

SPECTRUM

In just nine
days // 08

Smart Bleaching
at Suzano // 24

Two very special
customers // 38

METRIS

DryCo

Montes
del Plata / 20

Contents

- 05 Management Message
- 06 News
- 08 In Just Nine Days // Papierfabrik Adolf Jass
- 10 Measuring Alkali Levels // Performance Boosters
- 14 A health check for your plant // Metris Vibe
- 17 Planning ahead // Industry 4.0
- 20 Drying Line Performance // Metris DryQ MdP
- 24 Smart Bleaching // Suzano
- 28 Picture this... // Metris AVA
- 31 Value Added Products at Pulp Mills // MCC
- 32 A Day in the Life of // Franz Harrer
- 38 Two Very Special Customers // Schönbrunn Zoo
- 32 More From Less // Äänekoski
- 46 Two Top New Concepts // TechNews
- 50 Upgraded Performance // TechNews
- 54 On Schedule for the Next Phase // Arauco
- 57 Health & Safety: COVID-19 // HSE Column
- 58 Orders & Start-ups
- 60 Did You Know That...

Metris DryQ: STRENGTHENING DRYING LINE PERFORMANCE

GABRIEL MACHADO
Director Fiberline
Montes del Plata

"We now have a drying line that is performing in a much more stable and efficient way."

Cover Story // 20

AUGMENTED REALITY CONTENT

To view videos, illustrations and picture galleries 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.





Dedicated People for Dedicated Solutions

ANDRITZ is at the forefront of supplying top technology to the global pulp industry, not only for the biggest and highest capacity mills, but also innovative solutions that get to the very heart of all the processes involved to create successful operations – no matter what the size.

Added to these significant deliveries and orders, ANDRITZ also recently received the Final Acceptance Certificate for another world's largest; this time for a chemi-thermo-mechanical pulping system for Jiangsu Bohui Paper Industry in Yancheng, Dafeng, China.

Our operations in Finland have solutions for the chemical pulp- ing and bioenergy industries in particular, and even during these challenging times all our ANDRITZ sites and offices here have been busy working on full order books.

We are pleased to have had a record intake of orders last year for all our sites in Finland. Our workshops in Varkaus, specializing in boilers, and in Savonlinna, for DD Washers and other fiberline and white liquor plant products, are at full production. In fact, we have had to increase our workforce to keep up with the orders.



NEW TECHNOLOGIES MAKING A REAL DIFFERENCE

But this is not only about bigger and higher capacity. We have also made major progress in reducing start-up times as well as reducing chemical, water, power, and raw material consumption. A lot of these improvements have been made due to the ongoing develop- ment of our equipment and processes as well as the successful implementation of digitalization via our Metris platform. Our customers are finding that Metris solutions are making a big difference when it comes to availability, reliability, performance, and maximizing efficien- cies all around at pulp mills.

The dedication and team spirit among our ANDRITZ specialists also extends to our R&D teams who have been

This is a good indicator that the pulp and paper industries – far from being old fashioned and declining businesses – are actu- ally very attractive industries for people to enter into. And really, it's the people that make the difference in this industry; we are fortunate at ANDRITZ to have a very dedicated and motivated work force who are keen on their work and operate with excel- lent team spirit at all our locations.

successfully creating and building new technologies that allow our customers to also maximize the products that can be made from sidestreams at their mills. Such products include, for exam- ple, purified biomethanol as produced in Södra's Mönsterås mill. This development will allow companies to enter into completely new markets by supplying high-quality bio-products, thus increasing the added value achieved from the mills.

This dedication and team spirit are showing some impressive results; from our locations in Finland, ANDRITZ has been at the forefront in delivering some of the latest world records in terms of size. From Oki's massive recovery boiler, 60% larger than the next one down, to Suzano's Horizonte II, the largest fiberline in the world. We are also pleased to have recently received an order from UPM for its Taurus project in Uruguay that will become the largest single line fiberline in the world.

And in this issue you can read about new ANDRITZ technology for the production of MCC from the pulp mill process. A-Con- Crystal™ continuous technology is a patented technology that again opens up a whole new world of opportunity to enter the rapidly growing market for MCC in pharmaceuticals, food, and animal feed markets.

We hope you enjoy this issue of SPECTRUM!

Yours sincerely,

Kari Tuominen

President & CEO, ANDRITZ Oy

SPECTRUM is published by:
ANDRITZ AG
Stattegger Strasse 18, 8045 Graz, Austria
Phone: +43 (316) 6902 0
E-Mail: spectrum@andritz.com
Editor-in-Chief: Björn Hansen
bjoern.hansen@andritz.com
Project Director: Carina Weissensteiner
carina.weissensteiner@andritz.com
Editorial Consultant:
Mark Rushton, mark@editorialservicesdirect.com
Editorial Board:
Aline Gomes, Gudrun Hadolt-Rostek,
Minna Heinonen, Laurent Jallat, Silvia Weissl,

Sonja Kainulainen, Pirjo Nousjoki, Dietmar Scherer,
Saskia Schwab, Ursula Suppanen,
Manuela Wagner, Elisabeth Wolfond
Contributing Writers:
Robert Pühr, Mark Rushton, Clemens Mann
Contributing Photographers & Providers:
Lars Behrendt, Croce & Wir, Riku Isohella,
Johannes Kraxner, Christopher Rausch,
Guido Senger, Adolfo Vera, Thomas Wedderwille,
Daniel Zupanc, Arauco, Montes del Plata,
Södra Mönsterås, Suzano Imperatriz
Layout & Design:
INTOUCH Werbeagentur und
Internetagentur, Austria

General information and copyright:
SPECTRUM is published in three languages;
English, Chinese, and Russian.
Copyright © ANDRITZ AG 2020. All rights reserved.
No part of this publication may be reproduced
without permission of the publisher. Due to
legal considerations, we must inform you that
ANDRITZ AG processes your data for the purpose
of informing you about the ANDRITZ GROUP and
its activities. Find out more details about our
privacy policy and your rights on our website:
andritz.com/privacy. You can easily unsubscribe
from receiving printed SPECTRUM magazine
here: andritz.com/unsubscribe/spectrum.



NEWS

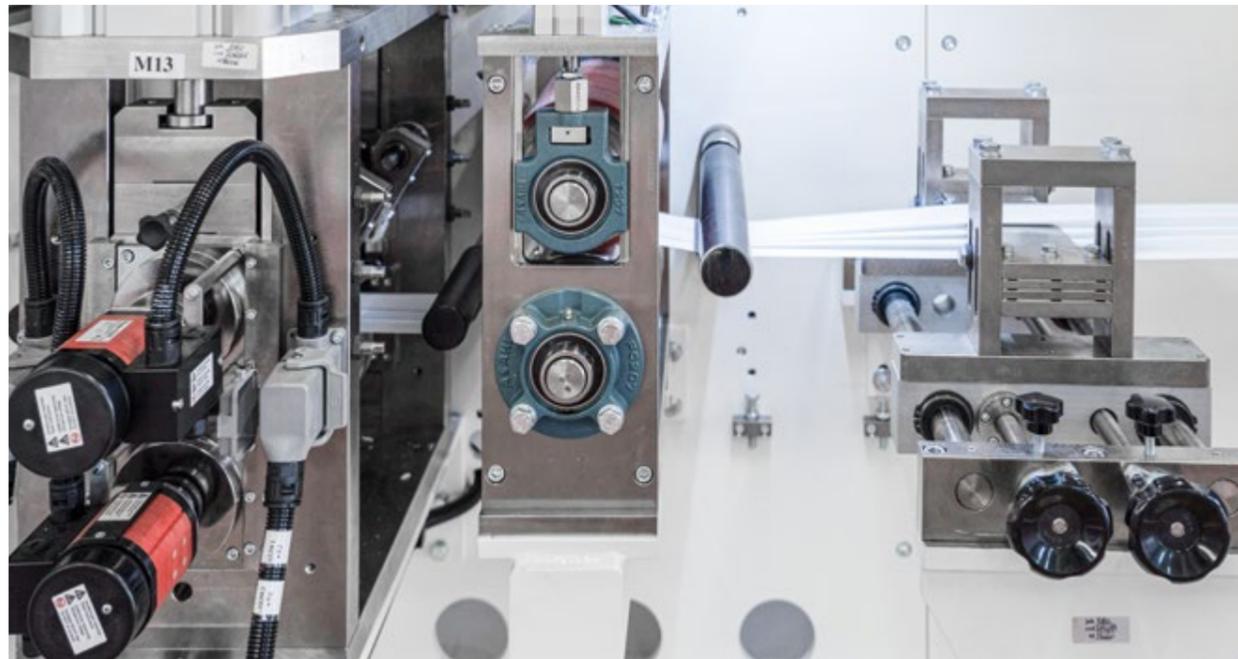
High-speed converting lines for the production of face masks and respiratory masks

ANDRITZ Diatec, part of the ANDRITZ Group, has developed fully automatic, high-speed face mask converting lines for the production of disposable face masks for surgical/medical applications. The new lines will also produce high-quality respiratory masks, such as duckbill and flat fold respirators.

The new ANDRITZ D-Tech Face Mask and Respiratory Mask lines can be customized to produce and laminate three or more layers of fabrics (spunbond, meltblown, thermo-bonded nonwovens and others) and ensures the highest quality and hygienic standards.

Customers benefit from a fully automated production line including complete ultrasonic technology, a facility to include printing systems, and an interface to the automatic packaging machine. Moreover, there are different packaging options available – products can be packaged in bags by an automatic flow pack machine or packed in cardboard boxes by an automatic cartoner.

For further information, visit our ANDRITZ D-Tech website: andritz.com/convert-face-mask



ANDRITZ acquires Enviroburners

ANDRITZ has acquired the Finnish company Enviroburners Oy, which designs and manufactures advanced industrial burner solutions for energy production and environmental protection.

The company was established in the mid-1970s, and has been a trusted sub-supplier of ANDRITZ for decades.

The acquisition includes all of Enviroburners' intellectual property rights, technical expertise, tools, systems, and inventory. The company supplies industrial burners, burner upgrade parts, and services that strengthen ANDRITZ's self-sustainability and reliability in the area of burners, and will provide growth possibilities especially in environmental protection applications where hazardous materials are burned in order to produce new raw materials such as complicated Non-Condensable Gas (NCG) systems combined with sulfuric acid production, wood powder burning to replace fossil fuel usage in lime kilns, and methanol and turpentine combustion in recovery boilers and many more.

The Enviroburners organization will be fully integrated into the ANDRITZ Pulp & Paper organization. Enviroburners is located in Vantaa, Finland.

For further information, visit our Enviroburners website: andritz.com/enviroburners



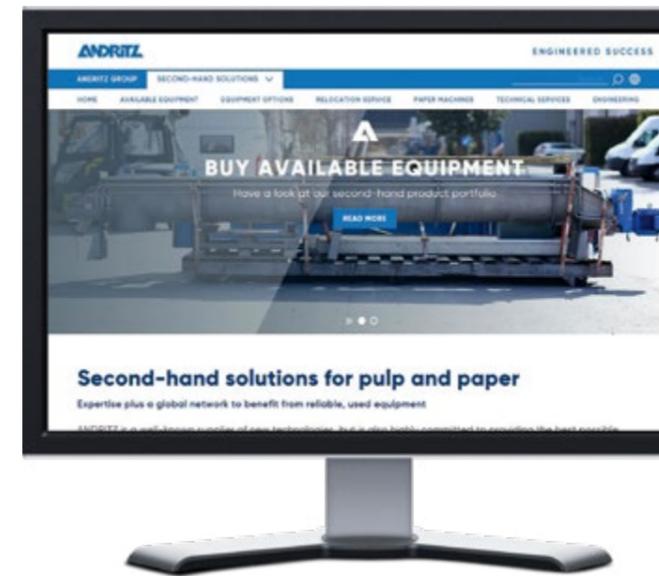
New online platform for second-hand solutions

ANDRITZ is a well-known supplier of new technology, but is also highly committed to providing the best possible support to those customers who are investigating or rethinking production options by integrating used equipment in their pulp and paper mills. Significant savings in valuable resources and investment costs are the striking benefits of second-hand solutions. But how to minimize risk?

"There is a large pool of proven, reliable and high-quality, used technology available. Being a full-line supplier, manufacturer, service partner, and top player in the pulp and paper industry for decades, ANDRITZ has the expertise and experience to use this enormous potential to best possible benefit in projects that will save resources as well as costs," says Johannes Hessenberger, Senior Sales Manager for Second-hand Solutions at ANDRITZ.

In order to provide a central point of contact, ANDRITZ recently published a second-hand online platform for those who are...

- searching for the best used equipment or complete line
- interested in related topics such as re-use concepts, audits and investment studies, plant transfers, full-scope technical services, engineering capabilities, etc.
- searching for an experienced partner to sell used machinery



For further information, visit the new ANDRITZ Second-hand website and browse through our current offerings: andritz.com/secondhand-pp

From shutdown to top-quality paper IN JUST NINE DAYS!

ANDRITZ is fully aware of what downtime means to its customers in the paper and board industry – however, to keep ahead in a competitive environment, rebuilding, updating, and refurbishing equipment is essential. The secret is to plan well in advance, shut down quickly, get the work done fast, and then be up and running again as soon as possible.

Family run German containerboard producer Papierfabrik Adolf Jass has come a long way since it was founded in 1960 when it made just 12 tonnes of paper a day. It is now a thriving business with two mills, Fulda in Hesse and Rudolstadt/Schwarza in Thuringia, producing some 1 million tonnes of top-quality containerboard from 100% recycled fiber.

As one of the leading producers of containerboard in Germany, the management at the company is well aware that good quality products demand only the best production equipment. After some years of demanding performance on its PM4 test liner machine at its Fulda mill, it was recognized that it was time for a complete rebuild of the headbox that had become heavily corroded.

The machine itself has a width of 5.5 m and a design speed of 800 m/min, producing some 250,000 tonnes of 150–300 g/m² testliner per year.

REBUILD SPECIALISTS SPRANG INTO ACTION

There was no immediate need for action, but as long-term operation with high equipment

availability was no longer guaranteed, the customer decided upon a well-coordinated, well-planned overhaul project for this highly critical equipment.

ANDRITZ was contracted to carry out the rebuild of the headbox in December 2019 and the task had to be done as quickly as possible as the overhaul was scheduled to be completed after only nine days.

With the clock ticking, ANDRITZ first began work on removing the headbox from the machine and transporting it 700 km to its workshop in Graz, Austria. On its arrival the service specialists in Graz sprang into action to completely disassemble the headbox, sandblast and paint all the steel parts, clean the stainless steel and bronze parts with a ceramic blast, plane and grind the slice and apron lip, and refurbish all the actuators used to adjust the profile.

Some new elements were also added, including a new headbox table made of stainless steel to replace the corroded one.

After the flurry of activity in Graz, which also included the assembling and adjusting of all



Before headbox overhaul



After headbox overhaul



View video footage of this report in our augmented reality App!

FOR FURTHER INFORMATION SEE PAGE 3

The virtually new headbox back in operation

the components, the virtually new headbox was then transported back to the mill by truck, installed on PM4, and put back into operation. The machine began producing high-quality testliner almost immediately – after just nine days!

“ANDRITZ succeeded our high expectations regarding the ambitious time schedule as well as the professional project handling. Right after the start-up, we were able to produce top-quality paper,” says Michael Habeck, Technical Director, Papierfabrik Adolf Jass.

CONTACT

Johannes Kraxner
johannes.kraxner@andritz.com

ANDRITZ HIGH PERFORMANCE HEADBOX OVERHAUL

Over time, headbox performance deteriorates as the forces of corrosion, damage to the slice and apron lips, wear on adjustable components, and defects in the heating channels take their toll. When this happens, sheet quality and operational safety can be impacted. The decision then becomes “replace” or “recondition”?

A COST-EFFECTIVE ALTERNATIVE TO REPLACEMENT

ANDRITZ offers an annual service to inspect, recondition and, when necessary, rebuild your headbox to restore performance, extending the lifetime of your initial capital investment.

RESTORE SHEET PROFILE

Headboxes for tissue, paper, and board machines work in very demanding environments, including heat, moisture, and vibration. By installing new heating channels, repairing or entirely replacing the slice and apron lips, exchanging various worn-out elements, and conducting final precise adjustment of all of these components, a stable sheet profile can be restored, thereby enhancing performance, extending lifetime and improving sheet quality.

OPERATIONAL SAFETY FOR A LONG PRODUCTION PERIOD

Heavily corroded parts, for instance the rear panel and the apron body, can lead to unsafe operation or unscheduled shutdowns. If such damage is detected during our annual service, the parts are replaced to ensure operational safety. Routine service checks on your paper machine should translate to high production, stable MD and CD profiles, and operational safety, ANDRITZ headbox reconditioning service is for all brands of headboxes. Reconditioning requires not only an intimate knowledge of the equipment, but also a deep understanding of the process. During inspection, each component must be evaluated to determine whether it can still be used or should be rebuilt or replaced.

SERVICE HIGHLIGHT – LIP REPAIR

Since any damage to the slice or apron lip, even the smallest scratches, will have a negative impact on MD and CD sheet profiles, ANDRITZ offers a lip repair service as an alternative to costly replacements. Specialists will perform all the operations, for example leveling, planing, grinding, shaping, and deburring, to bring the slice and apron lips back to specifications. These operations can be performed directly on-site in the mill or in our Graz workshops, depending on the extent of the damage.

MEASURING AND MANAGING DIGESTER ALKALI LEVELS

Reliable measurements from inside the digester

ANDRITZ has teamed up with Savcor, a Finnish technology provider specializing in the use of electrochemistry for corrosion prevention and structural health monitoring, and have together developed a novel method to measure alkali levels inside the digester.

At the moment, the only way to measure and monitor residual alkali levels from the digester is from side streams, which include circulation flows. These measurements not only give a late reading, but they also only provide an average reading as it is only a sample that may contain many discharge points. ANDRITZ, with its expert knowledge of the cooking process, and Savcor with its advanced sensor technology, have developed a completely new way to control the digester and cooking process. The system is suitable for both continuous and batch cooking.

During the cooking process, residual alkali strength fluctuates with changes in chip composition due to wood species, moisture, and concentration of cooking chemicals. The new measurement method is based on electrochemistry, measuring the rate of selected electrochemical reactions occurring on the probe surface. With the correct measurement parameters, the reaction rate correlates with alkali concentration and temperature. The temperature effect can be calibrated by measuring the temperature at the tip of each probe, giving additional information of variation inside the digester. The output values of each probe are alkali concentration (g/l) and temperature.

ENVIRONMENTAL BENEFITS

The new measurement technology enables more efficient methods to control the digester and the cooking process. The system is expandable so the mill could start with a smaller amount of sensors and then later add additional sensors based on the results obtained from the measurements. This means mills can start with a smaller investment and build up as the results help to improve digester performance.

MANY BENEFITS

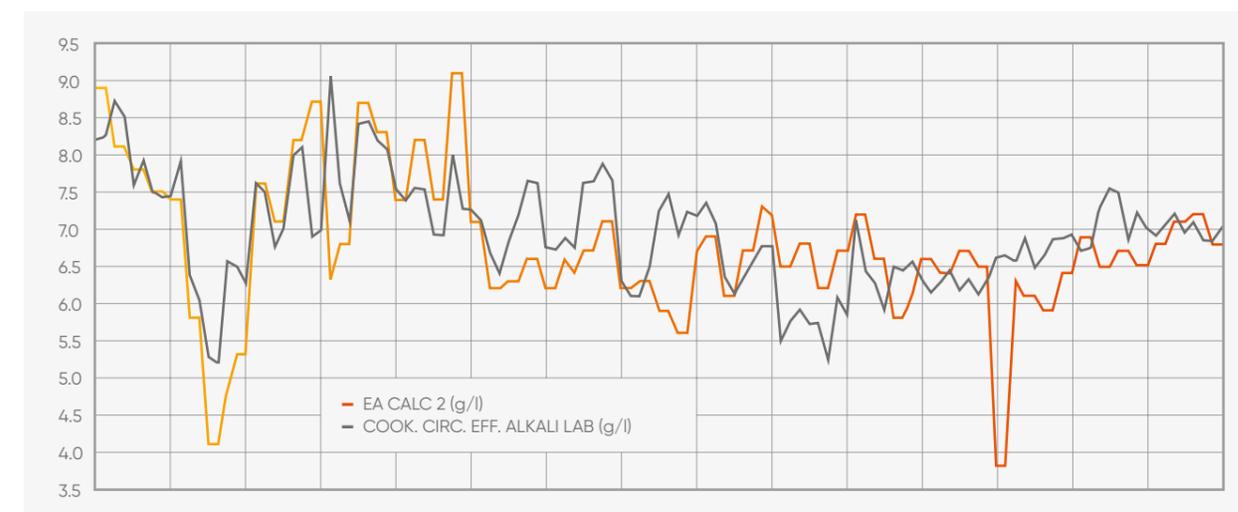
Measurement directly from the digester brings many benefits:

- When measuring on-line there is no delay between the measurement and the result. When lab analysis is needed to verify the result, there may be several hours delay between the sampling and the result from the lab. Added to this, lab results are usually only available during day-time hours.
- By placing several sensors inside the digester, it is possible to create an alkali profile that indicates how the liquors (and chips) are moving inside the digester and how the cooking process is developing over time.
- The cooking process can be controlled based on the measured alkali values → optimal dosing of chemicals. The operators tend to overdose just to be on the safe side, which leads to additional costs and typically decreased quality.
- The cooking process is not stable because the wood chip moisture and size normally varies. The chip quality varies from winter to summer and the harvesting area may also have an effect on how the chips can be cooked. The quality and the strength of the cooking liquor (WL) is also subject to variations depending on several factors. Instead of guessing the correct chemical levels, the measurement system allows a 'window' into the digester to 'see' what happens inside and adjust the cooking parameters accordingly.
- The big challenge with the existing sensors and sample piping has been that the sensors stop functioning due to scale buildup or plugging, so the measurement data is not continuously available. The alkali sensor is self-cleaning. The measurement is based on an electrochemical reaction and the cleaning is also done electrochemically at pre-determined intervals so the sensor stays clean. Mill tests have successfully proven this to be the case.

This technology is suitable both for continuous and batch cooking. Similar benefits are achieved in both technologies.

The new system also offers substantial potential to decrease the environmental impact by cooking wood chips in optimal conditions and avoiding chemical overdosing. Excess cooking liquor addition will decrease the Kappa number and yield and will lead to higher alkali residuals, potentially causing corrosion in the evaporation plant. Higher alkali residuals in the pulp out of the digester also decreases washing efficiency downstream, which results in a greater effluent load and corresponding negative environmental impact as well as increased makeup chemical costs.

Conversely, insufficient cooking liquor addition will result in higher than desired Kappa numbers and increased rejects as well as increased risk of lignin precipitation and vessel corrosion, particularly in carbon steel vessels.



Lab measurements vs. on-line





MEASURES DIRECTLY INSIDE THE DIGESTER AND OPTIONALLY FROM CIRCULATION LINES

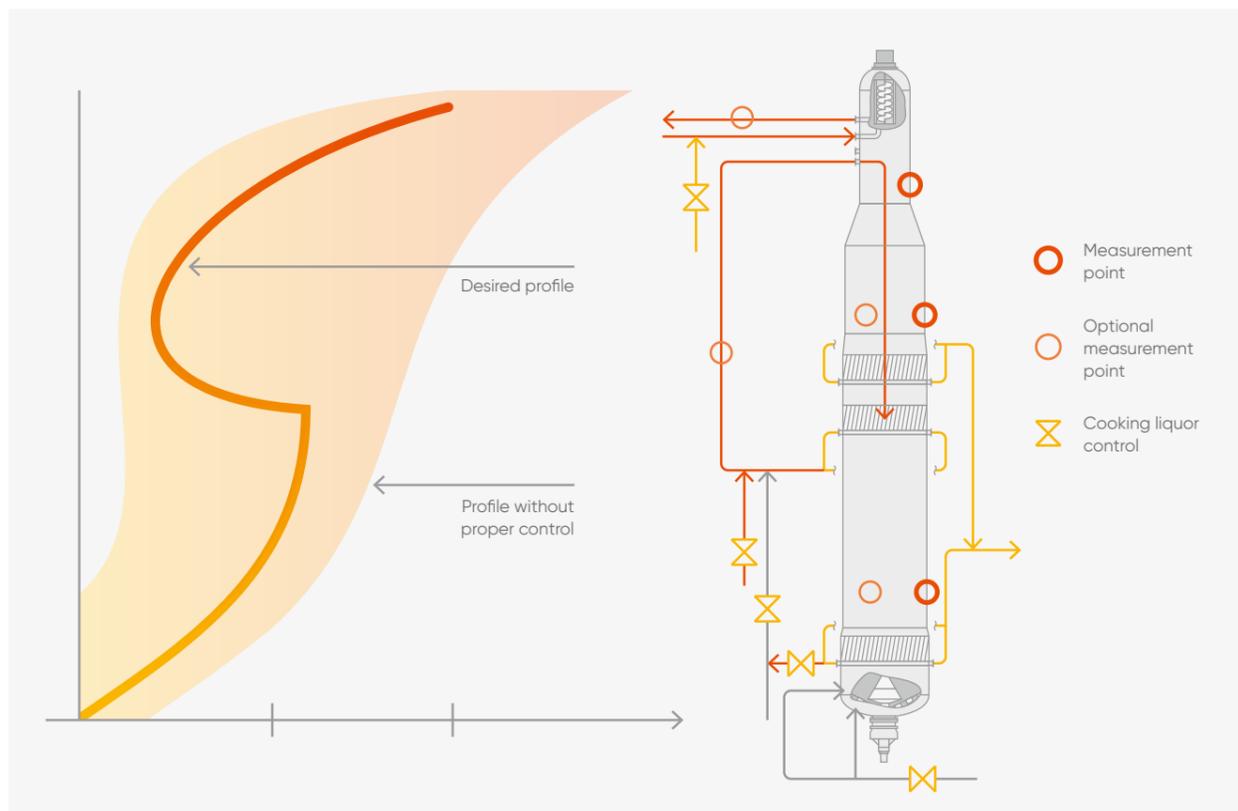
NO CONTINUOUS SAMPLING, NO CHEMICAL ANALYSIS

ON-LINE MEASUREMENT - NO DELAY

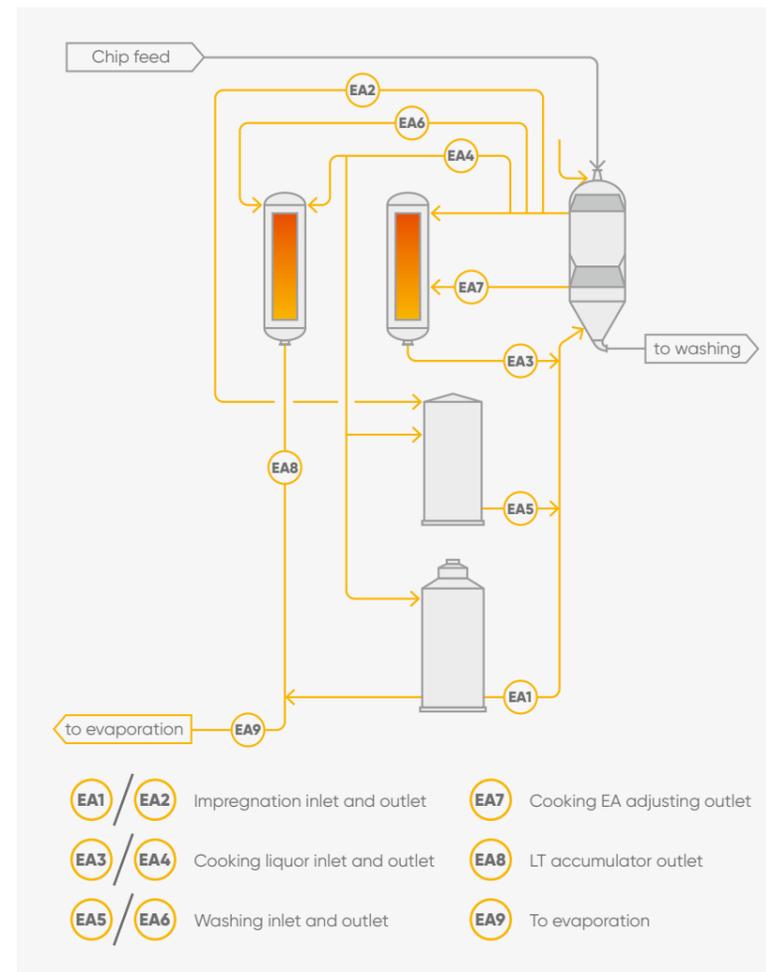
SELF-CLEANING SENSORS

By optimizing the alkali application rate, the mill's environmental impact and carbon footprint can be reduced while simultaneously ensuring maximized yield and pulp quality.

The alkali measurement system is currently in the piloting phase but interest has already resulted in two further installations at customer mills. The technology is being proved to follow alkali levels accurately and provides huge benefits especially for mills that run different grades, have variations in raw materials, or cook different wood species in one cooking line, for instance pine and birch.



Alkali profile with and without on-line measurement and adjustment



Optimizing the batch process with EA measurement



Mill Installation



IN A NUTSHELL

Savcor has been measuring electrochemical phenomena inside digesters for almost 40 years as part of its anodic protection systems, which are designed to prevent digester wall corrosion by passivating the steel with direct current. This experience with corrosion related measurements spawned the idea of measuring alkali concentration, which is a major factor in corrosion potential. The sensor technology was already robust and had a proven track record, but the measurement algorithms required rethinking.

ANDRITZ and Savcor have been working together since the 1990's in reducing the corrosion costs of the kraft pulping process. ANDRITZ has been able to push the development further by relying on Savcor AP system to stop the corrosion. It was only natural to start an even more extensive cooperation in on-line alkali profile measurement, developing a product now marketed under the ANDRITZ brand.

CONTACT

Aaron Leavitt
aaron.leavitt@andritz.com

CONTACT

Janne Leinonen
janne.leinonen@andritz.com



Sensor after one year of operation shows no scaling on sensor surfaces

METRIS VIBE A HEALTH CHECK FOR YOUR PLANT

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.

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.

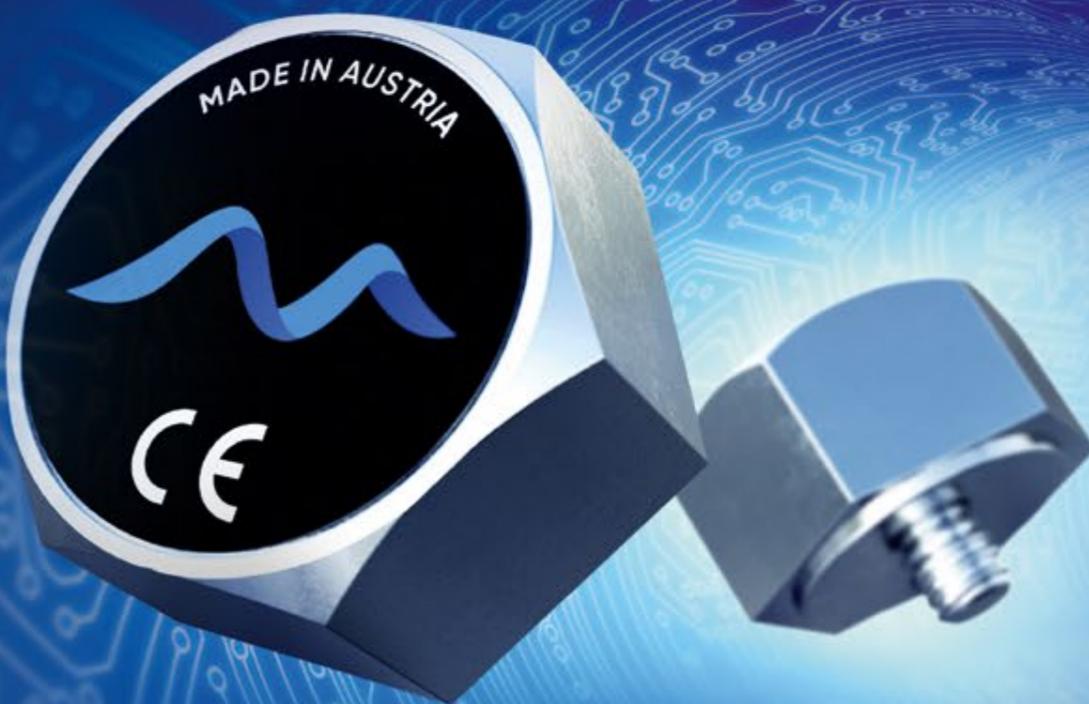
METRIS VIBE – THE ANDRITZ STETHOSCOPE

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.

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 – an ANDRITZ sensor for systematic condition monitoring of vibration and temperature



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, and 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 to maximize productivity, efficiency, and availability. Even



With energy-saving Bluetooth technology, the data gathered is transferred via gateway to the Metris server, where different analyses are carried out.



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 offered 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.

CONTACT
metris@andritz.com

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.



PLANNING AHEAD WITH INDUSTRY 4.0

IT'S ALL ABOUT THE DATA

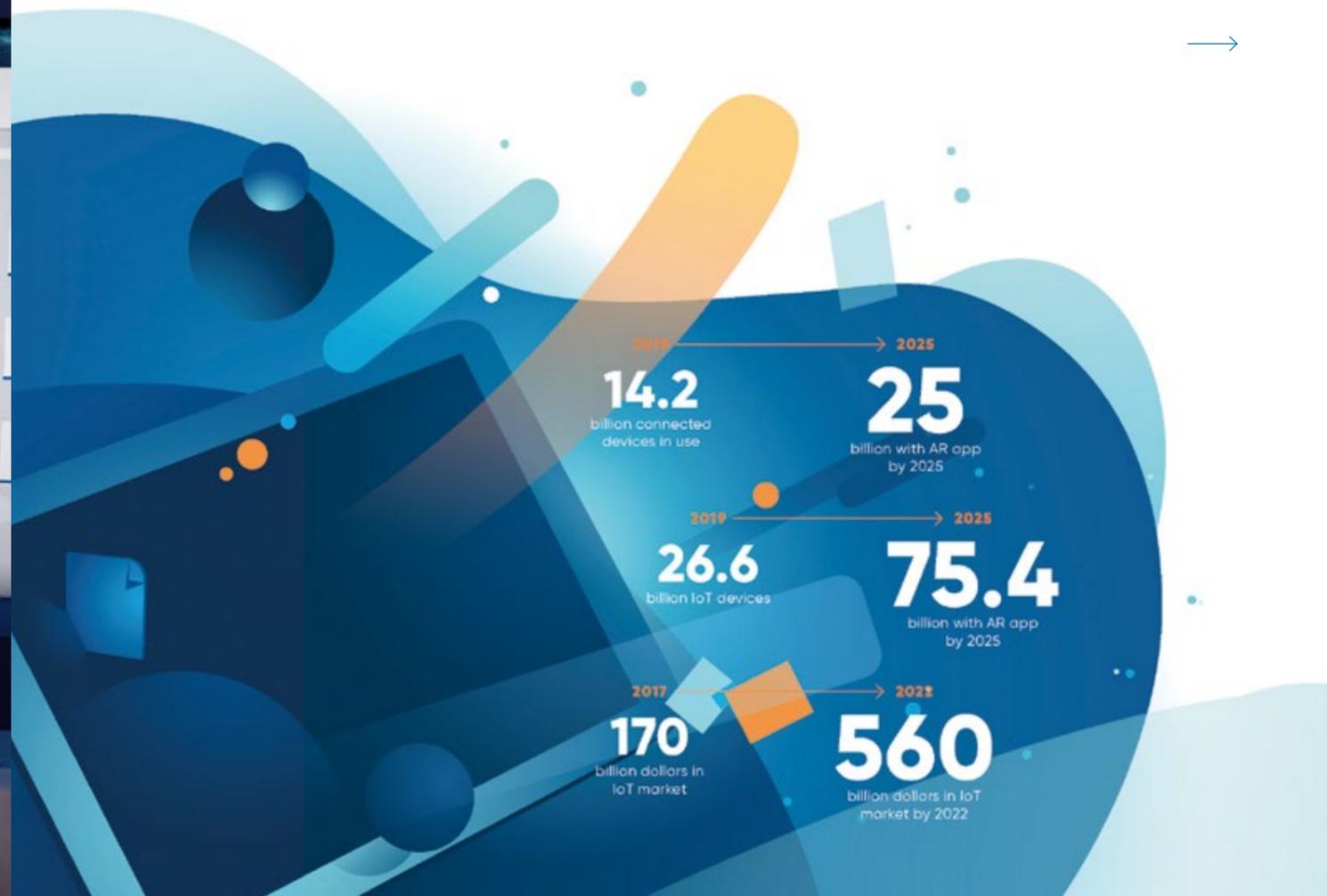
The fourth industrial revolution has nothing to do with the steam that powered machines in the first industrial revolution, nor the mass production that characterized the second one. But there is a connection to the computer-driven changes of the third revolution we have been part of in recent decades. 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 reinventing 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.

INDUSTRIAL INTERNET OF THINGS (IIOT)

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 such as 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

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



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

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.

malfunctions that could impact the profitability of an entire plant are identified, analyzed, and optimized.

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 filmmaking, 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.

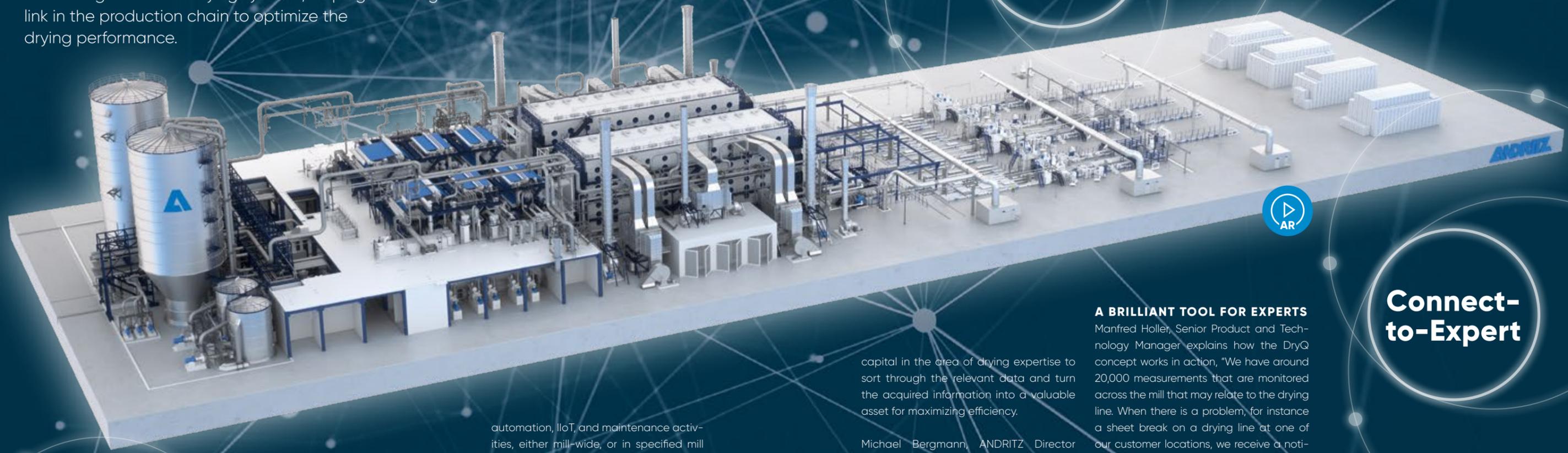
Technology helps us make progress. But we need to ensure that we adopt the best of IIoT technologies to achieve positive changes, such as more efficient operations, time savings, innovative solutions, and ways of making our everyday lives simpler.

CONTACT

metris@andritz.com

METRIS DryQ: STRENGTHENING DRYING LINE PERFORMANCE

Running a pulp mill successfully requires that all processes, technology, and equipment work in harmony across the entire system with the whole chain being only as strong as its weakest link. Metris DryQ™ is the new intelligent solution from ANDRITZ, designed for monitoring data from drying systems, helping to strengthen a vital link in the production chain to optimize the drying performance.



Smart
Devices



View video footage of this report in our augmented reality App!

FOR FURTHER INFORMATION
SEE PAGE 3

Analysis
Software

A new mill-wide concept from ANDRITZ is being well received by pulp producers around the world. Called SYNERGY™, the concept involves a long-term service agreement, typically lasting three years, which at its core provides ANDRITZ expertise from process and equipment in cooperation with its customers to achieve agreed targets.

As part of this agreement, ANDRITZ provides a broad approach to helping its customers improve their production and profitability by offering advice and expertise on operation, process, equipment,

automation, IIoT, and maintenance activities, either mill-wide, or in specified mill areas. The concept of Metris DryQ optimization processes is right at the heart of the SYNERGY concept.

DryQ – MUCH MORE THAN SIMPLE DIGITIZATION

One of the mill areas that ANDRITZ has been concentrating on its endeavours to maximize efficiencies across pulp mill production is the drying line. DryQ is an intelligent solution applied across the fiberline to gather information on the whole process so as to maximize drying line efficiency. However, this is not simply a digital add-on to gather data; DryQ is much more than that. ANDRITZ uses its human

capital in the area of drying expertise to sort through the relevant data and turn the acquired information into a valuable asset for maximizing efficiency.

Michael Bergmann, ANDRITZ Director of Digitization, Pulp Drying says, "DryQ consists of several elements which, when combined with deep knowledge of the process, can make a real difference to the efficiency of the drying line. We have a number of software programs that contain filters to sift through the data and determine what information is needed and what is not. But the key element is the expertise to interpret the information gathered from the data in the right way and derive the solution for the customer to allow decisions to be made in the process. This really is a way to apply our expertise and knowledge and share it in an efficient way."

A BRILLIANT TOOL FOR EXPERTS

Manfred Holler, Senior Product and Technology Manager explains how the DryQ concept works in action, "We have around 20,000 measurements that are monitored across the mill that may relate to the drying line. When there is a problem, for instance a sheet break on a drying line at one of our customer locations, we receive a notification. The notification contains graphs with the main operation data before the break took place. Using the acquired data, experts look at the parameters and operational information, and can analyze the reasons for the break. We have these experts dotted all around the world, with detailed knowledge of processes, automation, electrics, or machine hardware and depending on the nature of the problem, they can quickly get involved."

What DryQ brings to the drying line is visibility of operations so that ANDRITZ experts can quickly analyze what the problem is, how to fix it, and then more

Connect-
to-Expert

importantly, how to avoid the problem happening again. Bergmann gives another example, "One of our customers recently started up after its annual maintenance and quickly noticed multiple problems with the drying line; the settings had moved from the original positions before the shutdown.



"There is a real human element involved in this new digital way of working, and the ANDRITZ team both on site and remotely have worked right alongside us to improve stability and efficiency."

JUKKA HELTTUNEN
Technical Manager
Montes del Plata



The first Metris DryQ solution is installed at the Montes del Plata mill in Uruguay.

Using data from DryQ, we could identify process parameters that were altered and restore the original settings. This took just one hour; without this information it could have easily taken days to restore the settings."

Metris DryQ can be a stand-alone solution, or an add-on to SYNERGY. Its target is to maximize operational reliability to include high uptime, high availability, stable production, and increased flexibility to changing production conditions. It additionally uses performance monitoring and correlation analysis to predict problems in advance, showing pulp mill production experts where they are winning or losing in various production scenarios.

"DryQ is the perfect combination of the latest in data gathering combined with deep human knowledge and experience. Basically, it's a brilliant tool for pulp producers aiming at excellence in their operations," adds Bergmann.

MONTES DEL PLATA

One of ANDRITZ's key customers, the ultra-modern Montes del Plata mill located in Uruguay, recently signed a three-year SYNERGY agreement. The mill, jointly owned by Finnish company Stora Enso and Chilean pulp giant Arauco, will see all three main areas of its production and maintenance looked after by ANDRITZ: process and equipment, automation, and maintenance. The installation of DryQ is part of the SYNERGY agreement.

Jukka Helttunen, Technical Manager at Montes del Plata, says of the SYNERGY agreement, "We want to achieve world class results at this mill and the SYNERGY concept from ANDRITZ is the ideal way for us to achieve that goal. One of the areas we identified as in need of improvement under the umbrella of the SYNERGY contract was the drying area, so hence we decided that DryQ would be a solution to fit our needs.

"We chose ANDRITZ because of its expert knowledge of process and equipment and ability to optimize all areas of the mill. Also, the Montes del Plata mill is a complete ANDRITZ turnkey operation, which has clear advantages."

In September 2019, DryQ was installed and applied to the mill's two drying lines. The agreement included remote support and assistance, and access to ANDRITZ experts, with the aim of boosting the dryers' performance and stabilizing the process. Gabriel Machado, in charge of the fiberline at the mill says, "Since the very beginning, we have been very impressed with ANDRITZ's professional and transparent approach to the DryQ project. The experts involved both at the mill and remotely support us in every aspect of the drying line operations.

"DryQ came into its own when identifying a problem we had with damaged wires (fabrics) on one of the drying lines.

ANDRITZ experts analyzed the data and performed several steps, and then provided us with the optimum settings for the wedge zone. We decided to make some modifications and implemented them during the shutdown on both drying lines and now that problem is solved.

"The collaboration between the drying line team at the mill and ANDRITZ experts has been great. There is a real human element involved in this new digital way of working, and the ANDRITZ team both on site and remotely have worked right alongside us to improve stability and efficiency. They are particularly impressive when it comes to follow ups and any queries we have had."

DryQ also came to the mill's assistance when a problem was encountered with sheet control due to daily production being above the design speed. Using data from DryQ, ANDRITZ experts were able to recommend further improvements.

"We now have a drying line that is performing in a much more stable and efficient way. It gives us a lot of confidence to have ANDRITZ experts right with us as we deal with any challenges that may arise," concludes Machado.

CONTACT

Michael Bergmann
michael.bergmann@andritz.com

The mill is a complete ANDRITZ turnkey operation.



In September 2019, DryQ was installed and applied to the mill's two drying lines.



"Since the very beginning, we have been very impressed with ANDRITZ's professional and transparent approach to the DryQ project."

GABRIEL MACHADO
Director Fiberline
Montes del Plata

SMART BLEACHING = MAJOR CHEMICAL SAVINGS AT PULP MILLS

Suzano Imperatriz, located in Maranhão, northern Brazil, is one of the new breed of giant pulp mills. The mill has recently undergone a number of improvements including the implementation of a smart bleaching system from ANDRITZ that is making a real difference when it comes to chemical consumption.

The management at Suzano Imperatriz was already well aware of ANDRITZ's capabilities in its supply of the very best equipment for pulp mills. So, when major improvements were required at the mill in 2018, ANDRITZ was the first port of call for improvements to its brownstock washing and Suzano invested in a DD-Washer. Prior to the installation of the DD-Washer, Imperatriz had invested in other modifications and optimization at the mill in an effort to reduce the chemical consumption in the bleaching process. After the adjustments and

the installation of the DD-Washer by ANDRITZ, there was a notable improvement in efficiency at the mill.

Jose Wilhelms Ventura, Industrial Executive Manager, Suzano Imperatriz says, "During the investments and improvements we made at the mill in 2018, we were looking to fine-tune our operations further and we installed a DD-Washer. This was the perfect opportunity to have a good look at the advanced Metris IIoT technology of ANDRITZ and the possibilities to reduce our chemical consumption further.

"Historically we have had high chemical consumption at the mill, but after the shut-down in 2018 and with the installation of the DD-Washer and other modifications in the digester, we managed to lower the levels. But we still believed we could go further. We were aware of Sindus ANDRITZ's growing success in the area of smart solutions for optimizing all areas of pulp mills' performance and we called them in to see what technology could be applied to the bleaching area."

In early 2019, Metris UX experts began working with Suzano on a pilot to make the whole



"We were aware of Sindus ANDRITZ's growing success in the area of smart solutions for optimizing all areas of pulp mills' performance and we called them in to see what technology could be applied to the bleaching area."

JOSE WILHELMS VENTURA
Industrial Executive Manager,
Suzano Imperatriz



bleaching area of the Imperatriz mill autonomous, bringing in dynamic, standardized decision-making and quality control with an emphasis on the lowest possible chemical costs. Under the umbrella of Metris OPP, Metris UX is a platform in which local specialists work closely with mill customers to ensure all their requirements are taken into account.

Eduardo Avila Alves, Metris OPP Process Improvement Engineer at ANDRITZ says, "Each mill is a completely individual entity; they all run in different ways, and have their own peculiarities. The big challenge for us is to make a solution that is fit for the purpose and achieves continuous, successful results. To do this, we construct a pilot, live at the mill, bringing in the operational team so that all ideas and requirements are taken into account."

COMPLETE SMART CONTROL

The aim of smart bleaching is to have a process that is controlled totally automatically with an emphasis on less human interference and on eliminating time spent on decision-making. There are many associated benefits with a successful automated system, including major savings in chemical usage, greater adherence to production planning, and improvement of final product quality with less variation.

The smart bleaching project scope at the mill included a system to allow complete

control of brightness and pH of the whole bleaching plant comprised of Dhot, EP, D1, and P stages in order to guarantee final brightness after the drying machine. The implementation of smart bleaching also takes into account process disturbances, ensuring that automatic adaption takes place to guarantee performance and quality. The advantages of the process mean that only the correct, specific amounts of chemicals are used, and overcharging is dramatically reduced.

"After the creation of the successful pilot at the Suzano Imperatriz mill in early 2019, we implemented a complete smart control of the bleaching area step-by-step over the space of six months," continues

Alves. "It is very important for a project like this that people are made part of it, and accept and trust the tool, as not only does it get results, but also makes running the bleaching area less challenging for the operators. Close collaboration is of the utmost importance."

PROVEN KNOWLEDGE

The smart bleaching project at Imperatriz is now fully implemented and has made the whole bleaching area autonomous, including standardized decision-making in process and quality control. Added to this, the smart control is responsible for delivering final product quality whilst adhering to the production plan at the lowest cost and minimum waste.



ANDRITZ and Suzano team at a smart bleaching workshop



A DD-Washer was installed in the brownstock washing between existing wash presses.



"Our greatest advantage is our teamwork."

ALEX ANDRADE RIBEIRO
Metris OPP Local Specialist, ANDRITZ

The bleaching plant undergoes a more optimized and automated process and the DCS operator starts to have a more technical role in monitoring controls and fine adjustments aiming at the best characteristics and final quality requirements of the pulp.

Carlos Verciano Costa Santos, Recovery and Utilities Executive Manager, Suzano, says, "ANDRITZ has really proven its knowledge with the smart bleaching project. Before the implementation, our peroxide consumption at the mill was very high and we needed to get more control of stabilizing the brightness. Now the process is fully autonomous, and all four stages of the process are automatically adjusted to

keep the brightness stable from beginning to end. Combined, all the investments we have made, including the DD-Washer, have resulted in a process that is much more optimized and automated, and we have already seen a reduction of 25% in chemical consumption at the bleaching plant.

"Collaboration with ANDRITZ, and the way its experts have shared knowledge of the system, has been key to the successes at Imperatriz. They took all our ideas and experiences into account and sequentially we have arrived at a solution that we are looking to roll out at all our mills."

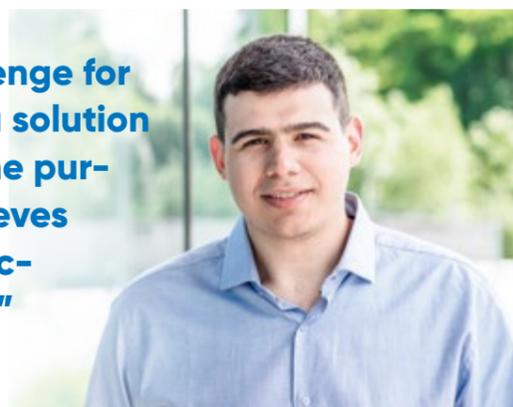
Alex Andrade Ribeiro, Metris OPP Local Specialist at ANDRITZ says, "Our greatest

advantage is our teamwork. The success of the company comes down to everyone playing their part, thus making us strong in all areas. This helps us customize solutions quickly and efficiently for our customers. Eduardo Alves, as a local analyst responsible for the project, can rely on our team for support and I'm glad to be a part of this project's success."

CONTACT
Eduardo Avila Alves
eduardo.avila-alves@andritz.com

EDUARDO AVILA ALVES
Metris OPP Process Improvement Engineer, ANDRITZ

"The big challenge for us is to make a solution that is fit for the purpose and achieves continuous, successful results."



"They took all our ideas and experiences into account and sequentially we have arrived at a solution that we are looking to roll out at all our mills."

CARLOS VERCIANO COSTA SANTOS
Recovery and Utilities Executive Manager, Suzano

PICTURE THIS:

CRITICAL DATA FROM LIVE FEED IN THE RECOVERY BOILER

ANDRITZ has utilized visual technology, combined it with the latest in digitization methods and created the Metris AVA Recovery Boiler Toolbox, designed to revolutionize the monitoring and managing of critical boiler operations and activities.

The concept sounds quite simple; have a live video feed from various recovery boiler operations and analyze the images to enable smooth operation. But the Metris AVA Recovery Boiler Toolbox goes much further than that – which is where the real beauty of the new concept lies. The five tools in the box analyze images and spot potential problems using algorithms and then convert the information into usable numbers on a screen. This means operators can be warned of any potential problems, identify trends, and ensure the boiler

is operating to its maximum efficiency – all from images sent via existing installed cameras or even handheld phones and tablets.

There are already huge proven benefits with the implementation of the new technology, including personnel and mill safety, increased production, chemical use reduction, less maintenance costs, and increased availability of the recovery boiler.

The toolbox has been designed for simplicity of installation and operation. It is

an independent platform, either cloud-based or server-based at the mill that can be applied to operate in any recovery boiler to visually monitor five different essential activities during operation; carry-over, the char bed, liquor/fuel spray orientation, smelt flow, and smelt reduction.

SAFETY FIRST

As always with ANDRITZ equipment and technology, safety is first on the list of priorities.

Recovery boiler sample taken with Metris AVA



Heikki Lappalainen, Development Manager, ANDRITZ, says, "We have the digital technology, we have the process knowledge, and we know recovery boiler systems and equipment inside out. With AVA we have brought all these elements together to create a unique concept for efficient and safe running of recovery boilers both old and new.

"What we have now is a tool that can tell operators exactly what the situation is inside the recovery boiler, particularly in regard to safety issues. We are now able to measure, for instance, carry-over or when liquor or fuel spray are increasing, or when the char bed may collapse. The operator can now see all this information in numbers, on a screen, without the need to check the boiler itself manually when there might be a potentially hazardous situation."

The visual connection to the AVA platform not only acts as the 'eyes' in the recovery boiler hot spots, it also intelligently reports back on the exact situation. Jarkko Brunou, Head of Business Development, ANDRITZ Warkaus Works, adds, "This is a totally new approach to safety of the recovery boiler, you still have the eyes through the visual connection, but you also have the analysis and information that allows decision making to take place remotely."

RECOVERY BOILERS – OFTEN THE BOTTLENECK IN PULP PRODUCTION

While safety is a key factor to the AVA concept for recovery boilers, when it comes to process optimization, it is the benefits that really attract attention. Lappalainen explains, "Number one in our customers' eye is, of course, safety, but the economical benefits of the AVA tools are huge. The visual technology, combined with intelligent reporting enables operators to see inside the process in a different way, making the

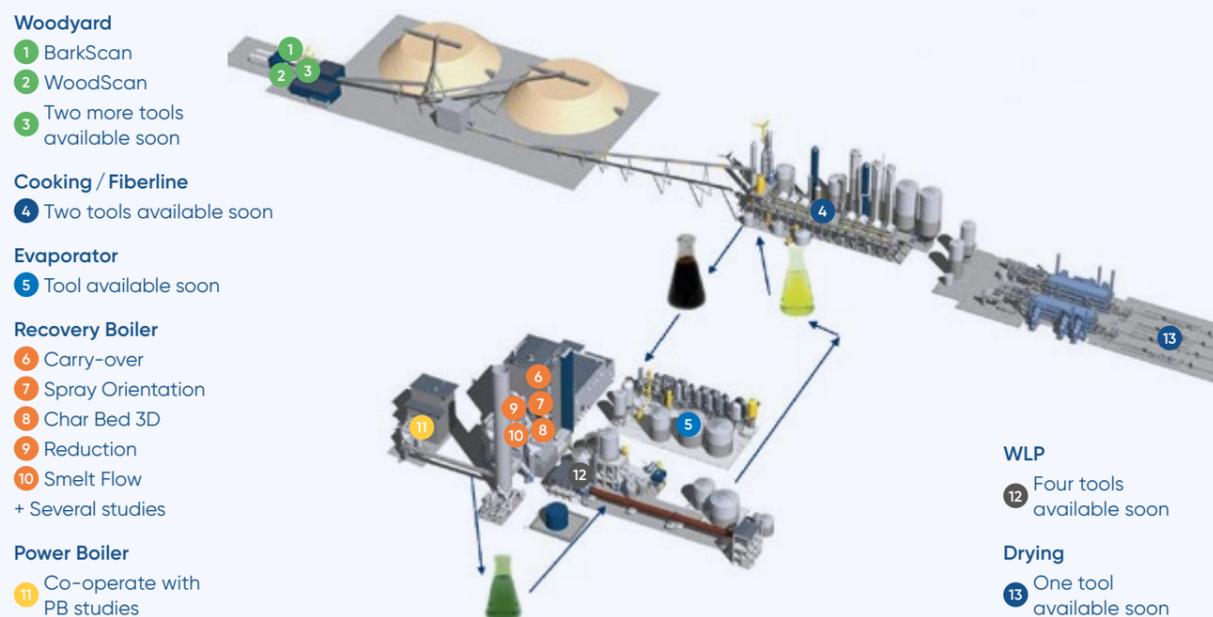
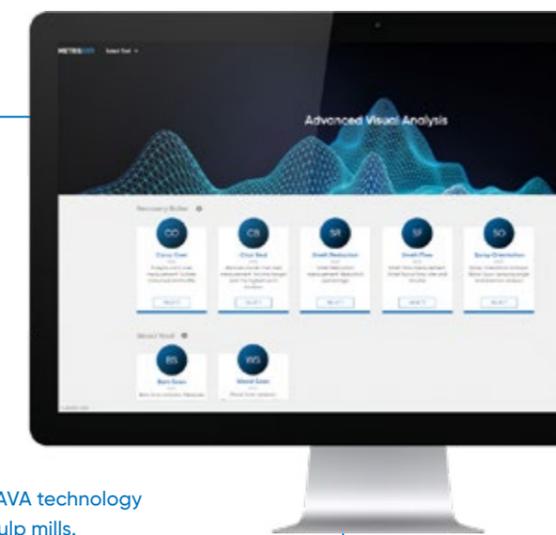
boiler much easier to tune and identify bottlenecks.

"This means first of all they can produce more pulp, but also they can increase steam production at the same time as recovering more chemicals."

Juho Nurmi, ANDRITZ Technical Specialist for AVA, adds, "When a recovery boiler is fine-tuned and operating at optimal efficiency, there is much less wear and tear on critical parts; for instance, if there is

COMPLETE RANGE OF METRIS AVA TOOLS FOR PULP MILLS

As well as the toolbox for recovery boilers, ANDRITZ has also developed Metris AVA technology for other key areas of the pulp mills.



less carry-over, or the combustion is better managed, there is much less need to stop and clean, which is obviously expensive when it comes to downtime.

FIVE TOOLS FOR ESSENTIAL ACTIVITIES BRING BIG RESULTS

Results so far indicate that the Metris AVA Recovery Boiler Toolbox is making a big difference at mills. A pulp mill in Finland took delivery of the first tool from ANDRITZ

in November 2018, with all five tools put into action by June 2019. It reports that the new measurements being derived from the images have resulted in a smoother operation and the mill has been able to keep the recovery boiler operating in the optimum range. The mill utilized its own cameras where possible and the algorithms were optimized at the beginning of the process, with ANDRITZ supporting activities closely since the installation.

Johanna Laaksonen, Project Manager, SYNERGY at ANDRITZ, concludes, "With Metris AVA we are focused on increasing the availability and steam production of the recovery boiler, and at the same time improving the chemical recovery. One of the ways we are doing this is by developing the recovery boiler's combustion and char bed control with the aim being to reduce fouling and plugging. Metris AVA enables operators to see properties not usually seen in recovery boiler operation in an objective way."

CONSTANT IMPROVEMENTS FOR LIFE-CYCLE MANAGED AVA SERVICE

"AVA software is designed with latest technologies, for instance, Kubernetes containers and AMQP messaging," says Metris AVA Solution Architect Tatu Liimatainen, Manager – Site Connections, Cyber Security Advisor P&P+SE, ANDRITZ. "This allows running the same Metris AVA code packages on-site or in the cloud independent of which platform. One of the AVA focus areas has been in DevOps, streamlining the agile development, building, testing, packaging, release, delivery, and monitoring process together with ANDRITZ Global Software development teams. AVA benefits from ANDRITZ global IT resources for infrastructure and services, for example, AzureAD as an authentication provider to ANDRITZ users and customers.

"Remote connection to the site is mandatory for enabling AVA updates, monitoring, and life-cycle services. As the Communication Center manages AVA deliveries and maintenance, the AVA setup to any existing pulp and paper customers is simple and straightforward and new connections are carried out following cybersecurity standard IEC-62443. The benefit for the customer is that they receive a secure, life-cycle managed, and future proof solution that they can rely on in the production environment."

CONTACT
sales.ava@andritz.com

THE FIVE TOOLS IN THE METRIS AVA RECOVERY BOILER TOOLBOX

1 CARRY-OVER TOOL

Designed to measure flue gas particles and provide data to control liquor temperature and flow, sootblowing and air distribution. Analyzing the carry-over data, for example, increases availability and decreases emissions.

2 SPRAY ORIENTATION TOOL

Measures the liquor spray direction and opening angle from the liquor burner. It provides data to control carry-over, char bed location, and spray burner maintenance. Analyzing the data can improve chemical recovery, ensure longer spray burner lifetime, and balance char bed.

3 SMELT FLOW TOOL

Measures smelt volume and velocity, and gives numerical information for spout fouling and flashing. By analyzing the data from fuel supply, air distribution, spout cleaning and green liquor quality, safety and savings can be achieved.

4 CHAR BED TOOL

Creates 3D models from char bed and measures volume and highest points in order to provide data to control fuel supply and air distribution. By analyzing the data, the mill can improve safety and chemical recovery, balance combustion, and reduce carry-over.

5 SMELT REDUCTION TOOL

Designed for reduction efficiency measurement and provides data to control fuel supply, char bed, air distribution, and green liquor quality. Regular measurement of the smelt reduction can improve chemical recovery and reduce carry-over.

ANOTHER OPPORTUNITY FOR VALUE ADDED PRODUCTS AT PULP MILLS

ANDRITZ is once again providing opportunities for pulp producers to increase the range of added value bio-products in their product portfolios with its A-ConCrystal™ continuous technology for microcrystalline cellulose (MCC) production. There is still an increasing demand for the use of MCC in several fields of applications, strengthening the position of being one of the fastest growing areas in the use of specialty celluloses.

MCC was first developed in the 1950s for use in pharmaceutical applications, including adhesives and filler agents for pills and tablets. Now there is also a growing demand for MCC use in food applications such as rheology modifiers as a source of fiber and a bulk agent. It is also in demand for industrial applications including use in rheology modifiers, oil drilling aid agents, and cosmetics. The global annual MCC production rate is around 190,000 tonnes and is growing at a rate of around 5% per year.

Up until now, the production of MCC has been an expensive process, restricting the use of the product despite growing demand. However, the A-ConCrystal™ continuous technology from ANDRITZ has addressed the high cost, now allowing more efficient, high production of MCC with equipment integrated into pulp mills instead of small, separate batch production units. The technology has lower water and chemical consumption with a reduced carbon footprint and broader product range.

SEVERAL ADVANTAGES OVER TRADITIONAL MCC PRODUCTION

The raw material for producing MCC can be either dissolving or paper-grade pulp. To make MCC, cellulose is purified and partially depolymerized, which is obtained by treating alpha-cellulose with mineral acids. ANDRITZ A-ConCrystal™ continuous technology has several advantages over traditional MCC production. Its unique integration into an existing pulp mill

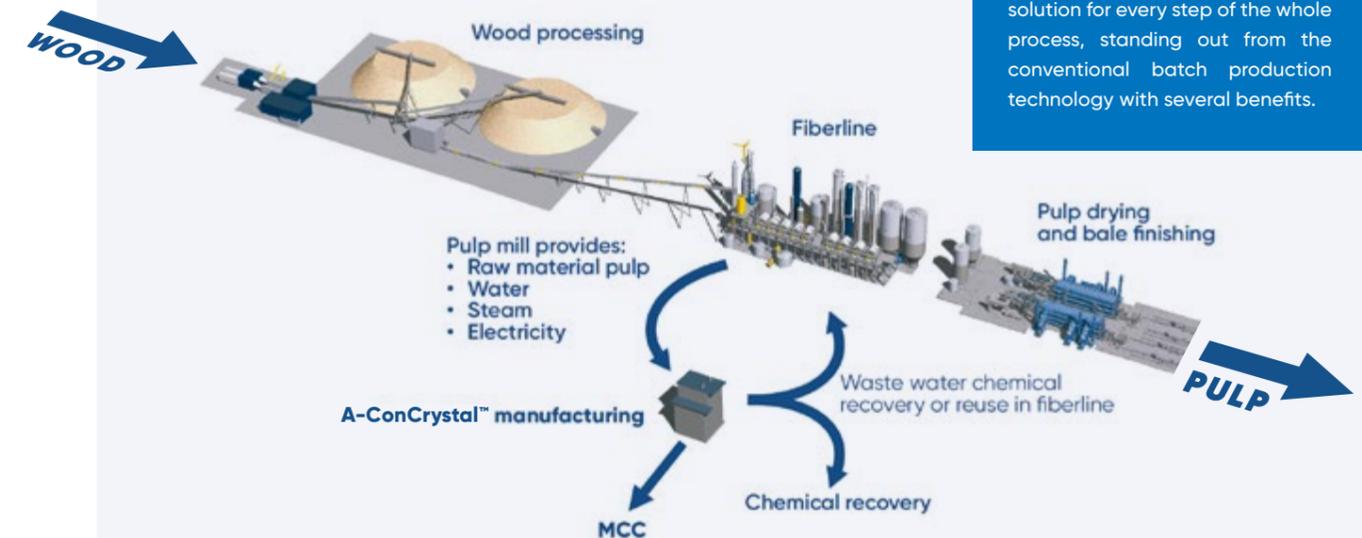
makes high MCC production capacities possible with low capital and operational expenses. Integration of the technology provides a platform that is self-sufficient and by-products can be generated in the manufacturing process that can be used to produce other bio-based products.

Microcrystalline cellulose manufactured with A-ConCrystal™ continuous technology has been proven to fulfill the USP/EU Pharmacopeia and European Union EFSA requirements.

CONTACT
Hannu Rämärk
hannu.ramark@andritz.com

Elina Pesonen
elina.pesonen@andritz.com

A-ConCrystal™ continuous technology for microcrystalline cellulose production



A-ConCrystal™ continuous technology for microcrystalline cellulose production complements ANDRITZ's Advanced series product portfolio with a comprehensive unique production method for microcrystalline cellulose.

Earlier known as the Aaltocell™ technology, which was developed together with Aalto University, the A-ConCrystal™ technology takes one more step forward as being the first continuous manufacturing process for MCC with a complete solution for every step of the whole process, standing out from the conventional batch production technology with several benefits.

A DAY IN THE LIFE OF...

... FRANZ HARRER

Workplace: ANDRITZ Headquarters, Austria

Position: Director Steel Yankee and Technology Tissue

Franz Harrer is the director of the ANDRITZ Steel Yankee and Technology Tissue team. He joined ANDRITZ about 13 years ago as a design engineer for tissue and paper machines providing a product development focus early on. He played a major role in various machine rebuilds and experienced how tissue and paper machines with the first ANDRITZ steel Yankees were successfully put into operation.

A real highlight was seeing the tissue machine "armada" of the Hengan Group in China, for instance, which encompassed 13 ANDRITZ tissue machines, the majority of which operated with PrimeDry Steel Yankees.

Today, Franz heads the ANDRITZ tissue technology team and is in charge of product management. He works closely together with the ANDRITZ tissue pilot plant (PrimeLineTIAC – Tissue Innovation and Application Center; andritz.com/tiac) team and research institutions to exchange expertise and continuously improve the product range. "To stay competitive, you have to listen to your customers, and you have to proactively innovate and explore the limits," Franz explains.





NOVEMBER 13, 2019

A DAY IN THE LIFE OF FRANZ HARRER, DIRECTOR STEEL YANKEE AND TECHNOLOGY TISSUE

07:00 // PERFORMANCE CHECK AT THE CUSTOMER'S SITE

Franz visits Zellstoff Pöls AG in Austria to check the performance of the largest steel Yankee for MG paper in operation worldwide. With a diameter of 24 ft and a shell length of more than 6 m, it is a real giant!



11:00 // BACK IN THE OFFICE

As Director of Steel Yankees and Technology Tissue, Franz coordinates product presentations, checks technical specifications for offers, and also checks technical reports for start-up documentation. He works closely with our customers, as well as with our R&D, engineering, and quality groups to continuously improve and further develop our products.



13:00 // QUALITY MANAGEMENT MEETING

Franz meets with Yassar Ghanimi, Head of R&D Services, Quality Management and Safety, and Riccardo Pierini, Steel Yankee Product and Customer Care Manager, to discuss the results of the steel Yankee performance check at Zellstoff Pöls.



15:00 // AT THE UNIVERSITY OF TECHNOLOGY

ANDRITZ has various cooperation partnerships with research institutions to advance R&D activities. With his colleague, Paul Richards, Senior Technology Manager, Franz has a meeting at the University of Technology in Graz, Austria to discuss the latest results of a significant research project. The aim of this joint project is to improve the properties of paper using different tissue machine configurations with steel Yankees. With the university, they plan to develop new testing methods for tissue.



18:00 // AT HOME

Franz lives with his wife, Eva, in the center of Graz. They enjoy the evenings together chatting about the day's events, relaxing on the couch, or going for a short walk around the old town.



READY TO RESCUE

In his leisure time, Franz is a voluntary firefighter in his home town close to Graz. It is a family tradition – his grandfather, father, and brother are also part of the team. They train regularly and do drills for emergency situations.



View video footage of this report in our augmented reality App!

FOR FURTHER INFORMATION SEE PAGE 3





TWO VERY SPECIAL CUSTOMERS

ANDRITZ received an unusual request: The world famous Schönbrunn Zoo in Vienna needed help to grate and process raw bamboo into refined flour for its giant pandas Yuan Yuan and Yang Yang. ANDRITZ, of course, accepted the challenge.



ANDRITZ thrives on the unusual at its R&D plants. At end of 2019, the Vienna Zoo contacted the Technology Department of the Paper, Fiber and Recycling Division about a very special project involving giant pandas. The request got the R&D team really excited; the task was to process 500 kg of bamboo into flour, which is the main ingredient used in the pandas' steamed "bamboo bread". The bread supplements the raw bamboo diet of 20-year old male giant panda Yuan Yuan and female Yang

Yang. The roughly refined flour is particularly important for female pandas when they are rearing their young.

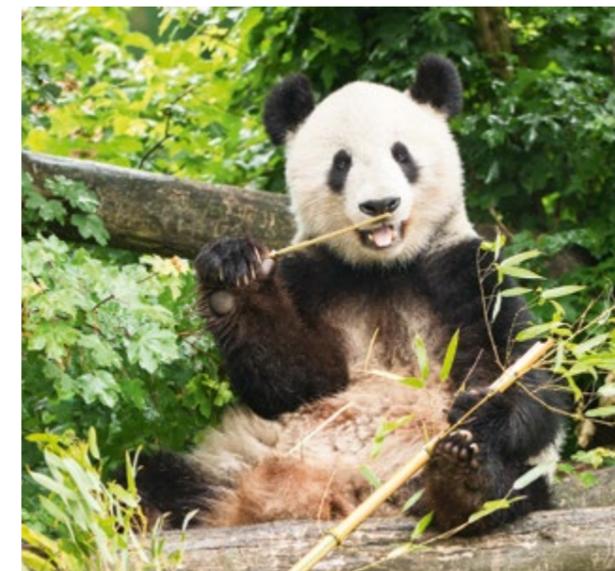
The Schönbrunn Zoo is said to be the oldest zoo in the world and has been named as Europe's best zoo five times in a row. It is also part of a UNESCO World Cultural heritage site as it is set in the grounds of the imperial summer residence of Schönbrunn Palace. The pandas are the most popular residents of the zoo and Schönbrunn is one of the

very few zoos in the world fortunate enough to be entrusted with a pair of pandas from the People's Republic of China. Yang Yang was already world famous, being the first panda in captivity to raise twin cubs without human intervention in 2016. These popular, famous, and well-revered animals at the zoo command a very high status, and that includes their diet.

Before contacting ANDRITZ, the zoo was grating and refining bamboo using a small,



Giant pandas Yuan Yuan and Yang Yang in Vienna Zoo, Tiergarten Schönbrunn



special device, which proved to be unable to handle the capacity demanded by the pandas. Giant pandas tend to eat a lot of the food they like, and the zoo was having trouble keeping up with the demand. The zoo urgently needed a solution. After the initial contact in January 2020, the zoo sent ANDRITZ 500 kg of pre-shredded bamboo. The shredded bamboo was sent to the Stock Preparation Pilot Plant in Graz where it was successfully processed using a CompaDis disperser. There was enough shredded bamboo to make one year's supply of flour, which was then transported back to the zoo where it was frozen.

Dispersing is typically used in recycled fiber processes in order to detach the ink particles from fibers and disintegrate dirt particles and stickies below the visibility limit. With different fillings a disperser can also be used to refine almost all kind of fibrous materials, such as bamboo.

Laura Liukkonen, ANDRITZ Director of the pilot plant says, "In this case, the pre-shredded material was refined with a CompaDis disperser between the edges of the "tooth type" fillings. Since refining bamboo was a novel process for the Stock Preparation Pilot Plant, the

first task was to find the right process parameters to reach the targeted quality. After dispersing, the green flour was fed into big bags and sent to Vienna Zoo. Due to the nutritional end use, it was our highest priority to avoid any contact with other materials."

"EXTRAORDINARY COLLABORATION"

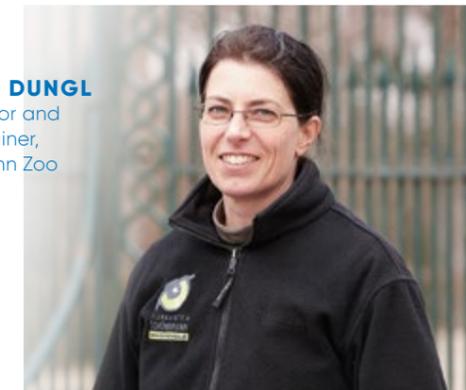
Clearly delighted with the results, Zoo Curator and Animal Trainer Dr. Eveline Dungal says, "The willingness of the ANDRITZ team to accept the challenge of our bamboo grating problem was a



From left to right: Dr. Eveline Dungal, Zoo Curator and Animal Trainer; Laura Hinterndorfer, Animal Keeper; Kiva Prinsloo, Animal Keeper; and Denis Jozic, Process and Technology, ANDRITZ Paper, Fiber and Recycling Division

"The way ANDRITZ dealt with this unusual and out-of-the-ordinary order was exceptionally kind and professional."

EVELINE DUNGL
Zoo Curator and Animal Trainer,
Schönbrunn Zoo





At the Stock Preparation Pilot Plant in Graz, papermakers have the possibility to test their ideas on a pilot scale and simulate paper mill conditions – regardless of whether a certain single piece of equipment or a complete line in different setups is being tested.

great relief for the whole panda team at the Vienna Zoo. The way ANDRITZ dealt with this unusual and out-of-the-ordinary order was exceptionally kind and professional."

Denis Jozic, Process and Technology, ANDRITZ Paper, Fiber and Recycling Division, says, "It is a pleasure having the Vienna Zoo among our customers. I hope that this extraordinary collaboration will continue for many years to come."

FULL-LINE CAPABILITIES FOR TESTING

The Stock Preparation Pilot Plant in Graz was the perfect place in which to find the much-needed solution for the pandas' dietary requirements. As part of its everyday existence, the plant tests and processes all types of raw material to fulfill the needs of customers, including the very special ones like the giant pandas. The mindset at the plant is very much based on the one of trial and error, enabling customers to take the opportunity to experiment

with potential raw materials, while allowing their mills to do what they do best: run at maximum uptime and efficiency.

The pilot plant has the full range of equipment for customer trials and experiments for process R&D, and is flexible enough to accommodate single machine testing or complete process lines. It is able to process both virgin and recycled fibers and has the ability to collaborate with experts from around the world including other technical centers, located in Foshan, China and Springfield, USA.



"Although we have experience with all kinds of fibers, producing food for giant pandas was something new for us. The whole pilot plant team is proud of this project."

LAURA LIUKKONEN
Director of Stock Preparation Pilot Plant, ANDRITZ Paper, Fiber and Recycling Division



View video footage of this report in our augmented reality App!

FOR FURTHER INFORMATION SEE PAGE 3



The shredded bamboo was sent to the Stock Preparation Pilot Plant in Graz where it was successfully processed using a CompaDis disperser.

Liukkonen says, "This is a very special place here in Graz where new raw materials or process configurations can be tested in a risk-free environment prior to investment commitment. Customers can see the benefits of a new concept themselves in realistic process conditions before taking the decision.

"Although we have experience with all kinds of fibers, producing food for giant pandas was something new for us. The whole pilot plant team is very proud of this project."

MORE INFO
andritz.com/sp-pilotplant



Arrival of pre-shredded bamboo

AVAILABLE EQUIPMENT IN OUR PILOT PLANT

PULPING

- Batch-type FibreSolve Pulper
- FibreFlow Drum

SCREENING

- Different types of screens of the ModuScreen series for coarse, fine, and headbox screening as well as fractionation

DEINKING / FLOTATION

- SelectaFlot flotation

REMOVAL OF HEAVY PARTICLES AND DIRT SPECS

- Various cleaner types

DEWATERING

- Pulp screw press
- Vertical Screw Thickener (VST)
- Disc filter with various filter segment designs (including bagless filter)

ATMOSPHERIC AND PRESSURIZED DISPERSING

- CompaDis disperser

DEFLAKING

- DeFlaker

REFINING (LOW / MEDIUM CONSISTENCY)

- TwinFlo disc refiner
- Papillon refiner with cylindrical refining zone

ASH REMOVAL

- RotoWash

HIGH-CONSISTENCY BLEACHING COMPONENTS

EFFLUENT / REJECT TREATMENT

- Mobile sludge dewatering unit
- RejectCompactor

AGITATION

- TurboMix agitator

AS WELL AS:

- Pumps
- Automation system and equipment
- Twin-wire sheet drying line for pulp drying trials

MORE FROM LESS

LIMEWHITE-H WHITE LIQUOR DISC FILTER

The pulp making process hasn't inherently changed over the years; however, ANDRITZ has had a lot of success with reinventing processes and technology in and around mills to increase capacity, improve quality, and cut operating costs. The LimeWhite-H White Liquor Disc Filter is another game-changing development.

"Pulp mills are getting bigger and bigger," says Henrik Grönqvist, Sales Director & Manager, ANDRITZ. "At the same time as being a major supplier of large technologies for these mills, ANDRITZ has also been innovating in and around the mills to improve processes and introduce some radical new technologies."

One of the latest developments from ANDRITZ is its new LimeWhite-H, which is a completely remodeled version of the existing LimeWhite filter. The new filter has major benefits including lower investment cost, increased capacity, and a smaller footprint.

The LimeWhite-H includes some important new technical advances including center shaft axial movement, a hollow shaft, a fixed scraper, and a higher vat level.

CENTER SHAFT AXIAL MOVEMENT

One of the major innovations of the new LimeWhite-H is the introduction of a center shaft with axial movement that allows continuous precoat renewal with no moving scraper, thus eliminating the need for low pressure washing.

In the new design, the scraper remains in a static position (as opposed to the previous version that moved), and the center shaft now constantly moves back and forth in an axial direction. The precoat blow-off function has been replaced with water jets that now remove the precoat. During the precoat removal the shaft rotates in a reverse direction ensuring that lime mud falls into the chute instead of the vat. In addition, the new LimeWhite-H filter slurry water is sprayed directly onto the scraper to ensure efficient dilution of lime mud and clean scrapers. This also means that there is better visibility through the sight glass and cleaner filters. The new design also means there is no need to adjust the scraper after filter cloth maintenance.

HOLLOW SHAFT

The LimeWhite-H contains a hollow shaft. This makes a big difference, as the previous filter contained inner piping. This means less flow resistance and therefore greater capacity. Several improvements from a maintenance point of view have also been implemented for the new filter, including the addition of a shaft stub bolted on the filtrate end for easier replacement.

HIGHER VAT LEVEL

Due to the higher vat level, the filtration area is larger in the new design. The vat level can be raised up to half of the center shaft. Over 30% increased capacity has been measured with this new filter design and without any build-up of lime mud on the shaft.

NEW LIME MILK FEEDING POINT

A new lime milk feeding point has been created through the bottom of the filter

through the air agitators. Previously, the feed point was from the side. The new feeding technology means a more efficient mixing of the lime milk, better process operation, no scaling on the central shaft, and no build-up or plugging of the mammoth pumps. In addition, the new feeding system achieves even lime density in the vat, allowing optimal precoat and ensuring a stable and efficient operation.



The new disc filter has much more capacity at the same time as lower operating costs, and a smaller footprint.





The first installation of a LimeWhite-H filter at Metsä Fibre's Äänekoski bioproduct mill in Finland.

THE FIRST INSTALLATION AT ÄÄNEKOSKI

The first installation of a LimeWhite-H filter took place at Metsä Fibre's Äänekoski bioproduct mill in Finland, ready for its start-up in 2017.

"We are utilizing best available technologies in our production to ensure the highest levels of energy, material, and environmental efficiency. This also supports the mill's cost and production efficiency," says Ilkka Poikolainen, Vice President, Äänekoski bioproduct mill.

Ismo Tapalinen, Metsä Fibre's Development Manager, says, "The main advantage of the new LimeWhite-H installed at Äänekoski is that the scraper no longer moves, which has eliminated the problem of the disc coat breaking. This has resulted in much more uptime due to reduced maintenance.

"Also, we are delighted with the capacity increase, which has gone beyond what we expected. The liquor level in the filter vat is now 20 cm higher compared to the previous filter, which has made our

lives easier – we can keep the breaks to a minimum, easily maintain the unit, and then run at full speed as the white liquor tank quickly fills."

Teemu Häkkinen, Project Manager, ANDRITZ Pulp & Paper says, "The Lime-White-H filter is a completely new design. Together with our customers we have looked at the possibilities to improve the filter, particularly when it comes to efficient operation as well as increased capacity. We have also worked on having a smaller

"We are utilizing best available technologies in our production to ensure the highest levels of energy, material and environmental efficiency. This also supports the mill's cost and production efficiency."

ILKKA POIKOLAINEN
Vice President
Äänekoski bioproduct mill



footprint of the filter that gives flexibility in regard to mill layout in order to meet our customers' expectations and demands.

"In the case of Äänekoski, it was not simply supplying larger hardware for increased capacity; it was much more about the design of the technology. With the LimeWhite-H filter we have definitely achieved that aim."

Grönqvist concludes, "When compared to the previous model, the new disc filter has much more capacity at the same time as lower operating costs, and has a smaller footprint. Normally to increase capacity a larger footprint is required, but in the case of the LimeWhite-H White Liquor Disc Filter, we have proved that more can be achieved with less. And that means more capacity and more

efficiency, all with a smaller footprint, less steel in construction and, of course, less capital outlay."

CONTACT
Henrik Grönqvist
henrik.gronqvist@andritz.com



HENRIK GRÖNQVIST
Sales Director & Manager,
ANDRITZ

"At the same time as being a major supplier of large technology for these mills, ANDRITZ has also been innovating in and around the mills to improve processes and introduce some radical new technology."



View 3D footage of this report in our augmented reality App!

FOR FURTHER INFORMATION SEE PAGE 3

GETTING TECHNICAL

LIMEWHITE-H:

- Capacity range single unit: 2,600 m³/d – 32,300 m³/d WL
- Increased surface loading up to 30%
- High efficiency cloth wash technology
- Minimized footprint
- Utilities consumptions unchanged despite increased WL production m³/d
- Designed for 24 months shutdown periods





TWO TOP NEW CONCEPTS FOR TISSUE PRODUCTION

In just two years ANDRITZ has launched two completely new machine concepts for tissue producers to provide the very best in technology available for making specialty products with maximum efficiencies. The two concepts, the *PrimeLineTEX* and the *PrimeLineVRT*, are now available on the market and can be tested at the ANDRITZ tissue pilot plant in Graz.

PrimeLineTEX

The *PrimeLineTEX* tissue machine has been designed with the high-quality, specialist tissue maker firmly in mind. The existing production technologies for these high caliper and high absorbency products, like Through-Air-Drying (TAD), are generally expensive in terms of capital cost, and at the same time they have been notoriously demanding when it comes to energy use. The *PrimeLineTEX* has been designed for the production of textured tissue to fully address both of these important issues:

energy-consumption comparable to the production of dry-crepe tissue, and quality close to premium TAD tissue.

The design of the tissue machine is derived from the clever idea to structure the tissue paper with a rush transfer operating directly on the belt of the shoe press. A conventional CrescentFormer is used to form the paper on the felt and then enter to the specially designed *PrimePress X* shoe press. The paper is then pressed with a line load up to 500 kN/m, increasing the dryness of the paper by up

to 45%. The paper web remains attached to the plain belt of the shoe press and is then rush transferred onto a structured fabric, similar to the ones used in the TAD process.

The structured fabric runs at a slower speed compared to the shoe press, resulting in the wet creping, and the fiber mat is pushed into the 3D pattern of the structured fabric to generate structured tissue. The paper sheet is then transferred from the fabric to the *PrimeDry Steel Yankee* surface with the help of adhesion

chemicals and is dried off by the Yankee and the *PrimeDry Hood*. The paper, removed from the Yankee surface by a creping blade, is calendered to maximize the 'quality feel' of the tissue surface and is finally sent to the reeling section at the end of the machine.

Stefano Marengo, ANDRITZ Director, *PrimeLineTIAC* and R&D, says, "*PrimeLineTEX* is a completely new technology for specialist tissue making, and is a direct alternative for making high-quality tissue without using the high-energy TAD process. The new tissue machine particularly excels in the making of paper towel products where the rough pattern of the structured fabric can provide good caliper and absorbency. Also, with a suitable fabric pattern and use of the calender, the

concept is perfect for making high-quality bathroom tissue with high softness."

PrimeLineTEX is available to fulfil all standard market widths, from 2.7 to 5.6 m. The machine speed depends on the product and basis weight, but it can be operated up to 1,500 m/min Yankee speed. The quality of the paper produced is close to TAD, but requires 50–60% less energy.

PrimeLineVRT

The *PrimeLineVRT* machine has been designed specifically to address the energy consumption of dry-crepe technology. Some 95% of global tissue production volume is produced using dry-crepe technology. The VRT

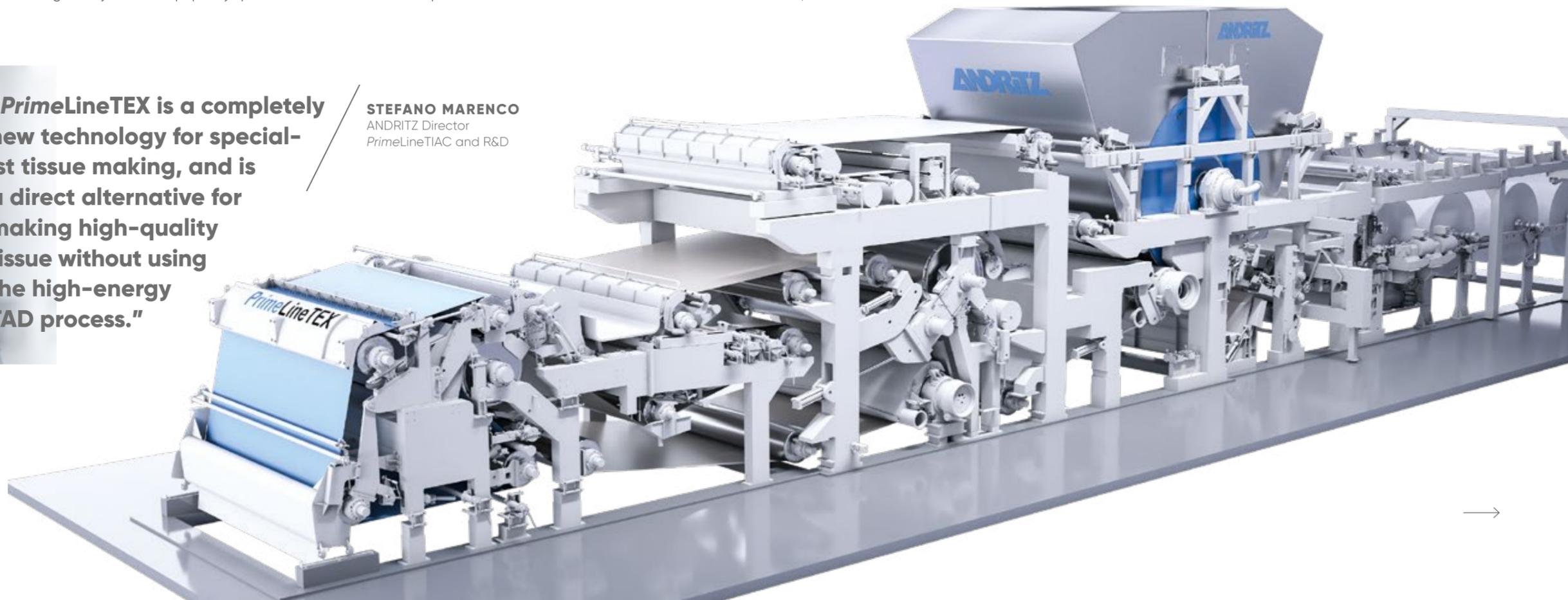


Test the two new tissue machine concepts at the ANDRITZ pilot plant!



"PrimeLineTEX is a completely new technology for specialist tissue making, and is a direct alternative for making high-quality tissue without using the high-energy TAD process."

STEFANO MARENCO
ANDRITZ Director
PrimeLineTIAC and R&D





“We tried many different ideas and configurations to remove additional water from the paper web in the forming section, and the VRT concept proved to be the best.”

CARLOS GALLO
ANDRITZ Director of Technology and Start-up, Tissue Machines



in *PrimeLineVRT* stands for Vertical CrescentFormer, which has been a project focused on further reducing the energy consumption.

The main concept of the Vertical CrescentFormer is to increase the dryness of the fiber web coming out of the crescent former. The idea consists of the drying out of the embedded water from the forming fabric once it leaves the paper, and then bringing the fabric back into contact with the paper sheet using a suction roll installed on the felt side.

The tension of the forming fabric squeezing the paper and removes further water from the paper.

The VRT can also be supplied with an additional press roll, which presses the paper before leaving the nip between the felt and the forming fabric and a hot air hood to increase the water temperature, reducing the water viscosity that facilitates the dewatering of the sheet. One key advantage of the VRT concept is that it can also be installed as a module on existing dry-crepe machines.

Carlos Gallo, ANDRITZ Director of Technology and Start-up, Tissue Machines, says, “Since the beginning with the first trials at our tissue pilot plant, we could see the huge potential of this technology for energy savings. We tried many different ideas and configurations to remove additional water from the paper web in the forming section, and the VRT concept proved to be the best. Additional trials focusing on paper quality have revealed that the VRT concept also increases caliper and tensile strength.”

PrimeLineVRT is available in all standard market widths, from 2.7 to 5.6m. The machine speeds are the same when compared to dry-crepe machines and VRT is available as a module to be retrofitted to a dry-crepe machine. The expected energy savings are in the range of 8–12% when compared to a dry-crepe machine. Depending on the product and paper quality, there is an expected gain in bulk of about 5–10% compared to dry-crepe.

TISSUE TRIALS

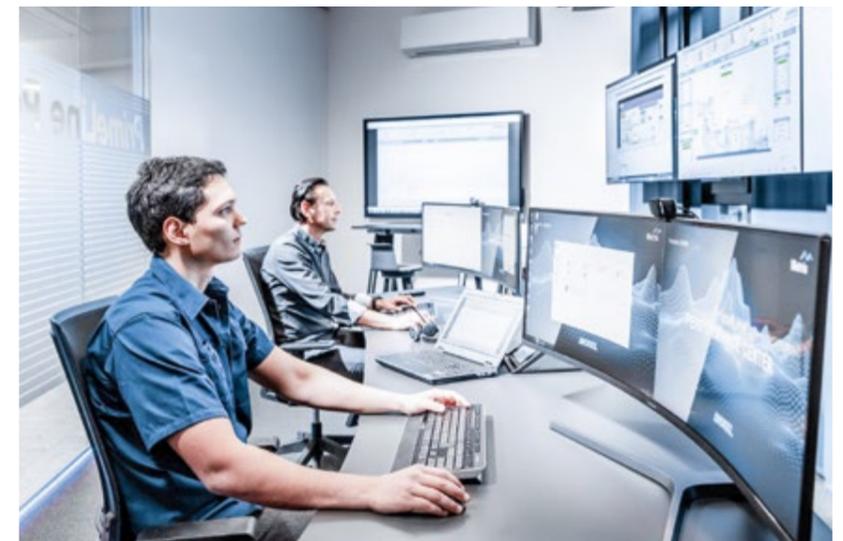
Both new tissue machine concepts,

PrimeLineTEX and *PrimeLineVRT*, were extensively tested at the ANDRITZ tissue pilot plant in Graz, Austria. Franz Harrer, ANDRITZ Head of Technology, Tissue explains, “As well as being able to visit our tissue pilot plant in person to view their own trials on our latest technology such as the *PrimeLineTEX* and *PrimeLineVRT*, we also have the latest in remote visual technology where we can conduct customer trials live and online. Operators using HoloLens visual technology along with support from the Metris Performance Center of ANDRITZ can give the

impression that the customer is actually there, on site, viewing and experiencing the trials. All our customers who have taken part in this online service so far have been very impressed with the performance and quality of the experience.”

CONTACT

Stefano Marengo
stefano.marengo@andritz.com



UPGRADED PERFORMANCE AND RELIABILITY

PrimeFilter D DISC FILTER

Major upgrades and a series of smaller innovations have been incorporated into the new ANDRITZ PrimeFilter D to improve performance and reduce maintenance. The new design includes the latest bagless technology, which is well-proven in over 65 installations to date. The upgraded PrimeFilter D has been well-received already – 15 units have been started up and more orders are being received from leading papermakers.

When engineering the new PrimeFilter D, ANDRITZ specialists evaluated the performance of over 600 disc filters the company has installed around the world, spoke with customers, and re-examined the design from end-to-end. The result is a disc filter that is perfectly suited for thickening all kinds of pulp and operating at higher consistencies, and for producing excellent quality filtrate when applied as a saveall for fiber recovery in PM white water systems.

MAJOR UPGRADES TO TECHNOLOGY

The PrimeFilter D fuses several key technological innovations into one unit to improve throughput and reduce both investment and operating costs.

HHw for even the most demanding thickening applications. HHw stands for High consistency, High freeness, and a wider distance between discs. This enables

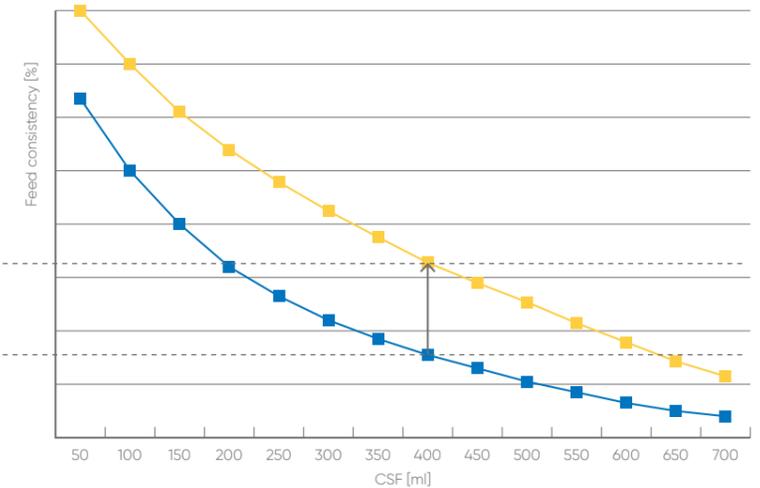
the PrimeFilter D to handle higher feed consistencies and higher freeness pulps. ANDRITZ's integrated feedbox with patented infeed chutes (Figure 2) provides individual feed for each disc in the PrimeFilter D. A new feature is the ability to add an optional second feed at the bottom of the vat to avoid creating a "dead zone" for pulps with high drainage rates while keeping the vat bottom properly diluted.

Figure 3. Feed consistency range for a PrimeFilter D versus standard disc filter DF38

Sizing of HHw max  Standard max 

HHw: Higher filter inlet consistency allowed

Standard disc filter: Inlet consistency is limited due to vat thickening



Feed consistencies with the PrimeFilter D can be considerably higher than a standard disc filter. This comparison (Figure 3) shows the feed consistency range at any given CSF of the PrimeFilter D compared to a standard ANDRITZ DF38 unit.

In the HHw design, there is more distance between the discs and the outlet chutes. This creates fewer rubbing forces on the surface of the fiber mat and reduces the tendency for the mat to peel off when the disc sector is submerged.

Disc guiding rolls with internal bearings ensure smooth, stable, and guided rotation of each filter disc. This results not only in smoother operation, but also longer life of the filter internals.

HHw technology allows the PrimeFilter D to reach higher specific loads for a given feed consistency. Figure 4 shows that raising the feed consistency from 0.75 to 1.1% results in a 30% increase in specific production (in terms of bone-dry metric tonnes per day). Or, if the production is not needed, the filter could be smaller (30% less filter surface area) to achieve the same production load.

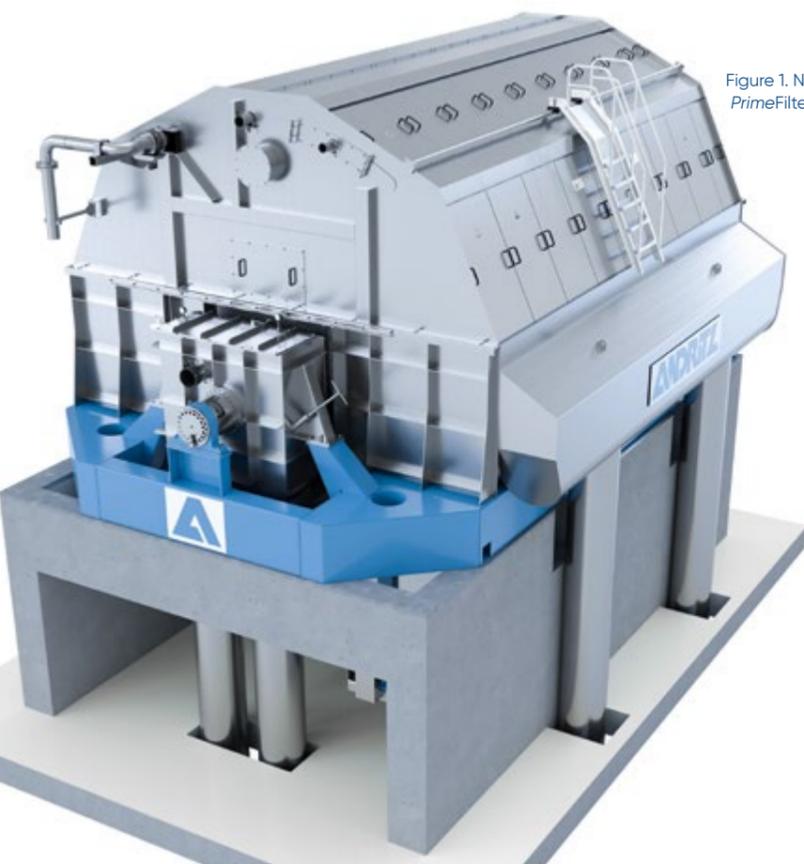


Figure 1. New ANDRITZ PrimeFilter D

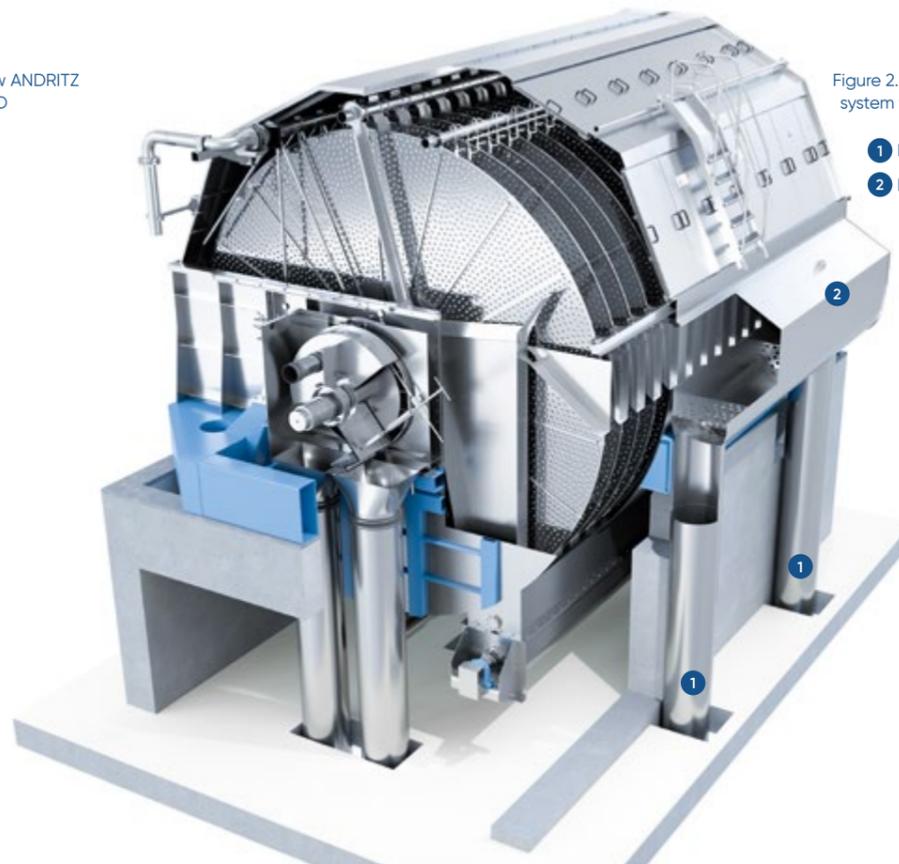
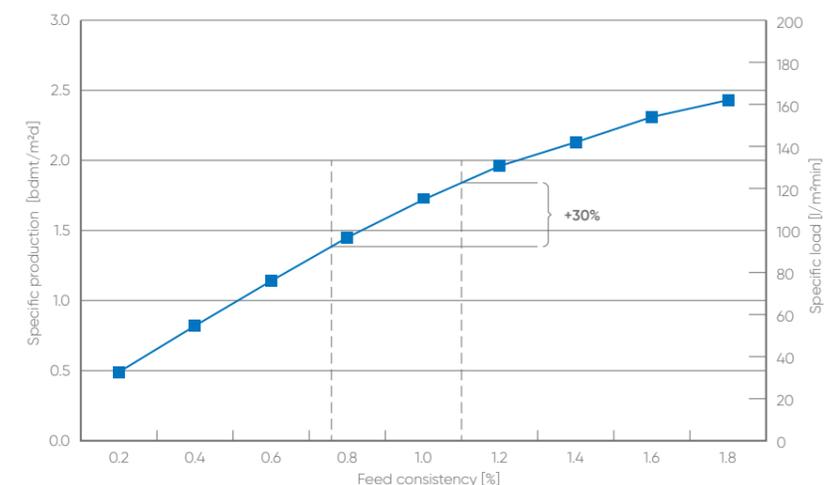


Figure 2. Advanced feed system for PrimeFilter D

- 1 Main feed
- 2 Feedbox

Production bdm^t/m²d 

Figure 4. PrimeFilter D: Specific production vs. feed consistency



Conical Cell bagless sectors for uniform fiber mats, long life, less maintenance. The Conical Cell bagless sector design of the *PrimeFilter D* (Figure 5) offers significant improvements in terms of operation and maintenance.

Since the sectors are basically flat, they produce a very uniform fiber mat that is easily doctored off in one piece. The way the plates are manufactured results in a 5% increase in effective filtering surface compared to a flat sector fabric. The open design is easy to clean.

Compare this to the performance shortcomings inherent in other bagless sector designs, particularly "corrugated" sectors. The asymmetrical corrugated design creates hydraulic flow impingements. The fiber mat is not uniform due to the peaks and valleys of the corrugations. This lowers the maximum rotational speed and therefore limits capacity of the filter. Overlapping areas in the sector interior make cleaning more difficult, and there is a tendency for inside scaling.

Because of this, the Conical Cell sector allows a filter to run faster than a corrugated sector. An example is shown in Figure 6, where the maximum rotational speed of a corrugated sector is 1 rpm for this grade of pulp. The *PrimeFilter D*'s Conical Cell allows

the disc to rotate in a range of 1.4–1.8 rpm for that same grade, accounting for a production boost of 15–20%.

Two-level shaft sealing for improved reliability and filtrate quality. A significant technical improvement in the *PrimeFilter D* is its advanced double sealing arrangement (Figure 7). The sealing is outside the filtrate valve making it easy to access. This eliminates the possibility for fibers to enter the filtrate directly. Ease of access allows the seal to be exchanged without

removing the filtrate valve housing, covers, and sealing support. In addition, no realignment of the filtrate valve is necessary after a seal exchange.

A rubber hose inside the shaft seal is inflated with compressed air to provide uniform surface contact with the sealing ring around its entire circumference. Other filters utilize an asymmetrical three-point spring system that creates uneven sealing forces, which can cause uneven wear of the seals and a shorter lifetime.

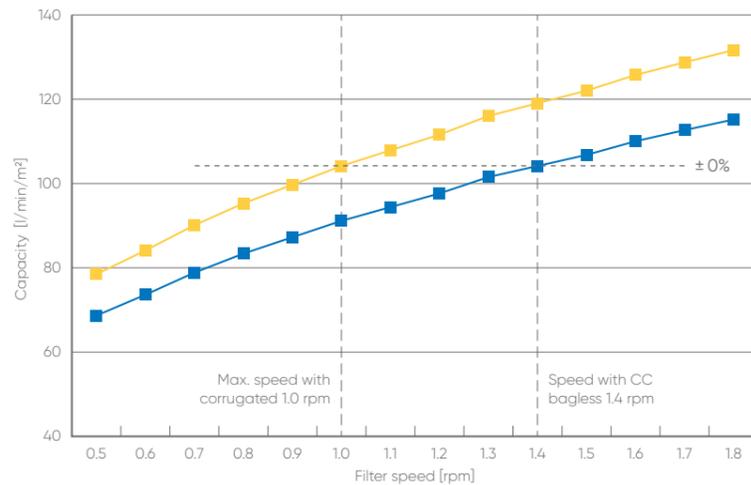


Figure 6. Rotational speed – corrugated vs. Conical Cell bagless designs

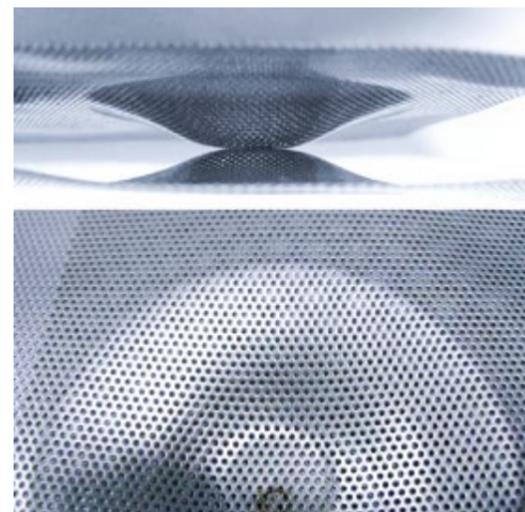
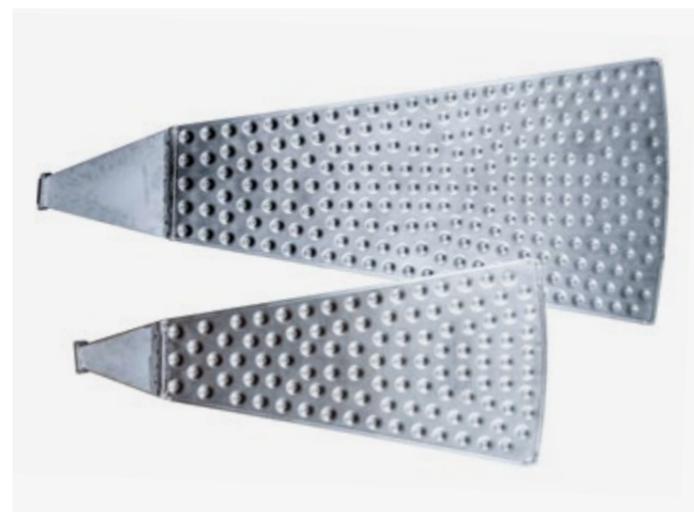


Figure 5. Conical Cell bagless filter sectors – close-up view



ANDRITZ Conical Cell bagless sectors

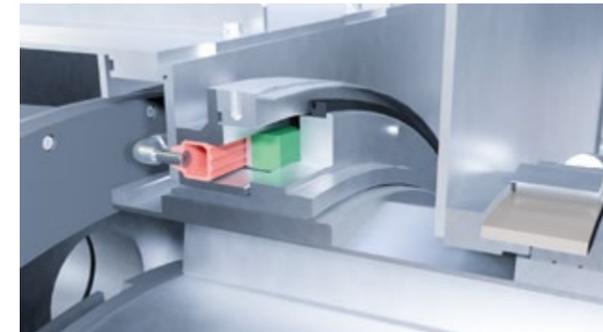


Figure 7. *PrimeFilter D* two-level shaft sealing



Figure 8. Tapered positioning plate

A RANGE OF OTHER DESIGN IMPROVEMENTS

The *PrimeFilter D* has a simple, ruggedized system for installing and locking the disc sectors into place with guide bars at each end. Integrated into the base of each sector is a tapered positioning plate (Figure 8) that guides the sector into position in the shaft. A rugged rubber seal covers the sector foot flange to ensure sector-to-shaft sealing for stable vacuum and enhanced filtrate flow.

Knock-off nozzles have been redesigned to make it easy to flush out fibers and deposits. A simple hand lever engages the easy-cleaning function while the filter is in operation.

THE COMPLETE PACKAGE

The new *PrimeFilter D* delivers superior throughput and operation (Figure 9). The uplift in production can be a 30% gain per disc surface area. Inlet consistencies up to 2% are possible. Up to 30% less pumping energy is consumed due to less water

in the suspension and reduced water recirculation requirements.

The fiber mat created on the Conical Cell bagless sectors is optimum in terms of formation and uniformity. The bagless sectors eliminate the need to shut down to change filter bags and the improved design for aligning and supporting disc sectors ensures overall smooth operation.

CONTACT
Ari Pelkio
ari.pelkio@andritz.com

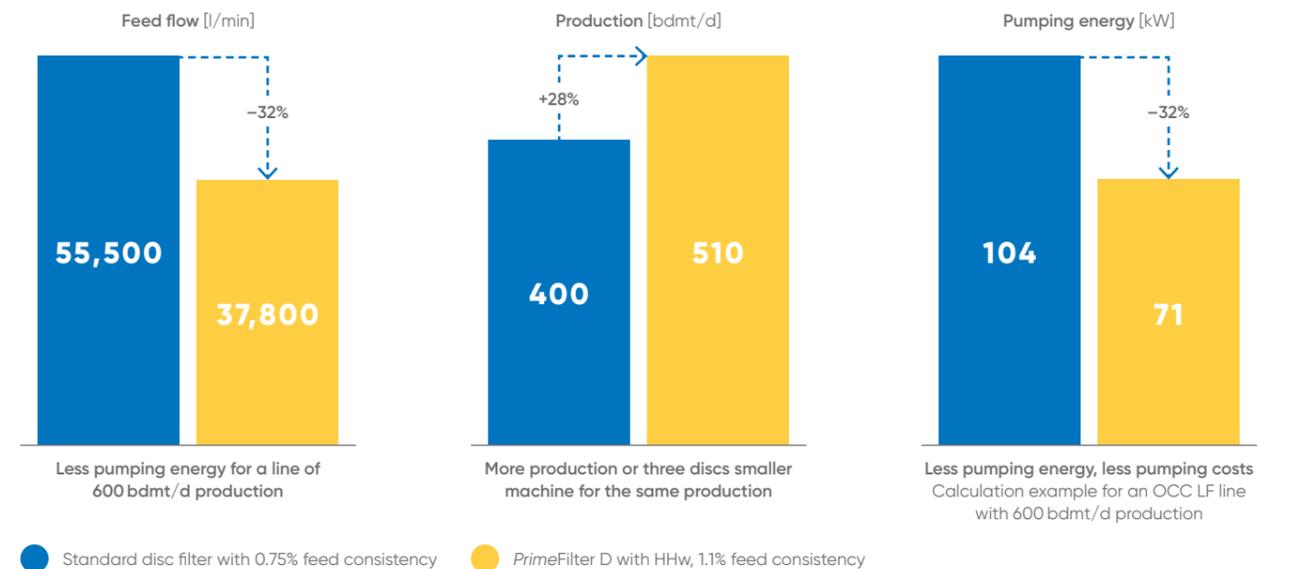


Figure 9. Summary of main benefits of *PrimeFilter D*

MAPA ON SCHEDULE FOR THE NEXT PHASE

The COVID-19 pandemic has wreaked havoc across the world's industries, shutting down operations and leading to the mass furloughing and laying off of workers and contractors. However, due to its massive importance to the country of Chile as well as to the global pulp and paper industry, Arauco's MAPA project has continued, although in a much-adapted way.

"We have had to completely rethink the way we work on the MAPA project as well as across all of our operations," says Charles Kimber, Vice President, Commercial & Corporate Affairs, Arauco. "The virus has made us look very hard and deep at ways we can adapt our complete working environment to keep the health and safety of all of the many people connected to our operations at the forefront."

The working environment Kimber alludes to is not just a normal operation, particularly in the case of the MAPA project. Here 8,000 workers from 40 companies and a multitude of disciplines and trades go to work at the site near the central Chilean city of Concepcion every day. Fortunately, Arauco was acutely aware at the beginning of the pandemic in China and was able to start work on preparing for the inevitable consequences.

"We employ 25,000 people in Chile and we also have another 10,000 employees

working elsewhere around the world, including a commercial office in China where we have important customers. We had eyes on the ground there as the COVID-19 situation developed and worsened in December, and by January we were already making preparations for what would almost certainly come to Chile.

"We then followed the situation as it developed in Europe and began looking closely at our IT infrastructure to make sure that key employees in our offices could continue working from home. As the pandemic developed further, in March we moved 3,000 key workers from our offices and they continued to work from home."

MAPA – A MAJOR REORGANIZATION

The MAPA project was a whole new challenge on its own when it came to the virus, which demanded the complete reorganization of the working environment.

Kimber continues, "In early March, we had around 8,500 people working at the site and we decided that if we were to continue with the project, new, stringent working methods and conditions would have to be put into place.

"On March 20th we announced, together with the main suppliers and construction companies, to all the project companies involved that we were going to introduce a short pause for two weeks as we needed to reorganize, and implement new health and safety procedures due to the virus."

In the two-week period, the company completely overhauled its working practices to take into account the threat from the virus – from the transportation of workers in and out of the project site, to a new working environment within the project – that took into account all the safety procedures and practices to ensure minimum threat from contagion or spread.



CHARLES KIMBER
Vice President,
Commercial & Corporate Affairs,
Arauco

"The virus has made us look very hard and deep at ways we can adapt our complete working environment to keep the health and safety of all of the many people connected to our operations at the forefront."



Work continues on civil works at the MAPA project in Chile; the mechanical installation stage is next.

"The MAPA project is by no means a small endeavor," says Kimber. "For example when it comes to transportation, we have more than 280 buses bringing people in and out every day. And then there is the challenge of allowing 5,000 people coming in at the same time with our already stringent security measures at the entrance to the project.

"We had to rethink and redesign the whole working environment, at that same

time as keeping our momentum up to continue with the project."

Arauco, through its HR and dedicated Health & Safety divisions, redesigned the MAPA working model to take into account the unprecedented threat of COVID-19. From social distancing on buses and transportation to new gates and doors at the entrances, to new canteen measures and sanitary conditions, adaptation took place from top to bottom of the project.

"Despite the seriousness of the virus, we didn't want the additional safety measures we were putting in place to be seen just as something extra or additional to our own stringent health and safety measures," explains Kimber. "Our HR and Health & Safety leaders created a systematic code of working that integrated seamlessly into our existing way of working and simply made it part of normal working procedure."

THE ART OF COMMUNICATING

After the brief two-week pause, in early April 2,000 workers began construction and working once again on the project, followed by the full 8,000 in the following weeks. One of the challenges Arauco has mastered during the pandemic is of communicating the new measures and working practices to the 40 or so companies working on the project, along with the 8,000 employees and contractors. "We were intent on not making this a vertical instruction coming from Arauco," says Kimber. "This needed to be horizontally communicated, to engage each and every person associated with the project.



As a unique added extra to getting important messages out about safe working practices during the virus, Arauco team members came up with their own COVID-19 rap.



The MAPA project was a whole new challenge of its own when it came to COVID-19.



The new measures have been positively and enthusiastically accepted by the MAPA project teams.

We have been very pleased with the way the new measures have been positively and enthusiastically accepted. The feedback we have is that workers feel very safe within the project environment, even safer than on the outside."

Arauco has utilized many different communication tools to relay the new working

procedures, as well as engage all people working on and around the MAPA project. As well as a daily newsletter and regular email updates, there is also a dedicated WhatsApp group with more than 3,000 members.

"Communications have become very complex with online and mobile devices, so we have used all the channels at our

disposal to make sure that everybody is involved and the message of keeping safe is reinforced.

"As well as daily updates, we have been posting videos and launching competitions. We even have a COVID-19 rap that has proved very popular and has even gone viral in Chile."

MORE CHALLENGES AHEAD

The next stage of the MAPA project is the installation of key equipment and will include bringing skilled technicians from other countries to take part. "This is our next challenge," says Kimber. "We will be bringing in 60-70 skilled technicians from countries including Finland, Austria, Brazil, and Uruguay to install our new equipment at the mill.

"We have already risen to this challenge and have been working very hard at a high level with the government in Chile. Due to the stringent measures and procedures we have put in place, we have full support to go ahead and continue with the next stage of the MAPA project."

CONTACT

Harri Makkonen
harri.makkonen@andritz.com



View video footage of this report in our augmented reality App!

FOR FURTHER INFORMATION SEE PAGE 3

ANDRITZ – ON SCHEDULE WITH DELIVERY

ANDRITZ is a major supplier to the MAPA project. The scope of supply to the mill includes a complete wood processing plant, fiberline, black liquor evaporation plant, and complete white liquor plant.

While COVID-19 has had an impact on the overall schedule of the project, deliveries of key equipment continue to take place. At present, civil works are being readied and all areas are moving to the mechanical installation phase. Harri Makkonen, ANDRITZ Project Director for MAPA says, "All purchasing is now complete, and we are on schedule with our delivery. We are now moving towards the site supervision part of the project.

"There have been some effects of COVID-19 hampering our progress, mainly due to ongoing manufacturing delays in China, as well as delays with South American sub-suppliers. We have also experienced some delays in shipping due to ship availability and access blockages at ports abroad, as well as inland transportation because of travel restrictions at origin. However, considering the extent and seriousness of the virus, we are continuing to get things done and we are content with our progress."



Health & Safety: The Challenge of COVID-19

ANDRITZ continues to service its customers around the world despite the COVID-19 pandemic. However, strict precautions are insisted upon both in our own operations and at our customer sites to ensure the safety of our own personnel as well as of our customers and any people working on or around projects in which we are involved.

ANDRITZ, like any other technology and engineering company supplying complex equipment, has experienced many challenges in regard to COVID-19. We have had to completely rethink and reorganize the way we work from a Health & Safety point of view, to keep our people in our offices and factories safe, as well as to ensure the safety on our many project sites all around the world.

For the most part, we have been able to continue with our projects, as we have capable and professional people in the various locations in which we operate. This means that when essential personnel or project managers cannot travel, we have been able to continue with our local experts. We have found that the new communication technology tools ANDRITZ has been developing – using photos or live videos from project locations – have been extremely helpful to keep projects ongoing and even on schedule.

When travel has been essential, we have been collaborating with our travel security, and working very closely with several experts in the areas we operate in to assess the local situation before we send any personnel out to any projects. We have taken some time in the training and instructing of all ANDRITZ personnel involved in the projects. When any of our personnel arrive at a customer site, they are not only well aware of the precautions they need to take, but they are also well informed of how important it is to follow the local regulations and, of course, the requirements of our customers.

We have also laid down some of our own requirements for the customers we visit in order to minimize ANDRITZ personnel exposure to the virus, including:

- Ensuring full compliance with all local legal requirements and restrictions imposed by competent authorities to avoid and limit spread of the virus
- Organizing frequent sanitation and disinfection of all areas, vehicles, and facilities
- Defining and establishing a suitable access control system, in order to identify and track all personnel entering and leaving the facilities
- Ensuring adequate and sufficient physical distancing between all site personnel, also adapting, reorganizing and if necessary extending, the existing facilities and structures (especially in all common areas such as access gates, canteen, welfare facilities, etc.)
- Establishing a systematic monitoring of body temperature for all personnel (own employees, contractors' staff, delivery drivers, and visitors) entering the facilities
- Reducing situations where more than three persons are gathering. These meetings should take place only if absolutely necessary. Replacing face-to-face meetings and training with conference calls and online sessions
- Ensuring all personnel entering the premises are provided with suitable safety masks that must be worn at all times

ANDRITZ has also contributed in efforts to overcome the virus by using its extensive knowledge of nonwovens technology to create high quality face masks. The new D-Tech face mask line can produce up to 750,000 surgical masks per day. These masks have been used to cover the internal needs of the ANDRITZ Group and to support some local communities in Italy, when finding masks on the market was quite difficult due to the unexpected increased demand.

ANDRITZ is ready to face any new challenge associated to the COVID-19, satisfying customers' operational expectations, without compromising the health and safety of all involved parties.



GIUSEPPE D'AMELJ
HSE Manager
Pulp & Paper Capital Systems



MIIKKA JOHANNALA
HSEQ Manager
Regional Safety Coordinator

New Orders

AO Knauf Petroboard, Kommunar, Russia
New reeling section for the KM2 board machine

Baoren Hezhong, Shaoxing, China
Complete spunlace line

BCNonwovens, Barcelona, Spain
Complete spunlace line

BillerudKorsnäs, Gruvön, Sweden
COMPACT PRESS® Washer

Eruslu Nonwoven Group, Gaziantep, Turkey
Complete spunlace line

Guangdong Hengan Paper, Yunfu, Guangdong, China
Four PrimeLineCOMPACT M 1600 tissue machines

Guangxi Sun Paper, Beihai, Guangxi, China
Chemi-mechanical pulping system

Karweb Nonwovens, Gaziantep, Turkey
Complete spunlace line

Klabi, Puma II, Ortigueira mill, Brazil
Gasification plant and biomass handling line

Kookil Paper, Zhangjiagang, Jiangsu, China
Stock preparation system including approach flow and fiber recovery

Mayr-Melnhof Karton, Frohnleiten, Austria
Vertical Screw Thickener

MOPAK Kağıt Karton, Dalaman, Turkey
Rebuild of PM3; conversion from coated board grades to lightweight coated and uncoated White Top Testliner

Papierfabrik Palm, Wörth, Germany
Two ADuro P shredders for reject handling

Riau Andalan Pulp and Paper, Kerinci, Indonesia
Twin wire press thickening for dissolving pulp system

Sun Paper, Beihai, China
Wet lap system including a Twin Wire Press, cutter-layboy and baling line, White Liquor Plant, Evaporation Plant key equipment and technology with ANDRITZ multiple-effect lamella evaporators, as well as ash re-crystallization (ARC) system

600 t/d P-RC APMP system

Toyo Engineering Corporation, Gamagori, Japan
PowerFluid Circulating Fluidized Bed (CFB) boiler with flue gas cleaning system for a new biomass power plant

Toyo Engineering Corporation and Nippon Steel Engineering, Omaezaki, Japan
PowerFluid Circulating Fluidized Bed (CFB) boiler with flue gas cleaning system for a new biomass power plant

Vinda Personal Care, Yangjiang, Guangdong, China
200 t/d stock preparation lines including approach flow system, brake systems for four tissue machines

Xuong Giang Paper Mill, Vietnam
PrimeLineCOMPACT S 1300 tissue machine with stock preparation and automation systems, detailed engineering, erection work supervision, and commissioning services

Start-ups

Arkhum Tissue Group, Vorsino, Russia
PrimeLine™ W6 tissue machine, including stock preparation, re-evaporation plant, hall ventilation, automation, and electrification

Bailonggang Wastewater Treatment Plant, Shanghai, China
Sludge handling, nine fluidized bed dryers, six EcoFluid bubbling fluidized bed boiler (BFB) lines, flue gas cleaning, as well as full plant automation

Daio Paper, Mishima Mill, Japan
HERB recovery boiler, HD concentrator at evaporation plant, DD-Washer at fiberline

First Quality Tissue, Lockhaven, USA
PrimeLineTAD tissue machine

JSC Ilim Group, Bratsk, Russia
Woodroom with three debarking lines and Smart Woodyard products, new DD-Washer and screening modernization at Fiberline

Mitsui Engineering & Shipbuilding, Chiba/Tokyo, Japan
PowerFluid Circulating Fluidized Bed (CFB) boiler

Smurfit Kappa Nettingsdorf, Austria
HERB Recovery Boiler

Nine Dragons Paper, Chongqing, China
PowerFluid Circulating Fluidized Bed (CFB) boiler

Nine Dragons Paper, Dongguan, China
PowerFluid Circulating Fluidized Bed (CFB) boiler

Nine Dragons Paper, Yongxin, China
PowerFluid Circulating Fluidized Bed (CFB) boiler

Pori Energia, Pori, Finland
EcoFluid Bubbling Fluidized Bed (BFB) boiler with auxiliaries

Shandong Wamat Paper, Shandong, China
First of two OCC lines, each with a capacity of 1,000 bdmt/d

Sun Paper, Zoucheng, China
High-Kappa Fiberline

Volga Pulp and Paper Mill, Balakhna, Russia
Rebuild of existing groundwood reject line as TMP line

Xinxiang Xinya Paper Group, Henan, China
P-RC APMP system partly with new and second-hand equipment



Södra Cell Mönsterås, Sweden
ANDRITZ has recently started up the world's first biorefinery plant using ANDRITZ's self-developed A-Recovery+ concept at the Södra Cell Mönsterås pulp mill in southeastern Sweden.

ANDRITZ completes the world's largest P-RC APMP production system at Jiangsu Bohui Paper Industry, China



ANDRITZ has received the Final Acceptance Certificate from Jiangsu Bohui Paper Industry Co., Ltd in Yancheng, Dafeng, China, for its chemi-thermo-mechanical pulping system. With a total capacity of 2,250 admt/d, this system is the largest worldwide.

ANDRITZ installed its well-proven P-RC APMP (Pre-Conditioning Refiner Chemical Alkaline Peroxide Mechanical Pulp) technology to ensure optimum pulp quality in terms of high bulk and low shive content at the lowest energy consumption

and the highest availability. The system processes eucalyptus wood chips for the production of folding boxboard (specifically coated ivory board), and consists of the world's largest single P-RC APMP fiberline with a capacity of 1,500 admt/d and a second fiberline with a capacity of 750 admt/d.

Read more: andritz.com/news-jiangsubohui

Pulp production technologies and key process equipment for Sun Paper's new mill in Beihai, China

ANDRITZ has received an order from Sun Paper to supply pulp dewatering and white liquor plant technologies and key process equipment for their new pulp mill in Beihai, China. Start-up is scheduled for the fourth quarter of 2021.

THE SCOPE OF SUPPLY ON EPS BASIS INCLUDES THE FOLLOWING EQUIPMENT:

- Wet lap system with two production lines
- White liquor plant comprising major recausticizing equipment and an ANDRITZ LimeKiln
- Evaporation plant with a high-concentration section
- Ash re-crystallization (ARC) system to treat the ash from the electrostatic precipitator by decreasing the chloride and potassium content while recovering sodium and sulfate

As a second project, ANDRITZ has received an order to supply a chemi-mechanical pulping system system. The new system will be the sixth ANDRITZ P-RC APMP (Pre-Conditioning Refiner Chemical Alkaline Peroxide Mechanical Pulp) line for Sun Paper. These orders once again confirm the excellent business relationship between ANDRITZ and Sun Paper.

Read more: andritz.com/news-beihai-pulp
andritz.com/news-beihai-mechpulp

Four PrimeLineCOMPACT M 1600 tissue machines for Guangdong Hengan in China



ANDRITZ has received an order from Guangdong Hengan Paper Co., Ltd. (Hengan) to supply four tissue machines to its new mill in Yunfu, Guangdong, China, for the production of high-quality facial, toilet, handkerchief, and napkin tissue grades made of virgin market pulp.

Each of the new machines is of the type PrimeLineCOMPACT M 1600 with a design speed of 1,700 m/min and a working width of 3.65 m. All of them are equipped with a proven PrimeFlow step diffusor headbox for superior formation quality. The 18 ft PrimeDry Steel Yankee together with the high-load suction pressure roll and canopy hood ensure high drying capacity at reduced energy consumption compared to conventional drying systems.

The scope of supply also includes an under-machine pulper.

This order confirms the successful partnership by Hengan and ANDRITZ that started in 1998 when Hengan bought its first ANDRITZ tissue machine for the mill in Changde city. In the meantime, Hengan has thirteen ANDRITZ tissue machines in operation, with the four new ones being scheduled to go into operation in the fourth quarter of 2021.

Read more: andritz.com/news-hengan

DID YOU KNOW THAT...

... ANDRITZ OFFERS THE COMPLETE PORTFOLIO FOR EXHAUST GAS CLEANING IN THE MARITIME INDUSTRY?



The exhaust gases of marine diesel engines contain harmful air pollutants, mainly sulfur dioxide, nitrogen oxide, and complex particulate matter. These are a big concern for human health and the environment.

The ANDRITZ SeaSOx technology is the right answer to meet the new legal requirements worldwide and to minimize the environmental impact of ships with SeaSOx Scrubber Solutions (as I-type (inline) or U-type (bypass) in round or rectangular form) and SeaSOx Dual / Multi Filtration (for SOx, NOx, and fine particulate removal).

Get more information at:
ANDRITZ.COM/SEASOX

... ANDRITZ PROVIDES COMPLETE NONWOVEN PRODUCTION LINES FOR SUSTAINABLE WET WIPES?

The rising threat of plastic pollution and stricter regulations from governments and trade associations have propelled ANDRITZ to develop the right nonwoven production technologies for fully biodegradable and plastic-free wet wipes.

Such processes are achieving high performance entirely with natural and/or renewable raw materials, like wood pulp, viscose, cotton, hemp, bamboo, or flax. The use of wood pulp has several benefits, such as a cost-effective production because of the raw material costs and in terms of biodegradability due to the shorter fibers it contains. ANDRITZ is the only supplier providing complete production processes for sustainable wipes from just one source.



Get more information at:
ANDRITZ.COM/BIOWIPES

... ANDRITZ RECYCLING RECENTLY DEVELOPED THE NEW ADURO S SHREDDER TO PREPARE REFUSE-DERIVED FUELS?

Refuse-derived fuel (RDF) is an alternative power source produced from various waste streams such as municipal solid waste and industrial or commercial waste. These waste types often contain lots of different materials. Many of them are precious such as metals and others have high-calorific content.

After shredding with the ADuro S, valuable raw materials are sorted out and high-calorific fractions can be converted into RDF and used to feed incinerators, thus reducing our reliance on fossil fuels and preventing reusable resources from landfill.



Get more information at:
ANDRITZ.COM/ADURO-S

