digital support via the Metris Performance Center, we are offering a service to our customers exactly when and where they need it."

The new Metris Performance Centers are available to each ANDRITZ customer worldwide. The network of plants is growing each week as operators learn about this latest offering in the area of digitalization and Industrial Internet of Things (IIoT) solutions.

"Digitalization plays a major role in business today," says Gerhard Schiefer. •

"We want to create digital assets that are tailored to a customer's preferences for on-site as well as remote assistance."

Gerhard Schiefer,
Vice President of Global
Automation at ANDRITZ



Watch the video.
For further information
about the ANDRITZ
AR App see page 2.

Online and anywhere: ANDRITZ cares for your spares

ANDRITZ is committed to providing its customers with faster and more efficient digital service. The launch of its online Metris Spare Parts Catalog two years ago plays a major role here. We look back over its road to success and forward to an even more closely integrated digital future.

We undertook a number of detailed investigations to develop a convincing tool that fosters our mission to digitally support our customers, while simultaneously structuring and improving our own internal processes."

Josef Haintz,
Program Manager
Smart Service

TRANSFORMING CUSTOMER TOUCHPOINTS

A few clicks and then simply wait for delivery: Online shopping has revolutionized private retailing in recent years, making it faster, easier and more efficient. Increasingly, it is making its mark in the industrial environment, too. For some time now, ANDRITZ has been digitalizing its products, services and machines with its innovative Metris solutions. At an early stage of this process, the company recognized the potential benefits digital technology could bring to the processes of quotation and spare part sales – both major customer touchpoints.

RAPID DIGITAL PROGRESS

To verify the demand for this change, ANDRITZ conducted a survey on customers across Europe. The response highlighted not only the importance of digital services, but also the desire for additional features like immediate assistance via remote support, or predictive maintenance notifications.

This is why ANDRITZ decided to create a single digital sphere of activity for internal and external partners: a shared online platform with access to a wide range of service modules and real-time interaction.

One of these service modules is the Metris Spare Parts Catalog, which offers the convenience

of online shopping to ANDRITZ's business partners. The tool benefits customers along the entire value chain, with high levels of transparency and traceability as well as rapid part selection, quotations and order processing.

In October 2016, ANDRITZ launched a group-wide smart services initiative. Employees worked with external partners to set up an ambitious schedule for the prototype of the Spare Parts Catalog with basic functions for areas in which spare and wear parts play an important role. Within three-and-a-half months, they had developed a minimum viable product serving around 100 machines; in less than one year, the team went live with an internal product including 2,600 machines – a status that other companies had taken three years to reach.



Josef Haintz presents the Metris Customer Care portal and the benefits of the integrated Metris Spare Parts Catalog at the 2019 Hannover Messe. Search functions, 2D drawings, 3D models and process flow sheets make choosing the right spare part(s) a piece of cake.



REFINING THE PRODUCT

The premise of the Metris Spare Parts Catalog was simple: users log in, select a machine and the respective spare parts they need, place them in the shopping cart and receive a quotation generated automatically in the ANDRITZ SAP system, including prices and delivery time.

An in-house trial run enabled further improvements to the system, especially in terms of user management, equipment and customer data quality, and usability in the selection and order process.

INTERNAL AND EXTERNAL BENEFITS

ANDRITZ introduced the Metris Spare Parts Catalog to selected customers at the beginning of 2018. "We undertook a number of detailed investigations to develop a convincing tool that fosters our mission to digitally

support our customers, while simultaneously structuring and improving our own internal processes," explains Josef Haintz, Program Manager Smart Service. Daily training and feedback from internal and external users are necessary to evolve such disruptive tools and make them successful.

The result is a comprehensive but easy-to-use instrument. "The shop interface is very user-friendly and was developed to suit all our customer needs," says Josef Haintz. "Due to the high level of individualization, the customer sees only his own plant, processes and all the related ANDRITZ machines in 2D drawings or 3D models. The right items can be identified easily, either in the drawings or models or in the spare parts list linked to them. Both the drawings and the models are highlighted upon parts selection."



Watch the video.
For further information about the ANDRITZ AR App see page 2.

But there are many more advantages to the catalog than simply identifying parts more easily. These include a comprehensive, transparent view of the history and status at any time, from enquiry to purchase order; the ability to select customized spare part packages for regular service work; and access to operating manuals and other useful documents.

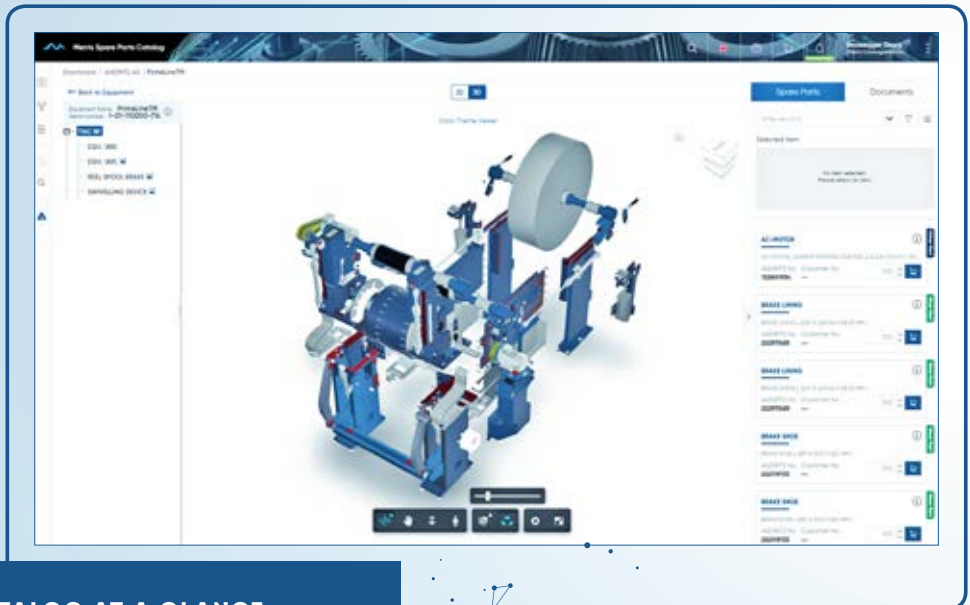
SPEED IS CRUCIAL

Above all else, it is important to submit a quotation promptly – speed is one of the main success factors in spare parts business. The future goal is to submit an approved offer for standard components by e-mail within a maximum of 24 hours – and even include the services of a technician in accordance with schedules and availability. This factor should enable ANDRITZ to predict and better target the personnel resources and meet the service slots available at customers' machines.

Constant improvements to the Metris Spare Parts Catalog enhance the usability and flow of information between partners. The link between ANDRITZ's SAP system and the customer's ERP system enables the online catalog to be fully integrated into customers' standard purchasing processes.

WHAT IS NEXT?

For ANDRITZ, the next steps include the coordination of all other digital service modules. Having a single point of entry for the customers will support and enhance services both internally and for the customers. Join ANDRITZ on this exciting journey into the digital future. •



METRIS SPARE PARTS CATALOG AT A GLANCE

- Easy access to customer-specific spare and wear parts
- Customer-specific dashboard with customers' own plants and equipment
- Interactive identification of parts via 2D drawings or 3D models linked to parts list
- Customized spare part kits and maintenance packages
- Viewing of machine manuals and as-built documentation
- History of orders for fast repeat purchases
- Shopping cart with "add" and "remove" function
- Tracking of quotation and order status
- ANDRITZ stock information and material number
- Integration into customer's ERP system possible
- ANDRITZ key contact with call-back function to answer any queries

UPCOMING HIGHLIGHTS

- Checklists of parts required for next planned maintenance
- Offline part selection as well as preparation of requests and orders via mobile app
- Part identification based on P&I diagrams on equipment and plant level
- Generic ANDRITZ wear parts offered for non-ANDRITZ machines
- Purchase-and-pay function to speed up the delivery of standard spare parts

BY 2022, OVER TWO-THIRDS OF COMPANIES THAT HAVE IMPLEMENTED IOT WILL HAVE DEPLOYED AT LEAST ONE DIGITAL TWIN IN PRODUCTION.

D I G I T A L

Digital Twin

WHAT IS A DIGITAL TWIN?

A precise digital replica of something in the real world – a process, machine, factory or even an entire city. Internet of Things (IoT) sensors gather data from the physical world and send it to computers to reconstruct. The digital twin is continuously updated to mirror the state of its physical counterpart.

WHAT ARE THE BENEFITS?

Creating a digital twin gives a deeper understanding of real-time processes. It offers valuable insights into how to improve efficiency and product quality or reduce maintenance and waste. Digital twins also enable virtual support, without an engineer having to be on site. Experiments can be carried out with much less risk and a lot more return on investment.

WHERE DOES THE CONCEPT COME FROM?

The concept of ‘pairing’ goes back to early space travel, when NASA built analogue models on the ground to monitor and modify spacecraft that were thousands of miles above the earth. As computer power increased, these models became digital. The term digital twin was attributed to University of Michigan’s Michael Grieves in 2002, but didn’t become more commonly used until the widespread adoption of IoT technology.

DIGITAL TWIN FACTS AND FIGURES

- 13% of organizations implementing IoT projects already use digital twins, while 62% are either in the process of establishing digital twin use or plan to do so.
- By 2022, over two-thirds of companies that have implemented IoT will have deployed at least one digital twin in production.

DIGITAL TWIN EXAMPLES

Digital twin technology is being applied in a wide variety of uses:

- In Formula One racing, every millisecond counts. Digital twins offer valuable insights into how to maximize a car’s performance.
- IoT sensors and digital twin technology are enabling farmers to improve crop yield, reduce wastage and cut fertilizer use.
- 3DEXPERIENCE City is a digital twin of Singapore. It has enabled the city-state to improve energy consumption, fine-tune traffic flows and advise shops on opening hours.
- The UK wants to create a digital twin of the entire country’s infrastructure to help it handle issues like climate change, population changes and energy consumption. This mammoth task could take decades to complete.

ENHANCE OPERATIONS WITH DIGITAL TWIN TECHNOLOGY

Double your plant insights



Digital twin technology uses real plant data to provide highly accurate process insights. This enables operators to make better and more proactive decisions.

Is the information on your human-machine interface (HMI) enough to run the plant at optimal conditions? Do your key process variables have accurate online measurements? If not, how would you gain these additional insights to make well-informed operational decisions? Metris Digital Twin technology provides answers to all these questions. In its quest to apply these technologies to industrial processes, ANDRITZ has recently customized Metris Digital Twin applications for the pulp & paper, and mineral processing industry sectors.

DIGITAL TWIN FOR THE EVAPORATION PLANT is designed to help process and operations teams by using field inputs to optimize online mass and energy balance. This principles-based simulation solution derives many critical process parameters like heat transfer efficiencies, fouling analysis, optimal washing frequency and quality of each wash. In addition, it provides reconciled data for many vital process parameters like Delta T BPR, Solid % for each effect, and guidance on maximum allowable plant capacity.

DIGITAL TWIN FOR THE WASHING PLANT

offers real-time solutions for the mass and energy balance of brown-stock and pre-bleach washers, as well as the O₂ delignification circuit. The principles-based model calculates critical factors like washing efficiency, Norden efficiency factor, displacement ratio, and soda loss to capture the effectiveness of the washing process. Moreover, the model provides predictions for pre-bleach Kappa and estimates for optimal chemical dosage in delignification towers to guide users towards best possible washer operation.

RECAUST DIGITAL TWIN predicts and warns operators of possible plant malfunctions like over- and under-liming. It also predicts critical operator actions such as white liquor filter washing, set points for G/L ratio and optimal slaker temperature to achieve highest causticizing efficiency. The application offers guidelines for inventory management by advising optimal production set points, and digital twin delivers data reconciliation for process instruments like density, temperature and flow transmitters. Digital twin also functions as a virtual sensor for hard-to-measure parameters such as density at critical locations like the slaker, each causticizer, white liquor filter or lime mud filter. The use of virtual instruments can save customers money by eliminating the high installation and maintenance costs of physical instruments.

In the mineral processing industry, **METRIS DIGITAL TWIN FOR OVERLAND CONVEYOR** provides a comprehensive overview of the material transport process. Using input from the live plant, the simulation model can offer reliable early warning systems against such disruptions capacity over-utilization, belt slip, roller jam or belt tear. The result is significantly reduced conveyor downtime and maintenance cost, thus increasing operational safety and equipment lifecycle. The digital twin also provides reconciled data and soft sensor readings for weightometers, and a dynamic loading profile across the length of the conveyor. The application can be extended to a network of conveyors to maximize overall utilization safely and reliably. •

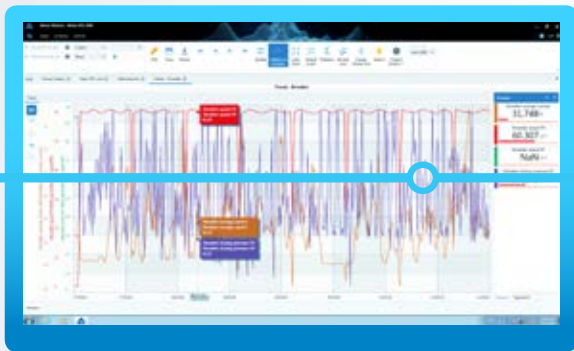
METRIS DIGITAL TWIN TECHNOLOGY

- Solution strategy based on necessary and reliable inputs
- Solution based on live mass and energy balance
- Design equations solved concurrently with accurate thermodynamics
- Predictions based on current plant status with built-in disturbances
- Solution provides numerous virtual measurements without physical instruments
- Solution is developed and supported by process and simulation experts

**One
step
ahead
in the
recycling
industry**



A highly competitive market inspires innovative solutions providing additional value for clients in the recycling sector.



It was a first for ANDRITZ and its customer and a landmark in refuse-derived fuel production. The July 2019 installation of an FRX3000 at SRP Sekundärrohstoffe in Pöchlarn, Austria, is perhaps the first time a pre-shredder has been used to process high-caloric input material down to 35 mm particles for use in cement plants.

Now, SRP and ANDRITZ are working to bring this application to the next level, further improving energy efficiency. In cooperation with ANDRITZ Automation, ANDRITZ Recycling is bringing new product features to its customers, offering competitive advantages in Industrial Internet of Things and digitization. To this end, it has implemented the company's Metris UX Platform at the SRP plant and customized it for a single unit application.

This innovative approach enables ANDRITZ Recycling to offer a completely new user experience and more comprehensive product support. At the SRP plant, Metris software was pre-configured during final acceptance testing at the ANDRITZ workshop before delivery. This enables immediate assistance with smart documentation via the myEquipment app, better commissioning support, data analytics and machine monitoring with Metris Vibe, process monitoring, as well as automatic daily report generation. A direct link was also implemented from the Metris UX Platform to the Metris Spare Parts Catalog.

The project is the first major step in combining the power of Metris solutions with a single-unit application to achieve higher machine availability and significant customer value. •

REDUCING HARMFUL EMISSIONS WITH

Machine learning



ANDRITZ Metals combines industry knowledge with state-of-the-art technology. In a recent pilot project, ANDRITZ Metals showed that artificial intelligence (AI) can estimate the concentration of nitrogen oxide (NO_x) at the outlet of a DeNO_x emission reduction system. This is the first step towards automated predictive injection that only injects the amount of ammonia needed, thus achieving more efficient operation.

WHAT IS THE DENOX SYSTEM?

The DeNOx system reduces harmful nitrogen oxide emissions from a steel plant. An exhaust draws the crude gas fumes into the DeNOx system, where selective catalytic reduction reduces the NOx content by up to 90%. Excellent process efficiency is essential in maximizing the environmental benefits while ensuring optimal operating costs, reagent consumption and catalyst lifetime.

HOW DOES MACHINE LEARNING IMPROVE EFFICIENCY?

Machine learning has various capabilities that allow highly automated efficiency. It can predict future outcomes; give recommendations for future actions; and make and revise decisions based on their success rates.

For the DeNOx system, the most important value to predict is the future NOx concentration at its outlet. To do this, a virtual sensor collects process parameters from the unit itself and the pickling line. This data can then be used to measure the NOx concentration in real-time, replacing the actual analyzer. By analyzing historical data, the AI can derive patterns and "learn" using data-based modeling and advanced mathematics, enabling it to estimate future changes in NOx concentration.

The next step towards full automation is the development of machine learning with the ability to give recommendations for more challenging control tasks. To do so, the technology's predictions of current and future NOx concentration have to be combined with a process control system. Successful integration into existing systems requires expertise in the process and operations of a specific unit. With enough historical data, AI can control and stabilize operation of the plant, accurately recommending successful actions and taking weak factors and hidden dependencies into account. These abilities mean the technology can even be used in complex, less well-understood processes or if physical models are hard to create and maintain.

DeNOx AI significantly reduces the ecological impact of the industry.

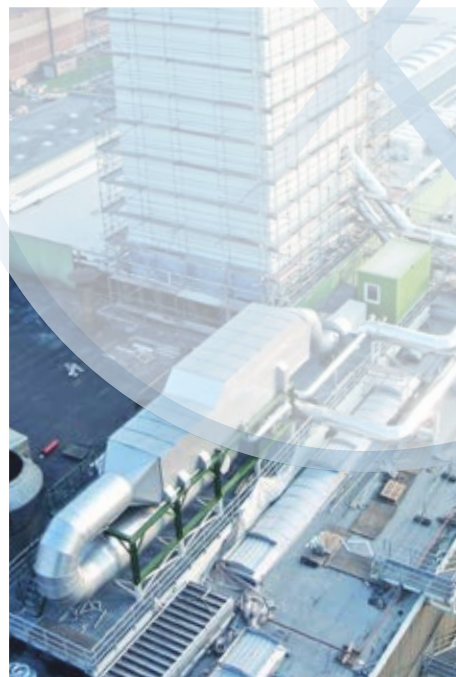
The most advanced AI would be able to take decisions concerning the data that is gathered and analyzed in the previous steps. Developing AI with these capabilities would finally create an automated injection system that optimizes the ammonia injection process without NOx overshooting or ammonia slip – when ammonia passes through the system unreacted. **It is the first step in a journey towards the autonomous plant.**

WHAT ARE THE BENEFITS OF AI PROCESS CONTROL?

- Minimize ecological impact of the industry
- Efficiently control and stabilize plant operation
- Minimize downtimes
- Optimization of operating costs
- Prolong equipment lifetime

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