

SPECTRUM

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at Södra Mönsteras // 28

A big step forward
at Vajda Papir // 40

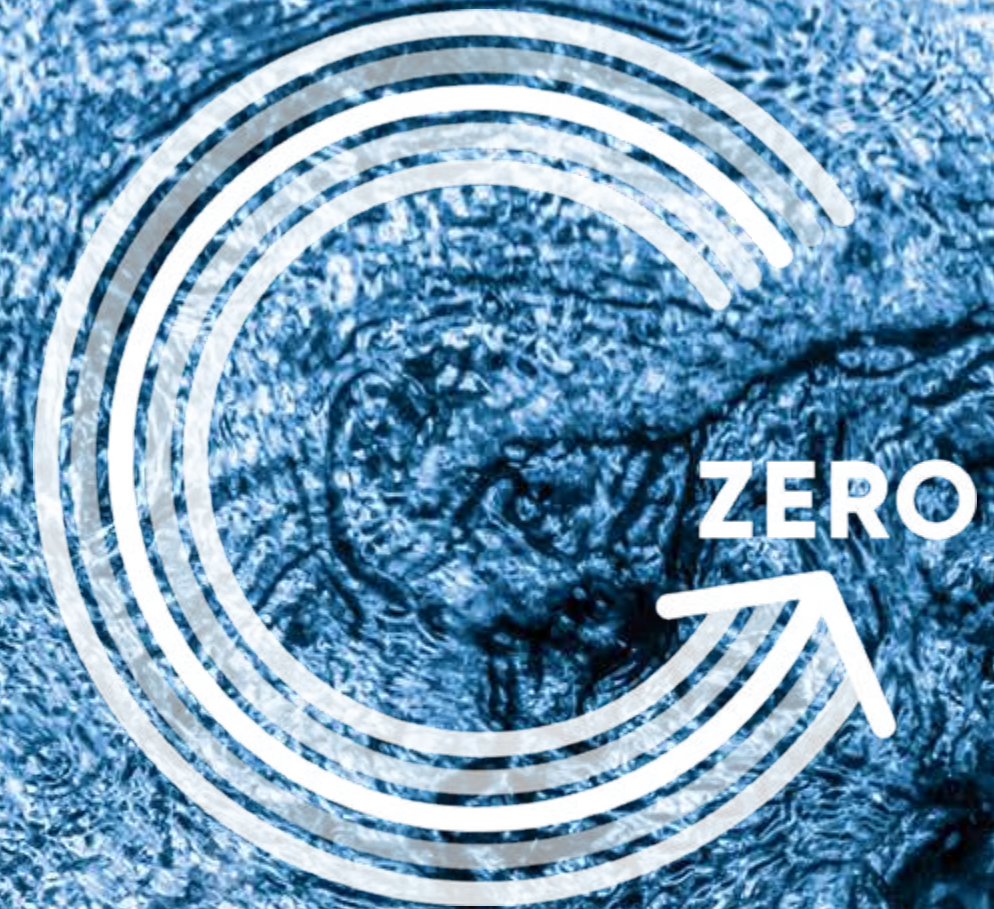


**ZERO EMISSIONS
AND ZERO WASTE**

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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.



CircleToZero:
**TOWARDS ZERO EMISSIONS
AND ZERO WASTE
AT PULP AND PAPER MILLS**

Cover Story // 18



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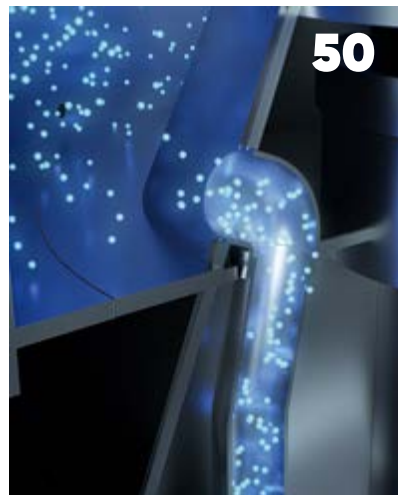
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On the cover: CircleToZero (page 18)

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The CircleToZero Journey Has Begun

ANDRITZ recently launched its CircleToZero initiative to minimize emissions and waste while creating value at pulp mills.

The circular bioeconomy is increasingly being seen as a valuable concept in the mitigation of climate change as well as addressing future raw material scarcity. Around the world the message is getting through that recyclable products derived from renewable resources are the only way forward for the future. It is also clear that these products must be produced at facilities that are maximized in efficiencies for climate-friendly manufacturing – creating minimal, or preferably zero, emissions and waste.

As most professionals working in the production of pulp and paper will know, our industries are already showcase examples of producing recyclable, biodegradable products made from renewable resources. In fact, pulp and paper industries around the world are already recognized as being at the very heart of the circular bioeconomy. And when it comes to production, pulp and paper industries have come a long way in a short time on major improvements to environmental issues at mills. The fact is, a modern pulp mill is already very efficient in terms of chemical and water consumption and the recovery as well as regeneration and reuse of these vital resources.

With the CircleToZero initiative, we are moving into a new future dimension that not only focuses on creating an environmentally sound mill, but one that is truly circular in its use of side streams, turning what was once waste into valuable bio-based products or vital resources for reuse in production.

CircleToZero – A DESTINATION AND A JOURNEY

A good example of the CircleToZero initiative put into action is ANDRITZ A-Recovery+, an innovative concept to improve the resource efficiency of the chemical recovery cycle. In this issue there are two of the latest success stories; one at Södra's Mönsterås pulp mill in Sweden, which is now producing commercial quality biomethanol, and Klabin's latest installation of a sulfuric acid plant at its Ortigueira mill in southern Brazil. Both of these installations are and will be utilizing side streams to either create value through new bio-based products, or will generate major savings by recycling and refining chemicals for their own use at the mill.

These two installations are prime examples of what can be done to maximize existing resources by closing loops and eliminating emissions and waste. This is why ANDRITZ has launched the CircleToZero initiative; not only has the initiative been designed to help our customers address climate and raw material resource issues, it has also been designed to ensure that maximum efficiencies can be obtained along the way. The ultimate aim of CircleToZero is to develop environmental and economic value hand-in-hand in close cooperation with our customers.

CircleToZero is the ultimate destination; however, at ANDRITZ we are well aware that this is going to be a long and challenging journey, full of collaboration and positive activity. We are also aware that this journey will certainly involve deeper partnerships with new, innovative business models. We have already started our CircleToZero journey; we welcome you to join us!

Yours sincerely,

Lauri Pehu-Lehtonen
 Director, A-Recovery+
 Recovery and Power
 ANDRITZ PULP & PAPER



SPOTLIGHT ON

Complete LC pulping system with several design upgrades started up at Papeleira Coreboard, Portugal

Despite the challenging circumstances caused by the pandemic, a complete continuous LC pulping system was started up successfully at Papeleira Coreboard, Portugal, via remote support from ANDRITZ.

The new LC pulping system installed features several design upgrades:

- FibreSolve FSR pulper with advanced rotor design for efficient slushing at lowest fiber loss and highest availability
- Advanced ANDRITZ TrashTrap for reliable separation and removal of heavy and light rejects early in the process
- State-of-the-art ragger that allows – in combination with the new pulper rotor design – superior forming, handling, and removal of pulper rags

The system also comprises a detrashing pump, FibreGuard detrasher, FibreWash Drum, cleaners, and a RejectCompactor for further treatment of rejects.

Papeleira Coreboard processes LOCC with a line capacity of 300 bdmt/d and a reject content of up to 10% to produce different types of coreboard. The company is part of Artech Paper Holding and manufactures pulp, paper, and cardboard, focusing on 100% recycled paper and cardboard as raw material for its production.

Contact us for further information:
andritz.com/stockpreparation
 or fiber.prep@andritz.com



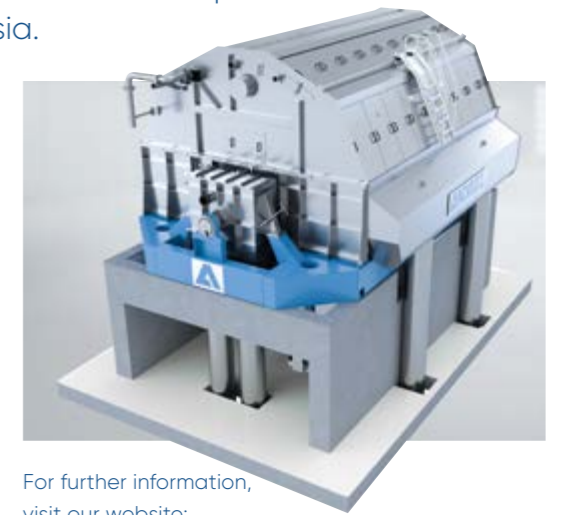
World's first PrimeFilter D disc filters started up!

ANDRITZ has successfully started up next-generation disc filter technology with eight PrimeFilter D disc filters at Malaysia Lee & Man Paper Manufacturing Limited, Selangor Darul Ehsan, Malaysia.

The new PrimeFilter D is the latest ANDRITZ innovation in thickening and fiber recovery, enabling the mill to handle higher feed consistencies and higher-freeness pulp, even in the most demanding applications, while in parallel offering significant improvements in operation and maintenance.

Malaysia Lee & Man Paper ordered a total of 15 PrimeFilter D disc filters for their four kraft paper production lines, applied as stock thickener and saveall disc filters in the white-water system of the PM water loops. After successful start-up of the first eight units, start-up of the remaining seven machines is planned for completion by the end of the year.

Malaysia Lee & Man Paper Manufacturing Limited, established in May 2018, is one of the production locations of Lee & Man Paper Manufacturing Ltd. and has four wet pulp production lines and four paper production lines, with an annual capacity of 300,000 tons of packaging paper.



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

Leverage the potential of your screw press

In many fiber preparation plants, efficient dewatering is essential for overall process performance. If a pulp screw press lacks efficiency, it might create a production bottleneck for the entire process. ANDRITZ has a comprehensive portfolio of spare and wear parts for all major screw press brands, as well as innovative solutions for screw press retrofits and upgrades, including:

- New screw shaft with tailor-made geometry
- Shaft exchange program (one-to-one)
- Customized screen baskets and plates for each application
- Highly wear-resistant screw flight protection
- Coated body plates for longer shaft lifetime

OPTIMIZATION TARGETS

Depending on customers' specific needs, ANDRITZ can supply the right combination of upgrade products and customized machine settings, while optimizing the economical effort needed.

- Savings of specific energy consumption: 30–50%
- Capacity increase: by up to 30%
- Outlet dryness increase: 5–10% b.d.



For further information, visit our ANDRITZ Screw press service website:
andritz.com/screwpress-service

SUZANO OPTIMIZES THE EVAPORATION PROCESS IN PARTNERSHIP WITH ANDRITZ

Suzano's pulp mill in São Paulo has generated significant savings in the plant's evaporation process by using the Metris UX technology from ANDRITZ for the digital transformation of its processes.

In total, Suzano has 11 industrial plants throughout Brazil, with each one bearing the name of the city where it is installed. The Suzano plant, located in the city of Suzano (SP), has played a globally significant role in the history of pulp production as it was at this plant that pulp production from eucalyptus fiber began. This change revolutionized the industry, which previously depended on pine for pulp production.

But this production site did not stop innovating there. In 2015 it was the first to sell Eucalfluff™, an innovative and sustainable solution that is applied in absorbent hygiene products, bringing more comfort and well-being to the consumer thanks to the unique characteristics of eucalyptus fluff pulp.

With a history of innovation references in the pulp and paper market from the very beginning, the Suzano plant is once again heading towards the future, living Industry 4.0 and IIoT by optimizing its processes

using Metris – ANDRITZ Digital Solutions to impact the quality of the final product.

Claudio Nunes Aguiar, Pulp Executive Manager, Suzano, explains how this has happened at the Suzano mill, "In recent times, due to the greater demands from our internal customers, we have implemented projects with the objective of reducing the variability of pulp quality. Metris has helped us to build correlations between the manufacturing process parameters and the final pulp quality in order to optimize the runability conditions of the paper machines."

MAJOR SAVINGS

One of the high-impact processes for guaranteeing production quality is the evaporation of black liquor in pulp production. Suzano and ANDRITZ have developed a successful system for standardizing the control of steam addition in the first evaporation effects, obtaining greater plant stability and reducing the

standard deviation of burning solids in recovery boilers by around 30%, generating savings of 55,000 USD/month.

This partnership brought the technical knowledge of the engineers, the participation of the management, and the practical knowledge of the Suzano operators together with ANDRITZ experts, making it possible to define a control logic that, after the planning and testing stages, managed to reduce both the standard deviation and increase the average solids in the boiler.

This perfect teamwork between ANDRITZ and Suzano, combined with Metris UX technology, led to the elaboration of the main logic control algorithms. The main Metris UX applications utilized for this project were Data Analytics (for graphical analysis and controls monitoring) and Machine Learning (which uses big data to make the studies through clusters, to find opportunities based on the evaporation process history).



André Ferreira, Specialist Engineer, and Marcos Donadio, Recovery and Utilities Manager, from Suzano



Eduardo Correia and Aline Martins, both OPP Local Analysts from ANDRITZ

The main task of the control logic defined was to observe the electric current for the pumps that transport the concentrated liquor to the recovery boiler. The output data were also used to correct the reference current, with the temperatures of the steam generated in each evaporation vessel as safety information and preventing any interlock in the process.

Throughout the project, the Metris Data Analytic application was also used to evaluate, monitor, and validate the responses by the controls on a daily basis, so from these results doing the proper modifications.

"In addition, the Metris Machine Learning application was very important to validate the correlation of the transfer pump currents used in the new logic with the boiler burning and evaporation solids, showing that this correlation is suitable for control purposes," says Aline Martins, ANDRITZ.

Marcos Donadio, Recovery and Utilities Manager at the Suzano plant, says that an important differentiation for this result was "the follow-up and involvement of the production team supporting the local ANDRITZ team with important feedback to improve the control algorithm during the implementation and testing phase."

This intense collaboration had a high impact on best use of the technology, according to Eduardo Correia, ANDRITZ,

"The team of engineers, the management, and the pulp production operations team worked very closely with the ANDRITZ experts. We have a great relationship with everyone at the mill and there is a real spirit of cooperation. We are always looking for ways to improve the processes together."

For André Ferreira, Specialist Engineer, Suzano, the partnership in joint development of the solution was the decisive factor, "We held some meetings with the local ANDRITZ staff and explored a variety of control scenarios for a solution to the problem of high standard deviation of the burning solids in the recovery boilers. After defining the control methodology, we planned the implementation and testing stages."

MORE IIOT INNOVATIONS FOR THE FUTURE

This partnership work, paired with the Metris technology, led to an experience that did justice to the entire history of innovation at the Suzano plant. Donadio comments on this experience, "It was very satisfactory because, at each weekly follow-up meeting, we could see the improvements happening, through feedback conversations with the operators and the local ANDRITZ team."

With many plans for the future of this plant, use of IIoT technologies does not stop here. "We've started a project to optimize the flow of steam in recovery boilers, and we're

also making use of the Metris technology to create a blower information panel that will help us in assessing problems as well as supporting operation and maintenance in agile decision-making," says Donadio.

Ahead of this new industrial revolution, Aguiar evaluates how Metris technology has helped the plant to have one more competitive difference in its market. "The Metris technology offers several tools and alternatives for data analysis and simulation that make it easier to find better results. Besides the technology, the concept of ANDRITZ teams working together with customers generates a unification of efforts and synergy with tremendous potential for generating new projects and ideas, such as performance improvements, cost reduction, reduction of process variability, and quality gains. As soon as one project is finished, another automatically begins, generating a virtual flow of continuous improvements."

In addition to the evaporation project, there are around 40 more projects utilizing the Metris technology, focusing on optimizing the processes at the Suzano plant, work that will continue to make history thanks to the partnership between ANDRITZ and the Suzano professionals, which is driven by results.

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EFFICIENT PROCESSES AND HIGH-QUALITY PRODUCTS ARE CREATED THROUGH COOPERATION AND COMMITMENT

ANDRITZ played a major part in Stora Enso's Oulu mill success in reaching a new era as the mill was converted from fine paper to kraftliner production. The virgin fiber-based kraftliner produced by the mill will serve the strongly growing global packaging market.

The conversion of the production line at Stora Enso's Oulu mill was a major undertaking, as the project will also increase the capacity of the pulp mill and the pulp drying line. Kraftliner, made of unbleached sulphate pulp, is used in food, fruit, and vegetable packaging that requires strength, high quality, and purity.

"The online shopping boom has led to increasing consumption of packaging materials. Demand for kraftliner is constantly growing, while the need for coated printing paper is decreasing at an accelerating rate," says Juha Mäkimattila, Mill Director, Stora Enso Oulu.

He says that the company is on the right track to respond to the current global trends related to the environment, changing lifestyles, urbanization, growing demand of bio-based products, replacement of plastic, and growth of the packaging market.

FROM WHITE TO BROWN PULP

Converting a mill from fine paper to kraftliner production does not happen overnight. In fact, this challenging, multi-phase conversion project took several years to complete. The total investment budget was approximately 350 MEUR. The implementation of the project itself took just under two

years. In that time, the extensive mill area has undergone an almost complete transformation with the help of some 200 suppliers.

The former paper machine was converted to the production of kraftliner, and the pulp mill was converted to produce unbleached pulp. Changes were also made at the mill to achieve considerable improvements in the treatment of odorous gases and wastewater as well as chip storage. Environmental investments totalled approximately 40 MEUR.

"Specialization in premium quality and high-price products will continue to be the backbone of our business. The competitiveness of our products is based on the use of the best possible raw material. With the investment at the Oulu mill, our processes are now efficient and highly competitive," says Mäkimattila.

ANDRITZ was among the suppliers responding to the strict quality production performance goals set by



Stora Enso during the Oulu mill conversion project. It converted the fiberline of Stora Enso's Oulu mill to produce unbleached high-kappa pulp, upgraded the pulp drying machine, and modernized the stock preparation. ANDRITZ also supplied a significant number of process pumps to various areas of the mill and was responsible for the rebuild and capacity increase of the lime kiln.

"The old production was in progress until September 2020, so the construction, testing, and commissioning related to new production had to be completed in just over two months."

"Our clear-cut goal is to be the market leader in terms of quality. Our pulp has to live up to this goal; that is, it must be better than any other producer's. The process solutions must, for their part, ensure that we are constantly able to produce premium quality. We reflected the technical solutions of various suppliers against this goal." This is how Klaus Leppänen, Area Manager responsible for Stora Enso's fiberline in the investment project, responds when asked what were the main reasons behind their decision to select ANDRITZ as the supplier of production technologies and key process equipment.

"The starting point of all our operations is that we are the best on the market, both in the production of market pulp and kraftliner. In pulp and packaging board production, →

ARI SAARNIO
Stora Enso, Project
Director, OCO Project



premium quality cannot be achieved by talking; it requires cutting-edge technology and expertise," says Pekka Kylliäinen, Project Manager responsible for Stora Enso's drying machine in the project.

CONVERSION OF THE VARKAUS MILL STILL FRESH IN MIND

ANDRITZ has proven experience in implementing similar modifications at Stora Enso's Varkaus mill in 2015–2016 and also with its Imatra mill's new drying line in 2017.

The successful conversion project in Varkaus, where a paper machine was converted to produce kraftliner, was still fresh in mind at Stora Enso. On the other hand, they also had an equally clear recollection of the challenges encountered in Varkaus. Based on previous experiences, Stora Enso and ANDRITZ joined forces in the Oulu project and created functional renovation concepts for both the fiberline and the drying machine.

"One of the lessons we learned in Varkaus was the fact that washers operate differently with high-kappa pulp. Furthermore, high-kappa pulp requires mechanical defibration to achieve a good level of quality. We reviewed the old washing line in Oulu and found that we would not be able to utilize all of the existing technology in the new production," Leppänen says.

Kylliäinen, for his part, had had previous experience cooperating with ANDRITZ in connection with the implementation of the new drying line at the Imatra mill.

"One of the great innovations is the ANDRITZ automatic tail threading system for the drying machine, which has proved to be both functional and reliable. This equipment has also increased the safety level of the drying line," says Kylliäinen.

TECHNOLOGY, BUT ABOVE ALL, HUMAN COOPERATION

When it comes to rebuild projects such as the one that took place at Stora Enso's Oulu mill, off-the-shelf technology alone is not enough. People carry out the work, and cooperation is needed to find solutions to the most demanding technical challenges when the goal is to tune the production

process performance to perfection and guarantee the customer world-class quality.

"Shared experiences, desire to learn, and cooperation are all very important factors in this. We continuously stressed the fact that the project was a joint venture. This way, we were able to utilize each person's competence and experience to the maximum and got them to fully commit themselves to the project," Leppänen says.

Kylliäinen agrees, "Everyone's contribution is so important in process development. The solution will not be good if the supplier only picks up standard pieces off the shelf and arranges them in line. The know-how of both parties is required. Production processes are always different, and you have to really understand what is required to create a functional solution. This is where professional skills and cooperation weigh in."

PROJECT WORK CARRIED OUT IN THE SHADOW OF COVID-19

Ari Saarnio, Project Manager responsible for the conversion project at Stora Enso, is satisfied with the outcome of the project and also with the fact that such a large-scale project was completed within budget and also almost on schedule, even though the work was carried out in the shadow of the COVID-19 pandemic.

"When the first news of COVID-19 carried from abroad, we were quick to respond. We immediately turned our attention to our Chinese deliveries, and made plans on how to get them all delivered. This is another example of our excellent cooperation with ANDRITZ. In the end, we received all of the equipment on



The upgrade project included a rebuild of the complete pulp drying line.

"A new mill can be designed completely in 3D. A mill conversion requires people to travel to the site and work there."

KLAUS LEPPÄNEN
Stora Enso, Area Manager
Fiberline, Woodhandling



schedule," Saarnio says. "Because of the COVID-19 pandemic, we also had to create additional remote control rooms from which the facilities were commissioned."

BUILDING A NEW MILL VS. REBUILDING AN EXISTING ONE

Saarnio emphasizes that a project such as the one undertaken at the Oulu mill, where an existing mill is converted to new production, is dozens of times more challenging than constructing a similar mill from scratch. Costs are saved, but the amount of work involved is tenfold.

"Connecting old equipment to new is extremely challenging. When constructing a new mill, the testing and commissioning work alone can take up to six months. In our project, the old production continued until September 2020, so the construction, testing, and commissioning related to new production had to be completed in just over two months."

"Many of the challenges and details that are involved in mill conversions became evident at the project planning stage. I consider it important that we were able to discuss the details together well in advance and find solutions to the most demanding issues," says Jorma Olkkonen, Project Manager at ANDRITZ.

The remote connections implemented by ANDRITZ in Graz, Kotka, and Växjö were used to plan and monitor the progress of the project and production. This has facilitated the flow of information between Stora Enso and ANDRITZ and has allowed for situations to be handled remotely without having to travel to the site.

Even without the COVID-19 pandemic, the project standards would have still been high. Discontinuation of old production, extensive dismantling work, and making new installations all have required overlapping and coordination among several operators within a tight schedule. Nor was compromising safety an option at any point of the project.

"The COVID-19 pandemic posed a whole new set of major challenges to the project, but we were able to solve all issues and achieved our original goals in terms of production and quality," Mäkimattila concludes.

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GETTING TECHNICAL

THE ANDRITZ DELIVERY:

- Conversion of the fiberline to produce high-Kappa unbleached pulp, including cooking modernization with new TurboFeed™ chip feeding system, Diamondback™ chip silo, and new impregnation vessel. The delivery also included a new DD-Washer™ for brown stock washing, new screening plant, and new refiners.
- Rebuild of the complete pulp drying line, including modernization of the wet-end with new headbox and shoe press, modernization of the drying section, and upgrade of the baling line.
- Installation of the latest innovation in dewatering – three Vertical Screw Thickeners, dilution conveyor system, MC-pump, and rebuild of the broke screening system.
- Rebuild and capacity increase of the lime kiln.
- Significant amount of process pumps to all areas of the mill.



The delivery also included a new DD-Washer for brown stock washing, new screening plant, and new refiners.

ANDRITZ PrimeLineTAD



Highest Quality at lowest possible Energy Input



ANDRITZ experts give a complete overview of its *PrimeLineTAD* (Through Air Drying) technology for the production of premium tissue products:

Joseph Guadagno: Vice President Tissue and Air Systems, North America
Stefano Marengo: Director *PrimeLineTAD* and R&D Tissue
Paul Richards: Senior Technology Manager Tissue



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

FOR FURTHER INFORMATION SEE PAGE 3

The TAD section of the ANDRITZ tissue pilot plant in Graz, Austria

Can you give an overview of the ANDRITZ TAD concept; please include anything interesting about the development timeline?

PAUL RICHARDS: ANDRITZ only entered the TAD machine market in mid-2000, following the breakdown and closure of the Beloit Corporation. While others looked to acquire the technology, ANDRITZ focused on the experience of the personnel in an effort to further grow into the TAD market

in general, and specifically on the US market. Over the next two years, a concept was conceived and engineered and by early 2003 ANDRITZ had its first order for a TAD machine.

The ANDRITZ *PrimeLineTAD* comprises a 2- or 3-layer headbox with dilution control that delivers the stock to a modified C-wrap twin wire former. The former is adapted to allow vacuum assisted

dewatering of the base sheet before the sheet transfers to the TAD section. At the pick-up, there is the possibility of running a speed differential to tailor the quality and sheet structure according to customer needs, before the sheet passes over the "shaping" or "moulding" vacuum box to lock in the sheet structure. Next, the sheet is dried over two patented TAD drums in series, up to anything between about 75% and 90% dryness, depending on the

needs of the specific customer. The complete air handling system has been developed and engineered using CFD, computational fluid dynamics analysis, by our North American colleagues in Canada.

The sheet is then transferred to the Yankee cylinder for application of dry crepe before passing over the recently developed and patented active air foils and being wound using the linear center-wind assisted reel.

When we first started down this route, we typically offered a single large diameter TAD drum but have since developed our standard machine to the two drum arrangement to optimize the overall energy efficiency of the process for our customers.

Can you share details about the hood and air system and what sets the ANDRITZ PrimeLine TAD concept apart from competitors?

JOSEPH GUADAGNO: The process air system is used to transport hot air through the paper sheet with a uniform temperature and pressure profile. There are different ways to properly mix the air and optimize the supply air temperature and pressure profile uniformity to the TAD drum. For this purpose, we developed specially designed static mixers, guide vanes and perforated screens that are incorporated into the ductwork and the TAD supply hoods.

"Of course, various types of heat recovery can be implemented to reduce overall energy consumption. Our goal is to make the highest quality tissue and towel products with reduced energy input."

JOSEPH GUADAGNO
Vice President Tissue and Air Systems, North America
ANDRITZ



"One of the main purposes of the trial is to produce paper reels that are then converted by the customer into the final products."

STEFANO MARENCO
Director *PrimeLineTAD* and R&D Tissue
ANDRITZ



The process air is transported through the large insulated ductwork by the variable speed supply fans that deliver the required air mass to the sheet. A natural gas-fired burner is installed after each TAD supply fan to heat the air supplied to the sheet and to increase its drying potential. The supply air ducts are connected to the TAD hood modules with articulating joints that permit the TAD hoods to retract, allowing access during fabric change, sheet breaks, or cleaning and inspections during maintenance shutdowns.

The wet and dry end TAD hoods are constructed of two independent, retractable halves, with perforated nozzle plates that allow proper airflow distribution into the space between the TAD hood and TAD drum. The supply air is "pulled through" the sheet by negative pressure within the TAD drum.

Moisture removed from the sheet is then partially evacuated to the atmosphere using the TAD exhaust fan. The air exhausted to the atmosphere is replaced with fresh air make-up. The TAD supply fan pushes the TAD return air back into the pre-dryer supply air duct system in this continuous drying cycle.

Thus, controlling the TAD supply air properties like mass flow, temperature, and absolute humidity, we

optimize the drying capacity of the system. With the proper control of exhaust air pressure, moisture, and temperature, the optimal energy use can be achieved together with extended life of your TAD fabrics, both which represent a significant operating cost.

Of course, various types of heat recovery can be implemented to reduce overall energy consumption. Our goal is to make the highest quality tissue and towel products with reduced energy input.

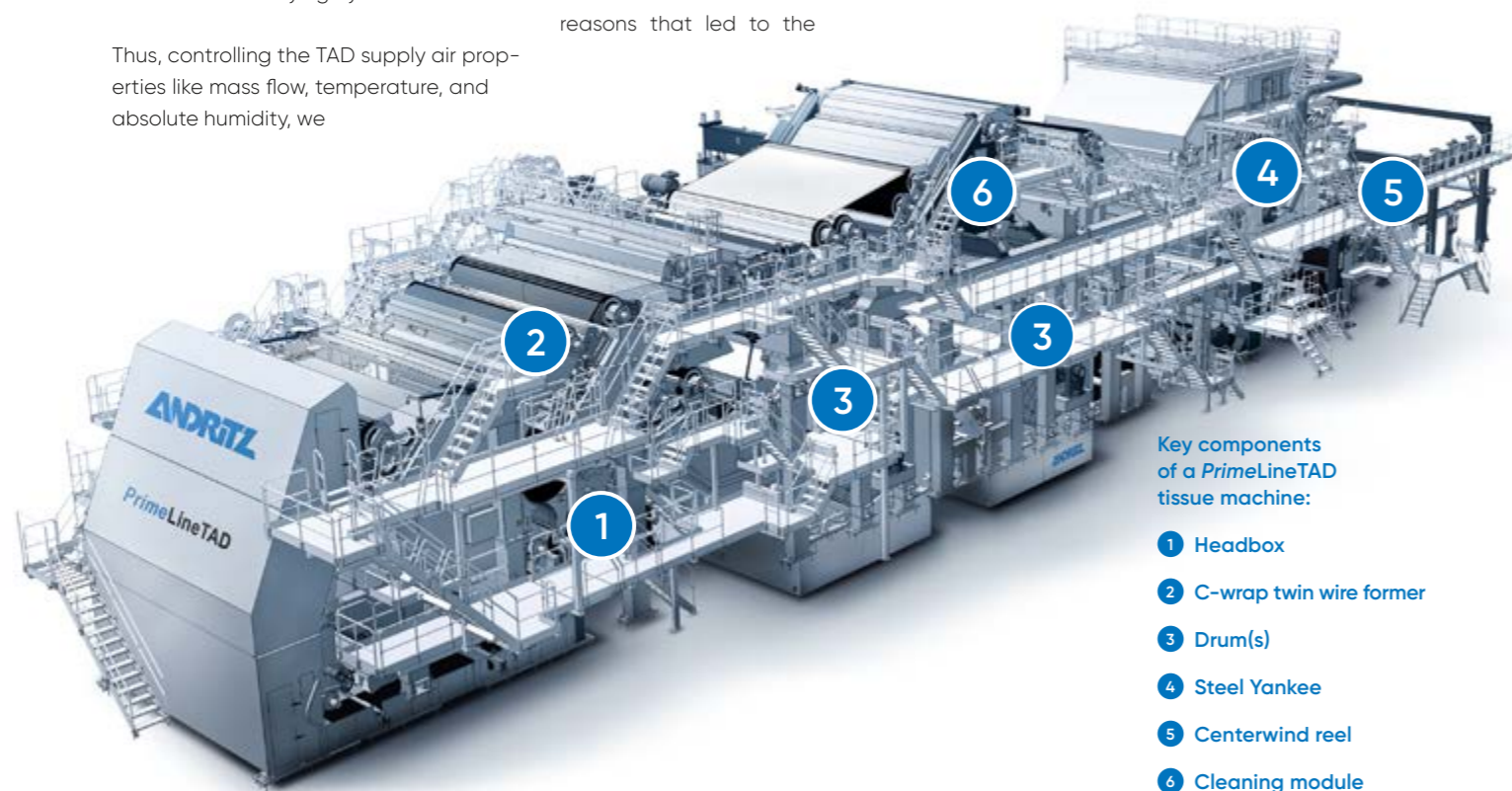
Can you talk in-depth about energy savings, and perhaps provide some numbers?

PAUL RICHARDS: TAD by its very nature is rather energy intensive, which is one of the key reasons the market has developed so much in the US, where energy is traditionally so much cheaper than in other regions. What we are seeing today, however, is an interest from regions where energy is much more expensive, but where a market can still be developed if a way can be found to reduce the energy consumption.

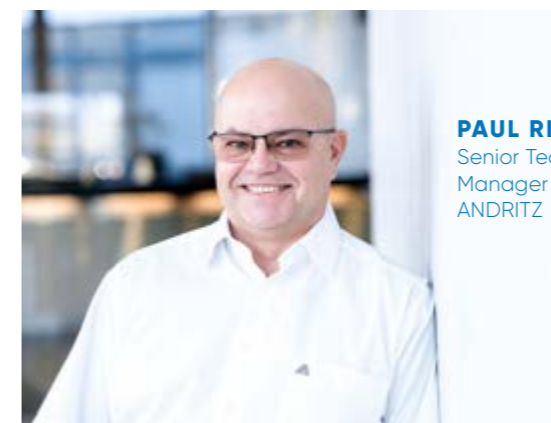
Historically, TAD was made with a dryness after the TAD of around 95% – one of the reasons that led to the

development of the UCTAD, or Un-Creped TAD, process. The Yankee, a traditional part of any Tissue Machine, was only really a carrier, allowing a percentage of dry crepe to be put into the end product. Today, depending on the technology being used and the manufacturer, the dryness after the TAD can be significantly lower. In fact, ANDRITZ and its customers are constantly making efforts to push these boundaries and are evolving with the chemistry suppliers to allow higher moisture to the Yankee. This movement of the drying balance is a major step in reducing the energy demand for drying.

From the time of the development of our first TAD machine to the current offering, we have reduced the drying energy demand in the range of 15 – 20% by the simple use of a second TAD drum, albeit smaller diameter drums. This allows a more controlled and targeted use of the hot air in the drying process. We can use much hotter air for the first air system, which also has a lower permeability of the tissue sheet, where the pressure drop is considerably higher. Then in the second system, where the sheet is drier and more open, we can use lower temperatures



- Key components of a PrimeLineTAD tissue machine:**
- 1 Headbox
 - 2 C-wrap twin wire former
 - 3 Drum(s)
 - 4 Steel Yankee
 - 5 Centerwind reel
 - 6 Cleaning module



PAUL RICHARDS
Senior Technology
Manager Tissue
ANDRITZ

"One of the key areas of interest in this technology is clearly a reduction of the drying energy."

and higher volumes. All of this protects the other system components, such as the TAD fabric, while allowing smaller overall system components and commonality between the system sizes.

Taking this line a little further, our drive is now to further push the balance of the drying towards the Yankee, with a target around 65% max solids to the cylinder. This can only be achieved in conjunction with our customers and our partners in the chemical side of our industry. Financially, however, if such a movement can be realized, then the energy efficiency of the drying process could finally be at an optimal level. Once all the "free water" has been removed and only intercellular water is left, the impingement process is much more efficient from a drying perspective.

Another recent addition to energy saving opportunities comes from developments in vacuum technology. Using blowers instead of traditional liquid ring pumps provides a hot air source that can be used for preheating a portion of the incoming air as it enters the system.

Another possibility, probably more popular in places where gas supplies are more limited or infrastructure is not yet available, is the use of steam (heat exchangers) as a heating medium. The system temperatures lend themselves to consideration of such heat exchangers, especially in situations where an excess of steam is available, such as near pulp plants, etc.

Can customers see the TAD concept in action, and see some samples produced of their own products?

STEFANO MARENCO: The PrimeLineTAD (Tissue Innovation and Application Center) pilot machine at our facility in Graz, Austria is currently configured in TAD mode. We are running trials with our customers and one of the main purposes of the trial is to produce paper reels (small rolls of 600 mm width) that are then converted by the customer into the final products. The tissue makers can then run market analyses and product quality tests to predict the interest of the consumer or market potential for a new product.

Can you give us some insights on any ongoing R&D work on the TAD concept?

PAUL RICHARDS: One of the key areas of interest in this technology is clearly a

reduction of the drying energy. Much of the current effort is directed at how we might achieve a higher reduction of the overall drying energy, without increasing the net energy input. Obviously, our goal here is to make deep cuts into the overall net energy.

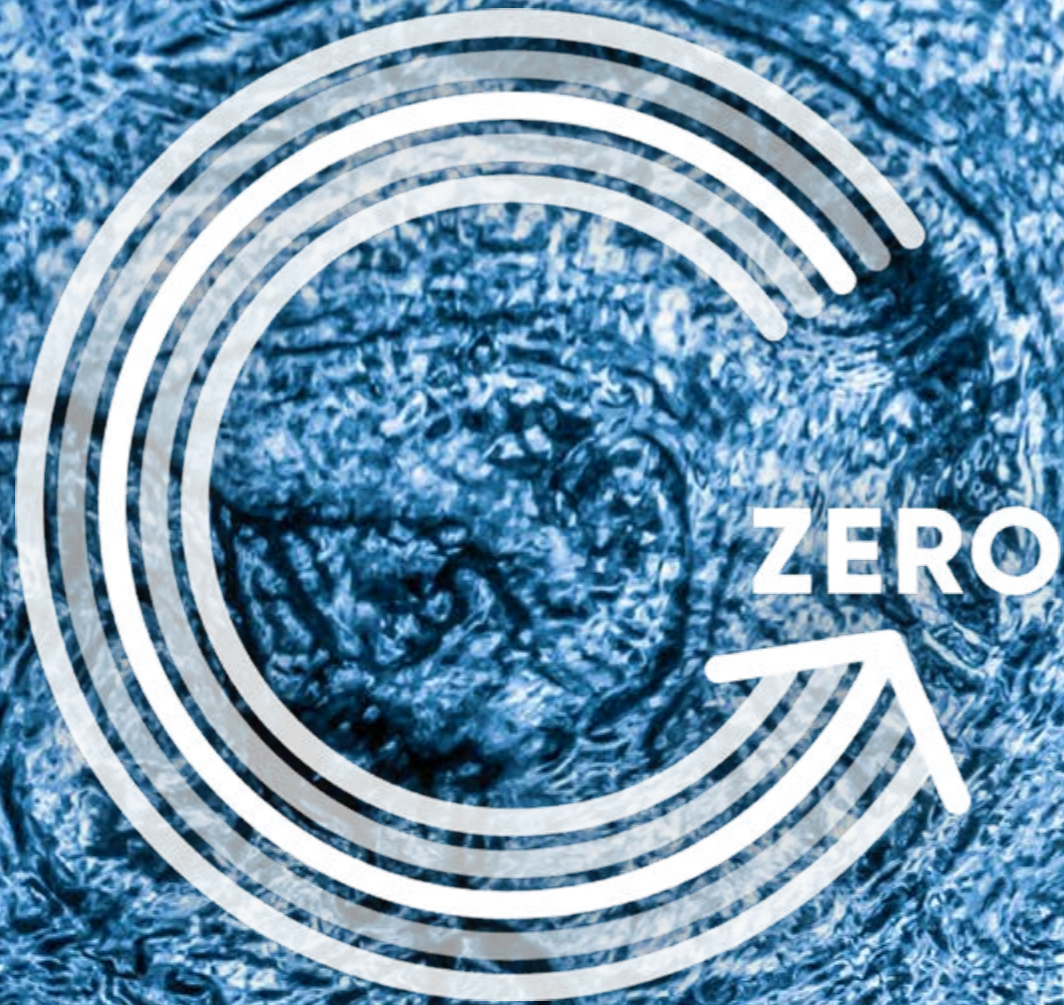
STEFANO MARENCO: We are also focusing our research on technical solutions that can increase the overall efficiency of the TAD machine with a more compact design in order to reduce the building footprint and the civil construction costs for this technology.

For more information please visit www.andritz.com/tissue or contact us at tissue@andritz.com

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TAD-drum installation at the ANDRITZ tissue pilot plant



CircleToZero

Towards Zero Emissions and Zero Waste at Pulp and Paper Mills



CircleToZero™ is a global ANDRITZ initiative with the goal of achieving zero emissions and zero waste at the same time as creating financial growth for customers. For pulp and paper producers, this means eliminating unused industry side streams, turning them into new value-added products and achieving zero emissions and zero waste production.

ANDRITZ is inviting customers, partners, and the research community to join a shared journey towards a more sustainable society and to meet the industry growth demands set by the transition into a fossil-free circular bioeconomy.

Pulp and paper production creates multiple gaseous, solid, and liquid side streams. Their elimination, reduction, purification, and conversion are a continuous challenge, requiring new technologies and solutions with clear environmental and financial payback.

The journey towards this has already started. ANDRITZ is currently helping its customers to use less fresh chemicals and water as well as reducing industrial emissions and waste. It is doing this by increasing resource and operational efficiency and turning traditionally unused side streams into new commercial products. In addition, these actions dramatically reduce pollution to air, land, and water as well as reduce traffic and logistics around the mill.

WHAT IS CircleToZero?

The pulp and paper industries play a key role in the transition and transformation towards a fossil-fuel free circular bioeconomy. By developing circular operations to eliminate unused side streams, and creating new value-added bio-based products, it can be the global leader in zero emissions and zero waste industrial processes.

CircleToZero brings together the continuous development and improvement of existing ANDRITZ technology solutions to achieve this leadership position with clear environmental and financial benefits.

CircleToZero is a collaboration-driven process, where we share innovations, develop new solutions, and contribute to the positive financial returns and environmental impact of the whole industry – together with our customers, research institutes, and other partners.

WHY CircleToZero?

The pulp and paper industries are growing. Growing while achieving zero emissions and zero waste together with higher overall resource efficiency is the main driver for sustainability of the industry. Regulations, capital and customer demand all

require solutions to resource scarcity, mitigating climate change, and the need to create more added value while using less natural resources.

Pulp and paper production creates multiple gaseous, solid, and liquid side streams. These side streams include, for instance:

Gaseous side streams: Nitrogen oxides, sulfur dioxides, odorous gases, and carbon dioxide

Solid side streams: Dregs and grits, sludge, ash and gasifier bottom ash, reject fibers, and lime mud

Liquid side streams: Filtrates, raw methanol, condensates, sulfate rich streams, and crude sulfate turpentines

Currently, the ANDRITZ A-Recovery+ concept unleashes the economic potential of the many traditionally unused side streams. These include purifying raw methanol into commercial quality bio-methanol, the on-site production of sulfuric acid, and recovery of kraft lignin.

CircleToZero OPPORTUNITIES

CircleToZero opportunities for developing both circular operations and new products in the pulp and paper industry are:

1. Circular operations. CircleToZero is achieved by applying higher efficiency and closed loops throughout the mill-wide production. Future opportunities include reducing fresh water usage by increasing the recyclability of used water – towards a Zero Liquid Discharge mill, process wide capturing of biogenic CO₂, and further utilization of captured carbon dioxide in the creation of new products.

2. Value added products. There is a significant opportunity for CircleToZero in replacing fossil-based products with new wood-based products and materials by utilizing the existing side streams in a better and more efficient manner. The replaceable materials include plastics, composites, textiles, industrial bio-chemicals, and biofuels. Also, ANDRITZ fiber

processing technologies make it possible to produce new value-added bioproducts from wood fiber itself, including dissolving pulp and micro crystalline cellulose.

Looking at the current side streams, ANDRITZ has identified several CircleToZero opportunities for elimination, reduction, and further use in and outside the mill.

GASEOUS SIDE STREAMS	CircleToZero OPPORTUNITIES
Nitrogen oxides	• NOx reduction technologies
Sulfur dioxide	• SO ₂ removal technologies
Odorous gases	• Odorous gas handling and treatment
Carbon dioxide	• BioCO ₂ utilization with hydrogen to produce biomethanol

SOLID SIDE STREAMS	CircleToZero OPPORTUNITIES
Dregs and grits	• Source of alkali • Conversion into fertilizers by removing hazardous components
Sludge	• Conversion into pellets • New product development
Ash and gasifier bottom ash	• Purification and reuse outside the mill • Gasifier bottom ash as new raw material
Lime mud	• Purification and reuse • Source of alkali

LIQUID SIDE STREAMS	CircleToZero OPPORTUNITIES
Filtrates	• New strategies to handle filtrates • Recirculation of purified filtrates • Reduced fresh water usage that is aiming towards the Zero liquid discharge mill
Raw methanol	• Purification and reuse in and outside the mill • New revenue generation
Condensates	• Reuse of condensates • Fresh water usage reduction
Sulfate rich streams	• Extraction of sulfate to reduce the fresh water usage
Crude sulfate turpentine	• Purification and reuse outside the mill • New revenue generation

FROM AMBITION TO SUSTAINABLE REALITY

ANDRITZ recognizes that creating economic and environmental value is not without its challenges. Alongside customers and partners, CircleToZero aims to change this.

Turning CircleToZero into reality will be fueled by achieving immediate bottom-line savings, identification of new business and investment opportunities, and the ability to comply with tightening regulations. CircleToZero can solve the age-old problem where an

investment set out purely to reduce emissions is rarely financially feasible.

ANDRITZ has strong customer support and partnerships to turn CircleToZero solutions into a reality. Collaboration will be crucial to grasp the wealth of opportunities at stake and develop innovative business models together. Building on technology expertise, ANDRITZ will provide its customers with gap analyses and recommendations for existing mills to adapt and is also able to demonstrate a payback time close to zero for new projects, if properly planned ahead with the CircleToZero approach.

The technologies and environmental and financial evidence already exist for CircleToZero, enabling us to make the best decisions for short- and long-term sustainability.

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FOR FURTHER INFORMATION SEE PAGE 3

WALKING THE TALK: CircleToZero IN ACTION WITH ANDRITZ A-RECOVERY+

With existing and developing technologies, CircleToZero can bring opportunities for new and lucrative bio-based products by converting and utilizing side streams. In this issue of SPECTRUM, there are two prime examples of the CircleToZero initiative being put into action using the A-Recovery+ concept from ANDRITZ:

Södra Cell recently started up the world's first biomethanol plant at its Mönsterås pulp mill in southern Sweden. Using the A-Recovery+ concept from ANDRITZ, the mill extracts methanol from the pulp process, and now has the capacity to produce 6.3 million liters of commercial quality biomethanol. The biomethanol is then sold as a substitute for fossil-based methanol to be used in the transport sector.

Klabin recently ordered a sulfuric acid plant for its Ortigueira mill in southern Brazil. Again using the ANDRITZ A-Recovery+ concept, the mill will use sulfur-containing gases – which are usually burned in the boilers or lime kiln – to produce its own sulfuric acid at the same time as controlling the sodium and sulfur balance of the mill. The result will be major savings on chemicals including sulfuric acid, but also drastically reducing consumption of sodium make-up chemicals.

The concept of A-Recovery+ is to look at all the chemical cycles in a mill as a whole and examine where further use, possible recycling, or the refining of different side streams can take place. Ultimately, the goal is to further use the side streams to create more value by producing bio-based products to either be used at the mill or sold on the commercial market.

SMART WOODYARD

Autonomy as a side product

Utilizing deep process knowledge and with many years of successful deliveries to woodyards around the world, the ANDRITZ Smart Woodyard has combined all its experience with the latest in IIoT technology. The result is an ongoing revolution of the woodyard.

Digitalization of the woodyard is nothing new – ANDRITZ provided various platforms and technical solutions using digitalization for a number of years in its constant efforts to help customers to save wood and increase yield. In fact, the woodyard is an area in which ANDRITZ has vast experience for pulp and paper customers, but also in MDF and biomass power generation applications – indeed, ANDRITZ has woodyard operations running through its veins.

Wayna Moncada, Director Wood Processing Digitalization, ANDRITZ, says, “Lately the autonomous woodyard has become something of a goal, along with the autonomous fiberline and autonomous drying area. But digitalization is about much more than autonomy; it’s about what the customer really wants and needs: harvesting the right wood, getting better yield from wood, getting the best quality pulp, maximizing uptime, and predicting shutdowns.

“Once we get these right, autonomy simply comes as a side-product.”

Moncada says having a woodyard running successfully means first decreasing the variation across the board. “This variation could be in the size of logs, the species, how the inventory is managed, or dry wood mixed with wet wood. All these examples are where there is a possibility of wood loss or interruption of woodyard processing.

“If you have variation in the woodyard, ultimately there is loss of yield, as well as production interruptions, and when fluctuations are high, there is usually one problem after another and it is just a case of where the next problem will arise. In a smart mill, where variations are minimized, you are always ahead of any upcoming problems. In other words you will never chase information, information will always chase you.”

“The economic benefits of a smart woodyard can be huge,” says Moncada. “There are wins from better yield, better quality products, less stoppages, and higher uptimes. There is also the opportunity to better predict maintenance issues

and ultimately the woodyard is easier to operate, meaning you don’t need highly skilled operators constantly in place.

“Another major benefit of a smart woodyard, with variation minimized, is the safety aspect. Less stoppages mean less operators going into the danger zone to unblock the bottlenecks.”

THREE LEVELS OF “INTELLIGENCE”

ANDRITZ Smart Woodyard’s concept and product portfolio are based on three levels of intelligence; the floor level, which covers a wide range of individual smart products including machine and process diagnostic devices, for instance, a ChipperEKG, or ChipSCAN; the second level is optimization systems for sub processes, which contain lower-level products; and the third level contains autonomous systems, which are built with lower level optimization systems or with dedicated technology such as in the autonomous crane system.

AUTONOMOUS SYSTEMS

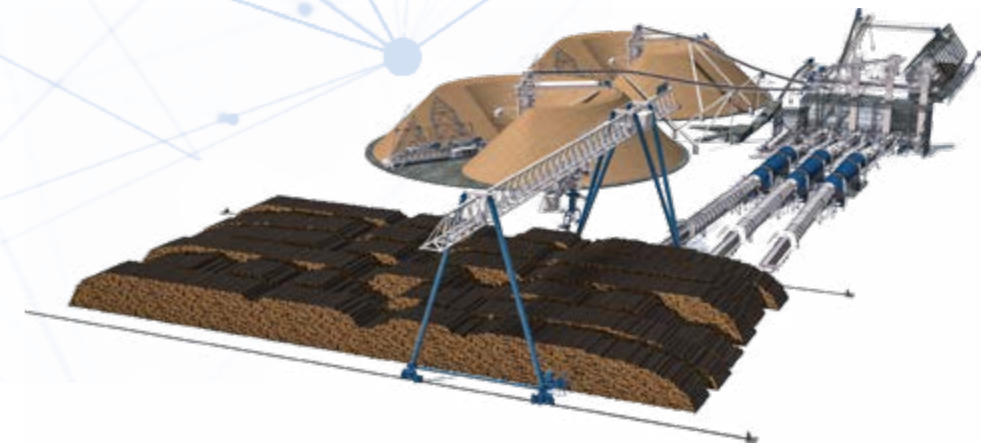
Autonomous operation of wood processing systems

OPTIMIZATION SYSTEMS

Optimizing process & equipment performance, production, and profitability

DIAGNOSTICS SYSTEMS

Process and equipment diagnostics, condition monitoring, and prediction



The ANDRITZ Smart Woodyard’s concept and product portfolio are based on three levels of intelligence.

The levels and systems within the Smart Woodyard portfolio have an emphasis on modular, upgradable products with futureproofing firmly in mind. Applications are suitable for both greenfield and existing woodyards.

“As a starting point for an existing mill, the customer really needs to understand its woodyard operation,” says Moncada. “Customers need to identify where they have the most hold ups and we can provide the right module for that particular area.

“We are quite aware that total autonomy cannot take place all at once at existing mills, so with a modular approach a mill can solve one problem area and then add on another module later. We can then tie in each island as the evolution of the woodyard takes place.”

SMART WOODYARD – REFERENCES AND ORDERS

ANDRITZ Smart Woodyard has many references globally and has vast experience

of providing successful solutions for woodyard operations. Recent deliveries include woodyard solutions to Bracell, Brazil, and Arauco’s MAPA project in Chile.

ANDRITZ recently received two Smart Woodyard orders from Metsä Fibre for its bioproduct mills in Finland, Äänekoski and Kemi:

Metsä Fibre Äänekoski signed a three-year contract with ANDRITZ for debarking process optimization using smart instruments enhanced with oversized chip and bark content in chip flow detection equipment. The agreement will operate under the ANDRITZ Synergy model for the mill’s three debarking lines.

Metsä Fibre Kemi, has ordered two fully autonomous logyard cranes for its planned mill in Finland. The cranes will be the first autonomously operated logyard cranes in the world, and will feature artificial intelligence to optimize log handling and minimize wood losses.

BENEFITS

The emphasis of smart solutions in wood processing is to optimize the whole operation using the latest technologies. The main focus areas are:

- **Getting the most out of wood raw material**
- **Best possible chip quality**
- **Increased availability:** Increased production line efficiency
- **Situation awareness and predictability:** Real-time and transparent production awareness through decision support walls and smart mobile devices
- **Improved safety:** Automated woodyards mean less operator interaction is required

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Something OLD and something NEW

A major pulp capacity increase at Mondi Swiecie

Mondi Swiecie's integrated mill in Poland needed to increase its pulp capacity by 25% to meet growing demand from its five paper machines using virgin fiber. The solution was a complex but hugely successful combination of utilizing older equipment at the same time as installing new, state-of-the-art technology from ANDRITZ.

Sureflow™ screens were installed for increased capacity and extraction flows.

Mondi Swiecie is one of the largest integrated pulp and paper producers in Poland. The mill produces some 500,000 t/a of pulp for consumption on five of its six paper machines – the sixth machine, PM 4, produces paper from 100% recovered material. In total, the mill produces 1.5 million t/a of a mixture of corrugated board, kraftliner, and sack papers.

Mondi Swiecie contacted ANDRITZ in 2012 to discuss its intention to increase kraft pulping capacity by 100,000 t/a with the ultimate aim of producing more virgin-based grades on two recently rebuilt paper machines. The management at the mill had a deep understanding of the underlying potential at the site when they estimated that two old parallel fiberlines, originally installed in 1972, still had room for a major capacity increase.

Marcin Bocian, Mondi Swiecie's Pulp Manager, explains, "As part of our Green Project at the mill, our target was to increase the capacity of the digesters by a further 150 tonnes per day to reach 750 tonnes per day of pulp from each digester. Of course, we needed to achieve this without any negative impact on pulp quality. We also wanted to increase the freeness and stability of the kappa number at the same time as reducing alkali losses.

"Before the project we were running up to 650 tonnes per day of good quality pulp, but everything was overloaded, including the digesters and washing lines. "The digesters are over 40 years old, and they were originally designed for just 250 t/d, so we were already pushing the limits."

REPAIR, UPGRADE, OR REPLACE?

In the Mondi Swiecie case, it turned out that the best solution was a mixture of upgrading and replacing old technology with new. In the cooking area, the main focus was to upgrade the existing main equipment and to add new auxiliary equipment, such as heat exchangers, to provide the needed capacity and conditions for the future capacity. On the other hand, in the washing area the most economical solution turned out to be a third line so that each of the lines would handle 500 t/d production.

Compared to a green field project, the pre-work prior to the investment decision was the key to a successful project. The proper understanding of equipment performance and existing bottlenecks required detailed analysis including comparing the current results to estimated equipment performance. ANDRITZ performed an audit in co-operation with mill people at Swiecie in 2014 to get a full understanding of the possibilities to achieve the set targets.

The mill's daily laboratory data and DCS data were used for the analysis and calculations of the existing conditions. The digester and washing area were modelled and simulated using simulation programs. By modelling the existing situation and predicting the potential, the following parameters were collected as the basis for the simulations:

- Physical size and design of the digester area
- All flows
- All temperatures
- All available wood and pulp parameters

In the simulation of the situation inside the digester, the following were considered:

- Chip column compaction
- Friction forces of liquor and chip flows
- Kappa, alkali, and temperature profiles

The main objective of this simulation was to assess how closely the theoretical

model reflected the actual operation and could accurately predict changes in the digester conditions as the chips moved through the vessel.

Besides the full understanding of the process, the mechanical condition of equipment was the second important key in evaluating the needed changes and total budget. The Swiecie mill provided excellent equipment lists to ANDRITZ, including a comprehensive evaluation about the condition and usability of each piece of equipment.

Mondi Swiecie's Pulp Production Engineer, Wojciech Jazdziewski, says, "We were very impressed by how deeply ANDRITZ experts and engineers studied our existing situation for this project. They were not simply looking to provide a mechanical solution, for instance, bigger pumps or larger areas of screens. They dug really deep, addressing the pulp quality, as well as taking into account further capacity increases in the future."

Aki Muhli, ANDRITZ Technical Specialist and Process Engineer for the Swiecie project, says, "There is no doubt that the mill was pushing the limits with the digesters and washing lines, and we looked closely at how best to approach the challenge and to get the most out of it. During the sales and engineering phase, we looked at the different options, and we visited a couple of references in Finland with the Swiecie team to see what best solution would fit."

Diamondback™ chip bin bottom and chip metering screw provide uniform chip flow.



MAIN TECHNOLOGICAL IMPROVEMENTS

The audit results confirmed that the main focus areas related to the capacity increase were chip pre-steaming and digester internal upgrades to improve chip flow and washing. Channeling phenomena in the silos caused variations in turpentine cooling and pre-steaming had an effect on shive content and blowline kappa, especially during winter. During summer time, gas escaping from the venting system of the silo was causing high temperature peaks and flash steam leaks were causing additional problems.

Efficient pre-steaming is fundamentally required to ensure that the cooking liquor will reach the center of each chip and result in uniform delignification. Pre-steaming refers to the removal of air from the chip pores and allows the cooking liquor to fill the pores (penetration) during impregnation. Adequate pre-steaming guarantees that there will be water/steam inside of chips instead of air, which makes the chips absorb the cooking liquor faster when they first get in contact with the liquor in the chip chute. This is also important to enable diffusion of the cooking liquor chemicals to the center of the chips and diffusion of the dissolved lignin from the chips out to the liquor.

The challenging layout in chip feedlines led ANDRITZ to promote replacement

of the old chip bin with a new HELP™ bin including center steaming. Based on good experience from 'sister' mills, the Swiecie team convinced ANDRITZ to check the possibility of modifying the existing silo utilizing the Diamondback technology. After careful investigation and calculations, ANDRITZ found this option to be feasible. The modernization was done by cutting the old bin bottom and replacing it with a Diamondback bin bottom. The advantage of the Diamondback chip bin over other chip bins on the market is that all chips move at the same speed inside the chip bin, thus providing:

- **Process uniformity**
- **Uniform retention time ensuring best possible pre-steaming**
- **No moving parts**

Due to increased volumetric flows, all pipelines affected by the upgrade were recalculated and some of them were

resized to meet the new flow ranges. The high pressure feeder liquor flow loop was improved by replacing the two-part screen plate with Unigrid™ screen providing 100% screen plate coverage throughout the rotor length.

The key point in the digester capacity increase was to ensure adequate and stable liquor flow throughout the cooking cycle and rearrange liquor circulations for efficient cooking reactions and improved washing. New top compaction circulation to the digester improved chip level control in the digester and brought stability to the operation. All these modifications provided stability and excellent kappa control even when running the digester with a very high specific loading.

SureFlow screens were installed in all positions to ensure an increased open area compared to conventional vertical slotted screens and profile bar screens



Wojciech Jazdziewski (left) and the ANDRITZ team (Jouni Pekonen, Mikko Haapsaari, Aki Muhli, and Tomi Suikki) on the top of the digester.



Marcin Bocian, Mondi Swiecie's Pulp Manager (third from left in the upper row), together with his team in front of a DD-Washer™. Within this project, a new washing line in parallel to the two existing lines was built.

in a checkerboard pattern. A relieved angle on the back side of the SureFlow screen allowed pins and fines to pass through without plugging the slots, and the sloping bottom angle forced fiber material back into the chip column. The more compacted chip column discharge was handled by upgrading the bottom scraper with a new design for the best possible discharge of cooked chips. The position of the horizontal dilution nozzles was optimized to ensure column dilution and relief from the digester wall thanks to the horizontal nozzles lubrication effect.

Cost calculations showed that the most economical solution to reach the project's design capacity and quality targets in washing was to build a new washing line in parallel to the two existing lines. Washing efficiency of the existing washing lines was at a good level so the need was mainly to handle the increased production. Equipment selection remained the same, being a DD-Washer and GFF vacuum drum washer. Two stages of screens and main and reject line refiners were also installed to ensure the required final quality.

AN INTENSIVE, CHALLENGING PROJECT

All equipment was delivered to the site at the end of September 2015 and after three weeks of intensive work the first line was ready to start up in mid-October. The line was started up successfully in smooth co-operation with Mondi personnel. Both parties were waiting for the second line start-up with confidence, especially when some minor improvements based on experience from the first line start-up and operation were adopted for the second line, prior to start-up.

Jazdziewski says, "The Mondi Swiecie mill is unusual in that our chip bins are actually enclosed in a building, which means we had to remove the roof that obviously proved to be an additional obstacle to the project."

"Yes, this was a challenging part of the project," adds Muhli. "We had to keep the old top part of the chip bins and then somehow bring in the Diamondback in rather difficult installation in this case."

When the third washing line was started up and in operation in October 2016,

the parties were ready for final tuning and optimization of the system to run the mill at 25% increased capacity level. The final performance test was carried out in November 2017, where most of the main design targets were reached. The system was now fully capable to run 1,500 t/d of pulp reaching the main guarantee values related to capacity, and most of the washing efficiency and pulp quality targets.

Bocian concludes, "We are really pleased with the result we have obtained here at Mondi Swiecie with the solution that ANDRITZ supplied. What we are talking about here is upgrading digesters that are nearly 50 years old and loaded to three times more capacity than they were designed for."

"With the old and new approach from ANDRITZ, we have broken production records at the mill and are now producing 865 tonnes of top quality pulp a day per digester that were originally designed for just 250 t/d each. And even better, we know we now have a line that can produce even more when we need to ramp up production again."



3D modelling of the plant allows visualization of the new and upgraded components.

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THE ANDRITZ DELIVERIES FOR THE GREEN PROJECT AT THE SWECIE MILL:

- Recovery boiler conversion into biomass power boiler
- New ANDRITZ HERB recovery boiler
- Evaporation plant upgrade
- Fiberline upgrade

BIOMETHANOL FORMING A CIRCULAR BIOECONOMY AT PULP MILLS

Over recent times pulp mills have become much more than simply “tonnes per year” in terms of revenue. First came the added extra of energy and district heating, then extracts of tall oil and turpentine, now all sorts of areas for extra revenue are being identified at pulp mills. As a clear example – and with the help of ANDRITZ – Swedish market pulp giant, Södra, recently started up the world’s first biomethanol plant at its Mönsterås mill in Sweden.

This was a concept full of pioneering, trailblazing activity; to extract raw methanol from the pulp process, refine it into high-end biomethanol and sell it on the open market as a premium product. This was a very complex and difficult process to achieve. Therefore, with much acclaim, the first plant of its kind in the world was started up late last year using ANDRITZ’s A-Recovery+ concept at Södra Cell’s Mönsterås pulp mill in southern Sweden.

But this world-first is only a part the story which originally began in another of Södra Cell’s three pulp mills, Mörrum. Leif Sjöblom, Senior Project Manager during the execution of the project explains, “We had some very curious process experts working for Södra at Mörrum that were very interested in the possibility of extracting biomethanol from the pulp

process and began by setting up a small laboratory. They saw some successful results and were so positive about their discoveries they formed their own company, Invico Metanol AB and patented the technology.”

The discovery was all about the complex ways of removing the sulfur content that would leave a clean enough product to become commercially viable biomethanol. Like all good ideas, creating biomethanol at pulp mills had been tried before, but had fallen down at the extraction process hurdle and had been abandoned. The process the former Södra experts experimented with leaped over that hurdle by introducing paraffin oil for extraction. The oil is then purified using steam and can be used again and again, creating a truly circular concept.



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FOR FURTHER INFORMATION
SEE PAGE 3





"Other attempts at the extraction process stage had failed, so the Södra experts came up with their own solution, and quickly proved that it was possible to achieve really good final product quality using their unique solution," says Sjöblom.

SCALING UP TECHNOLOGY

The exciting new development continued as a feasibility study project of Södra's, working with Invico Metanol as consultants and a pilot plant was built at the Mönsterås mill to further develop the process. "We built a container solution for the pilot plant next to the mill," says Sjöblom. "And added three small columns for the refining and extraction process. It was soon proved that this was a viable enterprise, and the decision was taken in 2016 to industrialize the process and make our own biomethanol at the mill for commercial purposes."

One of the crucial phases in moving from successful demonstration apparatus into full commercialization is the scaling up of the technology. Södra initially planned to carry out the project on its own, however this period coincided perfectly with the purchase of Invico Metanol's patents for biomethanol extraction technology by ANDRITZ.

"This was a crucial point," says Sjöblom. "We could have taken the whole project on by ourselves, but now with ANDRITZ involvement we knew we



Biomethanol is delivered by truck to the customer, where it can be used e.g. in biodiesel production.

had a partner that could take on the whole project and deliver the complete plant."

After a lot of discussion and planning a contract was finally set in March 2018 and work began. "This was a really exciting, but also demanding phase of the project, we were all learning as we went along such as the new, uncharted territory we were venturing into.

There was a lot of learning taking place as we progressed, both on the ANDRITZ side and with our project team."

Södra took responsibility with the building and ANDRITZ with the scaling up of the technology as well as designing and building the process equipment for the project. All parties involved with the project utilized 3D design technology, Södra, ANDRITZ, and the construction company involved and it was soon realized that the existing building was not big enough for the upscaled technology.

"We had to change the design and expand the building, which caused us a short delay," adds Sjöblom.

Joakim Johansson, ANDRITZ Commissioning & Start-up Manager, says, "I came to take over the project for commissioning and start-up in August 2019, and there was still some design changes going on at that stage. This was a time when ANDRITZ engineers and Södra operators were working very closely together, and we were learning a lot.

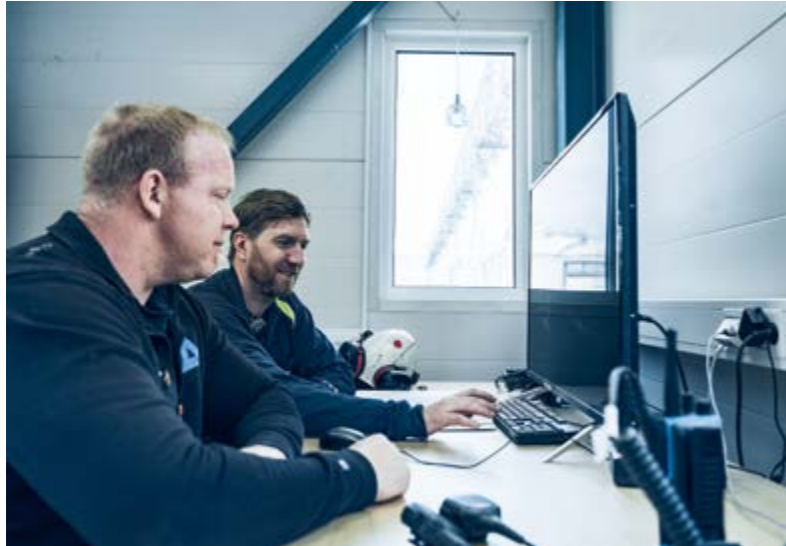
"Obviously with a new concept like this there were parts of the operation and problems we could not foresee until we actually tried them. But we overcame the challenges



"With ANDRITZ involvement we knew we had a partner that could take on the whole project and deliver the complete plant."

LEIF SJÖBLOM
Senior Project Manager,
Södra Cell Innovation
and New Products





Joakim Johansson, Site Manager, ANDRITZ, and Johan Blom, Operator, Södra, in the control room.

as they arose and together made it work. This was a real cooperation success between the operators and ANDRITZ."

The first start-up of the biomethanol plant with raw methanol being introduced into the plant was in November 2019, and all went remarkably well considering it was a totally new concept. "It all went quite smoothly considering the task at hand, there were a lot of different disciplines converging in one place.

"After a short break at Christmas, and a few teething problems when starting up in January, we very soon saw good quality biomethanol coming out of the plant. Like all plants of this kind, they are built to run,

and its only by continuous running that you achieve the stability desired," says Sjöblom.

Egon Paltmann, Project Manager, ANDRITZ, responsible for the biomethanol plant project at Mönsterås, says, "This was no normal project and there were no previous examples to follow. This biomethanol plant is a totally new concept from top to bottom, so we had something of a rollercoaster ride during the project, with lots of learning and some ups and downs on the way.

"However, we had a small group of people constantly working on this project, and it was the total dedication of this team – both from Södra and ANDRITZ – that made this project a success."

A FOREST RESIDUE PROCESSED PRODUCT

Using the A-Recovery+ concept from ANDRITZ the plant has a capacity now to produce 6.3 million liters of biomethanol which will be sold as a substitute for fossil-based methanol in the transport sector. Viktor Odenbrink, Sales Manager at Södra Cell Bioproducts, says, "This is a very exciting area we are entering into, with a lot of incentives for producers of biofuels to add even more sustainability into their own products.

"We will mostly be supplying our biomethanol to be used as a platform for chemical or biochemical industries to pull out the substances within rapeseed oil that are currently being processed by using fossil-based fuels. We have a unique selling point in that our biomethanol is categorized as a "forest residue processed product", which is very attractive when it comes to financial incentives.

The first commercial batches of biomethanol produced by the plant were delivered in February 2020. The plant was handed over to Södra in March 2020 and despite early challenges and some ongoing optimization, the plant has been in commercial operation during 2021. All biomethanol produced at the plant is sent to Danish company Emmelev and used for biodiesel production.

Lauri Pehu-Lehtonen, Director of A-Recovery+ at ANDRITZ, says, "The A-Recovery+ concept actually starts with a very simple

idea; to make pulp mills more resource efficient. Already over the years and decades we have closed chemical cycles and improved processes dramatically, but there are still side streams that are underutilized, and that is where A-Recovery+ comes in.

"Our idea is to look at all chemical cycles and the pulp mill as a whole, and look closely at where we can further reuse, recycle or refine different side streams for the production of new bioproducts. From our point of view, we would like to see our customers buying less chemicals, discharge less waste, and create new revenue streams."

In addition to biomethanol production, A-Recovery+ from ANDRITZ also produces sulfuric acid from odorous gases, recovers lignin for the use in advanced bioproducts, and is constantly looking for new opportunities to further improve climate performance of pulp mills.

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Using the A-Recovery+ concept from ANDRITZ, the plant now has a capacity to produce 6.3 million liters of biomethanol which will be sold as a substitute for fossil-based methanol in the transport sector.



GETTING TECHNICAL

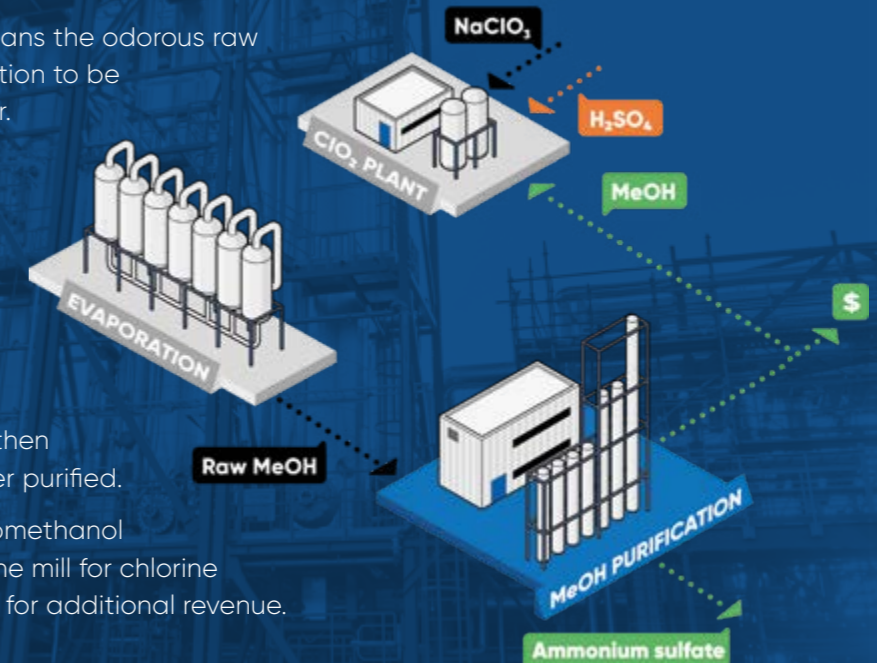


The methanol purification first cleans the odorous raw methanol (MeOH) from the operation to be free from nitrogen and most sulfur.

The clean methanol is ideal low NOx biofuel for use in the lime kiln, and the byproduct ammonium sulphate is an ideal nutrient for the biological effluent treatment plant.

If the mill decides to produce commercial grade biomethanol, then the clean methanol can be further purified.

At the end of this process, the biomethanol can either be used internally at the mill for chlorine dioxide generation, or be sold on for additional revenue.



The latest advancement in LC refiners: TwinFlo Prime makes its debut

ANDRITZ engineers are continually seeking ways to make products better – through design, manufacturing methods, and/or materials of construction. The introduction of the TwinFlo Prime refiner illustrates this point.



Peter Ortner, ANDRITZ Product Manager, inspecting the first TwinFlo Prime refiner manufactured at the ANDRITZ workshop in Graz

The ANDRITZ TwinFlo refiner is well established and proven, with over 2,000 LC refiners operating around the world, and it is a known benchmark when it comes to refiner technology.

The TwinFlo is a single-disc refiner with refining zones on both sides of the disc. The accepted state-of-the-art for adjusting the refining plate gap is to allow the rotor disc to “float” on the spline shaft, centering itself axially between the stator discs. A series of machined keyways around the circumference of the shaft serves to guide the disc as it floats on the shaft.

This works well for most applications, but there are occasions where chemical

deposits in the process water tend to scale up in the keyway guides and prevent the rotor disc from floating freely. When this happens, the energy input becomes imbalanced and the refiner plates suffer uneven wear. The corrective action is to replace the plates and manually scrape the deposits out of the keyway guides – a cumbersome, expensive, and time-consuming activity.

MAKING THE CONNECTION

For the new TwinFlo Prime refiner, designers at ANDRITZ have arrived at a better way to adjust the refining gap and eliminate the problems associated with deposit build-up in the keyways. The solution is to connect the rotor disc directly to the shaft so that the entire shaft and disc float as

a single unit. This is the primary advancement in the TwinFlo Prime LC refiner.

The bearing unit is special. Instead of roller bearings, a hydrodynamic plain bearing is installed, which uses sealing water as the lubricating fluid instead of oil. Only with this new bearing design is it possible to secure the rotor disc on the shaft as this type of bearing allows considerable movement in axial direction.

A RANGE OF BENEFITS

Not only does the fixed connection between rotor disc and shaft in the new refiner improve its ability to maintain an optimum plate gap, it contributes several other key benefits, too:

Compact size. The length of the TwinFlo Prime is approximately 30% shorter than conventional TwinFlo models. Since no lubricating oil is used for the bearing, there is no risk of oil contaminating the stock in the event of a leak. Hence, there is no longer any need for a separate mechanical seal. The bearing can be situated closer to the rotating disc, shortening the overall shaft length considerably. Papermakers will appreciate the simplified equipment layout, easier transport and installation, and more space for maintenance that the smaller footprint of the TwinFlo Prime provides.

Increased energy efficiency. With the bearing unit closer to the rotating disc, shaft strength and machine stiffness are improved

significantly. This enables the TwinFlo Prime to handle about 25% more power, improving specific refining performance significantly. Thus, it's possible to install smaller refiners in the same application.

Optimized pulp flows. Simplifying the connection between rotor disc and shaft creates an opportunity to enlarge the disc port openings by about 70%, improving the pulp flow and equalizing the distribution of stock suspension as it splits between the two refining zones.

Dampening mechanism. Starting up a refiner creates significant force as stock rushes in and pushes forcefully against the rotor disc. This pushing force can



See the TwinFlo Prime video product introduction: View video footage of this report in our augmented reality App!

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sometimes be sufficient to close the refining gap on one side of the disc so that the rotor disc is no longer able to float back and center itself. The result is poor refining performance and unnecessary plate wear. The TwinFlo Prime has a viscous dampening mechanism inside the bearing that absorbs these initial forces and prevents fast movement of the shaft during the initial high flow at start-up.

Simplified operation and maintenance.

Eliminating oil contamination from a bearing that may leak is a major positive for operation and maintenance. In addition, the design of the new refiner significantly reduces the time required to dismantle the unit for a bearing change or to access key components. The bearing unit has a cartridge design for ease of changing out.

Simple mechanical seals are now used, and the seal also has a cartridge design for easy replacement. The work can be done without having to lift the refiner or drive unit off its foundation.

The even distribution of stock and uniform application of power eliminate one-sidedness in refiner plate wear. This extends plate life and reduces downtime for changes.

SUMMARY

The fixed connection between rotor disc and shaft in the TwinFlo Prime improves the way the refining gap is adjusted and eliminates potential problems due to deposits building up in the floating mechanism. In addition, it offers several key benefits: a much more compact size, increased energy efficiency, higher possible installed motor power, optimized pulp flows in the refiner, increased plate life, and easier maintenance.

CONTACT

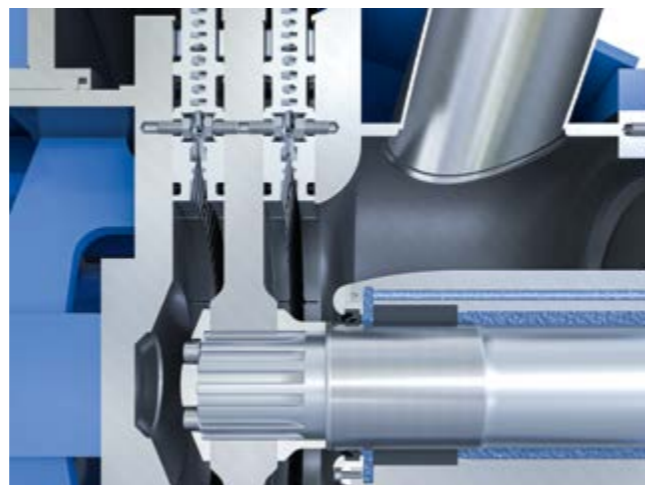
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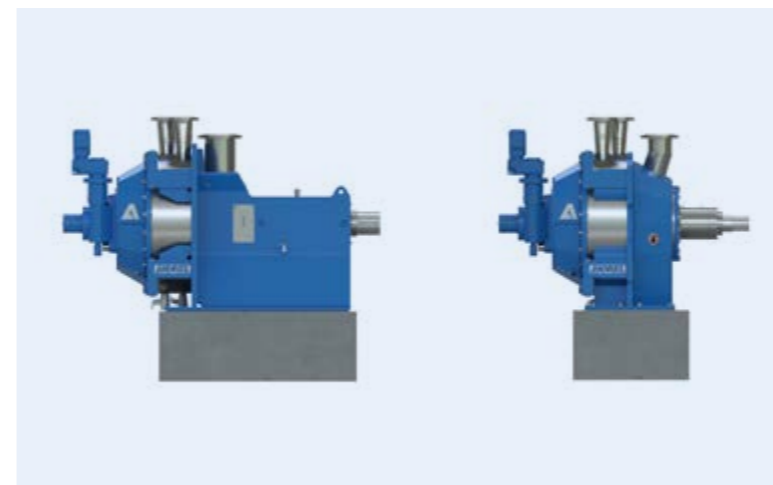
The new TwinFlo Prime LC refiner



Direct connection between rotor disc and shaft



TwinFlo (left) vs. TwinFlo Prime (right) size comparison





TAKING CONTROL.

Overview of Resolute FP Clermont mill in Quebec, Canada

Showing a truly pioneering approach, ANDRITZ and Resolute FP Clermont Mill in Canada created a world first recently by completely revolutionizing refiner load control and stability on two of its eight refiners. ANDRITZ's Hydraulic Commander was the secret ingredient, with added bespoke automation.

"We run a tight ship here at Clermont," says Mill Manager, Jean-Pierre Bouchard. "It is our absolute aim to achieve maximum efficiency right across the mill. The productivity of our machines and equipment here is a big deal, and due to our focus on maximizing our production capacity, along with preventative maintenance programs, we are proud to have an uptime of over 90%."

Resolute FP Clermont's TMP mill located in Quebec, Canada is one of the leading newsprint mills in the world when it comes to cost-per-ton of production. It also prides itself on the quality of its products which are used by well-known titles such as the New York Times and other major newspaper publishers in the USA, Europe, and beyond. The mill produces

newsprint of a low basis weight, 40–48 g/m², on its 8.7 m wide paper machine at a speed of 1,275 m/min.

The management at Clermont recently decided that it needed to upgrade one of the three refiners feeding its single paper machine to better control efficiency and stability. Bouchard explains, "When thinking about the refiner we were operating, I like to compare it to cruise control of a car. When you use cruise control, you want to go at one constant speed, whether driving uphill, downhill, or on a straight road. With our existing refiner we had no control at all."

ANDRITZ, already a long-term supplier to the Clermont mill, was contacted to see if it might have a solution that would

bring more control to the existing CD Refiner in question – an older model from another supplier. After consultation, it was decided that this would be possible and improving refiner stability could be achieved by replacing the electromechanical guide-valve with a hydraulic servo valve and removing the in-gap sensor.

The project meant embarking on a task that had never been carried out before; in fact, it was a world first. The scope included installing a Hydraulic Commander to provide more stable refiner load control as well as improved quality control. The installation also included the ANDRITZ refiner protection system, ADVACON. Also, a new plate positioning control system was installed on the refiner that permits control via





ANDRITZ hydraulic block

The first complete plate positioning control system was installed on the CD70 refiner starting up in March 2019 as planned, with the hydraulic conversion being completed in just four hours, including removing the guide valve, connecting the new hydraulic block disconnecting the TDC sensors, and verifying motor start-up sequences and logics.

The new control system now manages simultaneous plate positioning of the CD and flat zone on the CD refiner. It maintains plate positioning on both zones using standard contactless position sensors. The control system also manages plate protection, static and dynamic zero, as well as providing an up-to-date control platform that is user friendly for operators.

Mill manager Bouchard is delighted with the results of the updated refiner; he says, "We have gone from monitoring the running of the refiner literally by the sound it makes, to now being able to actually analyze the data and fine tune the efficiency and quality of the output."

"The delivery and start-up went well, and when there were hurdles or challenges, both the mill and ANDRITZ experts soon overcame them. We believe now that with just a few tweaks, we will be pretty much close to the optimum operational efficiency and we are very close to the sweet spot."

Philippe Martel, TMP Superintendent, Clermont mill says, "There was an adaptation period where operators had to understand the new system, where the

→ a hydraulic servo valve without TDC sensors, which considerably improved response time, accuracy, and efficient operation.

Sylvain Renaud, ANDRITZ Automation Product Manager, HC Refiners, says, "We first presented the Hydraulic Commander solution, along with ADVACON in 2018, and Clermont showed a keen interest in the automation it would bring to the refiner."

"At first the mill was going to use the existing TDC for controlling the plate gap, but it was subsequently decided to go with the ANDRITZ contactless position sensor."



JEAN-PIERRE BOUCHARD
Mill Manager
Resolute Clermont

"The productivity of our machines and equipment here is a big deal, and due to our focus on maximizing our production capacity, along with preventative maintenance programs, we are proud to have an uptime of over 90%."

plate zero was, and how to run the line with the new system; it went well and after a few weeks, everybody was trained.

"The most interesting aspect of the project to me was replacing the guide-valve with the new ANDRITZ hydraulic block and having a servo valve; it has really improved response time."

Steve Perron, Production Superintendent, Clermont mill, adds, "The most impressive aspect of the project from my point of view was the removal of the TDC, which makes our lives so much easier; no more head-phone calibration that changes depending on who is doing it, no more sensors to buy, no sensors to change and check. Now, we press a button and everything is automatic, and works every time."

Since Clermont's installation, Bo Paper Arapoti Brazil started up a Hydraulic Commander system on two CD76 refiners during a scheduled shut-down. TDCs, guide-valves, and stepping motors were removed and the line was started on time after dynamic zeroing of the CD and FZ gaps using Hydraulic Commander.

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Left to right:
Sylvain Renaud, ANDRITZ; Jean-Claude Bourget, Steve Perron, Jocelyn Gauthier, Sylvain Leblanc, Frédéric Turcotte, Philippe Martel, all Resolute FP Clermont



A BIG STEP FORWARD

Vajda Papír operates a cutting-edge, compact plant in Hungary for the production of sanitary paper. The project is proof of the comprehensive technology know-how ANDRITZ has and confirms that more and more European tissue producers are looking for the latter to increase their paper quality and profitability.

When one talks about companies that started up in a garage and were later extremely successful, one can't help thinking about Microsoft, Apple, and others. But there are also many captains of industry outside the internet economy who have worked their way up from modest beginnings with courage and far-sightedness. And one doesn't necessarily have to travel as far as Silicon Valley to find them. A visit to Hungary is worth it, too.

To Vajda Papír, for example. The company was founded in 1999 in a back yard with only one machine producing toilet tissue. Today, over 20 years later, it is the market leader in Hungary, producing over 100,000 tons of sanitary paper for napkins, toilet tissue, and paper towels, for example. And that's not all: the company's own products are sold under the brand name "Ooops!" in large drugstore and supermarket chains in over 20 other countries, mainly in Scandinavia, the Baltic states, and Eastern Europe.

ANDRITZ has accompanied this history of growth as a technology supplier and system partner in the past few years. Within 15 months, a complete paper production line was delivered, installed, and started up by the end of 2018. A new Vajda Papír location, with a workforce of 130, was built on a Greenfield site near the small town

of Dunaföldvár. Fifteen billion Hungarian forint (around 42 MEUR) were invested in building and extending the mill. It is the largest and most modern mill for sanitary paper in Hungary and Eastern Europe.

"The project has enabled us to take a big step forward," says founder and Managing Director Attila Vajda. "For a long time we have been working towards being able to produce sanitary paper ourselves and becoming an integrated supplier for various groups of customers instead of just purchasing, converting, and selling paper in Hungary. And now we have succeeded."

COMPREHENSIVE SUPPORT AND THE LATEST TECHNOLOGY

In an area of 26,000 square meters, around 30,000 tons of sanitary paper are produced every year in Dunaföldvár, and not just for consumers. By systematically extending the value chain and expanding production to include extra-strong and highly absorbent paper, Vajda Papír tapped into new target groups: hotels, restaurants, and cafés. "We were well aware that we needed a specifically improved paper quality for these customers that we could not purchase on the market in sufficient quantities," says Attila Vajda. "The obvious thing to do was to begin producing paper here locally – paper of very high quality."



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

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"The obvious thing to do was to begin producing paper here locally – paper of very high quality."

ATTILA VAJDA
Founder and Managing Director of Vajda Papír





MICHAEL AUER
Project Manager Automation,
Metris Performance Center,
ANDRITZ

“It is one of the first tissue production lines from ANDRITZ that is connected to the Metris Performance Center in Graz to enable 24-hour online support and remote control.”

Vajda Papír found the right partner for this in ANDRITZ: the company designed and supplied the complete tissue production line, provided comprehensive support during start-up and, thanks not least to digital solutions, is always available for advice and troubleshooting during operations. The scope of supply comprises a modern, spatially compact *PrimeLineCOMPACT VI* tissue machine with a *PrimeDry Steel Yankee* and a *PrimePress XT Evo* shoe press. In addition, it includes a complete stock preparation system, with pumps, automation, electrical equipment, all peripheral units, and the relevant ancillary services. The machine was also fitted with comprehensive sensor technology that allows us to gain a detailed inside view of current operating conditions and behavior. “We deliberately sought out a lean overall package that is state-of-the-art. The line provides the right response to our needs and those of our customers,” says

Attila Vajda. “We are particularly pleased with its efficiency, paper quality, and comparatively low energy consumption.”

From the ANDRITZ point of view, the project was extraordinarily broad, covering the entire engineering work. It began with basic planning and went on to include energy distribution, control systems, and automation technology. “Complex undertakings – particularly in Europe – are exactly in line with our capabilities and thus very interesting for us,” says Tine Kocbek, ANDRITZ Project Manager Tissue. As Vajda Papír opted deliberately for a lean management and organizational structure, the ANDRITZ team took on a wide range of support tasks – even partly coordinating the building and installation work, designing the machine room ventilation, and many more. To do this, the team had to deal with several challenges, some of which were not related to its core business or to the initial contract.



PrimeLineCOMPACT tissue machine with shoe press and steel Yankee

Klaus Blechinger, ANDRITZ Vice President Tissue, says this is quite typical of ANDRITZ. “We see ourselves as a productive enabler who spares no effort if it’s what the customer wants and it’s in the interests of the plant’s productivity and profitability.”

ECONOMICAL, EFFICIENT, AND CONNECTED

From a technological point of view, efficiency and connectivity are what stand out in Dunaföldvár: For example, the ANDRITZ *PrimePress XT Evo* shoe press dewateres the paper web very gently but also very thoroughly. By doing so, it achieves a higher dry content than conventional presses. Due to the special design of the press and the reduced need for thermal drying, energy is saved. Specifically, this means that energy savings of up to 20% are possible under optimum operating conditions in combination with the ANDRITZ *PrimeDry Steel Yankee*.

And ANDRITZ also tapped into new potential in Dunaföldvár in the digitalization sector. “It is one of the first tissue production lines from ANDRITZ that is connected to the Metris Performance Center in Graz to enable 24-hour online support and remote control,” says Michael Auer, ANDRITZ Project Manager Automation. This comprehensive and secure connectivity provides valuable support, and was especially important in the start-up phase; the experts in the Performance Center can actively assist during start-up and ramping up of the plant by keeping an eye on all the main parameters and intervening in an advisory and controlling capacity – if necessary and requested by the customer. “This generally shortens the start-up period of a tissue line significantly from several weeks to just a few days,” adds Gerhard Schiefer, ANDRITZ Chief Automation Officer. In addition, the plant has been prepared for further

optimization while in operation; the Metris Performance Center also helps out here remotely.

“Digitalization and artificial intelligence are very important in paper production,” Attila Vajda also believes. They help operators and engineers to find the optimum plant settings speedily, circumvent problems, and plan predictive maintenance. He concludes, “There is no alternative to comprehensive sensor technology, big data analysis, and the implementation of intelligent algorithms if you want to operate efficiently. In other words, the future has already begun at Dunaföldvár.”

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TINE KOCBEK
Project Manager
Tissue, ANDRITZ

“Complex undertakings – particularly in Europe – are exactly in line with our capabilities and thus very interesting for us.”



GETTING TECHNICAL

I. STOCK PREPARATION AT A GLANCE

The stock preparation system includes FibreSolve FSV pulpers, which are equipped with the latest design of energy-saving rotors to enable efficient slushing of pulp bales and broke, three proven ANDRITZ double-disc TwinFlo refiners for short and long fibers, two ModuScreen CP protection screens with rotating cylinder, and a low-energy ModuScreen HBE headbox screen. The approach flow features two technological highlights: the ShortFlow blending system installed enables reduced chest volumes in the approach flow as well as energy savings and fast grade changes. A double-dilution system significantly contributes to energy savings thanks to screening at higher consistency.



II. WHAT MAKES THE TISSUE MACHINE SPECIAL?

- **Headbox:** the optimized step-diffuser turbulence generator comprises tube bundles with inserts for optimum formation over a wide range of headbox flow rates and consistencies. In combination with the optimized nozzle geometry, this provides superior paper quality. The special design features include low recirculation flow achieved through a tapered header mounted directly at the headbox.
- **Press section:** the *PrimePress XT Evo* shoe press ensures both improved dewatering and better product quality, thus reducing the need for thermal drying. As a result, the energy demand of the tissue machine with shoe press is substantially lower. In addition, the ANDRITZ edge control system and the unique and patented deflection compensation lead to better product qualities.
- **Drying section:** with a *PrimeDry Steel Yankee* (16 ft diameter) for efficient drying and safe operation. ReEvaporation heat recovery system to bring energy back into the production process.
- **Reel section:** the secondary arm of the *PrimeReel* is equipped with a nip load compensation system to adjust the nip pressure through the winding process. A reel spool magazine is installed to store the reel spools and feed them to the reel via the reel spool lift, ensuring efficient and automated operation.



TISSUE MACHINE DESIGN DATA

- Annual capacity of 35,000 t
- Design speed of 2,100 m/min
- Working width of 2.74 m
- Yankee diameter of 16 ft
- Production of high-quality facial wipes, napkins, toilet tissue, paper towels, and kitchen roll: mainly 15.8–20 gsm
- Start-up: 11/2018

In addition to the complete production line, ANDRITZ also supplied Vajda Papír with 50% of the fabrics for the tissue machine and since then has been continuously supporting the customer with fabrics and service support to further develop the performance of the machine.



VAJDA PAPÍR

III. AUTOMATION AND DIGITALIZATION

At the Dunaföldvár site, the scope of supply included the entire field instrumentation, detailed engineering, start-up, commissioning, and training for the complete equipment. The newly installed distributed control system is connected to the Metris server on site, which increases operator and maintenance efficiency, and enables the customer to achieve constant and highest product quality and reduce unscheduled production downtimes. ANDRITZ uses its digital Metris UX platform to optimize production processes as well as for operator troubleshooting and decision support. The site is connected to the Metris Performance Center in Graz. The Performance Center and platform offer features for on-site as well as remote assistance services by specialists catering to customer's preferences, e.g.:

- Start-up support
- Support in implementing new control strategies
- Remote assistance in resolving process or equipment issues
- Training for mill specialists
- Direct customer contact using latest Augmented Reality (AR) solutions



→ Upgraded it. → Switched it on. → It all worked.

The testliner and fluting mill in Trebsen, Germany, used to send more than 1,000 tonnes a year of useable fibers to its rejects. Challenged by this obvious waste of resources, the mill asked ANDRITZ to help keep the valuable fibers in the production process.

Julius Schulte Trebsen GmbH & Co. KG makes around 240,000 tonnes of testliner and fluting a year. To do that, it buys about a quarter of a million tonnes of mixed paper and board, supermarket corrugated, and new corrugated shavings. Since mid-2020, thanks to a screening upgrade from ANDRITZ, the mill is buying 1,000 tonnes less of these secondary fibers.

This also means 1,000 tonnes less waste to dispose of, which results in the company saving around 100,000 EUR per year.

The Trebsen mill originally installed its current paper machine in the 1960s. It was then rebuilt in 2013 with the wire and dryer sections extended, and a new film press installed. In 2015 a new head-box for the top

ply was installed. The only part of the machine that hadn't been modernized was the approach section for the bottom ply. And that was why Trebsen turned to ANDRITZ, to resolve issues in the tail screen for the bottom ply, just before the stock approach section.

Most of the time, the mill runs the same raw materials through the stock-preparation systems for both the top and bottom plies of its testliner/fluting. The screening plant for the top ply has narrow slots, but for the bottom ply, screening in three stages, wider slots are used. Despite the larger screening slots, far too much of the stock was lost, rather than being accepted through the screens. As Steffen Petrich, Investment Projects Manager at Trebsen, explains, "There was no problem with quality or production uptime. Cost was the factor."

The reject disposal costs have been rising dramatically over the past few years. When it comes to fine rejects, which this particular upgrade dealt with, the waste disposal price has more than doubled in the past five years. Steffen Petrich, who is responsible for process and technology

costing, implementation, and start-up, says, "We were paying for it twice. We were paying good money to get rid of good raw material."

Trebsen brought in ANDRITZ experts and the condition of the screening process at the mill was checked. The first discussions and laboratory analyses took place in November 2018, and the order was placed in June 2019.

ANDRITZ DILUTION WATER UPGRADE

At Trebsen, the dilution water upgrade involved installing new housing for the bearing unit, while the rotor was fitted with new "Dolphin" foils, which agitate the stock efficiently, as well as minimizing energy consumption. But the key part was the dilution water, which is now fed inside the rotor from below, through two new feed pipes, and then shot out through newly-drilled holes in the rotor, into the stock between rotor and basket. A new sealing ring maintains overpressure, keeps the dilution water where it is needed, and the turbulence of the rotor mixes it with the stock.

In this case, ANDRITZ removed the tail screen's rotor and upgraded it, while Trebsen continued operating with spare equipment. ANDRITZ then put the finishing touches to the upgrade at the mill itself, culminating in installation during the mill's planned maintenance downtime



last year. The upgraded line then started up in June 2020. After trying out various adjustments, volumes have now settled at 450 liters of dilution water per minute, which results in a reduction of the reject thickening by approximately 50%.

REDUCED COSTS AND IMPROVED EFFICIENCY

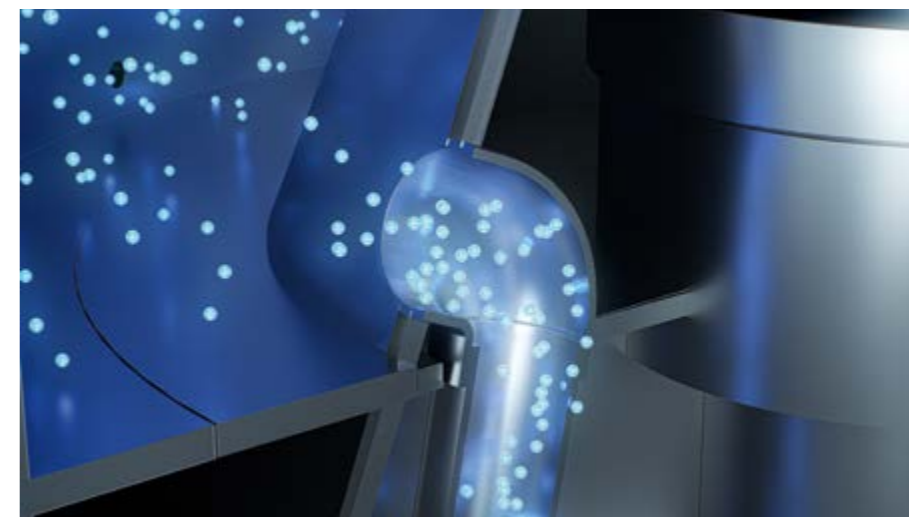
The result of the upgrade has been a reduction of about one third in fine reject volumes, contributing to a -25% to -30% drop in fine reject costs. In this case, the investment has already paid for itself, with considerable profit. Petrich says, "We

were throwing away 1,000 tonnes of fiber a year. Now we're using it."

In addition to the reduction in reject volumes, the upgrade has also resulted in environmental benefits for the mill. Steffen Petrich concludes, "That's 1,000 tonnes of rejects no longer being transported on German roads – equivalent to around 40 trucks. And 1,000 tonnes less raw materials being transported in."

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SAFE HANDS

Papier- und Kartonfabrik Varel, in northern Germany, had an urgent refiner problem. ANDRITZ not only solved it in time, but also helped prepare the mill for future expansion.

After 40-plus years, the two top-layer refiners on Varel's 130,000-tonne carton-board KM3 were nearing the end of their service. Peter Paul, Product Manager of ANDRITZ's Low-Consistency Refiner Plates business, noted problems with structural integrity and vibration.

Varel turned to ANDRITZ for help, but "this wasn't a case of ANDRITZ selling us new equipment," says Dirk Drawski, Assistant Operations Manager at Varel. "No, it was a partnership. We talked to (ANDRITZ Key

Account Manager) Karsten Laatz and Peter Paul, who showed us the possibilities, either installing new units or buying used ones."

Laatz explains, "ANDRITZ brought multiple departments together to offer flexible options that we combined to create a low-cost, turnkey solution, tailor-made to Varel's specifications."

In the end, it came down to budget and timing. Varel chose to replace the old

units with second-hand refiners that had previously been (lightly) used in a competitor's pilot plant. The second-hand machines were inexpensive and could be in place quickly.

CASH IN HAND

Varel is investing 280 MEUR to upgrade the whole 4-machine mill. This project cost about 0.1% of that.

ANDRITZ sourced the refiners, then Varel bought them directly, to minimize costs.

ANDRITZ then dismantled and refurbished them, fitting ANDRITZ Durabond refiner plates. ANDRITZ also won contracts for replacement refiner plates, maintenance, and automation.

Other savings came from the new refiners being smaller, with improved flow conditions and fiber treatment, and reduced energy consumption. Also, Varel runs both new refiners the same, rather than one each for coarse and fine refining, so the mill now only needs one set of spare parts and plate design, further reducing costs.

Besides saving money, other goals included stabilizing the strength, formation,

and structure of the board's top ply. Varel can operate the new refiners at variable speeds and throughput volumes, and is now correlating the best sheet results with the refiner settings used at the time, to work out which settings produce the best board.

These more modern refiners also mean that Varel will have plenty of refining capacity for planned capacity increases on KM3.

HANDS OFF

With this project, ANDRITZ also supplied process control for the new refiners and the stock-preparation system's high-density cleaners and screens.

And Varel are big fans of hands-off operation. Drawski says, "For a papermaker, the most important thing is that it runs stably, without us having to keep watching over it. And that's been a success. We switch it on and it runs."

Overall, Drawski says, "We are in safe hands and we are very well taken care of by ANDRITZ. When we need help, ANDRITZ always has time to listen to us. We absolutely trust them."

CONTACT

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DIRK DRAWSKI
Assistant Operations
Manager, Varel

"For a papermaker, the most important thing is that it runs stably, without us having to keep watching over it."

Left to right: Knut Hovenga, Day Shift Manager Stock Preparation KM; Dirk Drawski, Assistant Operations Manager

Left to right: Knut Hovenga, Day Shift Manager Stock Preparation KM; Dirk Drawski, Assistant Operations Manager; Kaj-Ole Wichmann, Head of Operations, Production Cartonboard



Overview of refiner area at PK Varel



GOING FULL CIRCLE

Sulfuric Acid Production for Puma I and II

Brazilian pulp and paper giant Klabin is further closing the circular sustainability loop at its Puma I and Puma II projects in the south of the country. Soon it will be making its own sulfuric acid from captured non-condensable gases at its Ortigueira mill site. ANDRITZ expertise is paving the way.

"Sustainability issues and the latest innovations go hand in hand at Klabin," says Francisco Razzolini, Klabin's Director of Industrial Technology, Innovation, Sustainability and Projects. "They are part of our everyday agenda at the company."

As part of its ongoing circular sustainability strategy, Klabin recently ordered a sulfuric acid plant from ANDRITZ for its Ortigueira mill, which will be the first of its kind in the pulp industry globally. The plant has been designed to produce 150 tons of commercial grade (>98%) sulfuric acid per day from concentrated odorous gases (CNCG) and elemental sulfur. The plant will supply the company's Puma I and Puma II pulp lines and will allow the mill to be completely self-sufficient in sulfuric acid. The technology for the plant, which uses

the wet-gas sulfuric acid (WSA) process, has been developed by Danish company Haldor Topsoe, which has more than 150 references across many industries.

"We are constantly looking for ways to use by-products generated at our mills and some of the most important ones are the sulfur-containing gases," says Razzolini. "These are usually problematic, and we need to use special burners in the boilers, lime kilns, or flares to get rid of them as they are odorous and can cause unpleasant smell".

PUMA II – THE PERFECT OPPORTUNITY

Klabin's ideal course of action was to find a way of using the sulfur-containing gases instead of burning them. "We have been

investigating ways of using these gases for some years now," continues Razzolini. "We now already have the Puma I project producing 1.6 million tonnes of pulp a year and with Puma II starting up soon we will have a mill producing a total of 2.5 million tonnes a year. That is a lot of pulp needing a lot of sulfuric acid for our production process needs.

"The coming start-up of Puma II has given us the perfect opportunity and is the perfect moment to include the sulfuric acid plant as part our project package. It means we are going even deeper into the circular aspects of our business and this adds to the wide range of chemicals we are already recovering from our production processes."

Once started up, the sulfuric acid plant will help Klabin control the sodium and

sulfur balance of the mill and will also improve the resource efficiency as less sulfate needs to be discharged due to the optimized Na/S balance. Major savings are achieved by reduced spending on chemicals, not only on sulfuric acid, but much more importantly, in reduced consumption of sodium make-up chemicals. The WSA plant also reduces the environmental footprint by reducing the need for purge streams containing sulfur and sodium.

There are also outside logistics advantages, "Sulfuric acid is used widely at the mill site to control pH in several parts of our process, and the amount we use is actually quite huge," adds Razzolini. "But this is not only about sustainability and economics; there is also a major logistics issue with transporting some five or six hazardous chemical trucks from 500 km away to the mill site, every day."

When all the sulfuric acid needed by the mill is produced internally, only elemental sulfur will need to be transported to the

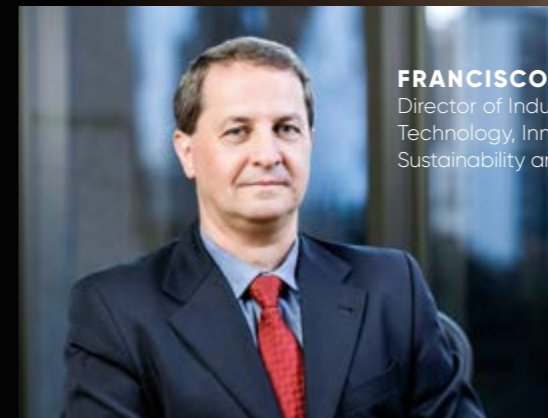
mill. The elemental sulfur volume represents one third of the sulfuric acid volume, and it is used only to supplement the sulfur flow in CNCG gases. Therefore, transport is reduced by as much as 85%, with the added advantage of the transported elemental sulfur not being a hazardous substance.

SULFURIC ACID PRODUCTION – LEARNING CURVE?

The Ortigueira mill will soon be 100% self-sufficient in sulfuric acid, which makes the mill a major chemical producer as well as a pulp producer. What is there to learn about the new process? Razzolini says, "At the site we generate oxygen, sodium chlorate, which generates hydrogen, used in the lime kiln. Chlorate is converted to chlorine dioxide. We also handle elements inside the cooking and evaporation process, as well as separate methanol, turpentine, and tall oil. In fact, there is actually a long list of what we already do, and we are very much heading in the direction of a true biorefinery when it comes to side streams generated from the mill."



Status of the on-site construction works in May.



FRANCISCO RAZZOLINI
Director of Industrial
Technology, Innovation,
Sustainability and Projects

"We have partnered with ANDRITZ for many years at Klabin, developing a lot of projects, initiatives, and technologies."

ANDRITZ SCOPE OF SUPPLY FOR PUMA II

For the WSA sulfuric acid plant, ANDRITZ has supplied technologies on an EPCC basis for elemental sulfur handling, sulfur and Concentrated Non-Condensable Gases (CNCG) combustion to form sulfur dioxide (SO₂), sulfur dioxide conversion into concentrated (98% by wt.) sulfuric acid, and a flue gas handling system. The sulfuric acid plant uses wet-gas sulfuric acid (WSA) technology developed by Haldor Topsoe.

As well as the WSA sulfuric acid plant, ANDRITZ has also supplied major pulp production technology and process equipment to the Puma II project, including:

- A complete Wood Processing Plant using the same and proven technology as in the existing Puma I line ANDRITZ wood-yard; including two eucalyptus debarking and chipping lines, chip storage with 360° stacker-reclaimer, chip screening, bark handling with ANDRITZ BioCrushers, bark storage, and purchased biomass receiving system for the new power boiler.
- An ANDRITZ HERB Recovery Boiler for combustion capacity of 3,300 tds/d with high steam parameters of 103 bar(a) and 502 °C for maximizing the power generation. The HERB recovery boiler features energy efficient flue gas cooling and feed water preheating technology to maximize the steam production for power generation.
- A complete White Liquor Plant, consisting of the same technology as the mill's existing Puma I line ANDRITZ white liquor plant. The new recaustizing plant has a capacity of 5,000 m³/d and includes efficient green liquor filtration with LimeGreen filters – producing clean green liquor and minimizing waste to landfill.
- A complete biomass gasification plant and a new biomass handling line. The scope of supply includes a 51 MW gasification plant, a belt dryer, a multi-fuel lime kiln burner, and biomass handling equipment with auxiliaries. By replacing 100% of the heavy fuel oil currently burned in one of the mill's lime kilns, the ANDRITZ gasification plant will significantly reduce the mill's carbon footprint.
- A Power Boiler based on ANDRITZ EcoFluid Bubbling Fluidized Bed (BFB) technology. The scope of supply includes a biomass-fired boiler with flue gas cleaning and other auxiliary equipment. The new Power Boiler is integrated together with the Recovery Boiler to a "Boiler Island" and some of the auxiliary equipment is shared between the two boilers.

BENEFITS OF WET-GAS SULFURIC ACID (WSA) PROCESS FOR PULP MILL

- Environmental and economic savings by reducing chemical costs and amount of effluents purged
- Helps managing and controlling the mill's sodium/sulphur (Na/S) balance
- Allows pulp mills to produce commercial grade (> 98%) sulfuric acid, thus eliminating the need to invest in parallel storage and distribution systems for acid of a lower concentration
- Due to savings of expensive sodium hydroxide, investment pay-back is extremely short
- Well-proven technology in other industries, now made available by ANDRITZ for implementation at all pulp mills

The technology used for Klabin's sulfuric acid plant is based on ANDRITZ's A-Recovery+ concept that enables mills to extract side streams from the pulping process and turn them into commercial grade products and commodities.

Razzolini adds, "Obviously in the case of the sulfuric acid plant, we are talking about a very corrosive material that is difficult to handle and we have to have a very high level of safety involved in all the operations, as we already do mill-wide. This safety priority has been at the top of our agenda when it comes to the sulfuric acid plant."

WHY ANDRITZ?

ANDRITZ was chosen as the supplier for the sulfuric acid plant for a number of reasons says Razzolini, "We have partnered with ANDRITZ for many years at Klabin, developing a lot of projects, initiatives, and technologies. Importantly, the company really knows how to operate in Brazil and has shown reliability in the

delivery of many projects, including the very latest ones.

"One key feature we recognize about ANDRITZ is the amount of effort it puts in, looking for the problems, challenges, and solutions that we have as operators at the mill sites. The sulfuric acid plant is a prime example, and the company has delivered an excellent package, with the proven technology from Haldor Topsoe, as well as a deep understanding of how we operate in our mills."

THE SULFURIC ACID PLANT IS DUE TO START UP EARLY 2022

Razzolini concludes, "When Klabin embarks on a new, pioneering project such as this, we do a lot of thorough investigations and assessments and in this case we have had excellent support and answers from ANDRITZ and we are confident we will have yet another successful result.

"The introduction of the sulfuric acid plant at the Ortigueira mill is a perfect example of how technology is enabling us at Klabin to achieve our goals when it comes to sustainability. It is also a step closer to achieving our goals for the 21st century, which is to close loops and reduce environmental impact across all our operations, at the same time as provide valuable employment to local people. At Klabin we are firm believers that the pulp and paper industries are on the right side of the equation when it comes to solving the world's current environmental challenges and through our renewable and recyclable products we are providers of solutions to these challenges."

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A BOOST FOR THE LIME KILN

LIMEFLASH-H

Increasing capacity of the lime kiln is time consuming and costly as it usually involves the lengthening of the existing kiln shell, or even a replacement with a larger diameter. ANDRITZ experts have approached the challenge from a completely different angle, and now a capacity increase of up to 40% can be achieved at much lower costs.

Typically, lime mud drying (LMD) at the kiln feed end is performed in a standard manner across the industry with ANDRITZ supplying its own LimeKiln™ solution for the white liquor plant. LMD kilns are also referred to as a “flash dryer kiln type”. ANDRITZ has installed some 100 of its standard lime kilns in pulp mills around the world.

Before the LMD technology was introduced, all the kilns were “conventional long kilns” with the first LMD lime kiln being delivered in 1990. In 2007, ANDRITZ introduced its own patented solution, LimeFlash™ for increasing the capacity of the lime kiln,

which has now been installed successfully at over 20 pulp mills across the globe.

The revolutionary LimeFlash technology has streamlined the processes in the lime kiln by offering various benefits, including quick mixing of lime mud and flue gases, thereby decreasing the temperature and eliminating plugging problems of the feed head. Other benefits include increased capacity because the lime kiln operates with higher feed end temperature. Operators using ANDRITZ LimeFlash technology have also noted better controllability and overall lower investment costs.

NEXT GENERATION LIME KILN – GOING VERTICAL WITH LIMEFLASH-H

ANDRITZ has now further developed the successful LimeFlash solution with the main focus on further increasing the capacity of lime kilns at the same time as reducing energy consumption – and all without the usual large capital outlay. Mika Mussalo, ANDRITZ Head of Product Management, White Liquor Plant says, “We have been engaged in a lot of development work since the first delivery of LimeFlash technology in 2007. This has included solving several process challenges and several changes in



“LimeFlash-H can now be considered part of the next generation in solutions for maximizing efficiencies of the lime kiln.”

MIKA KOTILA
Head of Technology, White Liquor Plant, ANDRITZ

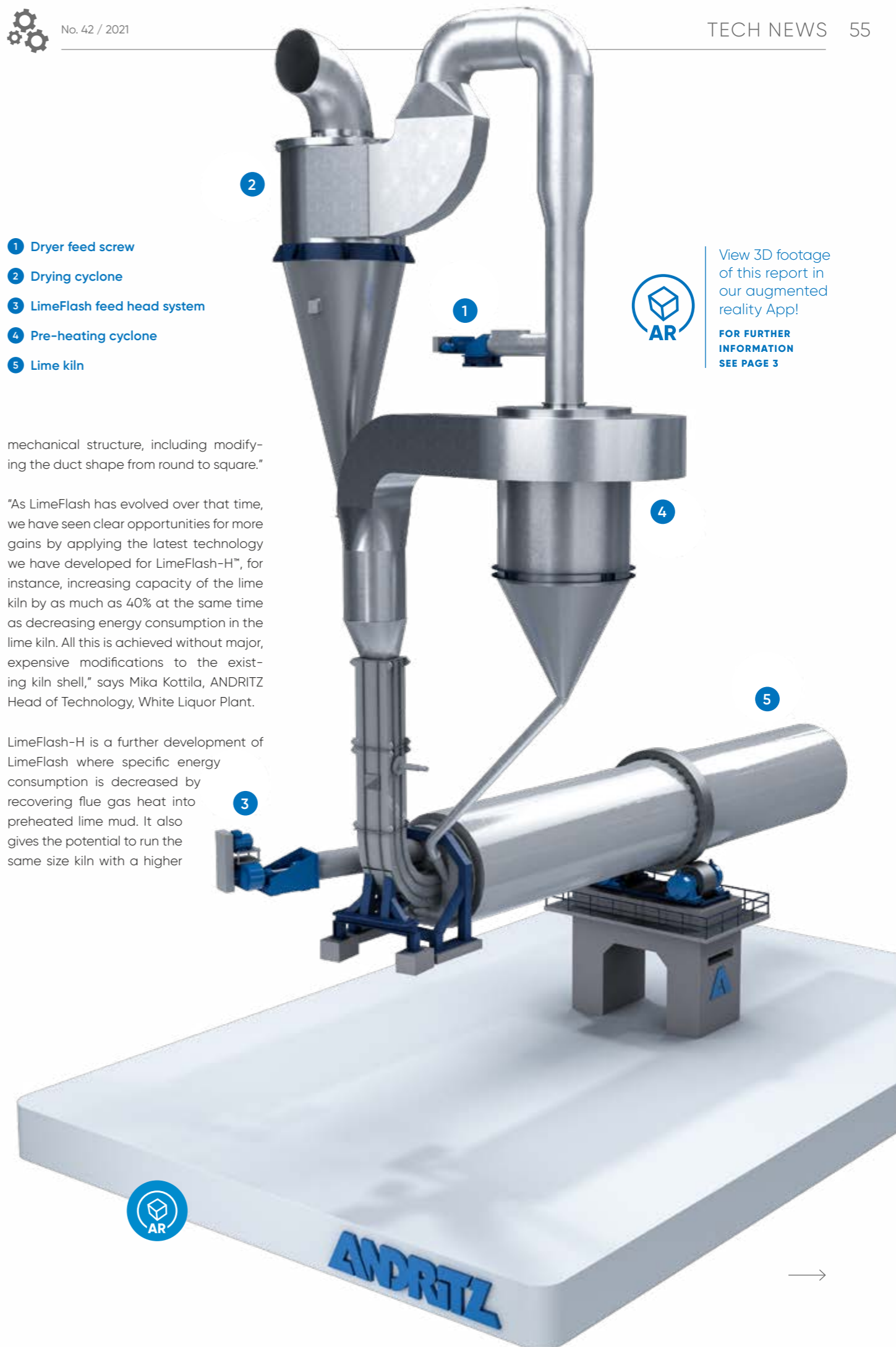


- 1 Dryer feed screw
- 2 Drying cyclone
- 3 LimeFlash feed head system
- 4 Pre-heating cyclone
- 5 Lime kiln

mechanical structure, including modifying the duct shape from round to square.”

“As LimeFlash has evolved over that time, we have seen clear opportunities for more gains by applying the latest technology we have developed for LimeFlash-H”, for instance, increasing capacity of the lime kiln by as much as 40% at the same time as decreasing energy consumption in the lime kiln. All this is achieved without major, expensive modifications to the existing kiln shell,” says Mika Kottila, ANDRITZ Head of Technology, White Liquor Plant.

LimeFlash-H is a further development of LimeFlash where specific energy consumption is decreased by recovering flue gas heat into preheated lime mud. It also gives the potential to run the same size kiln with a higher



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

FOR FURTHER INFORMATION SEE PAGE 3



ANDRITZ





JUKKA WASSTRÖM
Sales Manager, White
Liquor Plant, ANDRITZ

"Early indicators suggest a capacity increase of a lime kiln by 210 t/d by upgrading to LimeFlash-H can make an investment saving of up to 70% in comparison to installing a new lime kiln."



production, by adding the latest equipment and technology vertically into the ANDRITZ LimeKiln process by using two cyclone systems in the existing building.

New features of the LimeFlash-H include a preheating cyclone (an additional second cyclone) with refractory, a new design of the pressure lock under the cyclone, an elevated operational temperature of around 500 °C in all related equipment after the pre-heating cyclone, and a new lime mud feeding point above the pre-heating cyclone.

"LimeFlash-H can now be considered part of the next generation in solutions

for maximizing efficiencies of the lime kiln," says Kottila.

INVESTMENT SAVINGS UP TO 70%

A current LMD lime kiln with a diameter of 3.6 m, a length of 75 m and with a capacity of 300 t/d burnt lime, could see a capacity increase to 510 t/d with the implementation of LimeFlash-H. Major investment savings are made as the lime kiln size remains the same, and there are no requirements for civil works.

This represents a capacity increase of 40%, at the same time as running with ultra-efficient heat recovery using the LimeFlash-H two-cyclone system. Further

advantages include the lime kiln operating with a higher feed head temperature, flexibility to operate with different process conditions, minimum maintenance, and excellent availability.

"Early indicators suggest a capacity increase of a lime kiln by 210 t/d by upgrading to LimeFlash-H can make an investment saving of up to 70% in comparison to installing a new lime kiln," says Jukka Wasström, ANDRITZ Sales Manager, White Liquor Plant.

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"We have been engaged in a lot of development work since the first delivery of the LimeFlash technology in 2007. This has included solving several process challenges and several changes in mechanical structure, including modifying the duct shape from round to square."

MIKA MUSSALO
Head of Product
Management,
White Liquor Plant,
ANDRITZ



SMALL CHANGE BIG DIFFERENCE

ANDRITZ has created a simple but remarkably effective way to improve energy efficiency of the pulp mill, at the same time increasing the mill overall evaporation capacity. The DEvap is a small digester evaporator unit integrated into the cooking plant.

Pulp mill process experts at ANDRITZ are constantly looking for ways to optimize energy consumption mill-wide. One of the latest innovations is the DEvap, a mini digester evaporator that generates secondary steam which is used for heating chips in the digester instead of fresh steam. The DEvap concept can be as part

of a greenfield pulp mill or alternatively retrofitted into an existing cooking plant.

Arttu Klemola, ANDRITZ Sales Manager, Evaporation Plants, says, "In a traditional digester and cooking plant, fresh medium pressure steam is used in the digester top to heat up the chips and cooking liquor to

the temperature needed. This steam then condenses inside the digester which then needs to be evaporated in the evaporation plant.

"When the DEvap digester evaporator is integrated into the fiberline, 100% of the direct steam to the digester top is replaced by secondary vapour. This makes a big difference when it comes to energy efficiency. Secondary vapour is generated by evaporating part of the black liquor from digester extraction screens with DEvap. Medium pressure steam is used in the DEvap, instead of in the digester top. As the medium pressure steam no longer condenses inside the digester, the dry solid content of the black liquor going to the evaporation plant is increased and therefore less capacity is needed in the evaporation plant."

Reduction in needed evaporation capacity depends on digester steam consumption. In modern mills, DEvap decreases black liquor flow to evaporation by 3–5%. In greenfield mills, DEvap enables a smaller evaporation plant with less steam consumption.

In direct steam batch cooking plants, medium pressure steam used for heating can be replaced with steam generated in a DEvap. Some of the black liquor going to the evaporation plant is led to the DEvap via the economizers. The benefits are the same as in continuous digesters: higher black liquor dry solid going for evaporation leads to reduced steam consumption in the evaporation plant and lower boiler water consumption.





Displacement batch cooking plants use direct medium pressure steam in the pressure controls of the accumulators and the final cooking temperature adjusting in the heating sequence of the digester circulation. All these steam inlets can be replaced with steam generated by DEvap.

In retrofit cases, reduction in needed evaporation capacity can add up to almost 10%, which can be very beneficial especially if the existing evaporation plant limits mill capacity.

BENEFITS AND PAYBACKS

Due to the increased efficiencies and energy saved using secondary steam, the return on investment on the DEvap is very short, just 1–2 years. Lasse-Matti Björkst-edt, Development Manager, Evaporation Plant, says, "The benefit of the digester

evaporator is that the condensate of medium pressure steam is collected, not condensed on the chips and black liquor, and can be sent back to the boiler feed water system. This condensate has significant value in terms of feed water preheating and demineralization costs, which, added to the reduction in steam consumption in the evaporation plant, means major pay backs."

For a mill the size of Metsä Fibre's Äänekoski bioproduct mill, the steam flow to the top of the digester is around 15 kg/s. If this steam is generated via a DEvap instead a direct MP-steam, the water flow in weak black liquor is correspondingly lower, resulting in 15 kg/s less water to be evaporated. Also the steam condensate can be returned to the power plant, as the direct steam input is replaced with a secondary vapor from the DEvap. In case

of a direct steam feed, the lost amount of steam condensate would be replaced with demineralized water to maintain the required amount of water/steam in the power plant circulation.

A steam economy of a modern 7-effect evaporation plant is normally about 6 tonnes of evaporation per 1 tonne of steam, so the LP steam saving in the evaporation is $15 \text{ kg/s} \div 6 = 2.5 \text{ kg/s}$.

The DEvap uses around 1t/t steam for evaporation and thus the returned condensate amount is about the same as the evaporation, in this case 15 kg/s. The condensate from DEvap is at the saturation temperature of MP steam, which is normally around 170 °C. The saving here comes from the temperature difference of the returned condensate (in the case of a DEvap) and the demineralized water



(in the case of direct steam feed). The demineralized water temperature is normally around 40 °C. This heat difference is balanced in a feed water tank, where the mixture of returning condensates and demineralized water is heated to a temperature required for the boiler, so returning the hot condensates instead of cold demineralized water will save LP steam flow to the feed water tank.

The saved heating power in the feed water tank is about $15 \text{ kg/s} \times 4.19 \text{ kJ/kg}^\circ\text{K} (170^\circ\text{C} - 40^\circ\text{C}) = 8,170 \text{ kW}$.

The corresponding steam saving can be estimated by dividing the heat power with an approximate condensation heat of the steam: $8,170 \text{ kW} \div 2,150 \text{ kJ/kg} = 3.8 \text{ kg/s}$

The result is a total steam saving of around $2.5 + 3.8 = 6.3 \text{ kg/s}$.

As the process does not need this steam flow now, it can be fed to the condensing part of the turbine and thus generate more electricity.

The gained electricity in the condensing part of the turbine is normally around 450 kJ/kg, so the electricity generated with the saved LP steam is around $6.3 \text{ kg/s} \times 450 \text{ kJ/kg} = 2,835 \text{ kW}$.

Thus the annual savings are the extra generated electrical power multiplied with the annual operating hours and the price of electricity: $8500 \text{ h/a} \times 2.835 \text{ MW} \times 45 \text{ €/MWh} = 1.1 \text{ MEUR per year}$.

DEvap digester evaporators are built in the usual ANDRITZ robust style using its lamella evaporation technology. Tuuli Oljakka, Technology Director, Evaporation Plant, says, "The advantage of lamella

technology is its inherently non-scaling heating surface; there are fibers in the liquor from the cooking process in the fiberline. Using lamella technology means there is no extra washing required of the heating surface."

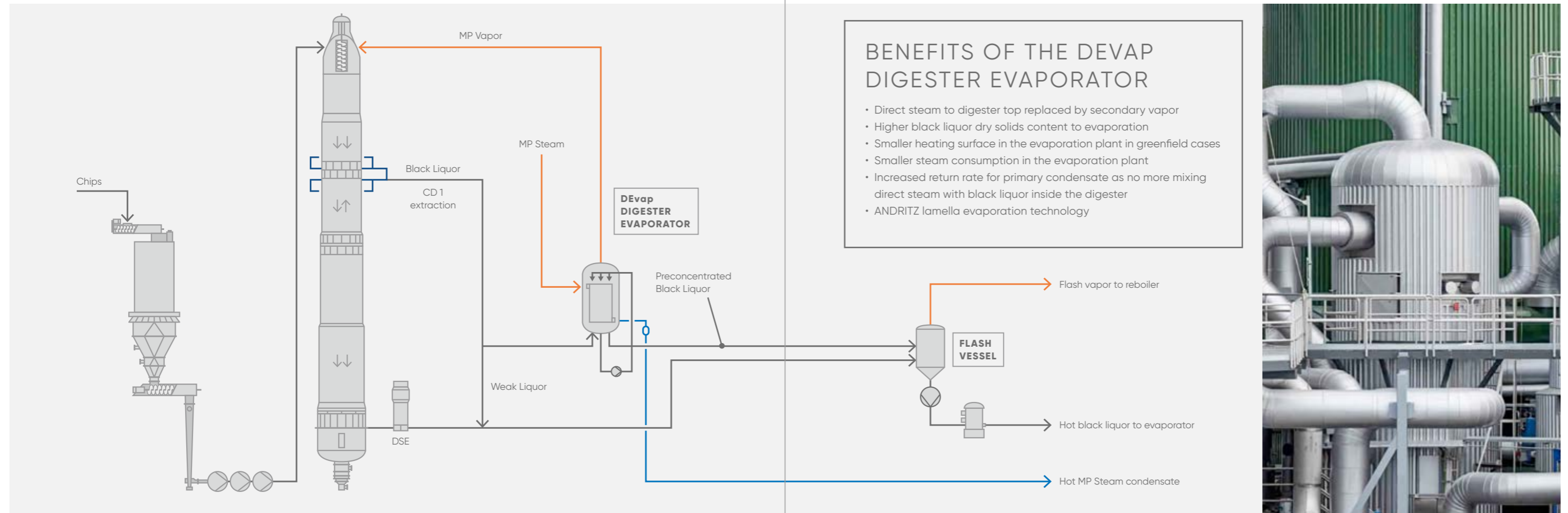
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A DEvap digester evaporator has been successfully installed at Metsä Fibre's bioproduct mill, Äänekoski, in Finland.

Another confidential customer recently ordered an DEvap system to be used for debottlenecking and increasing the mill's evaporation plant capacity at its mill in Austria.

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ANDRITZ DEvap at Metsä Fibre Äänekoski in Finland

GOOD IN A CRISIS: VOLGA TMP LINE STARTS UP

ON:TIME

Despite the COVID-19 pandemic, the Volga Pulp and Paper Mill team in Russia, along with experienced ANDRITZ experts operating remotely, started up a new TMP line at the mill on time and on schedule as planned.

"We chose ANDRITZ for this project originally for three different reasons," says Sergey Pondar, CEO of Volga Pulp and Paper Mill. "The technology, the cost, and the schedule."

And then along came the pandemic, just in the middle of the start-up phase of Volga's new TMP line, posing a major challenge to the already tight schedule. The project itself was already a challenging one; to rebuild an existing ground-wood reject line at the Volga mill as a Thermo-Mechanical Pulping (TMP) line. Nothing much new for ANDRITZ as this is an area of expertise it has been engaged in for many years, supplying complete TMP systems as well rebuilds or upgrades on its own equipment or competitors' machines.

The mill itself is around 90 years old and is situated about 400 km to the east of

Moscow. It produces newsprint papers, as well as packaging papers, and before the TMP project the mill was producing 280,000 tonnes of newsprint and packaging papers per year. The mill's production goes to both domestic and export markets. Pondar says, "The plan has been to increase production here at the mill by 50% in just three years. We have been doing this by improving efficiencies, as well as tackling bottlenecks around the mill. Our aim is to produce 320,000 tonnes per year by 2021."

The mill uses 100% spruce as its raw material and the decision was taken to install the new TMP line to solve a bottleneck on the furnish of its newsprint machine. "We run two paper machines here," says Pondar. "We wanted the extra capacity to increase our newsprint

production, as well as push down the mill's cost per tonne."

ANDRITZ was chosen to carry out the rebuild, mostly on the basis that it has the TMP technology that it could supply at a reasonable cost, and also that it could carry out the project on a tight schedule. "We already had a good relationship with ANDRITZ, and have carried out many successful projects together," says Pondar.

Philipp Egginger, Sales Manager at ANDRITZ' Paper, Fiber and Recycling Division, says, "The contract for the rebuild of the groundwood reject line into a TMP system was signed in October 2018. The scope of the project included the modernization of the high-consistency (HC) and low-consistency (LC) refining sections as well as the screening plant. ANDRITZ

"To have kept to the schedule during the crisis makes me very proud of the team at the mill."

SERGEY PONDAR
CEO of Volga
Pulp and Paper Mill



also supplied several new components, such as a new chip washing and pre-treatment system, the HC refiner feeding system, and an ANDRITZ DiscFilter."

In addition, complete automation and electrification equipment with DCS system was supplied. Engineering, training, and advisory services for mechanical installation work were also part of the scope and proved to be a solid basis for the successful start-up.

The line capacity was 180 admt/d with a raw material of 100% spruce with newsprint as the final product. Final start-up was scheduled for late March 2020.

Egginger continues, "The project for the TMP line proceeded according to plan with the last

main delivery of equipment from ANDRITZ arriving in October 2019. At the beginning of the project Volga Pulp and Paper Mill put together an experienced team at the mill, which began communicating with the ANDRITZ team on a regular basis. This way we were making sure we were on schedule."

"One thing I really like in dealing with ANDRITZ is the commonsense approach the experts and engineers take to a project like this," adds Pondar. "We basically together started with a new, clean page and planned the whole project, taking into account all the major challenges before they arose."

COVID-19 – A MAJOR CHALLENGE DURING START-UP

And then came the challenge of all challenges. COVID-19 struck just as the start-up procedure of the TMP plant at the mill was beginning. Pondar says, "Except for usual challenges, including the minor ones, the project was running very smoothly, and we were right on schedule."

The start-up phase of the TMP plant had begun in December and was proceeding according to plan when Pondar

JSC Volga is one of the largest Russian newsprint producers and uses 100% TMP as furnish.



WOLFGANG LASHOFER
Senior Vice President and
Global Division Manager,
Paper, Fiber and
Recycling Division

"It was essential to fulfill our obligations and assure a quick start-up in order to support our customer and partner Volga."



PHILIPP EGGINGER
Sales Manager, ANDRITZ
Paper, Fiber and
Recycling Division

"Our engineers established a direct access to the DCS system on site to assist the Volga mill project team in real time."

received a call from ANDRITZ management saying that all of its personnel had to be pulled out of the project and the mill effective immediately.

Wolfgang Lashofer, Senior Vice President and Global Division Manager of the Paper, Fiber and Recycling Division at ANDRITZ, explains, "The sudden and serious emergence of COVID-19 urged us to take immediate action. On the one hand we had to make sure that our personnel had the chance to travel home, not knowing how the situation would proceed. As we all know now, national borders were soon closed and not only Austria went into a strict lockdown. On the other hand, it was clear that we had to go on with the start-up and our support as agreed. It was essential to fulfill our obligations and assure a quick start-up in order to support our customer and partner Volga."

Pondar says, "Of course, we understood the situation, since the pandemic placed us all in the same boat. ANDRITZ immediately offered us online assistance and promised that the crisis would and should not affect the scheduled final start-up in late March."

Additional IT systems were put into place that allowed ANDRITZ experts to communicate directly with the Volga mill project team. Egginger says, "Our engineers established direct access to the DCS system on site to assist the Volga mill project team in real time. Daily and often hourly video meetings helped us to firmly stick to the goals and time frames we had mutually agreed upon in the early stages."

"The TMP line started up on April 4th 2020 and was very soon afterwards producing the first commercial paper off the line. We highly appreciate that Volga Paper

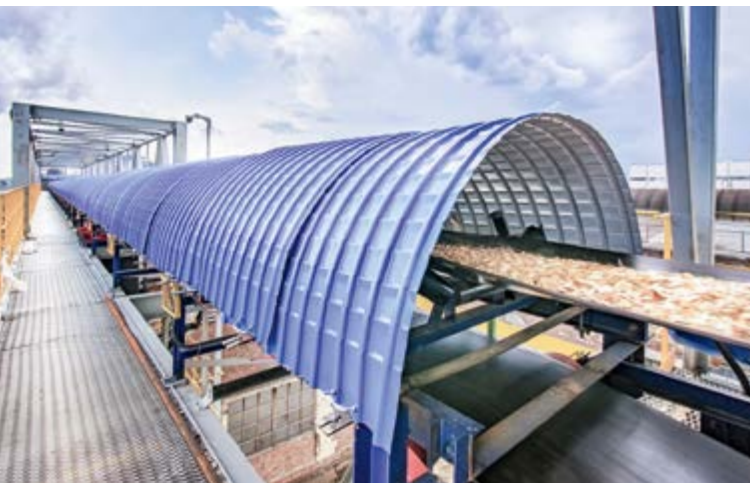
trusted in us and our capabilities, just as we value the excellent support and cooperation that was the basis for this success," Lashofer says.

In the meantime, Volga Paper is already reporting a huge productivity improvement, reduction in cost per tonne, and increased flexibility in producing different grades. "This was a "super-optimistic" schedule even before the pandemic," says Pondar. "To have kept to the schedule during the crisis makes me very proud of the team at the mill. We are delighted with the cooperation and can-do attitude that ANDRITZ brought to the project."

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100% spruce is used as raw material for the TMP fiberline.



Opening ceremony of the new TMP mill.



Streamlining Health & Safety Observations and Reporting

We at ANDRITZ are constantly looking at ways to improve performance and generate a proactive culture when it comes to Health and Safety issues, which is why we are rolling out world-renowned Quentic solutions and software tools for safety observation reporting at our projects and factories.

The very best way to avoid Health & Safety issues at industrial plants is to make sure they don't happen in the first place. In other words, we need to have a proactive safety culture embedded across all areas of our industrial platforms. To facilitate this process, a framework needs to be set up to allow easy reporting, evaluation, and processing of any potential threats or events that happen during ongoing operations.

This is why ANDRITZ has decided to roll out the Quentic Safety Observations tool for reporting and managing unsafe conditions and activities. Quentic is recognized as a world-wide leading provider of Health & Safety software tools for managing potential hazards and incidents across many industries.

The key to achieving a proactive safety culture is to create a reporting system that is easy to use, but also extensive in its functions. The rolled-out system allows users to instantly report possible safety hazards as they see them, using their mobile phones or tablets while they are working in a plant. The system works via a unique QR code that is directly linked to the reporting interface of the dedicated location or site, allowing any employee to scan the code and instantly report any potential hazard witnessed. The notification is then relayed to the Health & Safety person responsible, so that immediate action can be taken, thereby avoiding an incident.

This function works really well, allowing immediate corrective action at the same time as systematically collecting the relevant information. The information can then be analyzed for the identification of relevant general issues and an effective preventive action plan can be defined and developed, specifically based on the analysis of the collected information.

ADDED FEATURES AND FUNCTIONALITY

Further, in the ANDRITZ Pulp and Paper Capital business area we have developed additional functionalities within

the Quentic software. We are currently piloting a statistics feature, which enables all relevant Health & Safety data to be collected from all our locations and projects and stored together in one common database.

The collected data, based on leading and lagging indicators, can be easily analyzed by our Health & Safety experts, according to the reporting unit and reporting organization, to allow a continuous monitoring of the respective performance and an immediate adjustment of the established activities where required.

This new system also offers the possibility to all ANDRITZ partners and contractors to provide the required information directly, facilitating communication, avoiding double handling of data and errors during data transfer, and providing a transparent overview of the current Health & Safety situation for all interested parties.

Another functionality we have developed within Quentic in the pulp and paper business area is the incident reporting and investigation process. This means that employees have the opportunity to report an incident in the same system, which automatically sends a notification to the Health & Safety persons responsible to get immediate support. As a follow-on to the incident notification, the investigation process is triggered, which requests the person reporting to make a proper evaluation of the root causes of the event in the same system. This system facilitates the reporting and investigation process, helping us to guarantee that a similar incident will be avoided in the future.

So far, the roll-out of Quentic tools at ANDRITZ individual entities and plants is going very well, and we are proceeding positively on a location-by-location basis. When fully implemented, we are confident that the number of projects and sites being negatively impacted by hazards will be systematically reduced.



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ANDRITZ



VICTOR SILVA
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DID YOU KNOW THAT...

... ANDRITZ CAN BOOST YOUR EQUIPMENT VALUE WITH INNOVATIVE VIB SPRAY TECHNOLOGY AND STEAM-PROFILING SOLUTIONS?

Improving the sheet's cross-directional moisture profile has been demonstrated as being one of the most effective and economical means to save fibers and energy and to improve overall quality levels. To remain competitive in a challenging market, it is essential for paper machines to increase productivity and runnability.

ANDRITZ supplies optimized VIB systems using both water and steam that are customized to each customer's machine and operating and grade structure. From fine paper to paperboard, VIB systems are engineered to ensure the highest level of performance for the unique application of cross-directional moisture profile control.

Get more information at:
[ANDRITZ.COM/VIBSYSTEMS](https://www.andritz.com/vibsystems)



... FOR KRAFT AND MECHANICAL PULPING, ANDRITZ OFFERS COMPLETE SYSTEMS FOR TREATING LIQUID STREAMS AND PROCESSING THE CONDENSATES FOR OPTIMAL REUSE, WHILE MINIMIZING ENERGY CONSUMPTION?

ANDRITZ's lamella evaporation technology and the unique process solution for scaling control reduces washing needs, ensures cleanability, and avoids plugging of heating surfaces, which results in high availability and increases the overall production and efficiency of the evaporation plant.

ANDRITZ has a proven track record in delivering lamella evaporation plants with more than 450 references worldwide.

Get more information at:
[ANDRITZ.COM/LAMELLA-EVAP](https://www.andritz.com/lamella-evap)

... ANDRITZ WILL BE A KEY SUPPLIER OF THE PROCESS EQUIPMENT FOR INFINITED FIBER COMPANY'S PLANNED FLAGSHIP FACTORY IN FINLAND?

Circular fashion and textile technology group Infinited Fiber Company is looking for a location in Finland to build a flagship factory to produce its unique, regenerated textile fibers for the global market. The plant is expected to be operational in 2024.

Textile waste recycling is becoming mandatory in the EU from 2025 and ANDRITZ is keen to be involved in developing new bio-based fibers from textile waste and also from other cellulose-based materials. ANDRITZ's versatile product portfolio has the suitable equipment for the mechanical and chemical treatment of textile waste and it can deliver large entities for our customers.

Get more information at:
[INFINITEDFIBER.COM](https://www.infinitedfiber.com)

