Magazine of Pulp & Paper // 2026

ANDRITZ

# SPECTRUM №47

## Shades of progress

Technology. Innovation. Sustainability.


Defossilization of pulp mill lime kilns // 54

From plastic to fiber – Dry Molded Fiber // 64

Efficiency without compromise – Refiner exchange // 14



# Shades of progress

Technology. Innovation. Sustainability.

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**SPECTRUM is published by:**
ANDRITZ AG
Stattegger Strasse 18, 8045 Graz, Austria
Phone: +43 (316) 6902 0
E-Mail: spectrum@andritz.com

**Editor-in-Chief:** Elisabeth Wolfond
elisabeth.wolfond@andritz.com
**Project Director:** Saskia Painsi
saskia.painsi@andritz.com
**Project Manager:** Christina Hartinger
christina.hartinger@andritz.com
**Editorial Consultant:** Mark Rushton
mark@editorialservicesdirect.com

**Editorial Board:**
Aline Gomes, Minna Sinijärvi,
Pirjo Nousjoki, Tamara Huber-Huber

**Contributing Writers:**
Gary Thomson, Jonathan Roberts,
Mark Rushton

**Contributing Photographers & Providers:**
Adobe Stock, Unsplash, Chris Rausch, Croce, Ekolution, Hérbert Group, Jaakko Jaskari, Jannik Hammes, Jukka Kinnunen, Ken Buslay, Lars Behrendt, Riku Isohella, Shai Pal

**Layout & Design:**
INTOUCH Werbeagentur & Internetagentur



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# ENGINEERING TOMORROW: **PULP & PAPER TECHNOLOGY IN ACTION**

Technology is at the heart of everything we do at ANDRITZ. Our experts thrive on the challenge to create the future of the pulp, paper and bioproducts industries, inventing, innovating, enabling, partnering and collaborating. It's also what allows us to deliver on our promise of creating growth that matters, for our customers and for the industries we serve.

Ultimately all the technologies ANDRITZ pioneers and builds have one eye firmly on the pillar of sustainability: Will a new process or technology use less energy? Less water? Create less waste? And we are seeing concrete results; just look at the revolution that has taken place at pulp mills in the replacement of fossil fuels over the last decade – much of this progress has been enabled by our technologies.

The innovation, of course, continues and is becoming ever bolder and brighter. From new process development in tissue technology to save energy in the TAD process, to the very ambitious BioCircleToZero initiative which aims to double the value of wood utilized at pulp mills – this is a noble mission we are on, and every day is an innovation day at ANDRITZ.

These shades of progress are not limited to our technology alone. This issue also marks a milestone for SPECTRUM itself. What started around 25 years ago as a printed magazine has been extended by a digital platform and a podcast, a place where our experts speak directly to you. The way we tell our stories has changed just as much as the technology behind them and, for the same reason, we go where our customers are and keep finding better ways to share what matters.



What I value most about our engineering teams is that they keep asking what's next, even without knowing exactly where that question will lead.

That takes patience, investment in R&D, and listening closely to our customers and the industry.

The articles and stories in this issue perfectly reflect the deep work ANDRITZ is doing to create growth that really matters and pave the way for the future. I am proud of the diligent and vital dedication of our teams and am grateful for the trust our customers put in us.

Sincerely,

Simon Fagerudd

Vice President,
ANDRITZ Pulp Mill Systems Technology

SPOTLIGHT ON

# Turning fridges into valuable resources

Discover more!



Standard layout of a fridge recycling plant

## End-of-life fridge recycling

ANDRITZ offers advanced fridge recycling systems designed to safely handle hazardous substances while maximizing the recovery of valuable materials. Our fully automated solutions ensure environmentally friendly processing of refrigerators – from degassing to material separation – meeting the highest safety and efficiency standards.

Our technology goes beyond conventional solutions by integrating innovative membrane separation for maximum propellant recovery, enclosed process stages that prevent harmful emissions, intelligent automation for precise material handling, and modular designs tailored to customer needs. From recovering valuable raw materials to ensuring the safe treatment of hazardous substances, ANDRITZ solutions are engineered to provide long-term value, operational reliability, and full compliance with the strictest environmental standards.

### The process of fridge recycling

**STAGE 1: FEEDING AND DEGASSING**

ANDRITZ fridge recycling systems begin with the technology from ANDRITZ ATN Recovery Systems. The system enables the efficient recovery and separation of oil and cooling agents like chlorofluorocarbon (CFC), isobutane, and isopropane. A wide range of customizable features can be integrated, including automation, fridge detection and categorization, blowing agent identification and labeling, as well as specialized tools like drilling heads or piercing pliers.

**STAGE 2: DISMANTLING & GAS RECOVERY**

The material is fed via an enclosed chain belt conveyor featuring a sluice feeding system, followed by one-step dismantling. The system operates in a sealed ADuro QZ housing, a fully enclosed chamber for safe inertized processing, combined with a one-way discharge unit to minimize nitrogen consumption. Continuous oxygen level monitoring guarantees safe operation. As insulation foam (PU) is milled down to powder, gases such as CFC and pentane are released and safely removed with nitrogen as carrier gas. Moisture from the fridges is reduced with the drying circuit during the shredding process.

The material is further processed in a closed system, where temperature is maintained using a tempering screw conveyor. Remaining blowing agents and water vapor are extracted with nitrogen process gas. PU powder is separated from the material flow and directed to the matrix degassing unit. Coarse grain is then ready for Fe/NFe separation.

Final traces of CFC and pentane are removed via nitrogen gas, reducing residual blowing agents in the PU powder to below 0.1 wt%. The cleaned PU powder is then collected in a big-bag station or silo for further treatment or disposal.

**CONTACT**
Franz Fruehauf
franz.fruehauf@andritz.com



# Smart Fiberline Quality Tracking solution

## Covering all Metsä Fibre pulp and bioproduct mills in Finland

The analytics solution, Smart Fiberline Quality Tracking, has been installed at Metsä Fibre Kemi Bioproduct Mill, and will eventually cover all Metsä Fibre pulp and bioproduct mills in Finland. The solution has a successful history in Metsä Fibre Rauma, Äänekoski, and Joutseno mills, and now Metsä Fibre completes its latest Bioproduct Mill in Kemi with the quality tracking solution.

Smart Fiberline Quality Tracking provides real-time estimates of fiber strength and bonding. The impact of process variables is modelled as changes in pulping yield and converted to a Fiber Online Index (FOX) depending on their magnitude, duration, and variability. The software provides a prediction of pulp quality and operators can affect it by optimizing the process variables.

Traditionally, these measurements are carried out in a laboratory, leading to delays and additional costs. This ANDRITZ solution provides an immediate forecast of pulp quality, and the possibility to influence process variables proactively, leading to maximized pulping yield, improved pulp quality, high and stable production quality, and an improved customer experience.

"Smart Fiberline Quality Tracking gives us a clearer view of process performance and supports our daily work in following pulp quality development. It brings additional transparency to the fiberline and creates a stronger basis for discussions around process optimization," says Johanna Rautala, Senior Manager, Operational Excellence at Metsä Fibre.

"The implementation of Smart Fiberline Quality Tracking at Kemi progressed well, and the solution is now part of our daily operations. It provides valuable support for process follow-up and helps strengthen our overall understanding of the factors affecting fiberline performance and pulp quality," says Juho Lyytikäinen, Operations Manager at Metsä Fibre Kemi Bioproduct Mill.

"From ANDRITZ's point of view, the implementation of the Smart Fiberline Quality Tracking solution at Kemi was a smooth and prompt project. The collaboration between ANDRITZ and Metsä Fibre was truly outstanding, characterized by open communication and a shared commitment to excellence. This efficiency was made possible thanks to the valuable reference provided by the successful deployment at the Äänekoski Bioproduct Mill, as well as Metsä Fibre's comprehensive knowledge of the solution. This partnership enabled us to achieve a successful outcome that benefits both parties," concludes Saara Aksola, Project Engineer, Smart Products and Solutions at ANDRITZ.

**CONTACT**
Saara Aksola
saara.aksola@andritz.com



Metsä Fibre bioproduct mill in Kemi, Finland

Discover more!

HKB-Hoa Lu Paper:

# SUCCESSFUL REBUILD TRANSFORMS OCC LINE PERFORMANCE

Modern packaging paper production demands adaptability with smart investments being key to long-term success. Following the successful start-up of a complete new ANDRITZ Old Corrugated Containers (OCC) stock preparation line in 2023, HKB-Hoa Lu Paper Joint Stock Company in Ninh Binh Province, Vietnam, has recently completed a highly effective upgrade that has essentially enhanced capacity, raw material flexibility, and final paper quality.



*"We again chose ANDRITZ due to successful previous projects and we fully trust the company's capability to handle OCC and AOCC."*

**Ngo Huu Phuong**
Vice Chairman of the Board, HKB




When HKB-Hoa Lu Paper (HKB) decided to enter the OCC-based packaging market in the early 2020s, it chose ANDRITZ as its technology partner. The company ordered a complete stock preparation line, including an OCC system, reject handling, and paper machine approach flow and save-all system, which started up successfully in 2023 and quickly reached all performance targets. Production was stable and quality objectives were consistently met.

However, rapidly rising demand for premium packaging grades and a strategic shift toward higher proportions of American Old Corrugated Containers (AOCC) created new challenges for the original system. AOCC, while offering excellent fiber properties, contains significantly more strength with higher kraft pulp content and also more contaminants so therefore requires more robust processing technology than local OCC.

Rather than building a completely new line, HKB chose a smarter path – a comprehensive upgrade of the existing ANDRITZ OCC system. The objective was clear: achieve stable processing of 50-60% AOCC, increase line capacity by 30%, and deliver noticeably cleaner pulp and higher final paper quality - all while keeping fiber losses to an absolute minimum.


Raw material: AOCC and local OCC

Ngo Huu Phuong, Vice Chairman of the Board at HKB, says, "Our company vision is to be a leading cardboard producer. For our new production line, we invested in a complete OCC line from ANDRITZ that was successfully started up in 2023.

"As the packaging market quickly evolves, there is an increased demand for top quality paper with high burst strength. In 2024, the decision was made to upgrade the OCC stock preparation system to be able to process more AOCC. We again chose ANDRITZ due to successful previous projects and we fully trust the company's capability to handle OCC and AOCC."

## THE UPGRADE SCOPE

The rebuild was executed with surgical precision, focusing on critical process stages where the biggest gains could be realized.

Watch the video here



LC pulper

### LOW-CONSISTENCY PULPING SYSTEM

The heart of the upgrade was the installation of a new highly efficient pulper rotor. This innovative design excels at handling high AOCC content, while efficiently managing large contaminants through optimized rag operation and junk removal. The result is stable, trouble-free pulping even with difficult raw material mixes.



ModuScreen D

### COARSE SCREENING SYSTEM

The coarse screening section was significantly strengthened. A new deflaking stage with an additional third-stage coarse screen (ModuScreen D) was added. This flexible, multi-stage configuration now delivers superior deflaking efficiency and ensures excellent system runnability paired with minimum fiber losses even at high AOCC content.



*Prime*Cleaner LW

### LIGHT REJECT TREATMENT

To meet the stricter cleanliness requirements of premium packaging grades, HKB installed a new *Prime*Cleaner LW light-reject treatment system. This advanced technology efficiently removes stickies and microplastics, resulting in markedly cleaner pulp and more stable operation in downstream processes.



*Prime*Screen X

### FINE SCREENING SYSTEM

The long-fiber fine screening stage was upgraded with a *Prime*Screen X equipped with a dilution rotor. This high-capacity screen not only supports the increased production volume but also significantly reduces fiber loss while improving overall final paper quality.

Every component was carefully integrated into the existing line, thus minimizing downtime and making full use of the original ANDRITZ equipment that was still performing well.

## OUTSTANDING RESULTS: A REBUILD SUCCESS STORY

The upgraded OCC line has exceeded expectations across all key performance indicators:

- Raw material flexibility: The system now processes 50-60% AOCC stably without compromising runnability.
- Capacity increase: Overall, the OCC line capacity has risen by a remarkable 30%.
- Pulp and paper quality: Significant improvements in pulp cleanliness and final paper properties have been achieved.
- Fiber efficiency: Fiber loss remains exceptionally low, consistently below 1%.
- Contaminant removal: Highly efficient removal of stickies and light contaminants ensures superior stock quality.



Alexander Gscheider, Director, Technology & R&D, Paper & Textile APAC at ANDRITZ says, "This was a challenging project - not only was the target to increase the capacity of the line, but also to almost double the AOCC content.

"We mainly focused on the LC pulping system where we implemented a new highly efficient rotor, and also on the deflaking efficiency in the coarse screening system that was enhanced by adding an additional deflaking screen stage."

Furthermore, ANDRITZ experts rebuilt and upgraded the fine screening system in order to maintain high stock quality at minimum fiber losses.

"In a nutshell, we provided a rebuilt setup with minimum investment to reach the target of increased capacity with high AOCC content at very high final stock quality," continues Gscheider.

The mill can now produce higher-value packaging papers with confidence, even as raw material composition continues to shift. What once represented a technical challenge has now become a competitive advantage.

### PARTNERSHIP AS THE DECISIVE FACTOR

Both HKB and ANDRITZ emphasize that the project's success was built on close, trust-based cooperation. From the initial concept discussions through detailed engineering and seamless implementation, the two teams worked hand-in-hand. ANDRITZ's extensive expertise in OCC and AOCC processing technology, combined with HKB's clear vision and operational know-how, proved to be the winning formula.

For HKB, the upgraded line represents more than just technical improvements; it is a strategic investment in future competitiveness. With enhanced capacity, superior quality, and the flexibility to handle changing raw material conditions, the mill is now well-positioned to meet growing market demand for high-performance packaging papers in Vietnam and beyond.

The result is a textbook example of how a targeted rebuild can deliver outstanding returns while maximizing the value of existing assets.

Huu Phuong concludes, "After the upgrade we are now processing up to 60% AOCC and the line capacity has increased by 30%. Furthermore, the paper quality has improved to meet market demands.

"With the success of this cooperation we continue to have complete trust in ANDRITZ, and we look forward to working together on our future projects."

**CONTACT**
Huang Zhao
zhao.huang@andritz.com

# EKOLUTION

## … AND ANDRITZ SCALE UP $CO_2$-NEGATIVE HEMP INSULATION

In 2025, Swedish pioneer Ekolution successfully commissioned a fully integrated industrial production line for high-performance hemp fiber insulation at its plant in Malmö, Sweden. Delivered and installed by ANDRITZ, the new facility signals a major milestone in the commercialization of truly sustainable building materials.


Hemp-based insulation

## FROM FIELD

Founded in 2013, Ekolution started with a clear mission: develop $CO_2$-negative, bio-based building materials that outperform conventional alternatives. While many companies in the green construction sector purchase fibers from third parties, Ekolution took a bolder route. The company decided to control the entire value chain – from raw hemp stalks grown by farmers to refined fibers and finished nonwoven felts.

This vertical integration is still rare in the industry and gives Ekolution complete oversight of quality, traceability, consistency, and environmental performance.

"Coming from a construction background, we saw the need for better insulation materials," says Remi Loren, CEO of Ekolution. "We didn't just want to buy fibers – we wanted to produce them ourselves to ensure the highest quality and the lowest possible carbon footprint. Partnering with ANDRITZ allowed us to industrialize that vision."

### COMPLETE PROCESS SOLUTION

The ANDRITZ scope of supply comprises two perfectly synchronized technology platforms: A teXline bast fiber line for decortication and refining of industrial hemp and a neXline airlay flexiloft+ line for forming high-loft felts.

The bast fiber line processes approximately five tons of hemp feedstock per hour, separating the valuable bast fibers from the woody core (shives) and refining them into a clean, consistent feedstock. The airlay line then converts this material into insulation felts at a rate of up to 1.5 tons per hour. The result is a continuous, industrial-scale production flow that turns raw agricultural material into ready-to-install insulation products.

### OVERCOMING NATURAL CHALLENGES

Working with natural fibers brings unique challenges. Unlike synthetic fibers, hemp varies with harvest conditions, moisture content, and growing regions. Mastering the agricultural upstream process was therefore critical.

"Every natural material has its own character," explains Francis Elias Junker, Sales Manager, Nonwoven & Textile at ANDRITZ. "The biggest challenge is not just the machinery, but understanding and controlling the entire chain, from field to factory. Only when the agricultural part is mastered, the downstream processing can deliver consistent, high-quality output."

ANDRITZ's extensive experience in bast fiber processing, combined with its airlay expertise, helped Ekolution overcome these hurdles. The result is a stable, repeatable industrial process that delivers insulation with excellent thermal performance, moisture regulation, and sound absorption properties.

**EKOLUTION**
Sweden




Production line, Ekolution, Malmö

## GETTING TECHNICAL

**ANDRITZ teXline bast fiber line high-capacity decortication and refining system:**

- Processes ~5 tons of hemp stalks per hour
- Gentle mechanical separation preserves fiber length and quality
- Designed specifically for bast fibers (hemp, flax, kenaf)
- Produces clean bast fiber and shive fractions for multiple applications

**ANDRITZ neXline airlay flexiloft+ line advanced airlay forming technology:**

- Output up to 1.5 tons of nonwoven felt per hour
- Creates uniform, high-loft structures ideal for insulation
- Excellent fiber blending and web uniformity
- Flexible for different fiber types and densities

**Combined output: Full vertical integration from raw hemp to finished insulation felt in one seamless process.**

### VERIFIED CARBON-NEGATIVE PERFORMANCE

One of the project's standout achievements is its environmental credibility. The hemp insulation produced on the new line is among the first hemp-based products to receive a full Environmental Product Declaration (EPD). This third-party verified document confirms the material's carbon-negative footprint – meaning it sequesters more $CO_2$ during the hemp's growth phase than is emitted across its entire production life cycle.

This positions Ekolution's product as a genuine alternative to traditional glass wool and mineral wool insulation, which have significantly higher embodied carbon. Beyond construction, the hemp felts also serve markets such as automotive interiors, acoustic panels, furniture, packaging, and technical textiles – all sectors actively seeking high-performance natural fiber solutions.

### A LONG-TERM PARTNERSHIP

The collaboration between Ekolution and ANDRITZ began with first contact in 2021. After thorough evaluation and testing, the decision to proceed was taken in 2023, the contract was signed in August 2023, and the line was successfully commissioned in January 2025 – a rapid timeline for such a complex project.

"ANDRITZ acted as a true one-stop-shop partner," Loren adds. "From process design through to commissioning, the company supported us every step of the way. This project proves that sustainable ideas can be scaled into competitive industrial reality."

With this new line in full operation, Ekolution is well positioned to meet growing European demand for low-carbon building materials. The project stands as a compelling example of how ANDRITZ is actively supporting the shift toward a more circular and climate-friendly economy – one hemp fiber at a time.

## TO FACTORY

**CONTACT**
Francis Elias Junker
francis-elias.junker@andritz.com

# EFFICIENCY WITHOUT COMPROMISE



Refiner installation at Mondi Neusiedler Kematen




## Refiner exchange at Mondi

Mondi Neusiedler and ANDRITZ achieved higher capacity, stable quality, and lower costs with the Refiner Exchange Concept.

### "IT COULDN'T HAVE GONE BETTER"

Often, if you want more capacity, you need more space. That could mean anything from using more of an existing room, to constructing a whole new building. Or you might try more powerful motors, usually at the cost of more energy. It's not often that you can increase your output, while using the same space and motor set-up. But that's what happened at Mondi Neusiedler's Kematen mill.

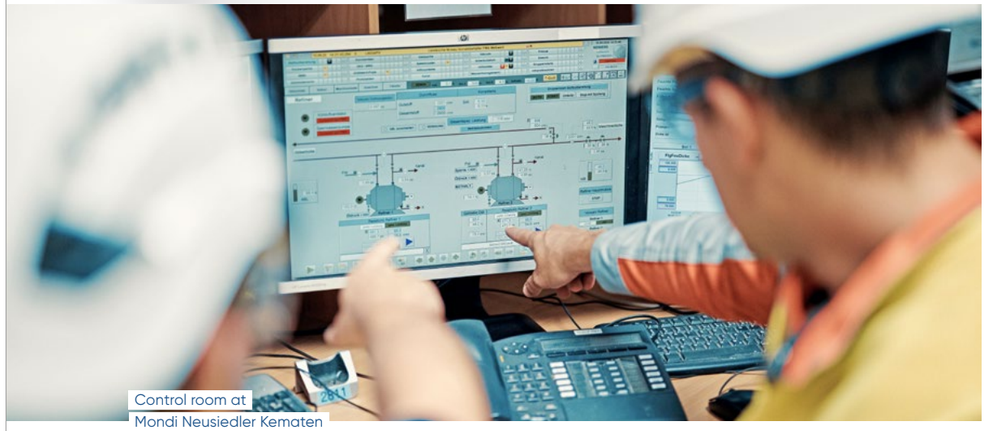
ANDRITZ was able to do all of this with its TwinFlo Customized (TFC) refiner concept, installing the upgrade in just two days.

Mondi Neusiedler's Kematen mill in Lower Austria combines a long tradition with an innovative mindset. Together with its sister mill in Theresienthal, just ten minutes away, it has been producing specialty papers for more than 150 years. The mill manufactures high-quality uncoated fine papers in sheets and reels, including premium brands such as PERGRAPHICA. Its wide portfolio covers more than 1,000 products in over 50 colors, with basis weights ranging from 40 to 400 gsm. Applications include laminated papers, books, sticky notes, colored copier papers, greeting cards, and luxury packaging.

With such an unusually wide range of capabilities, an innovative mindset is evidently part of the culture at Mondi Neusiedler. And that attitude clearly played a role when Kematen reconfigured its refining set-up in 2024. Before the project, the mill operated six refiners, supplying two paper machines. Its smaller PM3 was fed by three old conical units on the ground floor, while the larger PM4 used three much newer refiners, located one floor lower down (see table).

| | OLD REFINER SET-UP | NEW REFINER SET-UP |
|---|---|---|
| **UPSTAIRS:** | 3 × conical (PM3) | – |
| **DOWNSTAIRS:** | 34" + 2 × 26" (PM4) | 2 × 34" (PM4) + 26" (PM3) |
| **MILL TOTAL:** | 6 | 3 |

The firm's innovative proposal was to expand one of the relatively modern refiners so that it could use its two largest machines to feed PM4. The remaining refiner on the lower floor would then be repurposed to serve PM3 instead of PM4. This would replace the older conical refiners upstairs, and reduce the total number of refiners at the mill from six to just three.



Control room at Mondi Neusiedler Kematen

Christian Schadauer, Production Manager at Mondi Neusiedler Kematen, explains, "One of the main targets of this project was a considerable reduction of energy consumption in line with our sustainability roadmap MAP 2030." And as Martin Chabera, Global Product Manager for LC Refining at ANDRITZ, puts it, "Three refiners are cheaper to run than six."

Cost control wasn't only the end goal of the project, though – it also applied to the investment phase, too. Martin Affengruber, Project Manager at Mondi Neusiedler Kematen, explains, "We put the upgraded refiner on the existing foundation and re-used the motor, to keep costs down. We didn't want to have to remake everything." However, it is not such a straightforward task to build a new, higher-capacity refiner exactly where a smaller one sits. As Chabera explains, "A standard new refiner would have required a new, wider foundation and piping - there wouldn't have been enough space or headroom for it."

### OPTIMIZATION OPTIONS

With several other suppliers also competing to solve this challenge, ANDRITZ proposed its LC Refiner Exchange Concept, also known as the TwinFlo C (Customized) or "TFC" concept. The idea is to manufacture a refiner base that fits on the existing foundation while using a modular design that supports different housing sizes and mechanical seals. The entire system remains fully compatible with the mill's current drivetrain and inlet/outlet connections.



ANDRITZ TFC 34" refiner – taking samples at Mondi Neusiedler Kematen



ANDRITZ and Mondi Neusiedler group picture

Watch the video here

# Built for the challenge.

This ensures new capacity options for the existing framework and a very short installation time. According to Schadauer, "The modular concept is a real advantage in making best use of the space. It definitely helped make this rebuild easy and affordable."

Another reason why the mill was interested in ANDRITZ was its use of simulations, which showed Kematen how their operation would perform with a variety of different refiner options. As Chabera explains, "We are the only supplier that offers refining simulations, and we showed them a range of different size options (up to 34")." Klaus Oizinger, Global Product Manager for LC Refiner Plates at ANDRITZ, adds, "The tailor-made aspect of the refiner is one of our strengths, and we were able to demonstrate that a smaller refiner wouldn't have been enough – they would have had a bottleneck even with a 30" design."

Affengruber agrees, "Together with ANDRITZ, we calculated the size of refiner we needed based on the refining energy appropriate for the range of pulps we use. Their simulations really helped with this. They gave us some reassurance, and were a key factor in the choice of supplier."

Kematen also liked ANDRITZ's TFC solution because it is designed for much easier maintenance than standard refiners. Innovations include a swing door, a rotor changing device, a separate inlet housing, accessible process sealing options, and a drop-in bearing unit. Schadauer confirms, "The new design is much easier to take apart for maintenance."

After all options were considered, Kematen decided to have ANDRITZ convert one of its 26" refiners into a higher-capacity 34" type (a TFC 34). Once the design was chosen, ANDRITZ tailor-made the frame, housing, bearing unit, and process and mechanical seals, so the "new" refiner would be able to achieve the mill's technical requirements, while also taking into account the space constraints.

"Together with ANDRITZ we calculated the size of refiner we needed based on the refining energy appropriate for the range of pulps we use," says Affengruber.

## HAPPY CHRISTMAS!

As well as the innovative design, another notable aspect of this project was the unusually short timetable. The order was placed in March 2024, and start-up was due less than nine months later, around Christmas time. According to Oizinger, "Manufacturing alone normally takes 8-10 months and additional time is required for shipping, assembly, and installation. We had to work really intensively to get it manufactured in time." Chabera also gives credit to the customer in helping to achieve such a short project timeline, "The work that Kematen did on preparation, cabling, installation, and start-up was outstanding."

The cooperation was also evident between the mill and ANDRITZ's automation expert, Manfred Kargl, who was on site to facilitate the start-up. When it came to modernizing the process control system, he discussed the logic points with Kematen's team and performed the signal checks in person, paving the way for commissioning the new set-up. The mill's reconfigured refiner system first started up on December 20, 2024, following just two days of downtime, and was back in full operation after only a week. According to Affengruber, "ANDRITZ was a big help with the installation, especially just before Christmas," and Chabera adds, "It all went without a hitch."

ANDRITZ had guaranteed that the refining quality on the upgraded unit would be at least as good as it was before the project, at agreed production volumes. And the new system delivered. According to Affengruber, "The refining quality is identical to what we had before, which is a very big deal for us. We need excellent printability and strength."

The guaranteed values were achieved immediately on start-up – in fact, the mill didn't even do a guarantee test run; they just signed the acceptance forms straightaway. According to Schadauer, "The reconfigured refiner line is running without problems; it's very good."

In summary, ANDRITZ's modular TFC solution allowed Kematen to hit its quality and volume targets, using the existing space, motor and connections, as well as less energy overall – with everything installed in just two days. Affengruber confirms, "It's working just like we planned."

## QUESTIONS ANSWERED

This venture also strengthened the relationship between Mondi and ANDRITZ. From the ANDRITZ side, Chabera says, "The communication, coordination, and teamwork were excellent. When we had a question for the mill, there was never any waiting for an answer." Opinions are similar at Mondi Neusiedler; Schadauer says, "We got every bit of help that we asked for. There was always someone we could call, and our questions were answered quickly. The cooperation was really good."

And the collaboration is set to continue. As Affengruber notes, "Since start-up, we have had discussions with ANDRITZ about a few of the things that you can't plan in advance, like adapting production sequences, which we've optimized together. I can't think of anything that could have gone better. I would definitely do this again and I would recommend this concept for other Mondi mills."

**CONTACT**
Klaus Oizinger
klaus.oizinger@andritz.com



*"We are the only supplier that offers refining simulations, and we showed them a range of different size options (up to 34")."*

**Martin Chabera**
Global Product Manager, LC Refining, ANDRITZ

# ENCE'S NAVIA 80 EXPANSION PROJECT

## Even Better Results Than Expected

When Spanish group Ence decided to increase pulp production by 80,000 t/y at its flagship Navia mill in Spain, it was looking for the very best solutions for efficiency and environmental performance across the mill. ANDRITZ was selected for the project due to its experience, know-how, and proven technology in the fiberline and recovery island.

Long-term success story highlighting ANDRITZ capabilities in upgrading existing cooking plants to state-of-the-art performance standards, regardless of the original technology supplier.

It seems there is always a lot going on at Ence's Navia mill in northern Spain. Situated in a valley close to the picturesque village of Navia, the mill is at the forefront of developing specialist pulps for paper and tissue producers across Europe. It also takes its responsibilities seriously when it comes to the local environment.

Maria Luz Sanchez, Mill Manager at Ence Navia says, "We are totally focused on producing high-quality pulp at the Navia mill, with an emphasis on delivering differentiated pulps that help our customers produce the very best products. We produce a number of specialist pulps including Powercell, which reduces the need of long fiber in the furnish, and Natrucell, which is excellent when it comes to reducing the carbon footprint of the papermaking process."




The mill also produces a number of other differentiated pulps including High White, Decocell, Closecell, Porocell, Softcell, and High Bulk. Sanchez adds, "We see that the specialist pulp we produce is key to our future as it allows us to set ourselves apart from the more commodified pulps. However, it means the mill has to be very flexible to make the regular grade changes."

Looking after the environmental side of pulp production is at the top of the list at the Navia mill as the site is very close to the town where at least half of the 400 people that work at the mill live. Sanchez continues, "We have won a number of awards at Ence in recognition of our sustainability performance, and we are very proud of our environmental record at the Navia mill, which has minimum impact on the local community when it comes to noise and odors."

### INCREASE CAPACITY AND IMPROVE SUSTAINABILITY

In 2018, Ence management decided to build on the Navia mill's performance by increasing capacity as well as continuing to improve the environmental efficiencies. To make this happen, the "Navia 80" project was born, which would see the mill increase capacity by 80,000 t/y at the same time as optimize water consumption, improve effluent quality, and eradicate odors and noise.

"This was a challenging and ambitious project," continues Sanchez. "Increasing the capacity of pulp production to such an extent demanded intricate planning as virtually every single process area of the mill had to be expanded or adapted to cope with the increase."

In 2017, Ence contacted ANDRITZ to present a solution to the fiberline conversion and expansion using its latest technology, as well as upgrade areas of the recovery island. Contracts were signed in early 2018 and work began on the project.

### THE FIBERLINE MODERNIZATION

The ANDRITZ scope of supply for the Navia 80 project included the modernization of the fiberline to increase capacity and yield while decreasing chemical and energy consumption. The modernization involved converting the existing cooking system – originally delivered by another supplier in 2008 – to ANDRITZ LoSolids cooking technology. Further, the modernization involved replacing the existing chip feeding system with an ANDRITZ TurboFeed system and adding a vapor reboiler to improve digester heat recovery and minimize odorous gas emissions. Brownstock washing was also upgraded.

The project also included installing an ANDRITZ Solaris steam feeder to guarantee stable heating and operation of the first D-stage in bleaching as well as the modernization of the screen room.

The improvements in brownstock washing came from the relocation of the wash press and replacing six filter washers with just one three-stage DD-Washer, and improving the dewatering capabilities of the existing wash presses with an ANDRITZ UniDry upgrade.



The improvements in brownstock washing came from the relocation of the wash press and replacing six filter washers with just one three-stage DD-Washer.

ANDRITZ also modernized the screen room with the installation of an integrated knot separator and primary screen (CombiScreen) to minimize fiber loss and allow the reuse of knots and other screening rejects. New knot and reject washers were also installed.

Alberto Fombella, Senior Project Manager at Ence Navia says, "We had been working for a number of years with ANDRITZ in the boiler and dryer areas at the mill, so it was natural to bring in its fiberline experts for the Navia 80 project. What made this proposal regarding the fiberline most compatible was the LoSolids technology for the digester and the DD-Washer technology.

"In the fiberline we converted the existing digester into LoSolids technology and reused many elements including the heat exchangers. In the brownstock washing area we completely revamped the screen room and reused several of the screens by rearranging them. We installed the DD-Washer, removed six filter washers, and relocated the wash press – this meant the DD-Washer replaced seven washers in total, which was very impressive."

Alain Blanco, Senior Process Engineer at the Navia mill adds, "We chose LoSolids cooking technology from ANDRITZ as we knew it was the best available technology. But truthfully, at the beginning, we didn't quite understand how the technology worked. However, we got it eventually and we are deeply impressed with the performance.

Discover more!

"What has impressed us most is the pre-steaming with the Diamondback technology and TurboFeed, which is the benchmark for pre-steaming wood chips for optimum impregnation. We have noticed that due to the fiberline improvements we are already reducing the specific consumption of wood at the mill, which is very pleasing to Ence management."

## THE RECOVERY ISLAND

The Navia 80 project also demanded a number of upgrades in the chemical recovery area of the mill. ANDRITZ was contracted to modernize and upgrade the evaporation plant, recovery boiler, and white liquor plant.

In the evaporation plant, a number of upgrades were made, including a planned capacity increase to 525 t/h that was achieved by two existing units in parallel and adding a new evaporator effect along with an additional surface condensing area. Two older concentrators delivered by ANDRITZ in the late 1980s were revamped with lamella-type heating elements. In addition, a concentrator was installed to increase the dry solids content of black liquor entering the recovery boiler to 80%.

In the recovery boiler, ANDRITZ carried out a rebuild to enlarge the lower secondary air ports, boiler bank wall, and the economizer inlet to allow higher gas flows. In addition, the electrostatic precipitator was expanded to increase the unit's capacity for eliminating dust and particulate emissions from the air.

New technology was also supplied for the white liquor plant to improve green and white liquor production while reducing energy consumption.

Fombella says, "To go with the increased capacity of the fiberline, we needed to increase and improve the rate of the recovery island. In this case, ANDRITZ was the natural choice as we had already been working with them in the evaporation and recovery boiler areas since 2008.

"We revamped the recovery area completely in order to achieve a higher concentration to the boiler, and carried out significant modifications to increase the production rate across the whole process. We are delighted, as we have calculated that we have now increased the recovery boiler's capacity by 2% above the design capacity."

## "AN ENORMOUS CHALLENGE"

The project took place between early 2018 with start-up commencing in November 2019. The mill continued producing pulp throughout the project except for three shutdowns – two short ones for process tie-ins and a longer one of 30 days in October 2019 for the final commissioning and start-up.

"This project was an enormous challenge," says Sanchez. "We had to upgrade and retrofit across the mill in all areas, and the planning had to be meticulous. ANDRITZ gave us great support across the whole project, from planning and installing the equipment to training people in what was often completely new technology to all of us.

"The mill is now running at full capacity – we have increased production from 540,000 to 620,000 tonnes of pulp a year. This has been a fantastic project and we are very pleased with the outcome and the return on investment. We had sellable pulp just two weeks after start-up and now we are ready to solve the next bottlenecks a successful project like this creates!"

**CONTACT**
Jarmo Kinos
jarmo.kinos@andritz.com

*"We installed the DD-Washer, removed six filter washers, and relocated the wash press – this means the DD-Washer replaced seven washers in total, which is very impressive."*

**Alberto Fombella**
Senior Project Manager, Ence Navia





*"We chose LoSolids cooking technology from ANDRITZ as we knew it was the best available technology on the market."*

**Alain Blanco**
Senior Process Engineer, Ence Navia



# SERVICE TO SUIT YOU




In Abu Dhabi, the capital of the United Arab Emirates (UAE), Ittihad Paper is no stranger to doing things differently. Historically, most paper mills were built near trees and water. By contrast, Ittihad successfully did what most companies wouldn't even have dreamed of – they built a world-class paper mill in the desert. Instead of trees and fresh water, they use imported pulp and desalinated water (soon recycled water from the effluent polishing plant), to run a 325,000 t/a uncoated woodfree mill that now sells to more than 60 countries around the world.

## A FINER REFINER

It's clear that Ittihad and innovation go hand in hand. And the latest innovation came when they called ANDRITZ to upgrade their refiners. In fact, the champion of this whole idea is Ittihad's Plant Manager, Mika Viertola.

As part of this papermaking setup, Ittihad operates three OptiFiner Pro* refiner lines. In September 2024, they replaced the refiner plates on one of the refiners with ANDRITZ TrueFlow plates. These were tailor-made refiner plates that ANDRITZ designed especially for Ittihad, aimed at improving the efficiency of the refiner to ensure that more of the pulp fibers would pass through the refining zone in everyday operation. Specifically, the aim was to ensure that energy input would be better reflected in the refined pulp, with consistent, controllable physical properties. This gave Ittihad the option of using less energy to produce the same quality as before or using the same amount of energy to get higher-quality output. Or as Viertola says, "both".

ANDRITZ TrueFlow refiner plates, fitted onto two shallow-angled cones, use smaller exit zones to ensure that every single fiber passes through the refining zones. This prevents problems with unrefined and over-refined fibers, and delivers more uniform pulp quality, with controlled freeness, porosity, and tensile strength. As Brijesh Bhutki, Production Manager at Ittihad, notes, "The TrueFlow plates give you predictability. You know what quality of pulp is going to come out of the refiner."

A TrueFlow upgrade also ensures full use of the OptiFiner Pro's available refining capacity, as well as longer operating life. It also improves paper machine runnability, for no extra purchase cost. Ittihad has seen up to almost 50% longer run time, as Viertola confirms, "The first set of plates set a lifetime record for the mill. They ran for 3,200 hours and consumed 20 kWh/t less electricity. Plus, we save even more money because we need to replace them less often." Emre Mendi, Regional Product Manager for LC plates at ANDRITZ adds, "We could easily have run those plates for another month. With our metallurgical know-how, we can increase the plate lifetime from three or four months to five plus months."

## OPTIMIZE YOUR OptiFiner*

There's more to it than technological advancement. As Bhutki adds, "Our contract is also very convenient. We keep a minimum of spare plates at the mill, and ANDRITZ stores the future sets for us. We only pay for them when they are shipped, so this deal keeps our delivery times to a minimum, and frees up our working capital."

Markus Müller, Product Director for LC plates in the EMEA region at ANDRITZ, explains that ANDRITZ manufactures the TrueFlow plates in the USA, then stores them in Germany, which reduces supply lead times to just one month.

* OptiFiner is a trademark of Valmet Technologies Oy



ANDRITZ TrueFlow refiner plates installation

This is called "Make and Hold", part of ANDRITZ's "3S" program.

Ittihad is an example of this "3S" program. As Mendi explains, "We are in continuous communication with Ittihad. The product sale is just the beginning. We are present in the mill to support the whole conversion process through to start-up.

After that, we'll keep coming back; we'll listen and we'll adjust until they have the results they were looking for. Increasingly, we are becoming more like a consultant, not just a supplier of equipment and technology."

Mendi continues, "Before we even talk about a potential sale, we examine the state of the refiner, and the results that our Magnus simulations – a fiber morphology simulation program – suggest we should expect from different ANDRITZ TrueFlow plate geometries. In Ittihad's case, the first trial matched the Magnus simulations." Bhutki confirms, "ANDRITZ's simulations persuaded us. They proposed a plate design; we gave them some pulp samples, and they carried out extensive trials. This way, there was less 'try and see' involved."

Having achieved the target pulp quality, saved on energy, and set a new record for the refiner plate operating lifetime, Ittihad has signed up ANDRITZ as their contract partner. The mill has not only installed a new set of plates on refiner 1, but they have now also added ANDRITZ TrueFlow plates to refiner 2 as well (there are three at the mill, in total).

## THE ANDRITZ "3S" PROGRAM

- Safety of supply: ANDRITZ stores plates specific to each customer, guaranteeing availability and short lead times.
- Support of your operation: Before, during, and after the initial supply, ANDRITZ supports the customer with Magnus simulations, fiber sampling, and plate tracking to ensure a strong start, followed by continuous improvement afterwards.
- Success for your business: Much more than just supplying refiner plates, this methodical, low-risk approach to sustainable improvement ensures your mill meets its goals.




**Brijesh Bhutki**
Production Manager, Ittihad

**Markus Müller**
Product Director, LC Plates, ANDRITZ

**Emre Mendi**
Regional Product Manager, LC Plates, ANDRITZ

**Mika Viertola**
Plant Manager, Ittihad



*"ANDRITZ has a complete TrueFlow plate portfolio, so a mill can choose exactly what suits their operating conditions and product targets. We can even create a brand-new design that is completely unique to the mill, if we all agree that would make sense."*

**Markus Müller**
Product Director, LC Plates, ANDRITZ

"ANDRITZ has a complete TrueFlow plate portfolio, so a mill can choose exactly what suits their operating conditions and product targets. We can even create a brand-new design that is completely unique to the mill, if we all agree that would make sense." Mendi adds, "We understand that every mill has different products and goals, so it is normal for the ANDRITZ refiner plates division to create a specific solution for a customer. We have the flexibility to provide the results the customer is looking for."

All of the designs are compatible with ANDRITZ's well-established and trusted Kompressor, D-Floc-It, Spiral, and DuraPack technologies, which help to deliver precise refining quality and energy efficiency. Mendi says, "We believe these proven technologies can help to drive OptiFiner Pro refiners far beyond their design capabilities." Viertola is obviously convinced, "My wish is to continue with ANDRITZ. The refining is optimal with TrueFlow plates, and I want to use them for 100% of our refiners."

### WHAT'S NEXT?

After working at Valmet, Viertola spent about 15 years at various mills in Indonesia, Thailand, Korea, and China before moving to Ittihad in 2018. He has been calling for ANDRITZ to upgrade their OptiFiner Pro refiners for years, since he was still working in Asia. Knowing this, and other stories like it, ANDRITZ believes there is great potential for TrueFlow refiner plates on modern paper machines that are using OptiFiner Pro refiners.

ANDRITZ is already installing TrueFlow plates on OptiFiner Pro lines at several other mills. With its decades of experience working on competitors' equipment, ANDRITZ has ambitions to upgrade perhaps more than 100 other OptiFiner Pro refiners around the world. Prime candidates for these conversions include mills that are looking to achieve targeted refining characteristics consistently, to produce their specific type of paper, and/or to maintain their quality – with less energy consumption.

The Ittihad upgrade has proven that ANDRITZ TrueFlow refiner plates can improve OptiFiner Pro performance considerably. As Mendi concludes, "We're not just talking about mills that are having technical difficulties. Our TrueFlow plates can even improve OptiFiner Pro lines that are already running well."

**CONTACT**
Emre Mendi
emre.mendi@andritz.com

# HyperFlaker

DIFFERENCE MAKER

Traditional deflakers are a well-known technology. After decades of optimization, the state of the art no longer had much room left for improvement. Put simply, classical deflakers had been around for a long time, and had gotten just about as good as they were going to get.

Then ANDRITZ HyperFlaker technology changed the game. By replacing the traditional, smooth deflaker tooth edges with a revolutionary serrated tooth design, the ANDRITZ HyperFlaker has delivered a wide range of advantages compared with conventional deflakers. This unique design can be installed on almost any model of disc, ring, or conical deflaker (even older units and from any manufacturer). Now that the HyperFlaker has been patented or is patent pending both in the EU and worldwide markets, ANDRITZ is the only place in the world to get these one-of-a-kind deflaker fillings.

Upgrading with HyperFlaker rings transforms the cost, quality, and environmental impact of the deflaking process. This new technology boosts flake shearing and reduces fiber clumps, resulting in a cleaner, more homogeneous stock, and requires less energy to obtain a given result. This applies to all broke-handling or chemical/mechanical pulp stock preparation systems across the full range of stock consistencies, whether for coated or uncoated, virgin-fiber, recycled, wet-strength papers or tissue.



Erika Sboarina, Country Manager Paper Service Italy, ANDRITZ and Gianluca Simi, Senior Plant and Process Engineer, Lucart

As deflaker fillings need to be replaced periodically anyway, this new technology can be installed with no extra downtime or expenditure. Many mills have already made the switch, and they report benefits that include big reductions in repulping times, less or even zero use of certain chemicals (e.g., dissociating agents), lower energy use/more production at stable energy use, the ability to use cheaper raw materials, and better optical properties in the finished paper.

So far, so good, then. But with more than 2,000 stock deflakers in operation at paper mills around the world, the industry still has a great deal of additional potential to improve efficiency and product quality, all while reducing its costs and carbon footprint.

## SUCCESSFUL HyperFlaker PERFORMANCE AT LUCART PORCARI, ITALY

One of the many customers already enjoying the benefits of the ANDRITZ HyperFlaker is Lucart's tissue and flexible packaging mill in Porcari, Italy.

This fast-growing group has been expanding throughout Europe in recent years, and has demonstrated its forward-thinking principles time and time again. For example, Lucart operates Italy's only mill that recycles Tetra Pak® cartons into paper, it has invested heavily in solar power, and it has been collaborating for several years with the local IMT School for Advanced Studies Lucca on successful research into recycling and reusing paper mill sludge.



Lucart Porcari mill, Italy

It is perhaps unsurprising, then, that Lucart has also switched to HyperFlaker technology at Porcari, thus achieving a clear improvement in product quality on its MG* paper machine PM3.

Erika Sboarina, Country Manager Paper Service Italy at ANDRITZ, explains, "Whenever I walk through the refining room at Lucart Porcari, and I see the HyperFlaker at work, it reminds me that we at ANDRITZ are making our contribution to this mill's many ambitious targets. We never stop looking for engineered solutions that will raise effectiveness and sustainability – it could be a major rebuild, or, as in this case, a patented, new spare part concept. Whether the project is large or small, our passion and dedication are the same." Gianluca Simi, Senior Plant and Process Engineer at Lucart Porcari, sums it up by saying, "Every milestone marks a new beginning: ANDRITZ contributes to this journey, day by day."

The mill received its first set of HyperFlaker fillings in late 2025, and Lucart has since ordered more, not only for Porcari, but for one of the group's other mills, too.



Hand sheet comparison:
left: feed
right: standard
top: HyperFlaker

**CONTACT**
Erika Sboarina
erika.sboarina@andritz.com

* machine glazed

Bäckhammar mill's new high-tech woodyard

# A NEW ERA BEGINS

Nordic Paper's Bäckhammar pulp mill in Sweden has completed a transformative upgrade to its woodyard – the largest single investment in the company's history. The result is a state-of-the-art wood processing line, supplied by ANDRITZ, powered by Smart Solutions for the wood processing line and long-term service contracts for the highest chip quality, low water consumption, and long, trouble-free lifetime.

The Bäckhammar mill has a long history in kraft paper production. Established in 1871, it began producing the grade in 1886 using locally sourced slow-growing Nordic spruce and pine, which provide longer and more durable fibers. The mill produces extra strong kraft paper on two paper machines.

"It was recognized for some time that the very old woodyard at the mill was not fit for purpose," explains Lunås Trond, Nordic Paper's Project Manager for Bäckhammar's new woodyard investment. "The old system was outdated and not future-proof. This was an investment that we had to make to increase and improve our production."

Nordic Paper conducted a comprehensive pre-study from 2016 to 2021, followed by a two-year pre-project phase involving multiple suppliers. Board approval came in September 2023, and ANDRITZ received the order for a new wood room with chip and bark handling.

Trond adds, "Parallel studies showed that rebuilding the existing wood room would cost more than constructing an entirely new one."

## SUPPLIER SELECTION: WHY ANDRITZ STOOD OUT

"We chose ANDRITZ as the company emerged as a clear choice during negotiations," says Trond. "Key differentiators included strong written performance guarantees on chip quality and environmental metrics, a true turnkey delivery with single-point responsibility, and innovative technology only available from ANDRITZ.

"The standout innovation was steam de-icing, which dramatically reduces water consumption – critical for the Bäckhammar mill given strict environmental permits and high groundwater levels."

ANDRITZ further impressed with its advanced Smart Woodyard Process Optimization, including online chip quality measurement (Smart ScanChip) and chipper condition monitoring (Smart Chipper EKG).

Mechanical installation by ANDRITZ started in January 2025, and the new line achieved start-up in October 2025 – remarkably on schedule and within budget despite external challenges.

Recognizing the investment's expected 40-year lifespan, Nordic Paper and ANDRITZ established separate service contracts and a Synergy™ agreement for ongoing optimization. This partnership includes operator training, regular on-site support, and shared accountability.

**NORDIC PAPER BÄCKHAMMAR**
Sweden



## LOWER WATER USAGE, SMALLER LAY-OUT FOOTPRINT, AND HIGHER STABILITY

Since start-up in October 2025, the new woodyard has delivered measurable gains. Steam de-icing has significantly lowered water use and effluent organic load, helping the mill meet regulatory limits.

ANDRITZ Smart Solutions stabilize the process, which leads to reduced wood losses, increased chip quality, and provides real-time data to enable predictive maintenance. Controlling the process at a higher automation level enables the operators to focus on higher-level tasks. The Smart Woodyard Process Optimization has been active 100% of the operating time.

Furthermore, due to the HHQ-Chipper equipped with a TK-IV TurnKnife system, the chip quality is at an excellent level and thus a screening station was not required, thereby reducing fire risk, cost, and footprint.

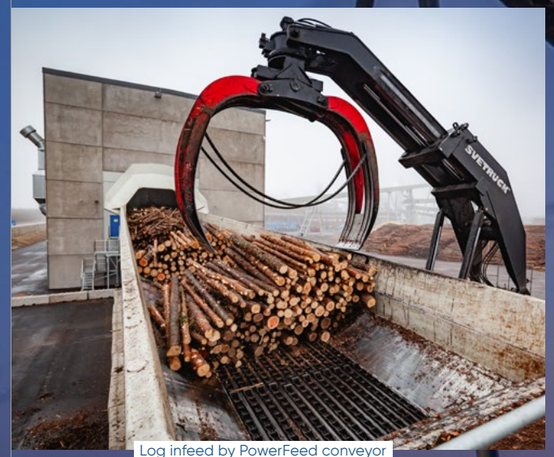
Trond adds, "Bark dryness guarantees remain under fine-tuning, but overall performance has exceeded expectations in several areas, including electrical consumption. Although operator adaptation to the high-tech environment has been challenging amid industry-wide skill shortages, the Synergy™ agreement ensures dedicated ANDRITZ support to bridge the gap."




HHQ-Chipper with TK-IV knife system and Smart Chipper EKG



DDW debarking drum with steam de-icing




Log infeed by PowerFeed conveyor

## FUTURE-PROOF OPERATION WITH THE LATEST TECHNOLOGY, LONG-TERM PARTNERSHIP AND CONTINUOUS IMPROVEMENT

Trond sums up the outcome of the project. "This major upgrade has transformed technical operations at the mill's woodyard into the modern era. With pending environmental upgrades and continued optimization, the Bäckhammar mill is poised for long-term competitiveness.

"The upgrade not only solves immediate bottlenecks but equips the mill with state-of-the-art technology and a strong supplier partnership for decades ahead. The possibilities of the Woodyard optimization powered by the Synergy agreement are tremendous. We can fine-tune and optimize the line in the future in ways that we don't even know about today."

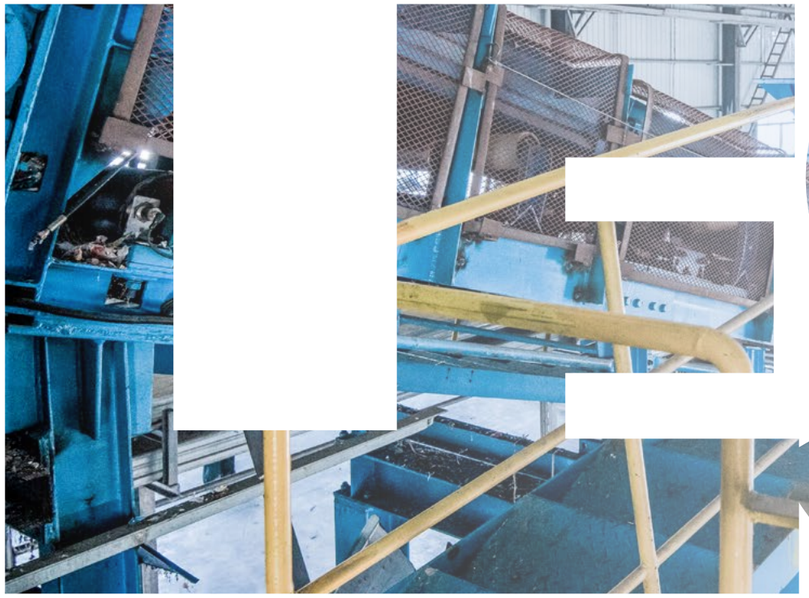
**CONTACT**
Erling Anderson
erling.anderson@andritz.com

## KEY EQUIPMENT

- Water hydrostatically supported debarking drum with steam de-icing
- HHQ-Chipper with TurnKnife TK-IV knife system and Smart Chipper EKG
- HQ-Press bark press
- Ground level sedimentation tank with a grit conveyor
- Smart Woodyard Process Optimization for stabilized process
- Smart ScanChip for continuous chip quality measurement

**The woodyard service contracts:**

- Synergy™ agreement for process optimization
- PartnerChip service contracts for chipper and bark crusher



# LESS WATER SPACE COMPLEXITY

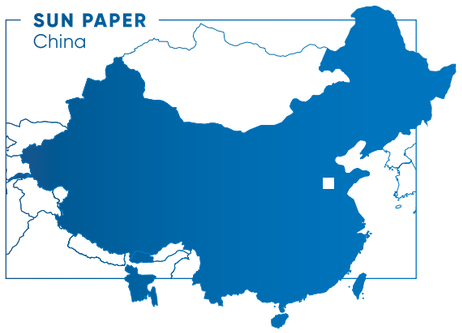
Get insights from ANDRITZ and Sun Paper experts on how ANDRITZ's reject treatment system reduces water use, saves space, and simplifies mill operations.

At the pivotal moment when China's paper industry is advancing towards green and low-carbon transformation, solid-waste management has emerged as a central issue that is crucial to corporate sustainable development. With the ongoing implementation of the "Dual Carbon" goals and the new Solid Waste Law, conventional wet treatment processes for coarse rejects – notorious for high water consumption, poor workshop conditions, and elevated labor costs – are increasingly becoming bottlenecks that hinder the high-quality growth of paper enterprises. Where does the solution lie?

Against this backdrop, ANDRITZ has successfully launched its innovative dry rejects treatment technology for the paper industry. In a recent interview with China Paper Industry Magazine, key individuals discussed the application of this technology: Mr. Shi Wei, Senior Vice President, APAC, Paper and Textile at ANDRITZ; Mr. Zhu Zhipeng, Technology Manager, Recycling at ANDRITZ; and Mr. Ying Guangdong, Deputy General Manager and Chief Engineer at Sun Paper.

## ADDRESSING INDUSTRY CHALLENGES WITH INNOVATION, REDEFINING REJECT TREATMENT BENCHMARKS

"Through meaningful innovation, we help our customers achieve growth that goes beyond financial gains - growth that secures future competitiveness," says Mr. Shi Wei, emphasizing ANDRITZ's strategic vision for global pulp and paper sustainability. "Our brand promise is 'Creating Growth that Matters,' and our dry process technology is a true embodiment of that commitment."






*"Through meaningful innovation, we help our customers achieve growth that goes beyond financial gains - growth that secures future competitiveness."*

**Shi Wei**
Senior Vice President, APAC Paper & Textile, ANDRITZ

Compared to traditional wet coarse reject treatment, ANDRITZ's dry process offers significant advantages. Mr. Zhu Zhipeng explains, "Our dry system features a proprietary integrated process combining high-consistency dewatering, all-in-one shredding, and dry sorting, completely eliminating the need for fresh water and preventing secondary wastewater pollution at its source." Utilizing advanced multi-stage screening technologies, the system efficiently separates fibers, metals, and combustibles, dramatically reducing fiber loss. "Most importantly," Mr. Zhu emphasizes, "precise separation ensures residual impurities are below 0.01%, which significantly lowers emissions such as dioxins during incineration. This enables mills to comply easily with even the strictest environmental regulations."

The effectiveness of this technology has been proven at Sun Paper. In 2014, ANDRITZ delivered two dry coarse reject treatment lines for Sun Paper's Zoucheng facility, a 1.6 Mt/y packaging paper project. Mr. Zhu recalls, "The first line was successfully commissioned in 2016 and has been running reliably for ten years. Its outstanding economic and environmental benefits directly led to multiple repeat orders for Sun Paper's projects in Laos, Nanning, and Yandian. The Nanning line boasts a design capacity of up to 250 bdt/d, achieving remarkable economies of scale."

"The ANDRITZ reject treatment line can separate virtually everything contained in the rejects from the pulper. This means we can recover and process materials: some are incinerated in the boiler, while metals can be sold as scrap. Most importantly, we no longer need to resort to landfill," says Mr. Ying Guangdong, Deputy General Manager and Chief Engineer at Sun Paper. →



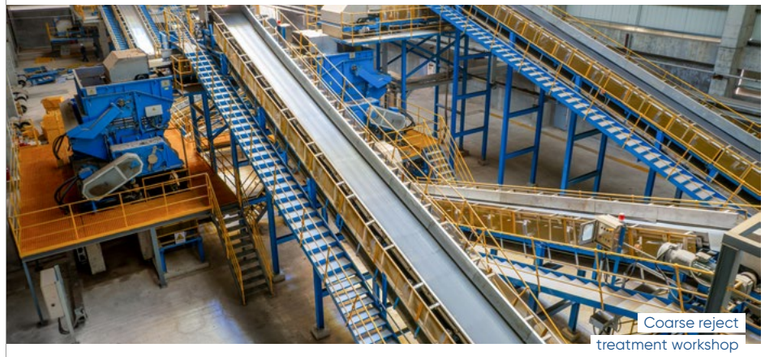
ANDRITZ's innovative technology supports Refuse-Derived Fuel (RDF) production



Coarse rejects from recycled fiber line



Rags/Reject handling



Coarse reject treatment workshop



High-quality output from the ANDRITZ coarse reject system

## TURNING VALUE INTO GROWTH FOR OUR CUSTOMERS

ANDRITZ's dry process technology generates "meaningful value growth" that is both significant and multi-dimensional. This value is demonstrated not only in economic returns but also in its role as a catalyst for green transformation within the sector.

In terms of economic value, the most tangible benefit is achieving zero freshwater consumption, eliminating both costly water charges and subsequent wastewater treatment expenses for reject handling. At the same time, the system's high level of automation reduces staffing requirements from more than a dozen operators under traditional wet processes to just two, significantly cutting long-term labor costs.

In terms of safety, the system fully embraces the "No Harm" philosophy. Operators can manage all key tasks from the control room, eliminating the need for frequent entry into harsh environments and significantly reducing exposure to harmful dust and corrosive substances. This ensures employee health and safety while safeguarding the company's most valuable asset - its people.

Mr. Shi Wei adds, "Through localized production at our Foshan facility, ANDRITZ has achieved full in-country integration across the entire value chain - from design and manufacturing to service. This allows us to help customers cut initial investment costs by up to 30%, which is a clear example of how we deliver on our promise of 'Growth that Matters'."

*"Leveraging ANDRITZ's global leadership and expertise across pulp, paper, and energy, we deliver fully integrated solutions covering the entire value chain - from pulping and papermaking to energy recovery and waste treatment. This closed-loop approach significantly boosts operational efficiency and resource utilization."*



**Zhu Zhipeng**
Technology Manager, Recycling, ANDRITZ

## BUILDING OPERATIONAL RESILIENCE THROUGH FULL LIFE CYCLE SERVICES

ANDRITZ's competitive advantage lies not only in its technology but also in its comprehensive life cycle services. "We regard the dry reject treatment system as an integral part of the entire pulp and paper production ecosystem," explains Mr. Zhu Zhipeng. "Leveraging ANDRITZ's global leadership and expertise across pulp, paper, and energy, we deliver fully integrated solutions covering the entire value chain - from pulping and papermaking to energy recovery and waste treatment. This closed-loop approach significantly boosts operational efficiency and resource utilization."

ANDRITZ's full life cycle service philosophy also delivers clear benefits in maintenance and reliability. "By implementing standardized preventive maintenance programs, we greatly reduce unplanned downtime and help customers lower overall operating costs," Mr. Zhu adds. "Beyond comprehensive start-up training and complete spare parts support, we tailor maintenance strategies based on real-time equipment performance data. For example, when a customer reported accelerated wear due to high sand content in the feedstock, our technical team quickly designed a new sealing assembly and executed a retrofit, effectively resolving the issue in record time."

Looking ahead, ANDRITZ is aligning its innovation roadmap closely with evolving customer needs. Mr. Zhu Zhipeng expands, "A significant industry pain point remains the heavy reliance on manual sorting for complex material streams, which also represents a key opportunity. ANDRITZ is accelerating the development of intelligent sorting systems to help customers achieve fully automated and smart sorting processes."

Mr. Shi Wei reaffirms ANDRITZ's position, "We are committed to working hand in hand with paper manufacturers, leveraging innovative technologies and comprehensive services to build a greener, more efficient future for the sector."

**CONTACT**

Shi Wei
wei.shi@andritz.com

Discover more!

# NOTHING ELSE COMES CLOSE



*"We are trying to do things that nobody else can do. Not just the mainstream stuff."*

**Maria Nordgren**
Maintenance Manager, SCA Ortviken




Not long ago, Sweden's SCA imagined a machine that didn't exist. Some people even thought the concept was impossible. Despite that, SCA and ANDRITZ agreed to do whatever it took to make the 'impossible' happen, and they proved the doubters wrong.

In today's digital age, it is no secret that demand for graphic paper is falling in most parts of the world. One company that reacted decisively to this reality was SCA, which radically changed the business model of its Ortviken mill, located on Sweden's east coast. The mill pivoted from graphic paper to supply the growing packaging and hygiene paper industries with market pulp, setting itself up for a more sustainable future.

This strategic turnaround involved SCA closing the publication paper machines at Ortviken, and converting the associated thermo-mechanical pulp (TMP) plant to make "SCA More", the firm's range of chemi-thermomechanical pulp (CTMP). The project tripled Ortviken's pulp capacity to almost 300,000 tons per year, and was completed in 2023.

A key factor here is that "SCA More" involves a very wide spectrum of CTMP qualities. It includes at least 25 spruce and birch recipes and is, according to Anders Granström, Mill Manager at SCA Ortviken, "an impressively broad product portfolio."

For tissue mills, the shorter-fiber birch variants with high fiber freeness provide both absorbency and softness, while the lower- and mid-freeness pulp grades are well-trusted by packaging producers. Other end uses for the mill's CTMP include molded fiber-based trays in the food industry. Maria Nordgren, Maintenance Manager at Ortviken adds, "With our experience, we will be able to use our new state-of-the-art operation and R&D resources to develop even more new products."

## RISK AND REWARD

Converting Ortviken to make such a wide range of pulps presented a fascinating technical challenge. Because the mill's CTMP needs to have dramatically different physical characteristics to be suitable for the different end-use markets, its fiber freeness can vary from 300 to 750 CSF (Canadian Standard Freeness). Normally, a pulp mill would use two separate disc filters in the dewatering stage to handle such a wide range of fiber freeness profiles. But SCA had other ideas.

Ortviken asked several firms to propose a solution that would meet all of these needs, using just a single disc filter. An extremely ambitious goal, but as Rickard Persson, Process Engineer at Ortviken, explains, "We are experienced, we know what is possible. But we are also engineers – we are curious to push, to explore, and learn new things." Maria Nordgren agrees, "We are trying to do things that nobody else can do. Not just the mainstream stuff." The other invited suppliers chose not to go on this journey, but ANDRITZ did. As Rickard Persson concludes, "We put the idea on the table, and ANDRITZ accepted the challenge."

Erik Nilsson, Paper Service Manager Scandinavia at ANDRITZ, says, "We were honest about the possibilities. We didn't promise anything we weren't confident of delivering. The trials went well, we were quick to answer their questions, and they got a good feeling." Daniel Stelzer, Product Manager at ANDRITZ, agrees, "We offered a good technical solution, and with our existing relationship, they trusted us."



SCA Ortviken:
Rickard Persson, Process Engineer
Anders Mattsson, CTMP Conversion Project Manager
Maria Nordgren, Maintenance Manager
ANDRITZ: Daniel Stelzer, Product Manager Disc Filter Service

Ortviken's CTMP Conversion Project Manager, Anders Mattsson, explains, "There was unknown territory when it came to the extremes of fiber freeness, but we were willing to take the risk, because ANDRITZ was willing, too." Stelzer confirms, "It was clear from the beginning that this project was extremely challenging, but SCA was willing to work with us. We didn't try to change their expectations – rather, we focused on our solutions and were committed to solving any problems that might come up." Nilsson adds, "We keep our promises; we don't run away."

## THE ONLY ONE ON EARTH

As 300 and 750 CSF are such starkly contrasting extremes, which had never been achieved on a single machine before, Daniel Stelzer says, "It was like asking us to design a truck that could win a Formula 1 race!" To make it possible, the solution ANDRITZ came up with included newly-developed technology, which didn't exist before this project. "These parts were developed entirely from scratch and represent completely new designs, with no prior comparable references. It ended up being almost a completely new machine," Stelzer explains. "The only part left of the old disc filter was the legs!"

New developments included redesigned inlet boxes, 22 filter discs (with 396 sectors) instead of 15, a new automated filtrate valve that ANDRITZ is now marketing as the 'AutoFiltratePRO'. The redesigned center shaft also set a new ANDRITZ record for filtrate volume (130,000 l/min), and there were further innovations on the repulper. To complete the package, the 'standard' parts are all ANDRITZ's latest state-of-the-art equipment.

So it is safe to say that there is no other disc filter like this in the world. "It's difficult to explain that one machine can now do the work that used to require two," says Erik Nilsson. "This is a unique achievement. You won't find another one anywhere else in the world. There is nothing even close."

*"The customer has to trust the supplier and the supplier has to trust the customer – you need to have faith on both sides. It's the only way this can work."*

**Anders Mattsson**
CTMP Conversion Project Manager, SCA Ortviken



## NO HICCUPS

ANDRITZ supervised and helped with the removal of the old machinery, and the installation and start-up of the new equipment. To ensure the agreed guarantees were achieved, ANDRITZ made some modifications at both ends of the CSF range during the disc filter's start-up phase, in close cooperation with Ortviken. And the modifications worked. As Stelzer states, "We guaranteed production volume targets for different pulp freeness levels, and we met them all."

Nilsson says, "It was installed on time, started up on time, and after we made the necessary adjustments, it's running extremely well – almost too well, as Ortviken doesn't need us to do any service work! There are no issues, no hiccups, no one calling us with problems." Rickard Persson confirms that, the new disc filter "is functioning really well. We are still making small alterations and improvements, both on our own and together with ANDRITZ."

## FLEXIBLE FRIENDS

The adaptable market strategy of SCA motivated ANDRITZ to develop an exceptionally versatile disc filter solution, uniquely available from the company. According to Daniel Stelzer, "Few mills require such flexibility in a single unit. Nevertheless, we are always ready to support our customers and address any issues they may face."

**So why are we telling you about this?**
**For two reasons:**

One is to show that ANDRITZ is not just selling off-the-shelf products but is willing to work with a mill to meet special requirements and solve unusual problems. As Erik Nilsson illustrates, "What we achieved here was really difficult… close to impossible. It was an unbelievable project in such a short time. It took many, many hours of engineering, day and night, but it was enjoyable."

The second reason for this story is to demonstrate that, "We are there to help, again and again, because a good and happy customer keeps coming back," as Nilsson puts it. For example, "Following this project, Ortviken keeps calling us with new questions about other things." Anders Mattsson concludes, "The customer has to trust the supplier and the supplier has to trust the customer – you need to have faith on both sides. It's the only way this can work."

Discover more!

**CONTACT**
Daniel Stelzer
daniel.stelzer@andritz.com



ANDRITZ upgraded SCA's disc filter in a way to handle a very wide range of fiber freeness profiles.



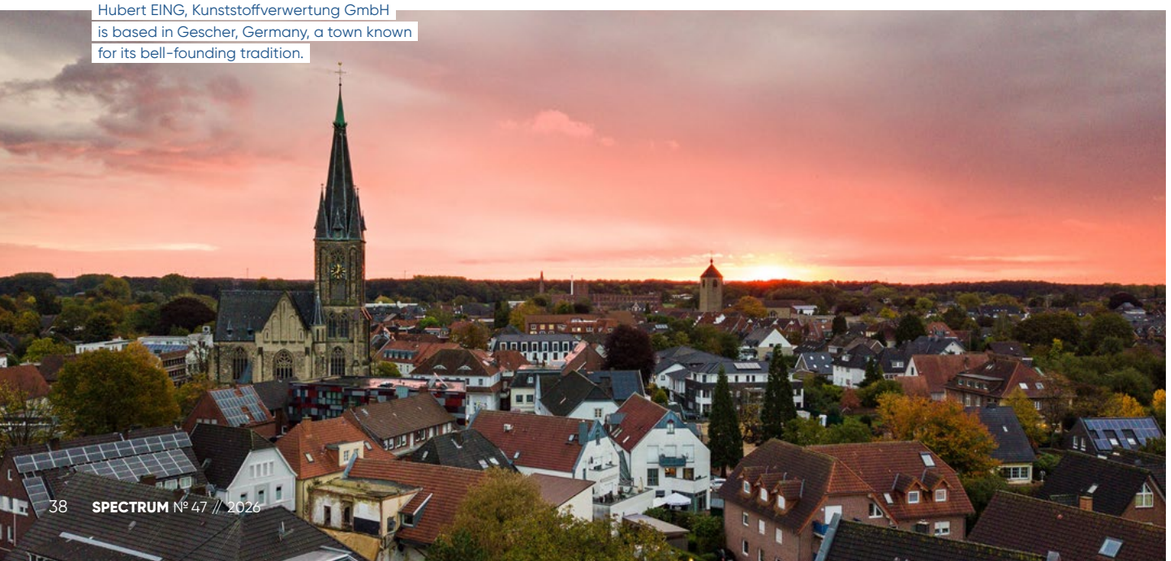
The CTMP project tripled Ortviken's pulp capacity to nearly 300,000 tons per year, requiring a single disc filter to match this increase.




## EING's RDF solutions from ANDRITZ are setting new standards for waste-to-energy processes.

Refuse-Derived Fuel (RDF) is a crucial substitute for primary materials such as gas, oil, and coal. The composition of RDF - primarily combustible fractions like plastics, paper, and biomass - ensures that it can replace primary materials while contributing to a circular economy.

# TRANSFORMING WASTE INTO ENERGY WITH EING



Hubert EING, Kunststoffverwertung GmbH is based in Gescher, Germany, a town known for its bell-founding tradition.

Using ANDRITZ custom waste-to-energy solutions, RDF can be produced in high, medium, and low calorific types to suit specific firing technologies. Waste processing serves the dual function of sorting and recycling materials from waste streams that include household, industrial, and bulky waste, as well as production residues. These inputs are processed to yield plastics, textiles, paper, and both ferrous and non-ferrous fractions, which are then refined to meet stringent standards for calorific value, moisture content, and particle size distribution.




Compact in size and robust in design, the ADuro S shredder is built for flexible, secondary shredding.

The potential is clear, but it is demanding to process large volumes of mixed waste into consistent fuel quality, particularly with industry's high expectations for throughput and efficiency. However, with expertise from ANDRITZ, EING's operation in Germany's North Rhine-Westphalia has risen to the challenge, and it produces high-quality RDF for cement and power plants.

### PIVOTAL ROLE OF ADuro S SECONDARY SHREDDER

EING has more than 30 years of experience in recycling post-consumer packaging. Following a technical upgrade at its plant in Gescher, an ADuro S-2400 secondary shredder from ANDRITZ is now at the heart of its process. Easy to run, operate, and maintain, this machine delivers an impressive average hourly throughput of 10 tons, reducing RDF material down to 20 millimeters, which is ideal for the cement industry.

The investment has provided a significant boost to EING's efficiency. "By replacing two older machines with a single unit featuring a 2.4 m* cutting length, EING has streamlined its operations without sacrificing capacity," says Bernhard Schachinger, Head of Product Management, Fiber & Recycling at ANDRITZ.

The technology has certainly had the opportunity to prove itself at EING, as Torben Vollmer, Production Manager at EING explains, "Our ADuro S shredder has already achieved more than 10,000 operating hours, consistently delivering reliable output quality and stable performance."

This type of shredder represents the next generation in secondary shredding and is designed for use with RDF, Municipal Solid Waste (MSW), Solid Recovered Fuels (SRF), plastics, and both commercial and industrial waste. It is durable and flexible while minimizing energy consumption.

Watch the video here

* Up to 3.2 m cutting length is available

## UNIQUE FEATURES AND BENEFITS OF THE ADuro S:

- Intelligent pusher control system: Detects pressure, rotation speed, and power consumption, continuously adjusting the pusher pressure to ensure high throughput.
- Cutting performance: With large cutting width up to 3.2 m. High throughput and continuous cutting (combined with low energy consumption) are suitable for extreme applications.
- Easy knife gap adjustment: Without opening the machine.
- Special rotor design: Prevents ropes from wrapping. The modular rotor system is tailored to input material and throughput requirements. The knife-holder exchange system reduces downtime.
- Quickly exchangeable screens: Allow many different output sizes. Tailored screen sizes are available for specific applications. They are also very light due to weld-free construction.
- Water-filled cooling system: This is applied to the inner part of the rotor and prevents plastics from sticking during shredding.
- Finely-shredded RDF: Ideal for the cement industry.

### OPERATIONAL SAFETY AND MAINTENANCE

Safety and efficiency are at the heart of EING's operations, so it is particularly welcome that the reject and service hatches of its ANDRITZ shredders are designed to facilitate safe and efficient maintenance. Additional features such as programmed pre-settings for various materials, protection clutches to avoid motor damage during overload, automatic safety lockout, and well-positioned service doors contribute to safety, ease of operation, and maintenance.

### PARTNERSHIP AND SERVICE EXCELLENCE

"Every new project brings unique challenges, but the partnership between EING and ANDRITZ is built on trust, expertise, and a commitment to long-term success," says Hendrik Thomas Iraschko, Plant Manager at EING.

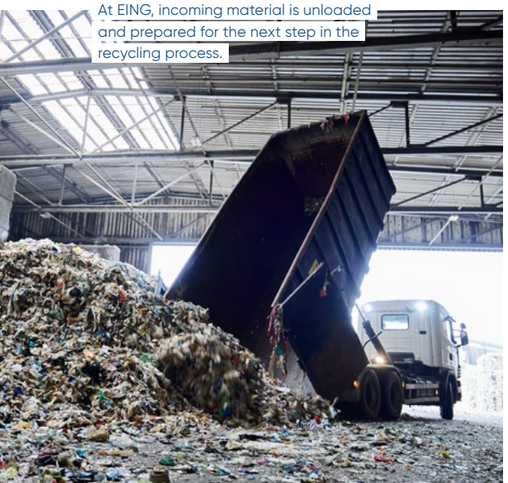
Service is a core part of all ANDRITZ customer relationships, and ANDRITZ's service team is always on site at EING when needed, ensuring quick and effective solutions to any routine matters or challenges that arise. From installation to optimization and long-term support, ANDRITZ's goal is to keep every machine running at its best. "At EING, we ensure on-site support at all times when needed - whether for commissioning, fine-tuning, or preventive maintenance. That close cooperation makes a real difference," says Michael Grossschädl, Director Global After Sales at ANDRITZ.

EING's journey, powered by ANDRITZ's advanced technologies and service commitment, shows what can be achieved through the right combination of innovation, expertise, and collaboration. "The EING project stands as a testament to the power of technology, service, and true partnership," according to Johannes Stindl, Director Global Product Management, Fiber & Recycling at ANDRITZ. "The ADuro S represents the strength and quality of the entire ANDRITZ product portfolio - reliable, efficient, and tailored to our customers' needs. We are proud of the results and of what we have accomplished together with EING."

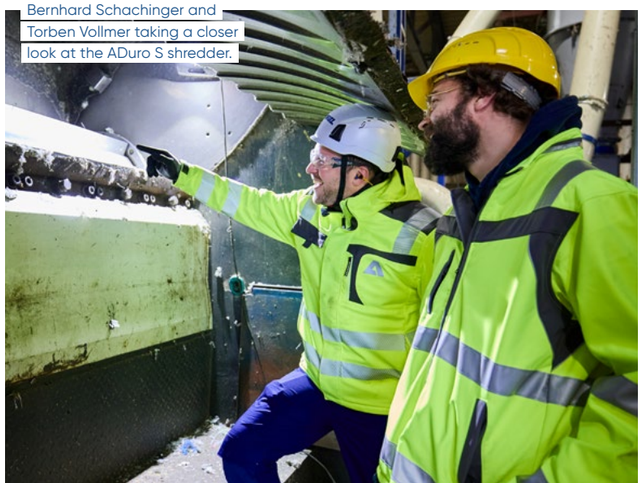
**CONTACT**
Johannes Stindl
johannes.stindl@andritz.com



Bernhard Schachinger, ANDRITZ; Hendrik Thomas Iraschko, EING; Johannes Stindl, ANDRITZ; and Torben Vollmer, EING; assessing the quality of 20 mm RDF material.



At EING, incoming material is unloaded and prepared for the next step in the recycling process.



Bernhard Schachinger and Torben Vollmer taking a closer look at the ADuro S shredder.



*"The ADuro S represents the strength and quality of the entire ANDRITZ product portfolio - reliable, efficient, and tailored to our customer's needs. We are proud of the results and of what we have accomplished together with EING."*

**Johannes Stindl**
Director Global Product Management, Fiber & Recycling, ANDRITZ

# DUAL JEWEL




This challenging trade-off is well-known in the paper and board industry: pressure screens need to run their rotor at a certain speed to prevent plugging and ensure stable operation. But that can be energy intensive, and there has never really been much one could do about that.

Until now.

In the northeastern corner of Bavaria, Germany, the Carl Macher core board mill has become the world's first to install and run the UTurn Dual Speed Split Rotor from ANDRITZ. All of the new components were tailor-made for the specific screen, and installed in a single day that had already been scheduled for maintenance downtime.

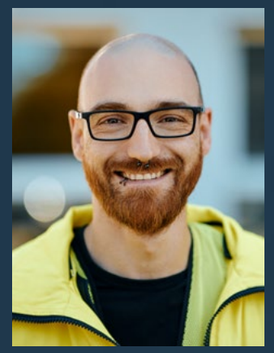
And the result? Patrick Stoschek, Production Manager at Carl Macher, says, "Since installing the UTurn, we are seeing major improvements in energy consumption, while screening capacity and quality are virtually unchanged from before."

This was all achieved with the help of a strikingly simple idea – constructing the pressure screen rotor in two separate sections instead of one. The unsolved challenge with one-piece rotors is the speed mismatch between the rotor and the incoming stock. The rotor needs to turn fast enough to prevent plugging at the bottom of the screen, but that is much faster than the stock flows in at the top of the rotor, which causes an unavoidable waste of energy in that area.

Unavoidable, that is, with a single-piece rotor. However, by splitting the rotor into two parts, ANDRITZ has made it possible to operate the top section at a slower speed to better match the flow


Paper cores

of the incoming stock. At the same time, the bottom part of the rotor can still revolve as fast as necessary to prevent plugging. This effectively eliminates the compromise between process stability, screening capacity, and energy efficiency that is typical with conventional rotor designs.



*"I'm very pleased with how it all went. It's a clever piece of equipment, and it's running really well."*

**Patrick Stoschek**
Production Manager at Carl Macher

## PLUG AND PLAY

Stoschek points out, "We had been looking at replacing some of our older screens but, instead, ANDRITZ asked whether we would consider a rebuild with this brand-new technology. The advantages were obvious; it was just a question of whether it would work – no other mill had used a UTurn before."

But ANDRITZ was well prepared. Florian Lingauer, Product Manager for Screening at ANDRITZ, explains, "The engineers at ANDRITZ Fiedler regularly brainstorm to come up with ways that our customers might use their existing machinery better. In 2022, a colleague suggested splitting the pressure screen rotor into two parts, to save energy. We came up with a design, and the simulations looked promising. So we built a trial unit at the ANDRITZ pilot plant in Graz, and it was a success. That's why we were already confident the UTurn would work, before we came to install it at Carl Macher."

In fact, the technology is notable for its simple, low-risk design, with no need for a major rebuild. At Carl Macher, for example, the housing, basket, and main structure of the screen were all left unchanged. The UTurn, a new bearing unit, split rotor, and new V-belt drive system (that enables the existing single motor to drive the two sections of the rotor at different speeds) were all manufactured to fit the specific screen and installed in a plug-and-play style in a matter of hours.

## UNLOCKING HIDDEN POTENTIAL

In this way, the world's first commercially-operated UTurn was started up at Carl Macher in October 2025, and as Stoschek says, "I'm very pleased with how it all went. It's a clever piece of equipment, and it's running really well."

Lingauer adds, "This project shows that energy efficiency in screening is not just a question of motor power, but of intelligent rotor design and flow management. It also demonstrates that process-driven retrofits can unlock hidden potential in equipment that a mill is already using. With the right engineering, even existing screening systems can see big improvements.

Stoschek concludes, "I would definitely recommend the UTurn to our sister mill in France, Papeteries du Rhin. It makes sense to copy what we've done here."

**CONTACT**
Florian Lingauer
florian.lingauer@andritz.com


Florian Lingauer, Product Manager, Screening, ANDRITZ and Patrick Stoschek, Production Manager at Carl Macher

In a strategic move to strengthen its position as a full-line supplier to the pulp, paper, and power industries, ANDRITZ has acquired Diamond Power International, a leading specialist in boiler cleaning technology. The acquisition integrates state-of-the-art boiler cleaning systems and services, significantly expanding ANDRITZ's offerings customers worldwide.

# A SPARKLING DIAMOND FOR BOILER CUSTOMERS

Diamond Power brings more than a century of expertise in boiler cleaning solutions. The company serves the pulp and paper, utility, biomass, waste-to-energy, and industrial sectors globally. Its comprehensive product portfolio includes sootblowers, replacement parts and upgrades, intelligent sootblower controls, cameras and monitoring systems, sootblower ports, gauges, and level indicators – all designed to maintain optimal heat transfer and boiler performance.

Michael Michael, President of Diamond Power International, now part of the ANDRITZ Group, explains the company's core value, "Diamond Power has been manufacturing machinery that helps increase heat transfer in power boilers for over 100 years. Our products improve boiler efficiency, extend runtime, provide safety alarms, and give operators better insight into boiler performance.

"In a nutshell, we optimize operations – delivering maximum output at the lowest cost and risk to boiler operators and owners."

The company's global footprint is extensive. Manufacturing takes place primarily in Ohio, USA, and Dumbarton, Scotland, supported by regional service facilities in Brazil, Finland, Sweden, Germany, and Thailand. Licensees further extend its reach to markets including South Africa, China, Japan, Australia, and New Zealand.

Founded in 1903 in Detroit, Michigan, Diamond Power's early success included supplying the Ford Motor Company. "Henry Ford himself was looking to improve boiler operations at the River Rouge plant," Michael notes. "The company's guiding motto - solving customers' problems – has driven innovation as boilers grew larger and fuel types diversified. All of our products came about by solving a problem, a challenge, or a regulatory requirement," he adds.

## A PERFECT STRATEGIC FIT THAT ENABLES FULL-LINE BOILER SERVICE

For ANDRITZ, the acquisition is a natural extension of its long-term vision. Henrik Wikstedt, Senior Vice President and Division Manager for Recovery and Power Service at ANDRITZ, emphasizes the strong alignment, "We have always had the ambition to be a full-line supplier to our boiler customers. With its extensive products and services, Diamond Power International fits like a glove."

Wikstedt notes that Diamond Power International had already been a trusted sub-supplier for ANDRITZ recovery and power boilers, making the integration seamless and enabling true full-lifecycle service coverage.

The move directly supports ANDRITZ's three strategic pillars: decarbonization, digitalization, and customer service. On decarbonization, Wikstedt highlights, "With Diamond Power International products, we can provide state-of-the-art cleaning equipment that increases boiler efficiency – and supports decarbonization goals at the same time."

Digitalization gains come from its intelligent control and monitoring systems, which complement ANDRITZ's expertise in helping customers optimize operations. Customer service is enhanced through expanded global reach, particularly in regions where ANDRITZ previously had less presence.

"Diamond Power International ticks all the boxes," says Wikstedt. Michael adds that the company has representatives in nearly 70 countries and facilities in 15 more, creating comprehensive global coverage. "True closeness means understanding the customer's operations, goals, and challenges – and being seen as an extension of their own staff."

## IMPROVED BOILER EFFICIENCY MEANS LESS ENERGY USE AND LESS EMISSIONS

Environmental benefits are key. Michael explains, "Our products allow users to derive more heat from every unit of fuel consumed. That means less fuel produced, less transportation, and more output per unit of fuel." The technologies also support biofuels and waste-to-energy applications by keeping heat transfer surfaces clean and controlling combustion byproducts.



Diamond Power International sootblower service

Wikstedt reinforces this, "Improving boiler efficiency is one way to produce more electricity from less fuel and reduce emissions, which is fully aligned with ANDRITZ's global targets."

Industry trends are driving demand for such solutions. Boilers are becoming larger and more technically advanced, while fuel, chemicals, and steam all carry higher value. "Everything has become more valuable in mills and plants – including waste," Michael says. "Maximizing all processes and side streams is now critical for owners."

Customers will benefit immediately from the combined expertise. Wikstedt explains that ANDRITZ's deep boiler knowledge will accelerate further development of Diamond Power International products, resulting in superior cleaning efficiency, higher durability, and lower maintenance costs.

Michael concludes, "Our experts are excited to work with ANDRITZ's technical teams to better understand boiler designs and enhance both functionality and controls."

Tune in to our podcast

**CONTACT**
Michael Michael
michael.michael@andritz.com



*"Our experts are excited to work with ANDRITZ's technical teams to better understand boiler designs and enhance both functionality and controls."*

**Michael Michael**
President of Diamond Power International, now part of the ANDRITZ Group

TECH NEWS

# ONE LAYER AT A TIME

## REINVENTING THE REPAIR SERVICE APPROACH: WAAM

ANDRITZ has been working hard behind the scenes with the latest technologies to revolutionize the approach to repair of expensive cast parts in the pulp and paper industries. Now, utilizing Wire Arc Additive Manufacturing (WAAM), it is possible to dramatically shorten the cost of heavy cast equipment repairs, shorten downtime, and improve environmental performance.



Metal 3D printing with welding robot

In an industry where heavy-duty equipment operates under extreme mechanical stress, high temperatures, and corrosive conditions, the pulp and paper sector has long accepted that large cast components will eventually crack and require expensive replacement. ANDRITZ is now challenging that assumption with Wire Arc Additive Manufacturing (WAAM) – a hybrid technology that combines conventional manufacturing with precise robotic 3D metal printing to repair what was previously considered unusable and destined for the scrap heap.

WAAM uses a robotic welding system to deposit material in very small, controlled layers rather than traditional large weld pools. This layer-by-layer approach eliminates the residual stresses and cracking that plague conventional repair welding.

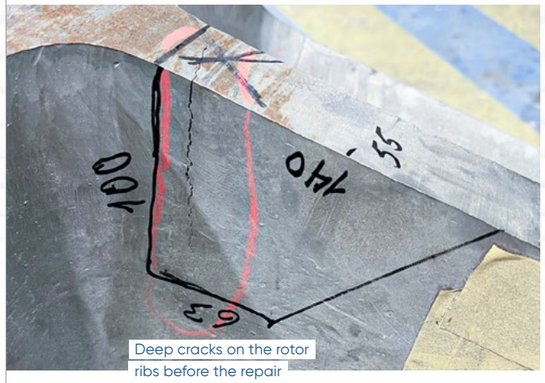
Mikko Wiren, Service Manager at ANDRITZ, has overseen the development of the technology for the past five years. "The big difference from traditional welding is that the software allows the repair to take place in small sections," he explains. "You don't have the usual large pool of liquid metal going into a mold. Instead, you print very, very small pieces, layer by layer."

The result is material properties that match and, in some cases, exceed those of the original material. Extensive university and independent laboratory testing has confirmed equivalent or superior yield strength, impact strength, corrosion resistance, and freedom from pores or cracks.

### ECONOMIC SAVINGS OF UP TO 50% – REPAIR TIMES DRAMATICALLY REDUCED

The most compelling demonstration of WAAM to date involves the repair of a rotary valve rotor used in pulp mills. These large, approximately 1.5-tonne components feature a final layer of extremely hard welding material, which is prone to cracking under operational loads. Traditionally, deep cracks meant scrapping the entire rotor and ordering a new cast replacement costing typically around 100,000 EUR with lead times of six to seven months.

Using WAAM, ANDRITZ technicians removed the cracked sections of the ribs and rebuilt them layer by layer using robotic technology. "We removed a bigger part of the rib and started printing it back," says Wiren. "With gradual layers, there is no build-up of tension as in conventional repair welding."




Deep cracks on the rotor ribs before the repair

The repaired rotor was returned to the mill and has now been running successfully for over a year, proving that the repair method worked well.

The economic and operational benefits are significant. Repair costs are typically a fraction of a new part – representing savings of more than 50%. Turnaround time is reduced from six or seven months to roughly one month. "Instead of investing in a new cast piece, more than half of the cost can be saved by repairing the original," Wiren confirms.

### SUBSTANTIAL ENVIRONMENTAL GAINS

Beyond cost and speed, WAAM delivers substantial environmental benefits. A detailed life cycle analysis by Savonia University of Applied Sciences compared repairing 50 kg of material on an existing rotor versus manufacturing a new 1.5-tonne cast part. The repair route dramatically reduces raw material use, energy consumption, and $CO_2$ emissions. Even when using fossil-based electricity, the carbon footprint is far lower; with green electricity, it is lower still.

Wiren emphasizes the sustainability angle, "The environmental benefits are clear to see when comparing the carbon footprint; melting one tonne of steel takes a huge amount of electricity. By adding material to the old piece instead of starting from scratch, we avoid that entirely."

The technology is currently utilized at ANDRITZ's workshop in Savonlinna, Finland, but the company sees broader potential. Because WAAM is essentially digital, future applications could include sending repair files electronically and performing work closer to customer sites, further reducing logistics, emissions, and downtime.

### FROM THROWAWAY TO CIRCULAR

For pulp and paper producers facing ever-tighter sustainability targets and pressure to minimize waste, WAAM offers a practical way to extend equipment life while cutting costs and the carbon footprint. It turns a throwaway approach into a circular one.

Wiren sums up the philosophy behind the innovation, "In our industry it has been too easy to say, 'You need to buy a new part'. Now we have to think outside the box. How about if it's not 100,000 EUR, it's 10,000 EUR to 15,000 EUR and we don't scrap it?"

As mills worldwide seek more resilient and responsible maintenance strategies, WAAM is proving that advanced repair is not only possible – it is already delivering results in daily operation.

**CONTACT**
Mikko Wiren
mikko.wiren@andritz.com



Repaired rotary valve rotor using WAAM



The world's largest recovery boiler in operation started up in 2021 at Bracell's pulp mill in Brazil.



UPM Paso de los Toros, the biggest pulp mill in Uruguay, is equipped with an ANDRITZ magnum-sized recovery boiler to maximize steam production for power generation.

# MAGNUM-SIZED RECOVERY BOILERS

## ENABLING THE CREATION OF GIANT PULP MILLS

ANDRITZ is the global leader in the supply of recovery boilers to the pulp and paper industry. Furthermore, its decades of experience in designing, building, and operating large boilers from 8,000 tds/d upwards has allowed pulp mill operators to construct the true giants of the industry that we see today in Latin America and Asia.

The main benefit ANDRITZ brings with its larger recovery boilers is the ability to super-size pulp mills in terms of capacity – a growing trend particularly in Latin American countries such as Brazil and Uruguay, and in Asian countries such as Indonesia and China. ANDRITZ is the only supplier on the market having proven recovery boiler references of over 8,000 tds/d, the largest being in operation for a number of years at Bracell's mill in São Paulo state, Brazil.

Ageu Silva, LATAM Divisional Director, Pulp & Power at ANDRITZ, says, "Up until relatively recently the size of the recovery boiler limited the capacity of the fiberline at pulp mills. The reason for this limitation was due to availability, as when recovery boilers go down, all production at the pulp mills stops.

"Due to our decades of experience in design and installation, we now supply recovery boilers that have the world's highest availabilities. This means that much larger boilers have become more viable, and mills can now run multiple fiberlines utilizing just one large recovery boiler. This ability results in major savings on CAPEX and OPEX as one large recovery boiler is a lot less expensive than installing and operating two smaller ones.



*"We have successfully installed various digital technologies and robotics, including Smart Smelt Spout Robots that improve the safety of the furnace area of the recovery boiler."*

**Ageu Silva**
LATAM Divisional Director, Pulp & Power, ANDRITZ

Timo Lindh, LATAM Senior Commercial and Technical Manager, Recovery Boilers at ANDRITZ, says, "The good news is that we can go even bigger, up to 20,000 tds/d. However, designing a magnum-boiler does not mean simply building a larger boiler. We have hands-on experience from several magnum-boiler projects over the last 10 years, and this has enabled us to continuously improve our design and delivery concept. Through this process, we are extremely confident that we will deliver our customers magnum-sized recovery boilers that are safe, efficient, and reliable well into the future."

### MAXIMIZING RAMP-UP SPEED AND QUALITY OF ONGOING SERVICE

With the experience of having seven of the largest recovery boilers in operation or under construction around the world, ANDRITZ prides itself in fast start-up and ramp-up speeds, "The speedy ramp up to full design capacity is a very important issue for our customers," says Silva. "Our experience in the installation, start-up, and ramp-up of recovery boilers and complete mills is second to none, and our installations are ramping up faster and faster, often reaching nominal capacity in record times."

When it comes to service, ANDRITZ has located its service centers with skilled engineers and spare parts close to customers' mills to ensure maximum lifetime service levels. The latest developments include an upcoming modern service center located at Três Lagoas in Mato Grosso do Sul state, Brazil, in addition to the outstanding existing service center at Araucaria in Paraná state. Another development is a brand-new service center at Palembang on the island of Sumatra in Indonesia, which was inaugurated in May 2026. The center allows ANDRITZ to service the larger mills on the island as well as provide services to other mills in Southeast Asia.

Silva concludes, "Our customers are delighted with our exponentially growing service offerings, particularly at the heart of large, new pulp mill expansion areas. We now have the ability to manufacture spare parts for large recovery boilers, as well as for parts across the rest of the mill, ensuring maximum uptime and quality maintenance and service."

**Discover more!**

**CONTACT**
Ageu Silva
ageu.silva@andritz.com



# CHINA'S PULP BOOM

***Things happen fast in China, and the pulp and paper industries are no exception. In the pulp production sector, there has been a dramatic transformation since 2020, shifting from heavy reliance on imported recycled fiber to a boom in domestic virgin pulp production. ANDRITZ has emerged as a key enabler of this shift.***

Before 2020, China was primarily a paper market, importing over 20 million tons of market pulp and up to 25 million tons of old corrugated containers (OCC) annually to feed its paper and board production. However, the ban on imported recovered paper changed everything. Companies like Sun Paper and Nine Dragons Paper quickly pioneered integrated pulp mills using domestic wood and imported chips, proving their economic superiority and kicking off a new trend.

The trend quickly spread, fueled by surplus wood from a slowing housing market and new plantations in provinces such as Guangxi and Hubei. Vietnam also ramped up wood chip exports to meet demand.

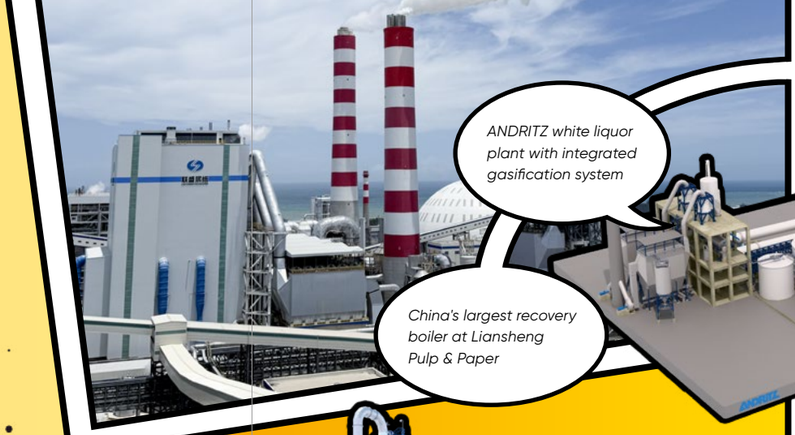
Thomas Schmitz, President at ANDRITZ China, explains, "Up until 2020, China was not really a market for pulp mills; the move into integrated mills first started with Sun Paper and has rapidly spread. It was soon clear that integrated pulp mills make much more economic sense when compared to importing market pulp and the boom was ignited."

## A WINNING STRATEGY WITH AN IMPRESSIVE REPUTATION

As the demand for pulp mills grew, ANDRITZ responded rapidly by significantly expanding its existing local team in China and investing in multiple new workshops for faster, more cost-effective delivery. This localization, combined with global technology, has been central to the company strategy.

In the space of just six short years, ANDRITZ has executed a number of large pulp mill projects within the Chinese market, including at Sun Paper, Nine Dragons, Lee & Man Paper, Liansheng Pulp & Paper, Jianhui, Xianhe, and Wuzhou Special Paper.

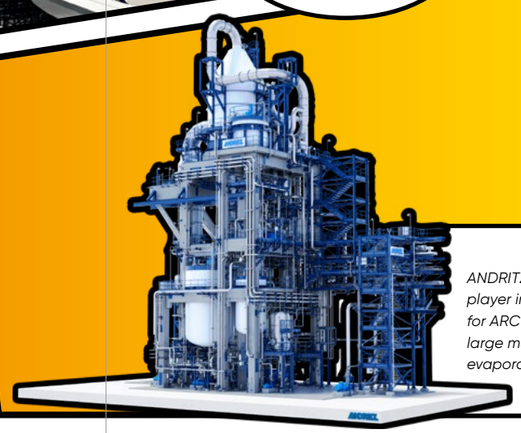
Zhang Yong, Vice President & General Manager, Pulp & Power at ANDRITZ China, says, "Our success in China is due to our advanced technology combined with competitive prices. For example, we have been awarded a major share of orders for new recovery boilers, ARC (Ash Re-Crystallization) chloride removal system, white liquor plants with gasifiers, and large multi-effect evaporators incorporating the widely preferred lamella technology in China."



*China's largest recovery boiler at Liansheng Pulp & Paper*



*ANDRITZ white liquor plant with integrated gasification system*



*ANDRITZ is a leading player in the market for ARC systems and large multi-effect evaporators.*

ANDRITZ has developed a strong reputation in China for the reliability of its recovery boilers. At the Liansheng turnkey delivered mill, an ANDRITZ recovery boiler ran for 18 months after start-up without a need for shutdown – a performance customers highlight in word-of-mouth recommendations.

"Our recovery boilers are becoming known for being more reliable, having more uptime and less maintenance," adds Yong.

Gasification plant installations have been particularly successful says Li Xiaoning, Senior Sales Manager, White Liquor Plant at ANDRITZ, "We have a proven track record of successful gasification projects in China. By converting biomass residues into product gas to be burned in the lime kiln, it replaces expensive natural gas or heavy oil, delivering major cost savings while supporting China's decarbonization goals."

Furthermore, ANDRITZ high kappa fiberlines, combined with DD-Washer, COMPACT PRESS wash press, and GasFree drum filter technology, the advanced washing/filtering systems have given ANDRITZ technology an edge in fiberline projects, particularly for demanding applications. The combination of technical performance and competitive local manufacturing has proven decisive.

Kader Rahkonen, Senior Sales Manager, Fiberline at ANDRITZ, says, "Our high kappa fiberline technology works perfectly in the demanding conditions experienced in China. Our washing technology combinations, local support, and cost competitiveness are stand out reasons for our success."

## SPEED, FLEXIBILITY AND COST EFFICIENCY

The Chinese market demands speed, flexibility, and cost efficiency. ANDRITZ has adapted to these demands by fostering strong local project teams and collaborating with proven global engineering resources for added agility.

Flagship partnerships with Sun Paper and Nine Dragons illustrate ANDRITZ's ability to deliver large-scale integrated projects. Schmitz says, "As an illustration of how quickly Chinese companies move, Sun Paper went from initial discussions to contract signing for a full mill in just one month."

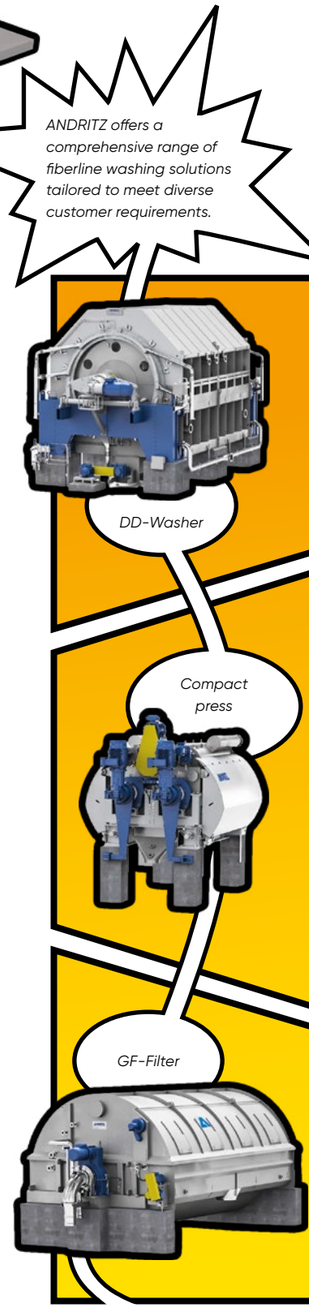
Nine Dragons, the world's largest containerboard producer, transitioned from OCC-only operations to full integrated lines. Lacking deep in-house pulp expertise, the company sought a "one-stop" supplier capable of managing complexity and accelerating timelines.

"Nine Dragons management realized that virgin pulp production was not that simple," explains Schmitz. "And they really wanted all pulp production processes from one supplier. Our willingness to accelerate schedules and maintain close consultative relationships proved critical in winning repeat business."

## LOOKING AHEAD

Although the conventional pulp boom is expected to level out over the coming years, new opportunities are emerging in dissolving pulp, fluff pulp, lyocell, and other non-paper applications, where China is already a global leader.

ANDRITZ's experience demonstrates that winning in China requires more than technology: it demands cultural understanding, proximity to customers, and relentless focus on execution. Schmitz concludes, "Chinese customers are innovative, decisive, and fast-moving – qualities that reward suppliers who can match their pace."




**CONTACT**
Zhang Yong
yong.zhang@andritz.com

# ATAD

## ADVANCED TAD TECHNOLOGY FOR PREMIUM TISSUE GRADES

SOFTER ON THE ENVIRONMENT, LIGHTER ON ENERGY, AND STRONGER IN PERFORMANCE.

The TAD process has been widely recognized across the tissue industry as a major breakthrough in terms of finished product quality; however, the process has also become synonymous with excessive energy demands. ANDRITZ has come to the rescue with the ATAD concept, which is set to revolutionize the energy-intensive demand of TAD production.

### SOFT TISSUE, HARD ENERGY REALITY

Through-air drying (TAD) has been celebrated in the tissue industry since the 1960s for delivering premium products with superior bulk, strength, absorbency, and softness. However, TAD's Achilles' heel has been its significantly higher energy consumption compared to conventional tissue production processes. This energy intensity has limited the technology's adoption, particularly outside regions like North America, where energy costs are significantly higher.

ANDRITZ has tackled this challenge with Advanced TAD (ATAD), an innovation that reduces energy use in the TAD drying process by more than 20% while fully preserving product quality. Developed over years of research at the company's *Prime*Line TIAC pilot plant in Graz, Austria, ATAD removes significantly more water from the sheet before it enters the energy-intensive TAD section.

Paul Richards, Senior Technology Manager Tissue and Grade Owner for TAD & Hybrid technologies at ANDRITZ explains, "Since starting the TAD journey, our goal has always been to target maximum energy efficiency. The ATAD concept is straightforward in theory: remove as much water as possible from the sheet before it reaches the first TAD drum."

### HOW DOES THE ATAD CONCEPT WORK?

"Conventional thinking tells us that tissue from the TAD process is never pressed. With ATAD we are challenging that perception," continues Richards. "Our aim is to offer controlled pressing of the TAD sheet while it is protected by the TAD fabric."

The ATAD process involves using a felted suction roll around which the TAD sheet passes. This felt is more akin to a press felt from the paper process and is softer and drier than conventional tissue-making felts. As the sheet wraps the suction zone, a hood with a combination of steam shower and hot air is located over the zone, using the temperature to help dewater the system. At the point just before the sheet leaves the suction zone, a press is used to create additional dewatering.

"Because the sheet is already molded into the TAD fabric at this time, there is a very limited impact of the pressing on the sheet structure, but the forced contact of sheet to felt increases the water removal and increases our sheet solids ahead of the first TAD drum," says Richards.



Advanced TAD originates from the ANDRITZ Tissue Innovation and Application Center in Austria – the hub for next-generation tissue solutions.

### ENERGY AND EMISSIONS REDUCTION, ALONG WITH TOP QUALITY RESULTS

Extensive trials at the Graz pilot plant confirmed the results. Boris Jancic, Head of Operations Tissue Pilot Plant at ANDRITZ, reports, "Energy savings on steam, gas, and electrical power (vacuum pumps and fans) ranged from 6–16%, depending on the grade. We achieved repeatable solids levels above 30% before the first TAD drum after three years of intensive R&D."

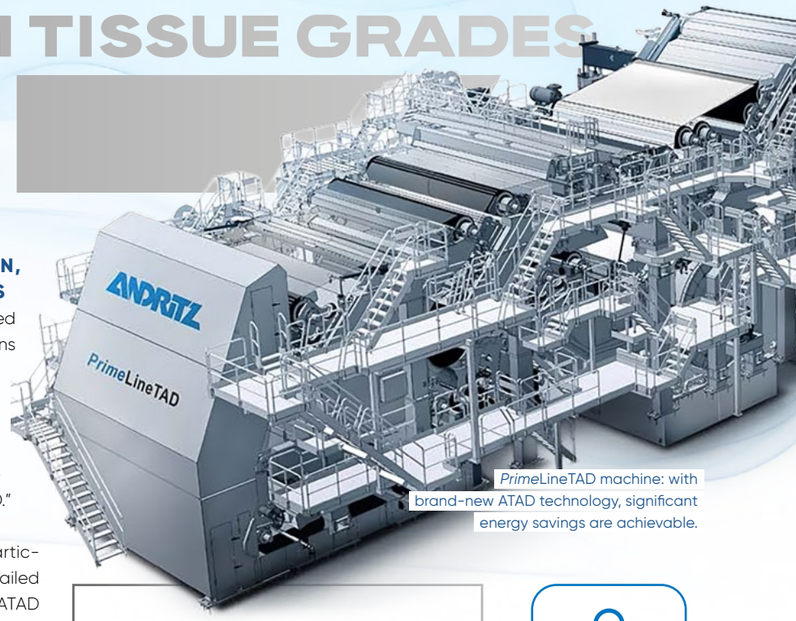
Concerns about potential quality loss, particularly caliper, were addressed through detailed laboratory testing. "Final analyses showed ATAD samples were equally comparable with standard TAD products," Jancic confirms.

Franz Harrer, Director of R&D Paper & Tissue at ANDRITZ, adds that $CO_2$ emissions in TAD mainly stem from gas used for heating. "Mechanically removing more water reduces the need for evaporation, cutting fossil fuel emissions by up to 15%. Efforts are underway to further improve sustainability through electrification and heat recovery."

### INSTALLATION AND OPERATION – SIMPLICITY IS KEY

"Our primary goal with ATAD has been universal applicability," says Richards. "While ideal for new ANDRITZ *Prime*Line TAD machines, ATAD technology is designed for retrofit on existing TAD lines – even those from other OEMs. We have kept the whole concept extremely simple, using known components and processes to minimize costs and complexity."

For operators, ATAD is straightforward: initial setup resembles any suction roll. It adds equipment, for example, an extra fabric loop, but the energy savings more than justify the additions to the process.




*Prime*LineTAD machine: with brand-new ATAD technology, significant energy savings are achievable.

A specially-developed module – integrating a suction pressure roll, controlled heating and pressing – raises sheet solids ahead of the first TAD drum. This reduces the amount of moisture that must be thermally evaporated, which is the costliest and most carbon-intensive part of the process.

ATAD

Richards concludes, "TAD must become more affordable and sustainable to expand the technology globally. ATAD delivers major wet-end dryness gains that can dramatically amplify overall energy savings when combined with Yankee impingement hoods and other optimizations."

Tune in to our podcast

**CONTACT**
Paul Richards
paul.richards@andritz.com

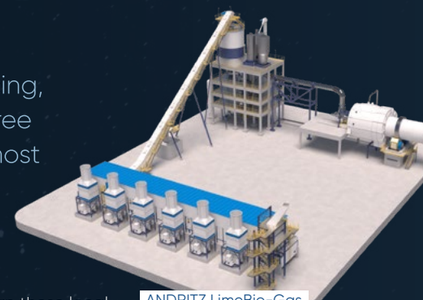


# ESSENTIAL IN A VOLATILE WORLD



# DEFOSSILIZING PULP MILL LIME KILNS

In a world of increasing oil and gas volatility in supply and pricing, ANDRITZ defossilizing technologies deliver fast, reliable fossil-free operation and provide an economical solution to one of the most energy-intensive processes in pulp mill operations.



ANDRITZ LimeBio-Gas is a gasification-based biofuel plant designed for pulp mill lime kilns.



Biomass gasification plant in Klabin, Brazil

Global pulp producers have long committed to phasing out fossil fuels, a drive intensified now by energy-price volatility, sustainability targets, and increasing governmental regulations.

Pulp mills face a clear imperative: the lime kiln is typically the single largest consumer of fossil fuel – both oil and natural gas. Replacing these fuels with biomass-derived alternatives is no longer optional; it is essential for decarbonization, cost control, and energy independence. ANDRITZ offers two proven, dedicated solutions: LimeBio-Gas gasification and LimeBio-Powder biomass powder burning, which enable mills to achieve 100% fossil-free lime kiln operation quickly, efficiently, and economically.

Mika Mussalo, Head of Product Management, White Liquor Plant at ANDRITZ says, "Pulp mills are ideally positioned to adopt these technologies quickly and painlessly. Generally, the mills already generate bountiful amounts of biomass side streams, including bark, chip screening fines, rejects, and other residues, perfect fuels for ANDRITZ defossilization technologies.

"Gasification and powder-burning turn these local resources into kiln fuel at roughly 50% of the cost of fossil alternatives, while producing biogenic $CO_2$ that supports carbon-capture strategies. The result is immediate defossilization of the kiln, without compromising output or product quality."

## LIMEBIO-GAS: TURNING SIDE STREAMS INTO HIGH-VALUE FUEL

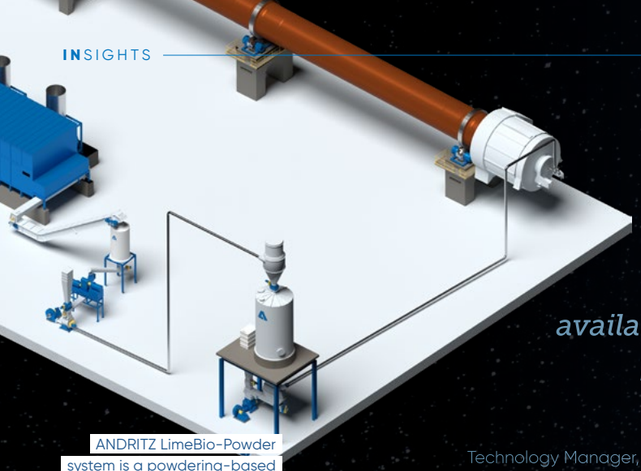
LimeBio-Gas uses ANDRITZ's proven Circulating Fluidized Bed (CFB) gasification technology to convert solid biomass, including lower-quality or reject streams unsuitable for direct combustion, into a clean product gas. The process dries the fuel with mill waste heat, gasifies it at atmospheric pressure, separates non-process elements (NPEs) to protect the lime cycle, and feeds the gas directly into a multi-fuel lime kiln burner. The gas burns with the high flame temperatures (~2,000°C) required for efficient lime reburning, temperatures currently unattainable with practical electric alternatives.

Topias Kuusrainen, Technology Manager, White Liquor Plant at ANDRITZ says, "Gasification excels in large-scale operations. Individual plants range from 48 MW to 115 MW of product gas, making the technology perfect for modern pulp lines. ANDRITZ's installed base and projects under execution already exceed 1,000 MW of gasification capacity worldwide."

ANDRITZ gasification references include Metsä Fibre Joutseno mill in Finland, Chenming mills in China, Klabin's Ortigueira mill in Brazil and Suzano's Ribas do Rio Pardo mill (two units), also in Brazil. In each case, these mills have replaced 100% of the fossil fuel in one or more kilns while maintaining full production.



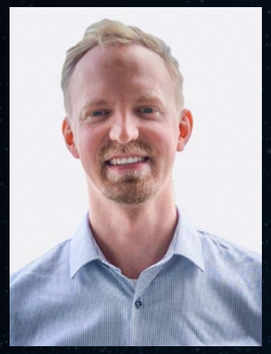
ANDRITZ LimeBio-Gas enables a significant reduction in fossil $CO_2$ emissions.



ANDRITZ LimeBio-Powder system is a powdering-based lime kiln biofuel plant.

*"If the biomass is available, it's virtually plug-and-play."*

**Topias Kuusrainen**
Technology Manager, White Liquor Plant, ANDRITZ



## LIMEBIO-POWDER: SIMPLE, DIRECT POWDER COMBUSTION

For mills with access to cleaner, low-ash biomass such as pellets or chips, LimeBio-Powder offers an even easier route to eliminating the use of fossil fuels. High-quality biomass is refined into a fine powder using ANDRITZ's advanced milling technology, then pneumatically dosed and injected into a dedicated burner. The system integrates seamlessly with existing kilns: the old fossil-fuel burner is swapped out and the new powder system commissioned, often during a single shutdown.

"LimeBio-Powder delivers competitive capital costs and is particularly attractive for smaller or mid-sized kilns," adds Kuusrainen. "Operation is similar to fossil fuel lime kilns, which means there is no steep learning curve for the operators."

ANDRITZ has supplied LimeBio-Powder technology to SCA Östrand in Sweden which has been in operation since 2011, with excellent long-term results, and project deliveries to a next-generation plant are ongoing in Europe. Because it burns dry, refined powder directly, the solution is highly automated, operator-friendly, and requires minimal additional infrastructure.

## IMMEDIATE BENEFITS AND RAPID PAYBACK

Both technologies deliver instant impact. Once commissioned, they replace 100% of the kiln's fossil-fuel consumption with no ramp-up period and no gradual transition. Mills achieve a dramatic drop in fossil-fuel use and $CO_2$ emissions on day one.

"Customer fuel-bill savings across the current installed base are estimated at 168–420 MEUR annually," says Mussalo. "Payback periods are typically 2–3 years for full turnkey installations, depending on local fossil-fuel prices, biomass availability, and carbon pricing."

The numbers are impressive when it comes to environmental and economic savings utilizing ANDRITZ defossilization technologies:

- The installed base and ongoing projects for ANDRITZ gasification and powder burning technologies add up to more than 1,200 MW.
- As 1,200 MW replaces natural gas and heavy fuel oil, the avoided fossil $CO_2$ emissions add up to more than 1.5 MTPA – equal to more than the annual emissions of 330,000 petrol cars.
- ANDRITZ customers combined will save 168–420 MEUR annually on fossil fuel costs.

The economics are compelling even without subsidies. Biomass is often sourced internally for pulp mills at low or negative cost; external pellets remain competitive in most markets. Mills also gain energy security, reduced exposure to volatile oil and gas prices, and an enhanced reputation as sustainable producers.

## ANDRITZ'S INTEGRATED ADVANTAGE

What sets ANDRITZ apart is its position as a single-source supplier of the entire white-liquor plant, including the lime kiln itself. ANDRITZ lime kilns are purpose-designed for pulp mill operations and have decades of proven performance with gasification and biopower systems. This integration optimizes air flows, heat balances, and process stability and customers benefit from one point of contact for engineering, delivery, commissioning, and lifelong service, backed by local presence worldwide.

Implementation is straightforward. Delivery times of 12–18 months are common, with start-up often achieved during a routine annual shutdown. The technologies suit both retrofits of existing mills and greenfield projects. "If the biomass is available, it's virtually plug-and-play," adds Kuusrainen.







*"As pulp producers accelerate their decarbonization roadmaps, ANDRITZ LimeBio-Gas and LimeBio-Powder technologies provide the fastest, most practical path to fossil-free lime kilns."*

**Mika Mussalo**
Head of Product Management, White Liquor Plant, ANDRITZ

## GASIFICATION – PROVEN PERFORMANCE

Sun Paper, Klabin, and Suzano have all publicly highlighted the reliability and sustainability gains from ANDRITZ gasification. Sun Paper in China continues to expand its gasification fleet, citing short delivery schedules and rapid ROI.

As part of its major pulp project at Nanning, Guangxi, China, Sun Paper recently started up an integrated white liquor plant including a lime kiln with a gasification plant for energy-efficient operation. Fei Da, Recovery Island Project Director at Nanning Sun Paper says, "We have full confidence in ANDRITZ's chemical recovery technology and equipment. We have a long history of cooperation and experience, and the project's successful start-up and rapid achievement of rapid production verified our choice of ANDRITZ technology."

Klabin's Puma II project in Brazil included a 51 MW gasification plant with a multi-fuel lime kiln burner and handling equipment with auxiliaries. Leonardo Scanavini, Recovery Area Specialist for Klabin Puma II says, "By replacing 100% of the heavy fuel burned in one of the mill's lime kilns the ANDRITZ gasification plant significantly reduces the mill's carbon footprint. The current lime kiln production remains at 650 t of reburnt lime per day."

For Suzano's giant Ribas do Rio Pardo project in Brazil, ANDRITZ supplied a complete White Liquor Plant with two gasification plants, enabling full fossil-free operation of the lime kilns. Mauricio Miranda, Pulp Industrial Director at Suzano says, "As a new energy model in the pulp industry, the biomass gasification plant produces renewable fuel for the lime kilns, where fuel oil, derived from petroleum, is replaced by a syngas (Syngas), produced from biomass.

"The technology results in energy-cost savings of more than 82% for lime kilns in addition to a 97% reduction in fossil fuel consumption, contributing to the reduction of greenhouse gas emissions in the operation".



Highly combustible powder, perfectly suitable for fueling the lime kiln

## ANDRITZ TECHNOLOGY TO ACCELERATE DECARBONIZATION ROADMAPS

Mussalo concludes, "As pulp producers accelerate their decarbonization roadmaps, ANDRITZ LimeBio-Gas and LimeBio-Powder technologies provide the fastest, most practical path to fossil-free lime kilns.

"With over 1,000 MW of gasification capacity delivered or under way, proven references on multiple continents, and payback periods that make investment decisions straightforward, these technologies are not just viable – they set the new standard."

The message from the mill floor is clear – the side streams are already there, the technology is ready, and the economics work. Pulp mills that act now secure both environmental leadership and a significant competitive edge.

**CONTACT**
Jukka Wasström
jukka.wasstrom@andritz.com

## A NEW OPPORTUNITY FOR PULP MILLS:

# E-METHANOL PRODUCTION



E-Methanol plants transform green hydrogen and captured $CO_2$ into a renewable fuel for hard-to-abate sectors.



Henrik Grönqvist, Director of E-Methanol, ANDRITZ

The market for e-methanol is poised for accelerated growth, driven by policy, shipping demand, chemical production, and falling renewable costs. It is the fastest-growing segment within the broader methanol and renewable fuels markets. ANDRITZ technology now makes it possible to produce e-methanol by utilizing biogenic $CO_2$ emitted from pulp mill production.

According to the World Economic Forum*(WEF), e-methanol represents an excellent opportunity to drastically reduce emissions in the global shipping industry. Shipping currently accounts for around 3% of global $CO_2$ emissions, with the potential to rise. Furthermore, the chemical industry, which relies heavily on methanol as a precursor to many of its products, represents another emissions-intensive sector that must rapidly clean up its supply chain.

The WEF states that e-methanol's dual role as a marine fuel and chemical feedstock aligns perfectly with these urgent emission reduction demands. For forward thinking pulp producers, this means industrial biogenic $CO_2$ sources, such as those at pulp mills, are no longer just emission points; when combined with renewable power and smart integration, they become the foundation for commercially viable e-methanol production.

## Henrik Grönqvist, Director of E-Methanol at ANDRITZ, answers some important questions for pulp mill operators.

EXPERT INTERVIEW

**Can you explain the concept of e-methanol and why biogenic $CO_2$ from pulp mill operations is particularly well-suited as a feedstock compared to other $CO_2$ sources?**

Biogenic $CO_2$ from pulp mill operations is especially well-suited as a feedstock for e-methanol production. In pulp mills, biogenic $CO_2$ is released during the processing of biomass, such as in recovery boilers, power boilers, and lime kilns, which use renewable raw materials like wood. This $CO_2$ is considered carbon-neutral because it originates from plant matter that previously absorbed atmospheric $CO_2$ during growth.

Compared to other industrial $CO_2$ sources, biogenic $CO_2$ is typically cleaner, with fewer contaminants, making it easier and more cost-effective to capture and utilize in chemical synthesis. ANDRITZ has recently partnered with Metsä Group to test carbon capture from a pulp mill's recovery boiler. The six-month pilot project was conducted at a pilot facility located at Metsä Group's mill in Rauma, Finland.

Furthermore, integrating e-methanol production at pulp mills leverages existing infrastructure and contributes to a more sustainable, closed-loop approach within the pulp and paper industry.

**What are the main sources of biogenic $CO_2$ within a typical kraft pulp mill, and how much $CO_2$ is typically available per metric ton of pulp produced?**

The main sources of biogenic $CO_2$ are the recovery boiler and potentially also the lime kiln, both of which process biomass-derived materials. Furthermore, in some cases, emissions from the power boiler can also be used.

Typically, around 1.5 to 2 metric tons of biogenic $CO_2$ are produced per metric ton of pulp, depending on the mill's operational efficiency and feedstock.

**Can you walk us through the key steps in the e-methanol production process when using biogenic $CO_2$ from pulp mills - from $CO_2$ capture to hydrogen production and final methanol synthesis.**

There are two main ingredients for the production of e-methanol, $CO_2$ and $H_2$. We are specifically targeting the Renewable Fuel from the Non-Biological Origin (RFNBO) sector.

First, we start by capturing $CO_2$ from the stack, clean the flue gases, and then apply a carbon capture technology that captures the $CO_2$ molecule from the flue gas stream.

→



ANDRITZ Electrolyzer Gigafactory, Erfurt, Germany:
Building on more than 125 years of manufacturing expertise



Every electrolyzer is manufactured and assembled with precision to ensure reliable, high-performance operation.



Built for industrial-scale, the electrolyzer stacks enable efficient green hydrogen production for e-methanol plants.

Then we need to extract the hydrogen molecule from the water. For this we use pressurized alkaline stack technology. Basically this means we hit the water molecule with electricity, and the outcome is hydrogen and oxygen.

These two molecules, $CO_2$ and $H_2$, are then combined in a catalytic reactor, a process called methanol synthesis, with the result being crude methanol. When cleaned, a pure methanol is achieved. The ANDRITZ integrated process leverages mill infrastructure for heat and utilities, with oxygen recycled back into mill operations.

**What carbon capture technologies have proven most effective for integrating with existing pulp mill flue gases, and what are the main technical considerations for seamless integration without disrupting core pulp production?**

ANDRITZ has its own technology for carbon capturing; amine based, Hot Potassium Carbonate (HPC) and membrane technology. This process needs steam and energy for extracting the $CO_2$ molecule.

HPC offers lower steam demand and can utilize available electricity. Membranes are promising for smaller scales but remain at pilot stage. Integration is designed to avoid disrupting core pulp production by using existing steam and water systems that are typically not bottlenecks.

**How does the production of green hydrogen (via electrolysis) fit into the overall e-methanol value chain at a pulp mill site, and what role does renewable electricity availability play in project feasibility?**

It fits in very well. We are using a pressurized alkaline stack technology where both hydrogen and oxygen are produced. The hydrogen is used for e-methanol production, and the oxygen can then be used in different stages of the kraft pulp mill process; for example, oxy-enriched recovery boiler operation or in the bleaching stages.

**What are the biggest technical and operational challenges when scaling e-methanol production from biogenic $CO_2$ at pulp mills, and how have recent projects addressed issues like energy intensity or heat integration?**

The main challenge is the high electricity demand and its price volatility. Methanol synthesis and distillation prefer steady operation, while electrolysis can ramp up and down quickly to follow low electricity prices. Solutions include hybrid operation – using steady mill-derived methanol streams alongside variable electrolysis output, and advanced distillation designs. Overall system integration, heat recovery, and ensuring 24/7 mill reliability are key to success.

**From an environmental perspective, how does e-methanol produced in this way contribute to decarbonization and circular economy goals in the pulp and paper industry?**

At present, 50% of the carbon leaves pulp mills via the stack. By capturing biogenic $CO_2$ that would otherwise be vented, the concept prevents emissions and puts the carbon to productive use in fuels or chemicals. It reduces reliance on fossil methanol, supports energy optimization, and creates additional value from existing biomass without requiring more forest harvesting. Integration exemplifies circular principles: waste streams become feedstocks, byproducts are reused, and renewable electricity is valorized.

**Economically speaking, what are the main cost drivers in biogenic e-methanol production today, and under what conditions (e.g., electricity prices, carbon pricing, or policy support) does it become competitive with fossil-based methanol?**

Biogenic e-methanol is always more expensive than fossil fuel when compared to pump prices as electricity price is the dominant cost driver. A stand-alone e-methanol plant's Levelized Cost of Product (LCOP), in this case e-MeOH, often exceeds 1,100–1,400 EUR per metric ton. A six-month study with one of the largest pulp producers in Brazil showed that full integration, leveraging shared utilities, steam optimization, oxygen use, and infrastructure, can reduce costs by approximately 15%, bringing production cost below 1,000 EUR per metric ton. Furthermore, we were able to boost the existing recovery boiler capacity by 7% utilizing ANDRITZ's innovative oxy-concept. This technology achieves groundbreaking results and gives further commercial benefits to both the e-MeOH plant as well as for the pulp mill. Competitive projects are emerging in regions with low-cost green electricity such as the Nordics, parts of South America, and China.

**Looking ahead, what do you see as the biggest opportunities and potential barriers for widespread adoption of e-methanol production from pulp mill biogenic $CO_2$ over the next 5–10 years?**

**Opportunities:** The technology is mature. Large $CO_2$ volumes, existing infrastructure, and policy tailwinds (carbon pricing, ETS, renewable fuel mandates) create strong potential. Long-term offtake agreements from fuel buyers will de-risk investments.

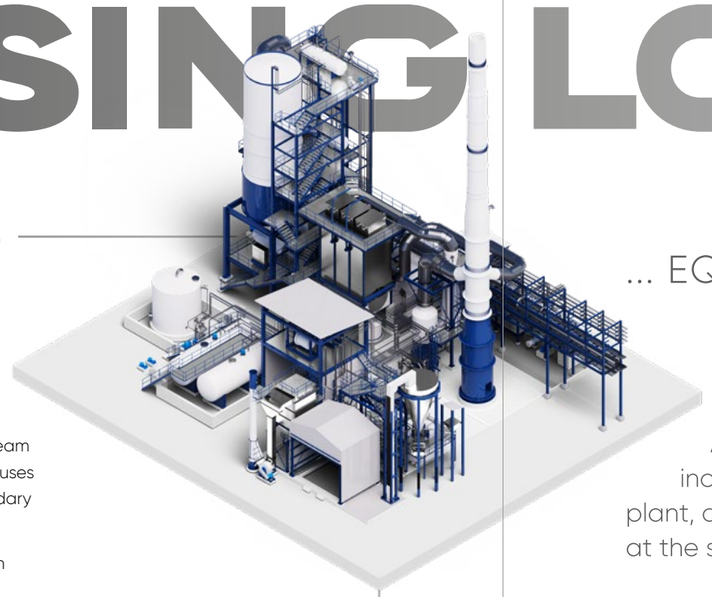
**Barriers:** High capital costs, a need for even cheaper green electricity, stronger regulatory incentives for biogenic $CO_2$ utilization, and development of the full supply chain (harbors, transport, end-users). The ecosystem is still nascent and requires coordinated growth.

ANDRITZ's e-methanol concept transforms pulp mills from traditional biomass processors into integrated renewable fuel producers. By closing carbon loops and creating synergies between pulp, power, and fuel production, it offers a practical pathway to decarbonize the industry while generating new economic value. With supportive policy and offtake commitments, large-scale deployment appears increasingly feasible.

**CONTACT**
Henrik Grönqvist
henrik.gronqvist@andritz.com

* https://www.weforum.org/stories/2025/02/emethanol-a-game-changer-for-decarbonizing-shipping/

# CLOSING LOOPS ...



## MAJOR BENEFITS

- **Towards chemical self-sufficiency:** In addition to producing all sulfuric acid, mills with SulfoLoop will reduce significantly or eliminate the need for sodium hydroxide make-up while fully utilizing the saltcake produced in the chlorine dioxide plant. Remaining sodium losses can be replenished by purchased sodium sulfate.
- **Energy recovery:** 80–90% of exothermic heat is recovered as high-pressure steam at 58 bar(g), usable for soot blowing, or electricity generation. The condenser uses ambient air cooling, producing hot air for processes like recovery boiler secondary air—reducing steam consumption.
- **Reliability and maintenance:** Corrosion-resistant design and proven long-term operation result in low lifecycle costs.

## ... EQUALS HUGE SAVINGS ON CHEMICALS AND ENABLES SELF-SUFFICIENCY IN SULFURIC ACID AT PULP MILLS

ANDRITZ leaves no stone unturned when it comes to providing technology for increasing circularity at pulp mills. One of its latest solutions, SulfoLoop™ sulfuric acid plant, allows pulp mills to make their own sulfuric acid from sulfur-containing side streams, at the same time as eliminating the purging of waste streams to the environment.

Modern pulp mills have advanced significantly in sustainability, with many achieving fossil-free operations, energy surplus, and very low carbon footprints. They are increasingly regarded as bioproduct mills or biorefineries, valorizing side streams into products such as biomethanol and lignin-based bioproducts. However, challenges remain in fully closing chemical loops, particularly managing excess sulfur in mills' sodium/sulfur (Na/S) balance to avoid sulfate purging.

Excess sulfur accumulates as mills tighten chemical cycles and reduce emissions. Traditional removal methods, such as purging fly ash from the recovery boiler or sodium sulfate from the chlorine dioxide process to effluent treatment, result in environmental harm and economic losses. Sulfate discharge can damage aquatic ecosystems, and regulators are tightening restrictions, with some new mill permits already turned down due to sulfate concerns. Economically, purging sodium sulfate means losing valuable sodium, which must be replaced with expensive make-up chemicals like sodium hydroxide.

### THE SOLUTION – ANDRITZ SulfoLoop WITH WSA TECHNOLOGY

The ANDRITZ SulfoLoop solution utilizes proven Wet Gas Sulfuric Acid (WSA) technology which recovers sulfur from concentrated non-condensable gases (CNCGs) generated in pulping, evaporation, and fiberline processes, converting it into concentrated sulfuric acid for mill use. This approach controls the Na/S balance, eliminates sulfate dumping, avoids sodium losses, and achieves self-sufficiency in sulfuric acid, thus delivering major environmental and financial benefits.



ANDRITZ SulfoLoop sulfuric acid plant in Suzano Ribas do Rio Pardo, Brazil

ANDRITZ partners with the Danish company Topsoe, who has licensed around 200 WSA references worldwide across industries including metals, oil & gas, and viscose. The technology is ideal for pulp mills because it handles wet gases without drying and can co-process elemental sulfur. In the process, CNCGs containing sulfur compounds and hydrocarbons are combusted with air to form $SO_2$, water, and $CO_2$. The gas is cooled, then passes through catalyst beds where $SO_2$ is oxidized to $SO_3$. $SO_3$ reacts with water vapor to form gaseous sulfuric acid, which condenses in the proprietary WSA condenser to produce commercial grade concentrated acid (>95%); no additional concentration steps are needed. Residual $SO_2$ is scrubbed with sodium hydroxide, yielding a salt solution that can return to the mill cycle or be used as sodium bisulfite in bleaching. Clean gas is released to the stack.

Key advantages include operation above the acid dew point upstream of the condenser (minimizing corrosion), high sulfur conversion (>99%), and flexible design. If CNCG sulfur is insufficient, molten elemental sulfur can be added to the combustor (roughly 1 ton of sulfur yields ~3 tons of sulfuric acid), reducing purchased acid volumes by about two-thirds and cutting transport and chemical costs.

### INSTALLATION AND RETURN ON INVESTMENT

SulfoLoop is a stand-alone unit; installation involves adapting the mill's CNCG collection system and can occur during normal production. The simple payback period typically ranges from 3–7 years, driven by savings on purchased sulfuric acid, sodium hydroxide, reduced sodium sulfate disposal, and recovered energy. Additional value comes from reduced exposure to chemical price volatility and supply risks. The plant can be tailored to specific needs, including sodium bisulfite production or future upgrades, and is supported by ANDRITZ and Topsoe digital tools and expertise.

ANDRITZ has already successfully introduced SulfoLoop sulfuric acid plants into the pulp industry with installations at two mills in Brazil, Klabin Puma Ortigueira and Suzano Ribas do Rio Pardo with installation ongoing for Södra Cell's Mönsterås mill in Sweden.

As part of ANDRITZ's CircleToZero initiative, SulfoLoop helps eliminate unused side streams, create value-added products, and move toward zero emissions and zero waste.

**CONTACT**
Mariana Carvalho
mariana.carvalho@andritz.com

# FROM PLASTIC TO FIBER

## HÉBERT GROUP AND ANDRITZ PIONEER DRY MOLDED FIBER TECHNOLOGY

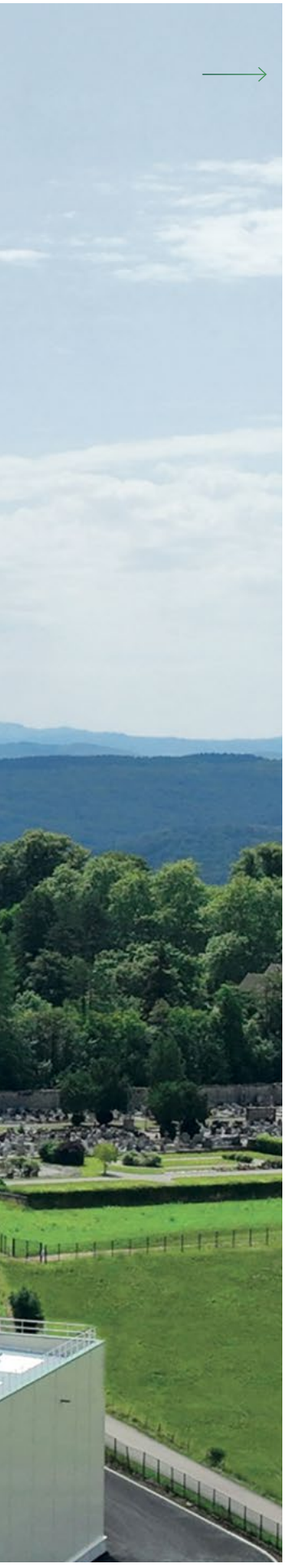
In the push for plastic-free packaging, French specialist Hébert Group has teamed with ANDRITZ to scale up Dry Molded Fiber production. Located in Orgelet, France, the family-owned company has long championed responsive, high-quality consumer packaging.

Consumers and brand owners are increasingly demanding alternatives to conventional plastic packaging. Hébert Group specializes in the development and manufacture of custom-molded packaging solutions for leading European and global brands across the food, dairy, cosmetics, and reuse sectors. The group is acutely aware of the challenges being faced to offer more sustainable packaging.

Julien Hébert, Chief Commercial Officer at Hébert Group, says, "We listen closely to our customers to create products that are chosen by the top names in the food and cosmetics industries. In the course of these discussions, we have gained a deeper understanding of their expectations regarding sustainable development.

"This approach has naturally driven us to diversify our technologies, creating new opportunities and strengthening our position as a pioneer into other raw materials and environmentally friendly processes." →





After intense market analysis in 2020, the company began to look deeply into the groundbreaking technology of Dry Molded Fiber (DMF) made from natural cellulose fibers. By 2023 the group had set up a dedicated building and ecosystem along with installation of its first DMF line.

"We pride ourselves in our approach to sustainability in our manufacturing processes, which are energy and water efficient and where we can use materials of renewable or recycled origin that are free from fossil fuels," continues Julien Hébert. "And this is why we have made the decision to add Dry Molded Fiber (DMF) to our process offerings."

## HÉBERT GROUP AND ANDRITZ NONWOVEN & TEXTILE TEAM

To launch its DMF journey, the group formed a separate business unit in 2023 – Herpulp – and since then has invested in several first-generation Modula lines incorporating ANDRITZ Dan-Web mill-to-web forming technology. In 2024, ANDRITZ stepped in to support the group with a dedicated expert team to complete the commissioning and stabilize process and product consistency. Throughout 2025 Hébert Group benefited from technical visits, parameter optimization, and process upgrades including the signing of a comprehensive service contract.

The service contract enables ANDRITZ to continue supporting Hébert Group during the commissioning of the lines, with the objective being to achieve a Site Acceptance Test (SAT) and ensuring proper and reliable operation of the lines.

Mathieu Hébert, Chief Operating Officer at Hébert Group says, "Fiber integration began even before the installation of our first line in Orgelet, with the construction of a dedicated facility designed to prevent any risk of cross-contamination. Today, we are incorporating this activity into the scope of our standards and, in the long term, aim to position this technology as a complement to our core business, allowing us to extend our product portfolio and meet a wider range of customer requirements.

"We have been supported in this process by the experienced ANDRITZ team that is highly dynamic, motivated, and committed. Customer feedback is already highlighting the cost effectiveness, high quality finishing, and unique premium perception of our DMF products."

The company currently produces trays and lids using DMF technology under its Herpulp brand name and is investigating deep-draw products for production in the future.

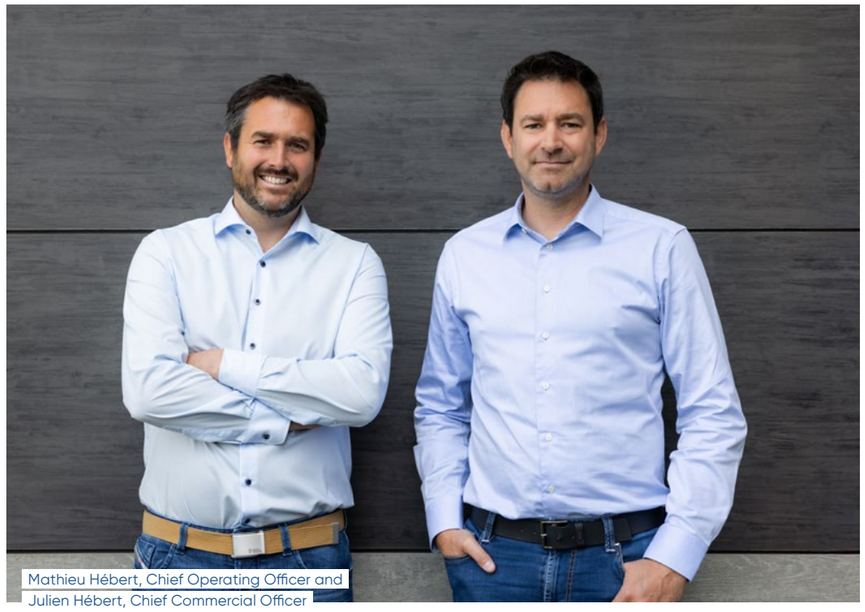
## LOOKING TO THE FUTURE: PARTNERSHIPS ARE ESSENTIAL

Regulatory pressure to phase out single-use plastics, rising customer expectations, and the need to maintain cost and performance standards are all challenges for the future. Packaging specialists are on the front line. Success requires strong technology partners who not only supply equipment but actively support optimization and long-term service.

"We strongly believe in the DMF concept as a way to scale up sustainable packaging, even more so since we started working with ANDRITZ," says Julien Hébert. "For us, this partnership represents an excellent opportunity for several reasons: ANDRITZ's extensive experience in providing complete industrial solutions to the pulp and paper industry, technical support in project management, and strong market demand for this type of packaging solution.

"Our next ambitions together include lowering the cost to the market, securing the stabilization of production lines, and co-developing molds tailored to DMF technology."

The Hébert Group-ANDRITZ collaboration is a clear example of how targeted investment, technical expertise, and shared vision can deliver truly sustainable packaging that is better for the planet – without compromising quality or speed.



Mathieu Hébert, Chief Operating Officer and Julien Hébert, Chief Commercial Officer

**CONTACT**
Bruno Roche
bruno.roche@andritz.com

## WHAT DOES ANDRITZ OFFER FOR SUSTAINABLE PACKAGING SOLUTIONS?

*Bruno Roche, Senior Vice President, Nonwoven & Textile at ANDRITZ, explains:*

Replacing single-use plastic by natural cellulosic fibers is definitely the most sustainable path forward for packaging. Dry Molded Fiber (DMF) is made industrially possible by combining well-known, proven technologies – airlaid forming, nonwoven converting, and thermoforming – all recognized solutions within the ANDRITZ portfolio, now integrated into a seamless industrial process that significantly reduces water and energy consumption while supporting recyclable and circular packaging solutions.



For ANDRITZ, DMF is a natural extension of its long-standing DNA, rooted in decades of expertise in pulp, paper, and tissue technologies. The opportunity is substantial: even a fraction of single-use plastic packaging converted to fiber would justify new pulp mill investments – at the core of ANDRITZ's businesses. Economically viable DMF starts with affordable, fit-for-purpose raw materials, where ANDRITZ brings both vast expertise and a full suite of sustainable energy solutions. Add to this our proven industrial know-how in scalable pressing and molding – drawn from our position in the automotive sector – and ANDRITZ is uniquely placed to industrialize DMF at the scale brand owners require. With pioneers like Hébert Group, we are building this value chain together, with ambition and humility.

To accelerate DMF industrialization, ANDRITZ has invested in a complete Airlaid DMF Technical Center in the "Cellulose Valley" in Grenoble, France, purpose-built to support pioneers like Hébert Group from day one. Proximity and deep collaboration between our teams create a unique advantage: solutions validated in a full industrial environment in Orgelet, from fiber formulation and forming through to mold validation and end-product applications.

Through its Solution as a Service concept, ANDRITZ de-risks innovation under strict confidentiality – helping producers move with confidence from pilot trials to full-scale turnkey DMF lines, and from ambition to market.

TECH NEWS

# Economic and operational benefits of LAMELLA EVAPORATION PLANTS

Watch the video here

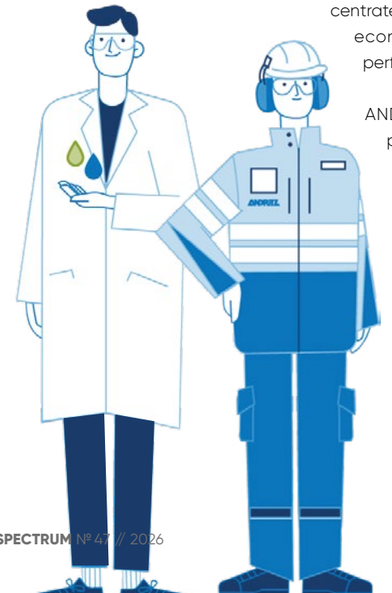
The evaporation plant plays a crucial role in the overall successful running of a pulp mill, therefore it's vital that it operates to its full potential. ANDRITZ lamella evaporation plants have proved their worth at some of the largest and most efficient pulp mills around the globe, with decades of reliable operation and many repeat orders.

In today's competitive landscape, businesses need solutions that are economically sound and deliver optimal performance. Therefore, selecting the right evaporation plant solution is a crucial decision with long-term implications for a mill's efficiency and productivity.

## MAJOR COST SAVINGS WITH ANDRITZ EVAPORATION SOLUTIONS

Casimir Svensson, Global Product Group Manager for Evaporation Service at ANDRITZ, explains, "There are three main areas critical to the successful economical operation of an evaporation plant, availability, energy efficiency, and the ability to produce clean condensate. With its lamella evaporation plants, ANDRITZ experts have concentrated on providing plants with economic and environmental performance at the forefront."

ANDRITZ lamella evaporation plants are designed to deliver a fully integrated solution that optimizes all three critical process areas. Furthermore, well-functioning technology is a key factor influencing the total life cycle costs of not only the evaporation plant but the whole pulp mill.



- **High availability** is achieved through ANDRITZ lamella technology, which has been developed to function in challenging conditions with minimum cleaning needs while the plant is in operation. This enables high availability of the plant.

- **Energy efficiency** is achieved through low steam consumption and, along with rapid start-ups, clear financial advantages are gained.

- **Clean condensates** can replace freshwater in processes like pulp washing and lime washing, leading to resource conservation and cost savings.

## PRIMARY ADVANTAGES – FAST PAYBACK

ANDRITZ lamella evaporation technology has been successfully implemented in some of the largest pulp projects around the world, with many repeat orders. The primary advantage of the plants lies in achieving a fast payback through increased availability and efficient, economical operation. Ultimately, ANDRITZ aims to help its customers operate the most profitable and environmentally friendly mills in the industry.

**LESS REQUIRED STEAM**

**50%**

Furthermore, ANDRITZ offers evaporation plant performance improvements through upgrades and retrofits, tailored to meet specific customer needs. Upgrades and rebuilds enable economic and performance advantages, and we are ready to deliver tailor-made solutions.

In addition, significant financial benefits can be achieved by utilizing the side streams from evaporation plant operation. ANDRITZ has developed specific solutions for purifying methanol, sulfuric acid production, and lignin recovery – all of which offer further revenue opportunities as well as substantial chemical savings.

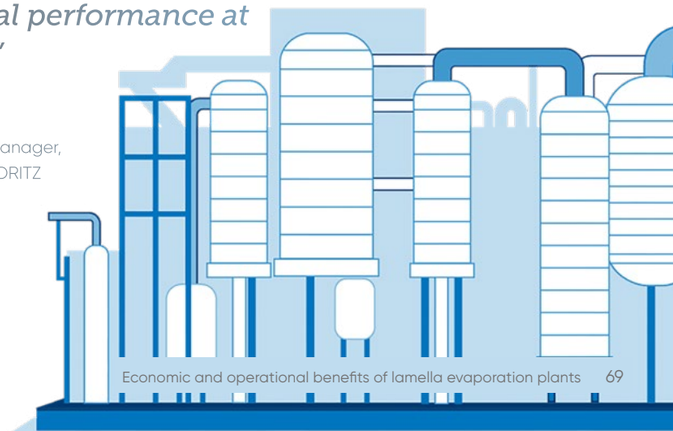
Whether it's a new greenfield pulp mill, or upgrading an existing evaporation plant, ANDRITZ's combined process and equipment knowledge will optimize performance and extend the lifespan of technology and equipment. By collaborating closely with customers to assess their operations, improvements can be made that yield significant financial returns way into the future.

**CONTACT**
Casimir Svensson
casimir.svensson@andritz.com



*"With its lamella evaporation plants, ANDRITZ experts have concentrated on providing plants with economic and environmental performance at the forefront."*

**Casimir Svensson**
Global Product Group Manager,
Evaporation Service, ANDRITZ



# FROM PRINT TO PODCAST
# THROUGH THE MANY SHADES OF PROGRESS




## THE SPECTRUM JOURNEY

It all started with a simple idea: to make complex technologies and projects more understandable to pulp and paper producers and to connect people across industries and continents. Since then, SPECTRUM has documented the many shades of progress that have shaped the pulp and paper industry over the past years.



At the beginning of the 21st century – some 25 years ago – the first issue of SPECTRUM, known as FiberSpectrum back then, was published by ANDRITZ. It was never intended to be just another corporate magazine. Right from the very beginning, SPECTRUM set out to tell human stories of innovation, deep collaboration, and progress.

In those days the experience was simple and to the point. Readers would flip through the printed pages, discovering insights into one article after another. Each issue created space to reflect and gave the possibility to dive deeper into the technologies shaping the world of pulp and paper.



### A TRUSTED SOURCE OF KNOWLEDGE

Fast forward a quarter of a century and SPECTRUM magazine has become more than a publication. Over time, it became a place where knowledge, experience, and industry insights could be shared. With every new edition, its role has grown, documenting not only the evolution of technologies but also the people and ideas behind them.







As the industry has evolved, so too has SPECTRUM. We speak to the key innovators from the front line, and the people who really make a difference in designing, innovating, building, and utilizing the latest in state-of-the art technologies.



Today, that journey is reflected in 47 published issues. Each one captures a moment in time: technological breakthroughs, global projects, and the challenges that define them. Together, they form a rich archive that mirrors the pace of change across industries.

### PROGRESS TAKES NEW FORMS

As the world became faster and more connected, so did the way people consume information. Waiting for the next print issue was no longer the only option. Content needed to be available anytime, anywhere – and in formats that match modern lifestyles.

This shift marked the beginning of a new chapter.

With SPECTRUM NOW, the magazine grew into a dynamic digital platform. Stories are no longer limited to publication cycles. They are published continuously, updated in real time, and are accessible to a global audience at the click of a button. What once lived only on paper now lives also across screens – faster, more flexible, and more interactive.

And then, in 2022, SPECTRUM found a new voice.

The launch of the SPECTRUM podcast added an entirely new dimension for our customers and industry experts. Suddenly, stories could be experienced beyond reading. Conversations replaced paragraphs. Experts shared their insights directly, adding depth, personality, and authenticity.



### MEANINGFUL, HIGH-QUALITY CONTENT

Today, SPECTRUM is no longer defined by a single format. It combines print, digital, and audio content:

- **A print magazine to explore in-depth**
- **A digital platform to stay up to date**
- **A podcast to listen and engage**

Each channel serves a different moment, a different need – but all are driven by the same purpose: to deliver meaningful, high-quality content.

With this issue no. 47, SPECTRUM once again forms a bridge between the past and future, reflecting the many shades of progress that continue to shape the pulp and paper industry.



SPECTRUM is more than a magazine. It is a story that has been told for over two decades – and today, it's not only read on paper and screens, but can also be listened to and watched via our numerous podcasts and informative videos.

Here's to another quarter of a century of SPECTRUM!

**CONTACT**
spectrum@andritz.com













# ANDRITZ BioCircleToZero PROGRAM SEES NEW DEVELOPMENT PROJECTS

In a vital effort to double the value of wood being utilized at pulp mills, last year ANDRITZ launched the BioCircleToZero program. The initiative is already gaining significant pace with three ongoing development projects launched: SAUNA, $H_2$ELP, and CirBRes.

The five-year initiative, led by ANDRITZ and supported by Business Finland, has been set up to encourage cooperation and R&D efforts with companies, research institutions, and universities working in the field of forest products development. Johan Engström, Chief Technology Officer at ANDRITZ Finland says, "We simply have to get more value out of wood by burning less and increasing pulp yield by utilizing side streams such as lignin and biomethanol or creating high value bioproducts such as fiber-based textiles.

"The BioCircleToZero program, with its intense combined innovation and effort, can realistically see a doubling of the value of wood into the future."

*"Our mission is to create high value bioproducts across value chains and to bring new products to the market. We believe the CirBRes project will go some way to support this journey."*

**Naveen Chenna**
Director Research & Innovations, Pulp & Power, ANDRITZ

**The three ongoing development projects accelerating the BioCircleToZero program:**

## CirBRes – GLOBAL CENTER FOR SUSTAINABLE BIOPRODUCTS

The mission is to facilitate international collaboration and exchange of knowledge to advance the bioeconomy sector. Through collaborative research in fundamental science and engineering, as well as economic, environmental, and social assessments of future biocomposite products, the GCSB seeks to promote sustainable and inclusive bioeconomy practices. Åbo Akademi and other universities in Finland have the project lead, and several international partners are involved, including leading Veturi companies such as ANDRITZ, Mirka, and Nokian Tyres, as well as Stora Enso and Boreal Bioproducts.

## $H_2$ELP – $H_2$ PRODUCTION LIFETIME AND PERFORMANCE EXTENSION

$H_2$ELP is a research and innovation project aimed at reducing the levelized cost of hydrogen and methanol production by improving system performance, lifetime, and operational practices under dynamic Nordic conditions. The project is carried out together with the VTT Technical Research Centre of Finland and industrial partners, including Vaisala and Fortum, which combine research expertise with real pilot and laboratory environments. Through hands-on collaboration across the hydrogen value chain, $H_2$ELP supports faster deployment of commercially viable hydrogen and Power-to-X solutions. The project is part of the Veturi Co-Innovation initiative funded by Business Finland.



*"In $H_2$ELP, lowering the levelized cost of product is a critical enabler for accelerating the large-scale deployment of green hydrogen and its derivatives, strengthening their competitiveness, and enabling wider, faster market adoption."*

**Thomas Kohl**
Technology Director Renewable Fuels, ANDRITZ

## SAUNA – SUSTAINABLE PULPING INNOVATION ACHIEVING ZERO POLLUTION THROUGH EFFICIENT WOOD RESIDUE FEEDSTOCK UTILIZATION

The SAUNA project is part of the Horizon Europe program that aims to strengthen the European green economy with a focus on achieving zero waste and zero pollution biorefinery operations. SAUNA is an EU-funded project aiming to develop an innovative pulping method that increases product yields and cuts emissions.

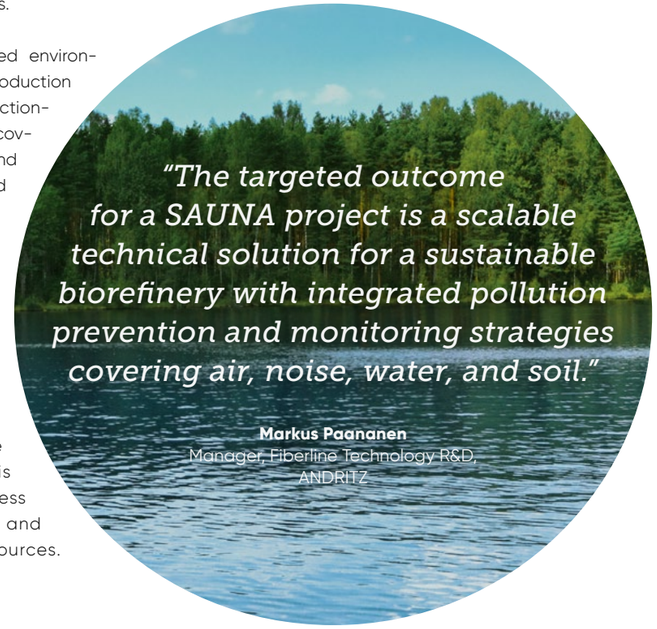
The project addresses enhanced environmental performance of pulp production by developing a novel wood fractionation concept where chemical recovery, environmental life cycle and sustainability, unit operations, and energy sources are reevaluated by 11 expert partners, including five companies that represent a wide range of expertise from production level to end user companies, four research institutes, and two universities.

## PARTNERS ARE KEY

Through these projects, the BioCircleToZero initiative is clearly making rapid progress toward more sustainable and valuable use of forest resources. Kari Tuominen, CEO of ANDRITZ Finland says, "This is an extremely important initiative. At ANDRITZ we have always been known for developing innovative new technology that is well received by our customers.

"Although we are leading the BioCircleToZero program, our partners are key in any new development that enables the creation of added value from wood."

**CONTACT**
Johan Engström
johan.engstrom@andritz.com



*"The targeted outcome for a SAUNA project is a scalable technical solution for a sustainable biorefinery with integrated pollution prevention and monitoring strategies covering air, noise, water, and soil."*

**Markus Paananen**
Manager, Fiberline Technology R&D, ANDRITZ

Discover more!

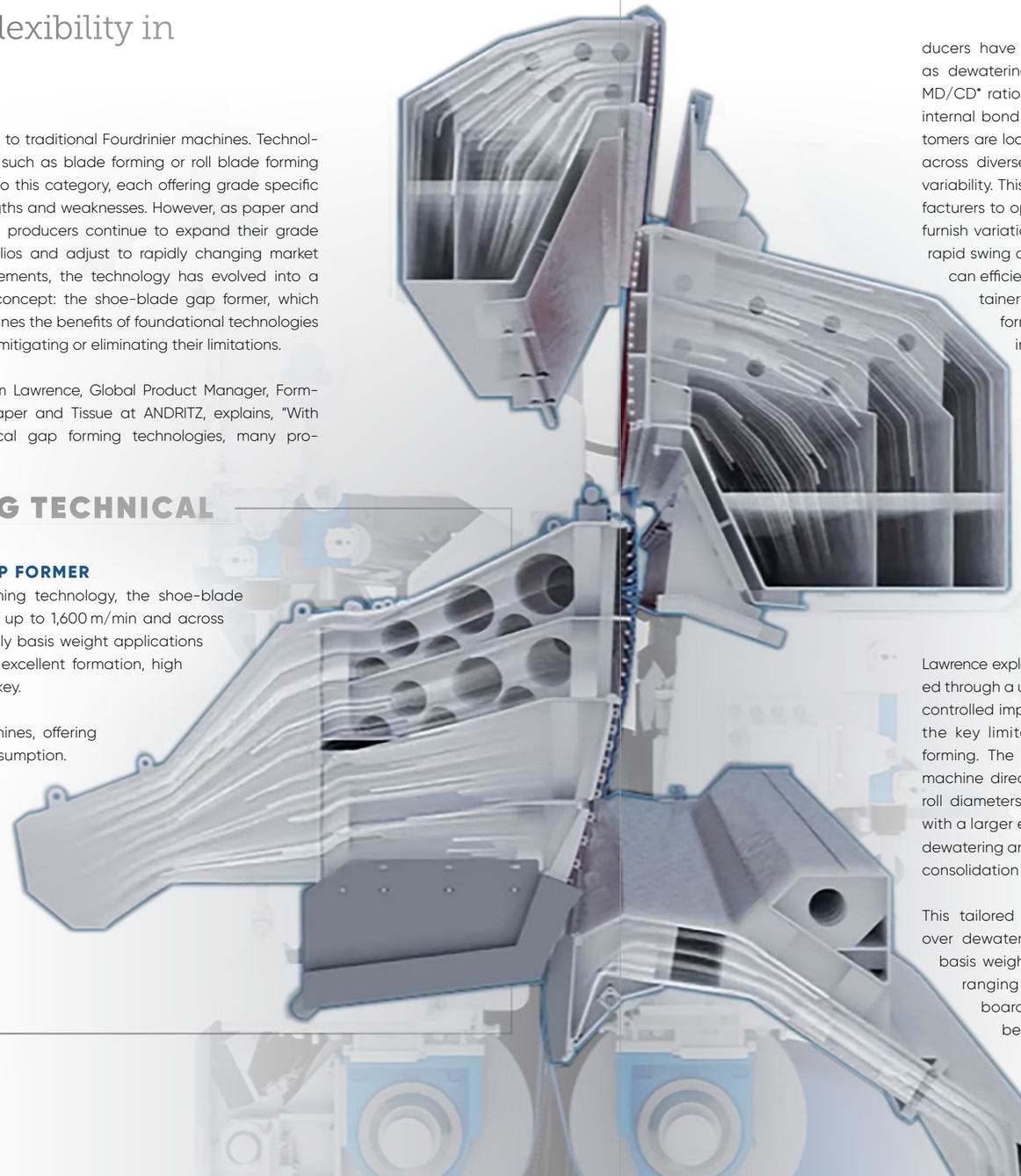
# ANDRITZ *Prime*Form TW SHOE-BLADE GAP FORMER

## Unlocking efficiency and flexibility in paper and board making

Operating in a highly competitive environment, paper and board producers need to maximize production as they push their paper machines to the limit. Furthermore, paper machines must be able to switch grades quickly and efficiently. The ANDRITZ *Prime*Form TW shoe-blade gap former technology provides an effective solution, delivering both improved efficiency and enhanced operational flexibility.

Several solutions categorized as gap forming have long been established in the industry as effective ways to support increased machine speeds by substantially increasing dewatering capacity compared to traditional Fourdrinier machines. Technologies such as blade forming or roll blade forming fall into this category, each offering grade specific strengths and weaknesses. However, as paper and board producers continue to expand their grade portfolios and adjust to rapidly changing market requirements, the technology has evolved into a new concept: the shoe-blade gap former, which combines the benefits of foundational technologies while mitigating or eliminating their limitations.

William Lawrence, Global Product Manager, Forming Paper and Tissue at ANDRITZ, explains, "With classical gap forming technologies, many producers have reached certain bottlenecks such as dewatering limits, constraints on achievable MD/CD* ratios, crushing at high basis weights, or internal bond challenges. At the same time, customers are looking for greater operational flexibility across diverse grade ranges with broad furnish variability. This push for adaptability allows manufacturers to optimize more quickly for day-to-day furnish variations and, when fully utilized, enables rapid swing operation so that the same machine can efficiently produce both graphic and containerboard grades. The shoe-blade gap former converts this operational need into reality."

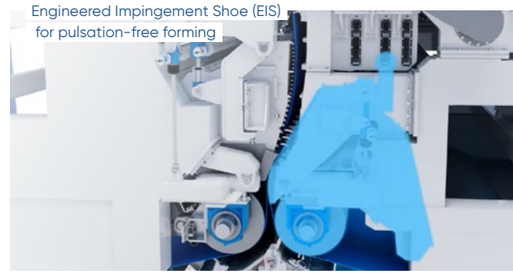


### TECHNICAL INNOVATION: PULSATION-FREE PRODUCTION

The ANDRITZ *Prime*Form TW shoe-blade gap former addresses the challenges of efficiency, dewatering capacity, and strength development while providing the ability to switch grades quickly and efficiently. It also overcomes limitations commonly seen at higher production speeds.

Lawrence explains, "Pulsation-free forming is achieved through a unique shoe geometry that creates a controlled impingement environment and resolves the key limitations of conventional roll blade forming. The shoe radius is adjusted along the machine direction, effectively simulating different roll diameters during sheet formation – starting with a larger equivalent diameter for gentle initial dewatering and transitioning to a smaller radius as consolidation increases.

This tailored curvature enables precise control over dewatering pressure, stock thickness, and basis weight. It also allows handling of grades ranging from light newsprint to heavy linerboard, including basis weights up to and beyond 250 gsm."



Engineered Impingement Shoe (EIS) for pulsation-free forming

### A PLATFORM FOR THE FUTURE

ANDRITZ has numerous references in operation, including recent installations on PM52 at Holmen Paper's Braviken mill in Sweden and PM6 at the Heinzel Group's Steyrermühl mill in Austria.

"We continue to receive positive feedback," says Lawrence. "One site in Australia achieves world class production rates – designed for 10 tons per hour per meter of machine width. Another customer is pioneering TMP-based linerboard production, while others run a diverse range from lightweight newsprint to heavy linerboard."

Beyond efficiency and performance, the shoe-blade gap former is engineered to meet grade specific requirements. Each installation is designed with a holistic dewatering and forming concept aligned with the customer's targeted grade portfolio and quality goals. Since the technology inherently preserves more fiber strength than traditional gap forming concepts, fiber and chemical usage can be optimized both economically and environmentally.

ANDRITZ continues to innovate with new shoe geometries and advanced wear materials under development to enhance performance for specialized grades and demanding swing operations.

**CONTACT**
William Lawrence
william.lawrence@andritz.com

* MD = Machine Direction
CD = Cross Direction

## GETTING TECHNICAL

### ANDRITZ *Prime*Form TW SHOE-BLADE GAP FORMER

Designed as an evolution of traditional gap forming technology, the shoe-blade gap former is highly versatile, operating at speeds up to 1,600 m/min and across a wide range of grades and furnishes, with single ply basis weight applications from 30–250 gsm. It is the preferred choice where excellent formation, high dewatering capacity, and operational flexibility are key.

Solutions are available for rebuilds and new machines, offering high production output with low specific energy consumption.

### BENEFITS INCLUDE:

- Reliable, high performance operation
- Flexible, on-the-run adjustment for formation, strength, and CD uniformity
- Excellent cleanliness and runnability with high sheet solids at the former outlet
- Global expertise with local support



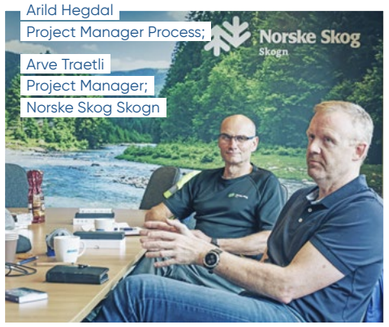
Norske Skog Skogn

# Norske Skog Skogn

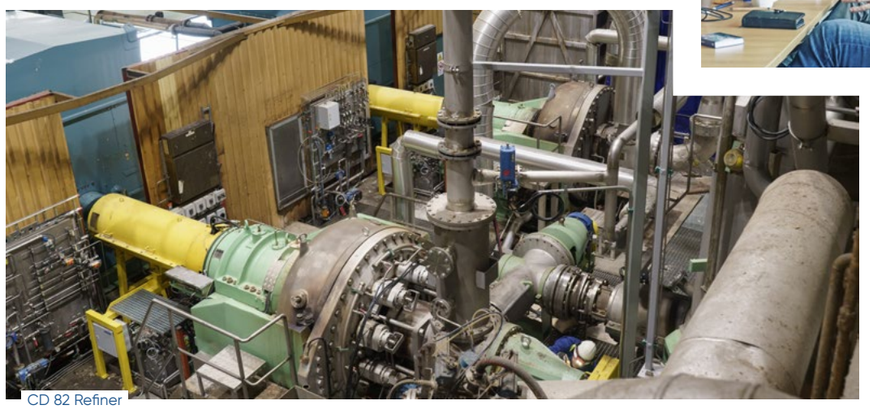
In close cooperation with ANDRITZ, Norske Skog Skogn has successfully realized a tailor-made thermo-mechanical pulp (TMP) retrofit that strengthens the mill's long-term competitiveness while significantly improving its environmental performance. Faced with declining wastepaper quality, rising operating costs, and increasing sustainability demands, Norske Skog decided to replace its deinking plant with a modern TMP line based on 100% virgin fiber.

The ANDRITZ team developed a customized solution that intelligently combined refurbished second-hand equipment with selected new technologies. More than 70% of the installed components were reused, reducing capital expenditure to around one third of the cost of a completely new line without compromising performance, availability, or reliability. Drawing on extensive service and engineering expertise, ANDRITZ seamlessly integrated equipment from different plants, suppliers, and generations into the existing machine hall.

The upgraded TMP line achieves pulp yields above 93%, lowers production costs, and reduces emissions, qualifying the project for governmental $NO_x$ funding. Advanced ANDRITZ service solutions, including the Hydraulic Commander control system for the CD 76 and RGP 65 refiners, ensure stable operation, precise refining control, and long-term process flexibility.



Arild Hegdal
Project Manager Process;
Arve Traetli
Project Manager;
Norske Skog Skogn


CD 82 Refiner






Norske Skog Skogn and ANDRITZ team

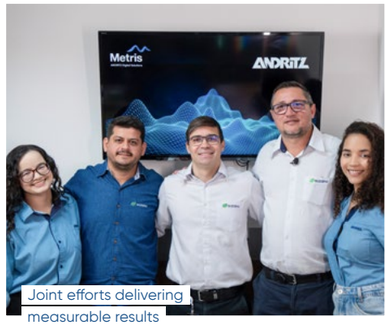
Following a smooth start-up supported by ANDRITZ service experts, the line has demonstrated excellent operational stability. The project highlights how tailor-made service concepts and the professional reuse of equipment can deliver sustainable value, further strengthening the trusted partnership between Norske Skog Skogn and ANDRITZ while laying the foundation for future service and modernization projects.

**CONTACT**
Robert Pfeiffer
robert.pfeiffer@andritz.com

Discover more!

# Suzano Imperatriz

## Improve process stability and efficiency at Suzano's 1.8 MTPA Imperatriz mill



Joint efforts delivering measurable results

### CHALLENGE

Suzano's Imperatriz mill, with 1.8 million tons of annual production capacity, faced operational instability in critical fiberline areas. In bleaching, a key washer showed unstable performance, increasing process variability, and contributing to unplanned shutdowns. Instability in the washing press and upstream conditions caused further deviations, resulting in more than 15 shutdowns within one year. In parallel, causticizing faced control limitations, as green liquor control depended on laboratory analysis and density correlation, which increased variability and reduced efficiency.

### SOLUTION

ANDRITZ specialists worked on improving process stability, control performance and operator response. In bleaching and washing, actions included control loop tuning, ANDRITZ Advanced Process Control (APC), operator alarms and training, with 47 control loops tuned across critical equipment. In causticizing, Suzano's digital and operations teams and ANDRITZ specialists joined a task force. The ANDRITZ Digital Twin developed a virtual sensor for raw green liquor TTA (Total Titratable Alkali) with more than 80% accuracy. More than 70 process variables were evaluated, with the final model using the three variables with the highest correlation.


Suzano and ANDRITZ team at Imperatriz mill

### RESULTS

The initiatives delivered measurable gains in stability and performance. The bleaching washer achieved stable operation with no unplanned shutdowns, while washing press improvements reduced production losses by more than 93%. In causticizing, effective alkali increased from 116 to 122 g/l, dead load decreased by 7 kg/ADT (Air Dry Ton), process deviations fell by more than 60%, and TTA variability decreased by 45%. Estimated savings reached 180,000 USD per year.

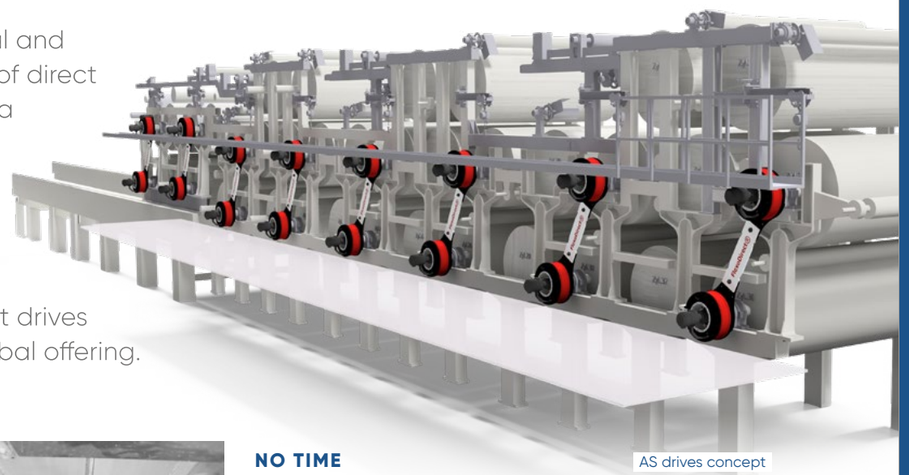
Together, Suzano and ANDRITZ improved process stability and operational performance. Quality losses decreased by 13%, operator actions by 80%, and mill availability increased by 0.7% points.

Watch the video here

**CONTACT**
Leonardo Soares
leonardo.soares@andritz.com

# DRIVE TO THRIVE

The continuous technical and operating cost benefits of direct drives often make them a smart investment for a paper mill. That is why ANDRITZ has entered a partnership with Germany's AS Drives & Services to include direct drives as part of ANDRITZ's global offering.



AS drives concept



FlexoDirect FZ05 wire section



FlexoDirect FY09 pulper

Permanent magnet synchronous motors (or, as they are often known, "direct drives") are gearless drives that provide a long list of benefits. A leading supplier of these systems is AS Drives, which has been perfecting this technology for more than three decades.

In this new partnership, ANDRITZ integrates AS Drives technology into ANDRITZ systems. On a small scale, this could be just a single-point, space-saving upgrade. At the other end of the spectrum, a world-first project in the tissue paper industry recently saw ANDRITZ deliver a high-speed tissue machine, that uses only direct drives across the whole machine.

The ANDRITZ collaboration with AS Drives means one can choose any combination of conventional drives, paired with direct drives using power electronics from well-established OEMs. Customers have the flexibility to use these solutions anywhere on a paper machine, from the forming section to the reel. As well as new projects and capacity increases, these combinations are also ideal for automation strategies, as ANDRITZ integrates the customer's chosen drive components into its control system. This state-of-the-art solutions portfolio is known as ANDRITZ's Multi Motor Drive offering.

## NO TIME FOR BREAKS

One of the big advantages that direct drives deliver is precise speed control, through advanced inverter technology. As might be expected, this is a key benefit of AS Drives' flagship FlexoDirect drive, which adjusts frequency and voltage to control the rotational speed of an electric motor, with extreme accuracy. This makes it possible to synchronize multiple drives, and reduce sheet breaks, by easing physical strain on the web caused by small differences in drive speeds. In addition, because there are no gears creating extra friction, the reduction in couplings can help to cut energy consumption by up to 15%, which minimizes both operating costs and the mill's carbon footprint.

Direct drives also deliver the many advantages of a fully-enclosed, gearless system. As Ramazan Ataman, Senior Sales Manager at ANDRITZ, explains, "The reduction in moving parts not only means smoother operation and high torque at all speeds, but also less wear and need for lubrication and maintenance. In terms of employee health and safety, the system creates low vibration and noise, has no openings or exposed moving parts that might pose a safety risk, and it uses no oil, so there can be no oil leaks."

## PERFECT BALANCE

This collaboration ultimately provides ANDRITZ customers with total flexibility, allowing them to choose any combination of conventional and direct drives that best suits their needs. In this way, they can optimize project and operating costs, as well as performance and environmental benefits, to fit their strategic goals.

**CONTACT**
Ramazan Ataman
ramazan.ataman@andritz.com



SPEC TRUM POD CAST

**FOLLOW AND SUBSCRIBE TO OUR SPECTRUM PODCAST!**

**Welcome to Season 5 of the ANDRITZ SPECTRUM Podcast.**

In this season, we focus on the latest highlights and new developments in automation as well as digital products and solutions, alongside key industry trends and innovations. We'll explore how advanced automation, smart digital technologies, and data-driven solutions are transforming mills, improving efficiency, and driving sustainable growth.

From reducing carbon footprint to innovative technologies – we've got it all covered.

Tune in to our podcast



Mark Rushton, Host of the SPECTRUM Podcast




What you can expect to learn in a single episode.



Season 5

# DID YOU **KNOW** THAT...

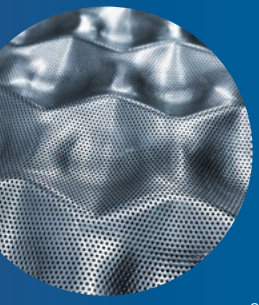
### ... ANDRITZ HAS OPENED A NEW SERVICE CENTER IN PALEMBANG, INDONESIA?



The Indonesia Service Center has been established as a dedicated workshop and service hub to support a wide range of maintenance and refurbishment activities. The facility includes light-duty and heavy-duty workshop areas, spare parts warehousing, and machining capabilities for critical equipment, hence enabling efficient servicing for key components. It supports customers with faster response times, regional expertise, engineering support, and workshop services such as repairs and rebuilds.

The Service Center also reflects ANDRITZ's commitment to sustainability, with more than 40% of the site preserved as green space – supporting site integration and local biodiversity.

**GET MORE INFORMATION!**



### ... ANDRITZ PolyHex™ BAGLESS SECTORS HAVE EXCEPTIONAL RIGIDITY?

The new PolyHex™ bagless disc filter sectors feature a much larger dewatering area and increased sturdiness. Their advanced hexagonal design boosts both the disc filter's efficiency and the durability of each sector.

This is backed by evidence, not just theory. The combination of rigorous internal and external testing and successful field installations creates a robust and reliable validation process. Every PolyHex™ sector design that reaches the customer has already proven its performance in controlled test environments. These important trials help ensure lasting durability, reliable operation, and optimal design in real-world use.

With exceptional results in our first customer installations, these results confirm the strength of the PolyHex™ concept.

**GET MORE INFORMATION!**

### ... ANDRITZ HAS BEEN RANKED #17 IN EUROPE'S BEST EMPLOYERS 2026?

The Financial Times/Statista ranking is based on more than 6 million employer evaluations across Europe and recognizes 1,000 companies. ANDRITZ achieved a top position in this independent ranking, reflecting how employees and industry peers perceive the company as a workplace.




This recognition is a strong signal of trust, collaboration, and commitment across the organization.

**GET MORE INFORMATION!**