



SPECTRUM

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Switch on GREEN POWER solutions from ANDRITZ

More and more companies are switching on their **GREEN POWER** options. **ANDRITZ** offers a range of technologies for producing solid biofuels and energy from waste by-products.

We have included several stories in this issue of **SPECTRUM**, highlighted with the **GREEN POWER** symbol, which showcase our customers' successes with renewable energy technologies.

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spectrum.andritz.com



Decades ago, a papermaker could produce a stronger sheet OR a whiter sheet OR lower basis weight OR higher filler content OR lower energy usage OR more throughput. But, not all at the same time.

What changed?

The first quantum leap was the advent of computer control. This brought with it the concept of optimization. ("We can monitor jet-to-wire, draws, weight, and moisture – so we can optimize for each.")

We are now in the midst of the next quantum leap. Some call it "Industry 4.0," others refer to it as the "Industrial Internet of Things (IIoT)." Whatever the name, it brings the potential for optimization to an entirely new level. Optimization relies on data (lots of it) and speed: data to analyze trends in terms of the bigger picture, and speed of response to get information to operators and maintenance at the moment they need it. No human – even your most dedicated and talented – has the capacity to handle thousands of inputs and make thousands of computations per second.

What makes the latest "quantum leap" possible is our access to new data through the IIoT connection AND the ability to deliver diagnostics on-the-fly. Many machines now have the ability to monitor their health and performance and report their status to other machines and higher-level systems. In addition, the higher-level systems (what we used to call "process control computers") are now linked to millwide business databases, giving them access to sales, energy, productivity, maintenance, and quality trends.

We at ANDRITZ are taking these exciting new tools and developing them specifically for pulp and paper producers. We have written before about our service/solution called Optimization of Process Performance (OPP), which melds high-powered analytical software (capable of data-mining the thousands of signals in a mill's databases) with the experience of very skilled people who know the process and equipment. In its early form, OPP had a dedicated expert (either at the mill or remotely) who would sift through the data trends and bring problems/opportunities to the mill's attention. The efficiency improvements and costs savings in this approach were well documented.

The latest innovation in OPP brings us closer to true optimization. In many cases, the dedicated expert can be eliminated. Powerful soft-

ware not only collects and analyzes mill data, but performs diagnostics in real-time. It then notifies mill personnel about opportunities or problems. Imagine your operators and maintenance people having this information available not only in the control room, but also on their mobile devices (tablet or smartphone):

- Simplified process layouts with real-time equipment status and performance (clear visual image of what is working well and problem equipment that needs attention).

- An equipment "EKG" (similar to an electrocardiogram in a doctor's office) that not only shows the signal of the equipment's "heartbeat," but also diagnoses the equipment's health.

- An OPP "toolbox" window for motor management, control loop assessment, valve monitoring, and an equipment logbook.

- A two-way Smart Glass application (wearable digital computer) that sends live video to an expert and, in return, receives maintenance and repair info for the specific equipment being viewed.

- A predictive tool that mines high-level data from all the mill's computer systems and predicts key process variables (production, quality, energy, etc.) 12 hours beforehand so that corrective actions can be planned.

These tools are not "science fiction," but are examples of the impact of IIoT and Industry 4.0. They are being used today. For example, we currently use Augmented Reality at two mills in South America. Video from the field (obtained through a Smart Glass worn by a mill maintenance person) appears on our equipment expert's computer – allowing him/her to guide the maintenance person through the steps necessary to troubleshoot and repair. In another application, the Smart Glass links the person in the field with the DCS operator during a restart after a shutdown.

Our tools, in combination with the experience and knowledge of your best operators and maintenance people, will raise the performance of your mill. The ability to make real-time optimum decisions about grade mix AND quality AND productivity AND energy AND raw material costs AND chemical consumption AND equipment health is growing rapidly. We look forward to working with you to continue this growth.

Sincerely,

OPTIMIZATION: MOVING FROM "OR" TO "AND"



▲ Joachim Schönbeck, Member of the Executive Board, Capital Systems.



▲ Humbert Köfler, Member of the Executive Board, Service & Units.

Joachim Schönbeck

Humbert Köfler

NEWS

New generation bark press makes its debut

The patent-pending ANDRITZ HQ-Press delivers bark with approximately 5%-units higher dry solids content than any competitive unit. This can increase the net green energy value of the bark up to 15%.

Unlike competitive units that have enclosed structures, the HQ-Press has an open, simple design. The components are easily accessible for maintenance. As a side benefit, the open design helps with housekeeping activities, which reduces odors and mold spores in the operating environment.

The design of the HQ-Press features a self-orienting



drum with two-phase pressing to achieve the higher dryness. While conventional presses typically achieve an annual average of 40% dry solids, the HQ-Press is able to deliver an annual average of 45% dry solids in normal operation. Advanced controls on the unit maximize the output under a variety of operating conditions. The HQ-Press is a robust, reliable solution for bark handling in any woodyard or biomass handling operation.

Find out more about the HQ-Press
www.andritz.com/hq-press

Update from Äänekoski: bleaching towers arrive on-site

In what has been called one of the largest road transports ever in Finland, ANDRITZ bleaching tower segments made their way by truck to this bio-product mill under construction in central Finland. While there will be about 150 special transports from ANDRITZ in support of this project, this one was very impressive.

The sections (the largest being 9 m wide x 10 m high x 22 m long) were transported by trucks from Pietarsaari to Äänekoski. Total weight of the two largest tower segments was 193,000 kg. Total transport time took four

days to complete (mostly during the nights) and involved lifting of telephone and electric lines, removal of portals at roundabouts, and some reinforcement of certain roads.

ANDRITZ is supplying the wood processing plant, fiberline, evaporation plant, and recausticizing plant for the new 1.3 million tonne bio-product mill that Metsä Fibre is building adjacent to the existing Äänekoski mill.

For more info please contact:
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UniFeed upgrade for wash presses



Older wash presses often have significant limitations: frequent plugging, limited throughput, and limited feed consistency.

ANDRITZ is now offering an easy-to-install upgrade – UniFeed – which helps overcome these limitations. UniFeed creates a homogeneous pulp web over the roll's entire screen area. Washing efficiency and throughput are improved since the wash press can now operate at a higher feed consistency. With plugging problems virtually eliminated, availability of the wash press is increased. With a lower pressure drop in the feeder, less energy is consumed. Plus, it is safer to operate since no manual cleaning is required under the unit.

Depending upon the brand and model of the existing wash press, on-site work to perform the upgrade can be accomplished in as little as four days.

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Not pretty, but an important raw material

Pulper rags – that beautiful string of “waste” that is formed in the vortex during recycled fiber pulping – can be a very valuable raw material source. For the longest time, this waste stream (which contains a high portion of steel baling wire) was cut into manageable pieces and sent to landfill. However, this steel has value when it is sold to a recycler.

Up until now, it was difficult to find the right shredding technology to handle this task. ANDRITZ has developed a two-stage process for turning difficult-to-handle pulper rags into a revenue stream. In the first stage, the rags are fed to a coarse shredder called the ANDRITZ UC Universal Rotary Shear. For stage two, an ANDRITZ UG Universal Granulator is used to cut the shredded rags into the proper size and loosen up the material so the wire fractions can be easily removed.

Normally, an overband magnet is used to remove the steel wire fraction, which can be sold. The residual fraction (mostly plastics and some cellulose) has a high calorific value and can be used as a fuel source for the mill.



Find out more about ANDRITZ solutions for pulper rags:
andritz.com/pulper-rags

Coming full

CIRCLE

Two decades ago, the Woodland mill in Maine was a vibrant pulp and paper complex. Suffering the fate of many commodity pulp and fine paper mills, Woodland was near extinction in 2010 when a company with a vision bought the assets, injected USD 180 million (EUR 155 million), and changed the course to value-added tissue production.

St. Croix Tissue is among the newest producers of premium tissue parent rolls in North America. The machine hall is built next to an existing hardwood pulp mill (Woodland Pulp). Mirror-image ANDRITZ *PrimeLine* tissue machines, which started up in 2016, are quickly ramping up to a combined design production of 126,000 t/a.

“Without question, the addition of tissue making capabilities saved this pulp mill,” says Arvind K. Agarwal, CEO of International Grand Investment Corp. (IGIC), the parent company of Woodland Pulp, St. Croix Tissue, and Cascade Pacific Pulp mill in Halsey, Oregon. “Just prior to our buying Woodland in 2010, the owner (Domtar) put the mill into indefinite shut-

down. The future of this facility as a producer of commodity pulp was simply not sustainable.”

The rebirth of the mill has special meaning to Marty Richard, Tissue Manager. Richard was raised in the local community and worked at the mill for 16 years. “We saw some tough times and it looked like the end was near,” Richard says. “In the late 1980s, there were 1,200 people working in the pulp, paper, and oriented strand board (OSB) plants around here. Before IGIC came in, there were about 320 people left in the pulp mill. To come full circle where we are investing and hiring – for a mill that has a bright future – is really rewarding to be part of.”



◀ St. Croix's Marco L'Italien, Vice President (left) with Marty Richard, Tissue Manager.

Setting the stage

“When we acquired Woodland in 2010, we already had the idea to maximize our return by



adding tissue making capacity,” says Agarwal. “My job was to turn this facility around by converting it from a commodity producer to a value-added facility.”

Agarwal and his team went to work immediately. “First thing,” Agarwal says, “was to reduce our dependence on oil by bringing natural gas to the mill. Local distribution companies said it would take several years to permit and build a pipeline. We did it in 10 months with an investment of USD 17 million. That was a positive indicator to the employees and community that we meant business.”

“There were also investments to improve the reliability and throughput of the kraft mill,” says Marco L’Italien, Vice President. These investments set the stage for the announcement in 2013 that a new tissue mill would be built.

Proven supplier

According to Tom Dorsch, Project Leader for St. Croix, “We went through a very detailed process to develop the specs for this mill, and

ANDRITZ was able to fulfill all the requirements of our spec.”

Of importance was a specification for a steel Yankee instead of cast iron, because of the heat transfer advantages and safety factors. St. Croix specified 18-foot diameter Yankees instead of the standard 16-foot ones. “The larger Yankees were a good choice,” L’Italien says. “We don’t have

nuisance breaks since we have eliminated the steambox and simplified the machine.”

Another consideration was machine width. “To meet the needs of one of our key customers,” Richard says, “we needed a machine that would give us roll widths from the standard 102 inches (2,591 mm) up to 112 inches (2,845 mm). Not too many tissue manufacturers have this capability on-machine.”



“The future of this facility as a commodity pulp mill was simply not sustainable.”

Arvind K. Agarwal
CEO, International Grand Investment Corp.



“We have come to appreciate ANDRITZ’s contribution not only for their up-front engineering, but also for their understanding of the entire process,” Agarwal says. “They have been an excellent partner the entire time – from the initial design to optimization of the mill. They have also kept in the forefront of technology, ahead of their competitors.”

Building the vision

The contract with ANDRITZ was signed in January 2014. Groundbreaking for the new mill occurred in October 2014. “We had one of Maine’s harshest winters,” Dorsch recalls. “At this time, we were doing the deep foundation work. There were challenges to be sure, but all of the suppliers, including ANDRITZ, stepped up to help us recover schedule.”

For the Baileyville area (population 1,500), this was a massive construction project. “Logistics was one of our biggest challenges given our remote location,” Dorsch says. “It is 35 miles to a deep water port, 90 miles to the closest airport, and highway access is by two-lane roads. We had over one million construction hours involving 525 people on-site at our peak in the middle of winter.”

On the equipment side, ANDRITZ delivered the first machine in May and the second one in August 2015. “We began commissioning TM1 in January 2016,” says John Schamell, ANDRITZ’s North American Vice President for tissue and drying. “Even though construction was proceeding around us, we checked out the machine section by section. It was a little hectic and the operators were brand new. But, we got stock on the wire in early March.”

The second machine was commissioned and started up with a more traditional approach and pace. “It started up well,” says Schamell,

“even though we had fewer resources since TM1 was in full operation by then. We had a good start-up in July 2016.”

“In our first full month of operation with both machines, we reached 70% of saleable design capacity for this mill,” Dorsch says. “That’s a very fast ramp-up.”

When asked about the working relationship with ANDRITZ, Dorsch comments, “Whenever there were issues, ANDRITZ took ownership. Any problem got fixed and got fixed well. They were very open and trans-



◀ St. Croix specified a large Steel Yankee (18-foot diameter) for both machines. TM1 started up in March and TM2 in July 2016.

◀ Mirror-image *PrimeLine* tissue machines. Design speed is 2,000 m/min. Width 5.6 m. Capacity 126,000 t/a combined.

▼ Operators in the control room for TM1 and TM2.



Tom Dorsch, St. Croix Project Leader (left) with John Schamell, ANDRITZ's Vice President North America for tissue and drying, on TM2. ▼



parent. They were always sensitive to timing, costs, and the impact on our operations. They are an excellent partner that way.”

Multinational machine

About 85% of the machine components were manufactured at the ANDRITZ facility in Foshan, China. The Steel Yankees were fabricated in ANDRITZ's state-of-the-art workshop in Hungary. Headbox, press rolls, and hydraulic systems came from Europe and the air systems came from Canada.

“Like many North Americans, I wondered what the quality of the components manufactured in China would be,” Richard says. “I went to the ANDRITZ workshop in Foshan to inspect the first machine. It was clear that quality was the first thing on the minds of the people—we didn't even have to ask the question before management was explaining their QA/QC processes. It was impressive. After delivery, we could see that the workmanship was really excellent.”

Local training partnership

“ANDRITZ committed a very good team to this project, and they integrated well with

our group,” Dorsch says. “This is the third machine-pair start-up I have worked on and I can say that this project had more vendor support than I have typically seen. But, it was essential here given that our workforce was green with very little tissue experience.”

St. Croix partnered with the local community college to design a training program so potential job candidates could learn about tissue making. Completing the program did not guarantee a job, only gave the opportunity for an interview. “Then in August 2015, we hired the initial team of 58 employees,” Richard says. “The community college again partnered with us for a four-month training program. Much of this training was conducted by suppliers, including ANDRITZ.”

Part of the funding for this project comes through a New Market tax credit program. A requirement for that credit is that St. Croix hire 60% of its new employees from a low-income bracket and maintain that ratio for seven years. “This has a huge benefit for the community,” L'Italien says.

Excellent runability – excellent smoothness

“Every converter, who has run our tissue, likes it,” L'Italien says. “One converter was able to raise speeds by 70% due to the runnability of our product.”

St. Croix considered investing in structured tissue, but decided to go with the CrescentFormer. “Even though our tissue is not structured, it is of very high quality,” Richard says. “In some cases, it has allowed us to get a foot in the door in traditional structured markets. The formation on the CrescentFormer is just so good that we can compete well in the softness for the higher end bath tissues.”

“Before we started up, I was concerned about physical quality of the reels, since we would be making 88-inch (2,235 mm) diameter rolls,” L'Italien says. My concerns were unfounded. These machines make nice flat rolls with excellent profiles. Whatever ANDRITZ is doing with its reel building technology certainly is working.”

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Starting up a

DREAM



The opportunity to work on a greenfield mill project is the dream of many people in our industry. The people who helped create the 1.5 million t/a Puma Mill exactly on time certainly lived the dream. This includes ANDRITZ, which was recognized as being the best performing supplier in the project.

It seems that all the stars were aligned for the birth of the Puma Unidade (mill) in Ortigueira. The speed with which the project progressed from construction to completion (24 months) was remarkable. The virtually error-free start-up and ramp-up of the mill not only pleased Klabin's shareholders, but gained the respect of the international pulping community.

At the mill's inauguration in June, large banners gave a hint of Klabin's secret for success:

Dream + Execute
Klabin's formula for achieving extraordinary results

The Puma Mill (named for mountain lions that live in Klabin's preserved native forests and were spotted in the area during the

pre-feasibility studies) was carved out of Klabin's 270,000 ha of forests in Paraná state. "There was nothing but trees and hills here when we arrived," says João Braga, General Manager for the Puma Project. "The amount of earth we had to move to level out this site makes this the largest earthmoving project that we know of in the industry."

Transportation is a major issue for any mill. The existing roads to the site were not good enough, so Klabin built a new road to improve access, a 22 km long railway to connect the mill to the existing network, and another road with a bridge over the Tibagi River to accommodate logging trucks without having to put traffic on public highways. As part of the project, Klabin also built 100 km of power transmission lines.



“The dream has been achieved and it will help Klabin keep growing.”

João Braga
 Project General Manager, Klabin

Overview of the ANDRITZ woodyard with one of the two 360° stacker reclaimers in the foreground and four chipping lines in the background. ▶

(L to R): Klabin's João Braga, General Project Manager; Edemilson Pagano, Project Manager for the fiberline; and Rodrigo Santos, Project Coordinator for the fiberline in front of the DD Washers. ▼



“Considering that we have four debarking lines, two fiberlines, a large energy plant, and an extra converting machine for fluff pulp, we estimate that there is about 40% more equipment in this mill than a normal single-line eucalyptus mill,” says Francisco Razzolini, Director of Industrial Projects and Technology,

“Even with this, we started production exactly as planned two years ago,” says Braga. “Our target was to feed chips to the hardwood digester on March 1st and we did it.”

Fiber advantage

“We use short and long fibers from the two ANDRITZ fiberlines in ways that give us both technical and cost advantages,”

Razzolini says. “Annual production capacity will be 1.5 million tonnes (1.1 million tonnes of hardwood and 400,000 tonnes of softwood). A sizable portion of the softwood will be processed as fluff pulp.”

Brazil mostly imports its fluff pulp today. Interestingly, Klabin produced small amounts of fluff back in the 1990s.”

“From the beginning, ANDRITZ put excellent people on this project and managed all aspects of their work very well.”

Francisco Razzolini
Director of Industrial Projects and Technology
Klabin





◀ In the white liquor plant, there are two kilns (capacity 650 t/d each). The recausticizing plant is designed to produce 16,000 m³/d.

“Resuming production will enable Brazilian customers to source fluff pulp locally,” Razzolini says.

A shift in strategy

The Puma Mill marks a change in Klabin’s business strategy, which has been focused on packaging papers and corrugated boxes. “We move from being a 1.8 million t/a paper and boxboard supplier to a 3.5 million t/a company producing paper, board, fiber, and green energy.” Total investment in the project was BRL 8.5 billion (EUR 2.33 billion), the biggest investment in the company’s history.

Another Brazilian pulp producer, Fibria, will be the exclusive sales partner for most of Klabin’s hardwood pulp (900,000 t/a) in countries outside South America.

Energy exporter

The new mill has the two largest turbine-generators ever built for the pulp and paper industry. The units have generation capacity of 270 MW. Biomass accounts for about 20% of the energy generation. “We started

commercial sale of our power (50 MW) to the national grid in July,” Razzolini says. “Our plan is to increase this to 150 MW by the end of the year.”

Local labor – local employees

“In order to be successful, one of the things we had to do well was to manage the huge amount of people working on-site,” says Razzolini. “At the most hectic time, there were 12,000 people here. We were also building roads, transmission lines, railways, etc. nearby which added another 3,000 people.”

Since many of the new employees are local and did not have specific pulping experience, Klabin elected to use the IDEAS dynamic simulator from ANDRITZ. IDEAS models the operation of the fiberlines, bleach plants, white liquor plant, evaporation plant, recovery boiler, and power boiler (some of this equipment is outside ANDRITZ’s scope of supply) to check out the DCS loops and then train employees in a “virtual” environment before the mill started up.

Best available

“We are using the best available world-class technologies to maximize yield and minimize emissions and effluents,” Razzolini says. “The ANDRITZ DownFlow Lo-Solids cooking process gives good flexibility and excellent quality pulp; their DD washers are well-proven in reducing chemical consumption.”

For wood processing, Klabin also selected ANDRITZ. The Puma Mill will process about six million tonnes of wood each year with four large chipping lines from ANDRITZ. The average distance from forest to mill gate is only 72 km, which ensures a low total fiber cost. “These chipping lines are the largest equipment that ANDRITZ makes,” Razzolini says. “We use three for eucalyptus and one for pine.”

On the white liquor side, Klabin opted for two smaller ANDRITZ kilns rather than one large one. “Bringing in make-up lime to this mill would be difficult,” Razzolini says, “so we wanted to have redundancy in this area to increase our operational flexibility.”



▲ Close-up of the 360° stacker reclaimer at ANDRITZ woodyard and two ANDRITZ fiberlines in the background.



▲ Percio Pereira, ANDRITZ Project Manager for the white liquor plant, standing in front of the two lime kilns.

Best supplier

“In addition to being on time, the start-up was smooth,” Razzolini reports. “The ramp-up is better than we planned, and the safety record is better than any project that Klabin has done in the past. The commitment of all our suppliers was very high – all were working to the same goals with us.

“We consider ANDRITZ to be the best overall supplier on this project,” Razzolini says. “From the beginning, they put excellent people on this project and managed all aspects of their work very well – both here and abroad. There were very strong and positive relationships between ANDRITZ and our project managers. Their support in training our people and the quality of their team during start-up was excellent. This project also had high visibility and support from the top managers at ANDRITZ.”

Braga shares a similar view. “ANDRITZ has a very good project organization,” he says. “They man-



▲ ANDRITZ delivered two fiberlines for the mill: a 1.1 million t/a hardwood line and a 400,000 t/a softwood line. Much of the softwood will be used for the production of fluff pulp.

aged the work of three different civil construction companies and three different mechanical erection companies. It meant more coordination work for their team, but it reduced project risks and maintained competitiveness. I think that was smart.”

Complete cooperation

Braga and his team had weekly meetings with key suppliers. “If we found any deviation from the plan, we acted immediately,” he says. “We all worked together. When a supplier had a problem, we all had a problem, and we all worked to recover.”

A good example of the joint cooperation, according to Braga, was when Klabin faced some earthmoving delays in the white liquor plant area. ANDRITZ could not start its soil survey work until the area was ready. Valuable time was being lost. “ANDRITZ immediately went to work with a recovery plan,” Braga says.

“We discussed with Klabin and came up with a solution,” says Percio Pereira, ANDRITZ Project Manager for the white liquor plant. “We decided to move the entire plant 21 m to a part where the earthmov-

ing was completed and we could do the soil survey and civil engineering. We put more labor effort in and all the lost time was made up.”

Engineering coordination

“We were under a tight time schedule erecting two fiberlines in the same time that a single line would normally be built,” says Andre Ehlke, ANDRITZ Project Engineering Coordinator for the fiberlines. “We had to get the engineering done on time, and it had to be right to avoid rework in the field. So, we set up our project organization a little differently and created the role of project engineering coordinator.”

A system was developed to have better information about, and control of, basic engineering. The project engineering coordinators monitored the amount of data that was being entered into the software for developing flowsheets and other documents. “This gave us a measure of engineering effort, both internally and with our external engineering companies,” says Ehlke. “It also showed how much work remained to be done, so we could focus on areas that needed attention. This close

monitoring kept us on schedule and saved us considerably in change orders with our suppliers.”

Dreaming ... and then executing

“For me personally, this project has been a dream come true,” Braga says. “It was a wonderful professional challenge for me and a great opportunity to be part of the largest investment in my company’s history. The dream has been achieved and it will help Klabin keep growing.”



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ANDRITZ pumps up

PUMA'S SUCCESS

About 425 process pumps and specialized pumps – virtually all the pumps at Klabin's Puma Mill – were supplied by ANDRITZ.

The start-up and ramp-up of Klabin's Puma Mill in Ortigueira has special significance for the Pumps Division of ANDRITZ HYDRO, one of ANDRITZ's main business areas. Not only are the pumps installed in one of

the largest and most advanced mills in the world, the order for 425 centrifugal pumps – containing 19 medium-consistency pumps – was one of the largest orders the Division has received from the pulping industry.

The decision to utilize ANDRITZ pumps resulted in a frame agreement through which the EPC contractors at the Puma Mill could specify ANDRITZ pumping systems for its various process areas. In total, there were nine EPC groups plus Klabin with specific needs, delivery times, etc., coordinated by ANDRITZ HYDRO.

In addition to the logistics of order handling, ANDRITZ specialists were in demand for pump sizing, drawings, documents, and other engineering tasks.

Most of the pumps were supplied through ANDRITZ HYDRO's Brazilian subsidiary. The pumps were manufactured at ANDRITZ factories in Austria, China, and Germany.

ANDRITZ pumps were installed from the raw water intake system, through the mill, and to the wastewater treatment process. Five two-stage vertical line shaft pumps were installed on a floating barge (first time in the pulping industry), combined with five booster split-case pumps (750 kW motor



◀ These low-maintenance pumps have been optimized for use in the pulp and paper industry, where they operate with an efficiency of over 90% with low pulsation.



▲ These single-stage centrifugal pumps are used as process pumps in various areas of the pulp mill. With efficiency of up to 90% and the ability to transport pulp suspensions of up to 6% b.d., these pumps are true all-rounders.

and flywheels) to transport water to the mill from the nearby Tibagi River.

A large portion (99) of the ANDRITZ pumps are installed in the fiberline. Of these, the majority are single-stage centrifugal pumps of various designs with efficiencies up to 90% capable of transporting suspensions up to 6% consistency. Two high-pressure pumps are also installed in this area. The medium-consistency pumps move pulp suspensions up to 16% consistency without difficulty.

In addition, dozens of process pumps from ANDRITZ were installed in the boilers, evaporation plant, drying plant, and chemical preparation plant delivered by other EPC suppliers. Six split case pumps, weighing nine tons each and driven by 1,000 kW motors, were installed in the cooling tower system.

Installation, commissioning, and start-up were supervised by field technicians from Brazil and Austria. The Puma Mill started



The ANDRITZ MC-pump was developed specially to convey viscous media. It can transport pulp suspensions of up to 16% b.d. without any difficulty. They reach an efficiency of over 70%. ▶

production exactly as planned when the original contracts were signed.

In order to be able to respond quickly to maintenance and servicing of the pumps, Klabin set up a store in the mill with ANDRITZ recommended spare parts and wear parts. ANDRITZ is also collaborating with Klabin to develop an innovative “shop-in-company” concept at the Puma Mill.

Such a huge project demanded a lot of interaction between HPU locations. Communication was a key to success. The lessons learned have also prepared the team for similar projects in the future.

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HEALTHY HEART

Long, productive life

It is said that the Yankee is the heart of a tissue machine. To keep its machine's heart healthy, Slovenian tissue producer Paloma Hygienic Paper relies on Yankee service from ANDRITZ. There are numerous advantages for Paloma to these on-site services.

Paloma Hygienic Paper is headquartered in Sladki Vrh, Slovenia, close to the Austrian border. Paloma has more than 140 years' experience in the production and sale of high-quality hygiene papers and today is a leading supplier in the Adriatic region and Central Europe. Annual production is more than 70,000 tonnes in the form of kitchen rolls, paper handkerchiefs, paper napkins, medical towels, and different kinds of toilet paper. In addition to its own brands, Paloma develops and produces private label products for leading European retail chains.

Nataša Iršič Bedenik is Head of R&D and Quality Management at Paloma. As such, she has a deep understanding of the role

that technology plays in developing her company's varied products. "Most consumers do not think of high-technology when they think of their everyday facial or bath tissues," Bedenik says. "They only



know the softness and quality of the end product in their hands. We in the business think about technology at every step – from the preparation of the raw material, to the production steps on the tissue machine."

“The heart of the machine – the Yankee – is of special importance in ensuring quality and maintaining efficient production.”

Nataša Iršič Bedenik
Head of R&D and Quality Management
Paloma Hygienic Paper



◀ Thermal coating applied to the Yankee on-site with PrimeCoat Stratos.



◀ TM3 at Paloma, where ANDRITZ performed on-site grinding/coating services.

unfortunately led to a number of Yankee failures over the years.

In addition, producers are seeking to make greater quantities of tissue at higher quality, increasing the demands on the Yankee. The largest Yankees in tissue production are now 22 ft (6.7 m) in diameter with machine speeds in excess of 7,000 ft/min (2,100 m/min).

Because of its importance, the Yankee requires monitoring and regular maintenance. “We became aware of ANDRITZ’s comprehensive Yankee service,” Bedenik says. “They view the Yankee as part of the complete production process instead of as a stand-alone unit, and we share that view. Their service, which combines specific knowledge about the Yankee in the context of the entire production line, is what led us to select ANDRITZ as our strategic service partner.”

ANDRITZ is an expert in Yankee dryers. Its expertise starts with the design of new Yankees, through the manufacturing of the cylinders in a specialized workshop with extremely high quality assurance standards, and extends to cover on-site services at tissue mills around the world.

According to Wolfgang Herbst, Sales Engineer for Paper Machine Service and Spare Parts, ANDRITZ services include on-site checks, measurements, and performance tests. “Sometimes, Yankee problems are not due to any fault of the Yankee, but because of the failure of some system or component supporting the Yankee,” he says. “That is why we take a holistic view of the Yankee being part of the entire production line. A program to monitor valves, bearings, lubrication, and interlocks is essential for long and safe operation of the Yankee.”

Bedenik knows that key quality and softness parameters are established in the first few production steps. From her perspective, “The heart of the machine – the Yankee – is of special importance in ensuring quality and maintaining efficient production.”

Indeed, the Yankee – that massive rotating pressure vessel – serves a vital transport function (supporting the tissue web through the drying process with no open draws) and is the component on which most of the water in the tissue web is evaporated while adding crepe and structure to the tissue sheet as it is doctored off the Yankee.

Heart-healthy maintenance

Just like the human heart, the many process variables and operations taking place can put the Yankee under considerable stress. Steam pressure, rotational forces, temperature differentials, and line loads are all at work on the Yankee. This combination of mechanical and thermal stresses has

“From initial calculations to grinding/coating to optimization, our services substantially extend the useful life of the Yankee.”

Wolfgang Herbst
Sales Engineer for Paper Machine Service
and Spare Parts, ANDRITZ AG



One of the measurements that ANDRITZ specialists perform is an on-the-run (OTR) profile measurement to monitor the surface wear of the Yankee at production speeds. "Our measurements and tests indicate the proper time to grind the Yankee to minimize material removal," Herbst says. "Grinding, coating, and polishing are all activities that we perform on-site to shorten the downtime."

An added benefit of the OTR profile measurement, Herbst explains, is that it "not only improves the drying process, but also can help in resolving MD and CD issues related to wear patterns."

Starting with an audit

ANDRITZ was first brought in to audit the performance of one of the tissue machines at the Sladki Vrh mill prior to a rebuild. The on-site grinding and coating of the cast Yankee for TM3 in 2016 met with Paloma's complete satisfaction. This was the beginning of a close service partnership. A follow-on order for servicing TM5's cast Yankee was placed shortly afterwards.

ANDRITZ's Yankee service focuses on adding value with the Yankee. A well-maintained Yankee improves runnability and efficient production. The improvements in throughput, machine efficiency, and reductions in downtime can trigger a remarkable

competitive advantage for producers like Paloma.

Throughout a long, productive life

As the person responsible on-site at Paloma, Herbst knows the challenges of modern Yankee service well. "Each mill and each machine is unique," he says. "We offer much more than a conventional service, which means we focus on listening carefully and responding to unique customer needs. We must be near the customer, ready to act. We define our actions together as partners. Since needs are different, sometimes our services are highly customized. Whether for a new installation or a rebuild, our services accompany the customer throughout the long productive life of their Yankee."

ANDRITZ Yankee service is for Yankee cylinders delivered by any OEM. Services are available for all types of Yankees, Herbst notes, for tissue or paper machines, MG paper or tobacco, steel or cast iron Yankees, old or new. ANDRITZ offers solutions for operating units or anticipated upgrades or replacements, and to solve specific issues related to safety, capacity, or quality.

"We really appreciate the competence of ANDRITZ and their willingness to transfer their knowledge to our people," says Bedenik. "ANDRITZ stands apart from its

competition in that they offer consultation before, during, and after the execution of the work. Their pricing is very competitive. Their speed of response to our needs or questions is excellent. In our case, since we are close to their headquarters, collaboration is easy."

The work with ANDRITZ represents Paloma's first strategic partner for maintenance and service. "This is not something so traditional in our country," Bedenik says. "The key for us lies in ANDRITZ's expertise in specialization. Our core competence is the development and production of tissue. It is not in the maintenance and service of tissue machines. Their renovation of one of our important tissue machines showed their depth of expertise. It also showed our ability to manage a project with international team members and foreign experts. The project was a complete success."

Paloma is confident it has found a reliable service partner in ANDRITZ. "They will work with us well into the future to optimize and continuously improve our production stages, which will improve the quality of our products," Bedenik says.

CONTACT

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ANDRITZ Yankee Service

Mechanical on-site services

grinding, coating, leakage repairs, nip calibration, doctor blade adjustment, etc.

Consultation

drying system, heat recovery, energy savings, runnability, etc.

Troubleshooting

surface inspection, steam and condensate, automation, dewatering, chemicals, etc.

Inspections and measurements

pressure testing, OTR, finite element analysis, acoustic measurement for crack detection, etc.

◀ On-site machine check of Yankee shell thickness.

RED LIQUOR. GREEN POWER.

Tembec calls it a “game changing investment.” The new ANDRITZ sulfite recovery boiler and turbine-generator improve production costs and environmental performance while providing steady, long-term revenue for green electricity. The CAD 273 million (EUR 185 million) project also permits a future capacity expansion of specialty cellulose production.



The slogan for the Canadian forest products company Tembec is “Rooted in tomorrow.” This is an apt description of how a strong sense of history is blended with a forward-thinking strategy to find success in difficult markets.

To understand Tembec’s drive for success, travel back in time to 1973 in Temiscaming, Québec, a town whose livelihood depended on the pulp mill that was shut down as being unprofitable in 1972. The mill’s rebirth was made possible by four individuals who teamed up with former employees of the mill, the residents of Temiscaming, and government authorities to purchase the shuttered mill. Against an investment of CAD 2.4 million (EUR 1.6 million), the company’s first-year after tax income was CAD 9.3 million (EUR 6.3 million). A Canadian success story was launched.

The Tembec strategy has been to carve out a niche for the sulfite mill: tailor-made specialty dissolving pulps (ethers, acetates, nitrocellulose, and microcrystalline cellulose), chemicals (lignosulfonates), and coated bleached board. “This mill has been here for 100 years,” says Paolo Dottori, Vice President of Environment, Engineering, and Procurement. “The batch sulfite process gives us higher pulp quality and the flexibility to produce to buyer specifications.”

As Dottori explains, Temiscaming is actually a very complicated site from an energy perspective. “We have a board mill, a high-yield



◀ (L to R): Michel Monet, Tembec; Paolo Dottori, Tembec; Bernd Zuschin, ANDRITZ; and Paul Cousineau, Tembec, in front of the new SulfitePower boiler.

pulp mill, and a specialty cellulose mill here, with many swings in production,” he says. “We needed an extremely robust boiler to replace our old units that could handle our variability of liquor swings. We also needed certain fuel capabilities. The boiler had to be oversized by a certain factor. We wanted dual scrubbing capabilities (ammonia and/or caustic). Plus, we needed a flexible condensing turbine design to handle outages and shutdowns in a variety of ways.”

Green electricity project

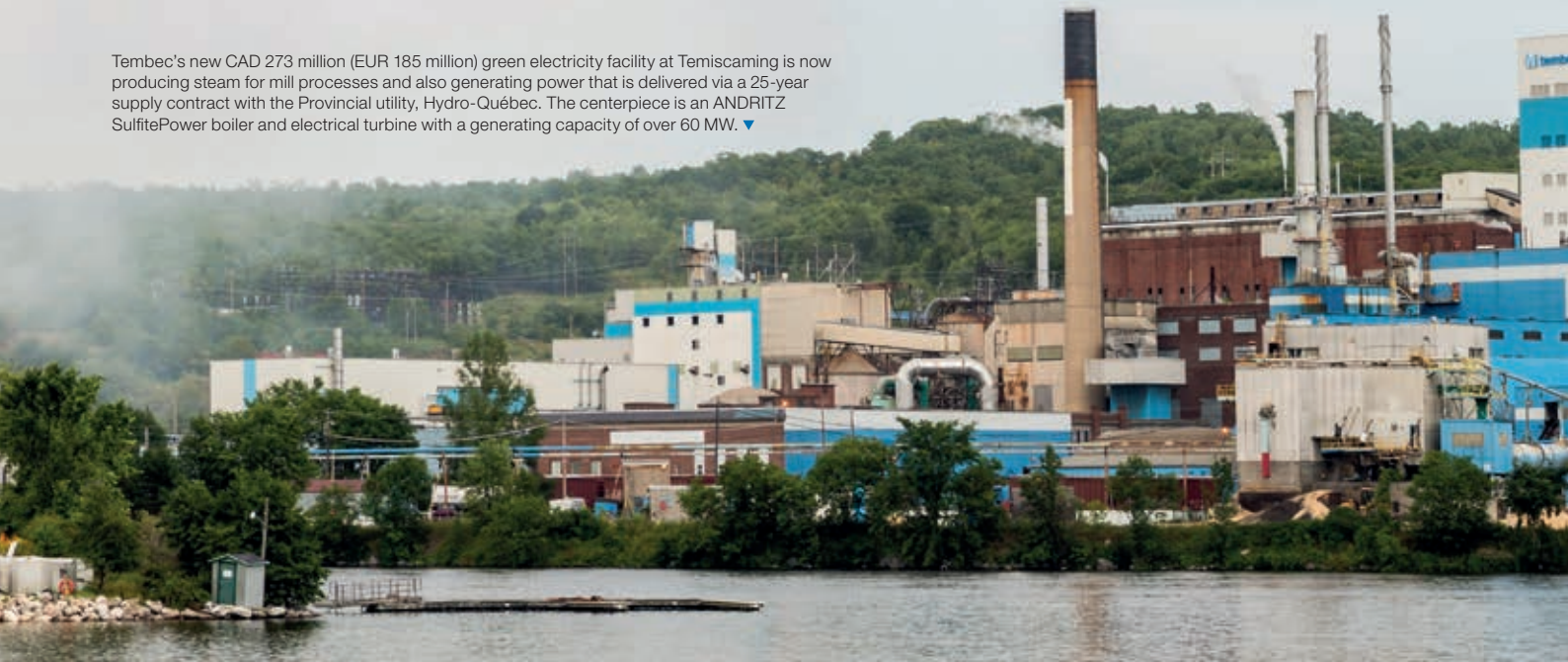
Tembec’s new CAD 273 million green electricity facility at Temiscaming is now producing steam for mill processes and generating power that it is delivering to the Provincial utility, Hydro-Québec, through a 25-year supply contract. The centerpiece is an ANDRITZ SulfitePower boiler and electrical turbine with a generating capacity of just over 60 MW. The

boiler burns “red liquor,” which is a co-product of the ammonia-based sulfite manufacturing process at the mill.

The main drivers, according to Paul Cousineau, Corporate Manager of Major Projects (who stepped in to become Tembec’s Project Manager after the original project manager experienced health problems) were the age of existing boilers and the desire to reduce SO₂ emissions considerably – plus the ability to create a steady stream of revenue from the power agreement with Hydro-Québec.

Efficiencies of the new ANDRITZ boiler improve manufacturing productivity and reduce costs. Once fully optimized, the new scrubber and environmental control equipment will reduce the mill’s SO₂ emissions by 70%, which will be much appreciated by the local community.

Tembec’s new CAD 273 million (EUR 185 million) green electricity facility at Temiscaming is now producing steam for mill processes and also generating power that is delivered via a 25-year supply contract with the Provincial utility, Hydro-Québec. The centerpiece is an ANDRITZ SulfitePower boiler and electrical turbine with a generating capacity of over 60 MW. ▼



Best available technology

ANDRITZ was selected to provide the engineering, the boiler itself, erection supervision (civil construction and erection were handled by Tembec), and commissioning services at Temiscaming.

“Sulfite mills are few and far between in Canada,” Cousineau says. “The last recovery boilers in North America for sulfite mills were installed in the late 1970s. ANDRITZ has done considerable work since then by installing sulfite boilers and chemical recovery units around the world. ANDRITZ has strongly promoted its design to the point that we believe it is the best available technology.”

ANDRITZ is unique in that it offers all three types of recovery boilers: black liquor (kraft), red liquor (sulfite), and sodium liquor (for example, sodium-containing effluents from the BCTMP process). “Our first sulfite boilers were installed in the 1950s,” explains Bernd Zuschin, ANDRITZ Project Manager, “so we have a long history and deep experience. We have continued to develop this technology and this is certainly recognized by our customers. For example, this is the first ammonium sulfite boiler we have ever built. Our deliveries up to this point have been for magnesium-based sulfite processes. We also delivered the world’s largest sulfite boiler and chemical recovery unit to Sappi Saiccor in South Africa, started up in 2008.”



Christoph Gruber, Commissioning Manager from ANDRITZ (standing), with Trevor Turner, Head Boiler Operator, in the control room. ▶

“We were looking for a highly flexible boiler to deal with the steam consumption swings at this site and not have our utilities constrain our pulp production processes,” Dottori explains. “ANDRITZ’s track record convinced us that they were the best supplier for this project. We were especially impressed with their capabilities in handling different and difficult fuels – even municipal solid waste, refuse-derived fuels, and various cooking liquors. We have two of their units at our sister mill in Tartar, France, which gave us a good reference.”

“Liquor incinerators”

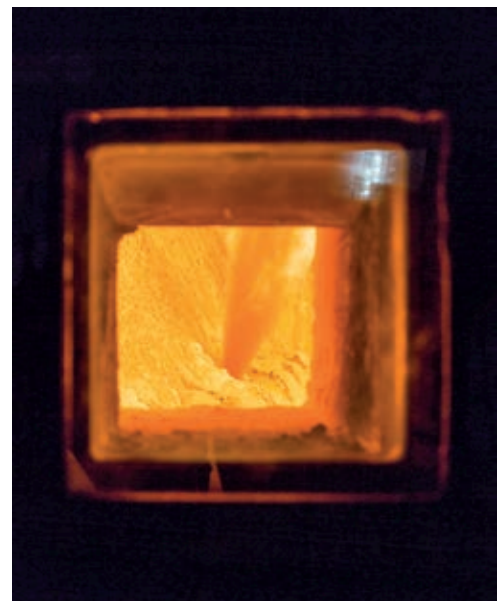
The new boiler replaced three operating boilers and one boiler that had been shut down. As Cousineau explains, “Our three old recovery boilers were what I like to call ‘liquor incinerators’ since they were converted coal-fired boilers operating at low pressures and

temperatures. They had reached the end of their useful life. Fouling was one of the biggest issues. This led to corrosion issues and made maintenance more intensive.”

Tembec began talks with then Austrian Energy & Environment (now ANDRITZ) in 2010 and sent out tenders the following year. “We began to talk in detail in 2011, and provided some budget estimates and calculations,” says Zuschin. “We signed the contract with Tembec in March 2012.”

ANDRITZ delivered all the boiler components to the site by mid-2013. “This was a relatively fast-track for delivery, especially considering the sea transports from Europe to Canada, but we made all of the milestones,” says Christoph Gruber, ANDRITZ Commissioning Manager. The boiler was started up early 2015.





▲ The ANDRITZ boiler has capacity to burn 78.5 t of wet liquor at 50% dry solids each hour, equating to 942 tds/d producing 222 t/h of high-pressure steam.

▲ Inside the boiler: liquor being sprayed into the furnace, atomized by steam.

Simplified operations and maintenance

Life for Tembec's boiler operators is now simplified. "We now run two boilers – a high-pressure bark boiler which had a small 8 MW turbine, and the new ANDRITZ boiler," says Trevor Turner, Head Operator. "With this project, we shut down the small turbine since it was only back-pressure and now have all the steam flowing through one high-efficiency turbine with a condensing unit."

Fouling is considerably reduced with the ANDRITZ boiler. According to Michel Monet, Steam Plant Superintendent, the arrangement of the heat transfer surfaces in the SulfitePower boiler allows his operators to optimize temperatures in specific zones to reduce fouling and potential corrosion. "This, coupled with the horizontal configuration of the economizer and superheater, will hopefully help us extend the time between major outages," he says.

About 78.5 t of wet liquor at 50% dry solids can be burned each hour. This equates to 942 tds/d producing 222 t/h of high-pressure steam. Ammonium bisulfite is recovered in the flue gas cleaning plant. Currently, due to limitations in the fiberline and evaporation plant, the red liquor is responsible for about 80% of the capacity of the SulfitePower boiler. Natural gas is now the supplemental fuel to achieve the steam capacity needed, but the boiler is designed to burn red liquor without supplemental fuel and sized to allow for upgrades in pulping capacity.

"We have room for expansion in our pulping operation," Dottori says. "We started replacing our refractory-lined digester vessels with duplex stainless steel, which will give us additional capacity in each of the 11 units."

Much-needed project

Trevor Turner and Dan Guénette, now both Head Operators, were appointed Operating Commissioning Coordinators and were involved with the project from the very beginning. The fact that the ANDRITZ boiler replaces three units creates a new mindset, according to Guénette. "When this boiler is down, the mill is down," he says. "So, we are training every operator to be at a high level to match our best people."

"Any large project requires a little time for the operators to get accustomed to it," Turner says. "But our operators have been up to the challenge. We are making adjustments day-to-day to further improve the boiler's performance. Now that the operators are learning the boiler, we are giving them more flexibility."

Turner and Guénette agree that the boiler is a much-needed addition. "The SO₂ emissions from any sulfite mill must be tightly controlled," they say. "This boiler does that superbly. This is a great thing for the environment and the local community. The boiler runs well and stabilizes quickly. We can adjust liquor flows and air ratios based on pulp mill needs, with most of the operation in automatic mode."

"The entire steam plant team was involved in making this project a success," says Marc Barrette, Mill Manager of the Specialty Cellulose mill. Barrette was Project Owner for the boiler project, responsible for commissioning and start-up. "Our operators and the commissioning team worked long hours on many consecutive days during the training and commissioning phases."

Turn the page

"The project is over; the boiler is built," Dottori says. "Now it is Operations' job to turn the page and look forward to the next 30 years. That is how we are working with ANDRITZ – shifting from project mode to operating mode: maintaining, optimizing, and then looking at future opportunities."

Dottori says the team made a lot of very good decisions in terms of equipment selection. "You can see that in the way that the mill is operating today," he says. "Our digesters and the board machine are performing better because of the solid and stable steam supply we are delivering to them. The boiler is big and robust, with spare capacity at the moment. It burns difficult liquors quite effectively. We're still optimizing, but overall we are happy."

Cousineau agrees. "I would definitely do another project with ANDRITZ," he says. "That's the bottom line."

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EVERYTHING HERE IS BIG

Interview with Júlio César Rodrigues da Cunha, Fibria's Director of Engineering and Projects and Joel Starepravo, ANDRITZ Project Director

The second pulp production line at Fibria's Horizonte mill near Três Lagoas will have a capacity of 1.95 million tonnes per year of bleached eucalyptus pulp. That will bring total production at the site to 3.05 million tonnes per year, making Horizonte one of the largest pulping sites in the world. Total investment in the second line is BRL 7.5 billion (USD 2.3 billion). ANDRITZ is supplying all the process areas (woodyard, fiberline, pulp drying, chemical recovery, and power island) on an EPC basis. We spoke with the Project Directors from both Fibria and ANDRITZ to get a status report on how the project is progressing.



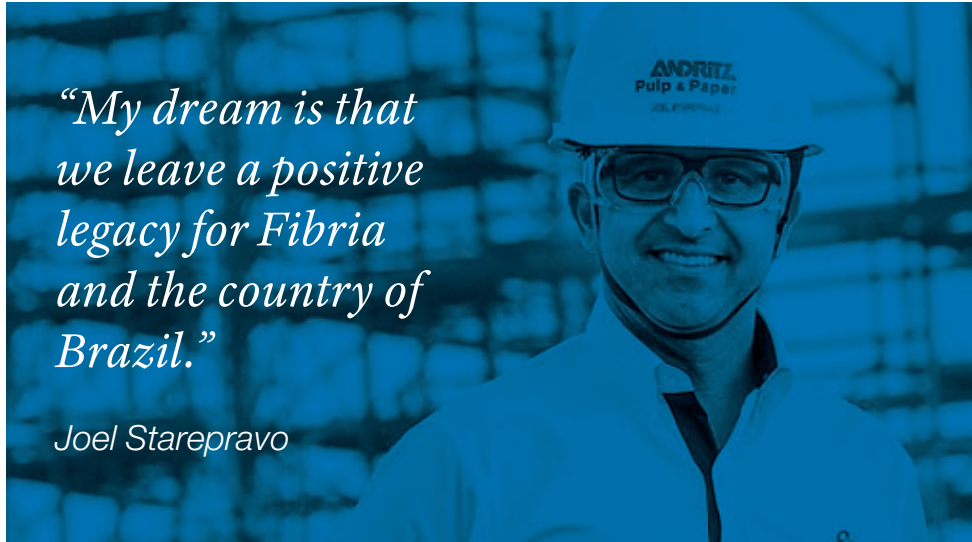
“

Even though this is the largest equipment in the world, I don't have any doubts.

Júlio César Rodrigues da Cunha



◀ Júlio César Rodrigues da Cunha, Director of Engineering and Projects for Fibria



“My dream is that we leave a positive legacy for Fibria and the country of Brazil.”

Joel Starepravo

Background for the project

da Cunha: “We have been planning the second line here at Horizonte for years and quite intensely since 2013. Our original calculations put the maximum line size at 1.5 million t/a. We kept wondering, though, if there was something we could do to make the economics more attractive. With some changes here, and an addition there, we arrived at a new conceptual design for a 1.75 million t/a mill.”

ANDRITZ approached us with some new thinking

da Cunha: “When it came ANDRITZ’s turn

for commercial negotiations, they asked if we would be interested in some new ideas to get design capacity up to 1.95 million t/a. Of course, they had our complete attention. We talked through the morning about what changes would be necessary and our technical people had intense discussions with their technical team. By the end of the day, we had a solution.”

Starepravo: “In the fiberline, Fibria wanted four of the DD Washers to be as big as possible. The size of our largest existing drums would limit production to 1.75 million t/a. We knew that would be a deal-breaker

if we couldn’t come up with a creative solution. Our technical team designed a bigger washer, on paper. But we didn’t have the manufacturing machinery to make that size of a drum. Our people in Finland set the wheels in motion to add a section to the workshop, acquire the larger machinery, and be able to manufacture these larger drums. When we presented our solution, custom-tailored to Fibria, we had a deal.”

No doubts

da Cunha: “Even though this equipment is the largest in the world, I don’t have any doubts. Of course, with any project





there are risks. But I can tell you these are all calculated risks. The concepts and designs are proven. We trust ANDRITZ. We have worked together for a long time. The real risk for us is schedule, as we are on a fast-track delivery for all the equipment.

Starepravo: “Fibra signed the contract for purchase in July 2015. Our schedule is to start-up the line in the fourth quarter of 2017. As of now, we are on target, in fact just a little ahead, with the civil work almost complete. Fibria did a great job getting all the roads, sewers, and other

infrastructure in place before the civil contractors came on-site. Even during our rainy season, the contractors could work effectively.”

da Cunha: “I have been doing project work for 30 years. This is the first project I have been involved with where we will start the mechanical erection with all the flooring, drainage systems, etc., in place.”

A complete team

da Cunha: “One thing we have chosen to do differently here is to co-locate everyone on our team to the same offices.

Not just the people building the mill inside the fence, but also all the related activities from the plantation nursery to shipping and logistics. This is truly a big team effort.”

Lessons learned

Starepravo: “The lessons learned from previous large projects is that the first 100 days are critical to the success of a project. If you don’t get started on the right things at the right speed, you are forever playing catch-up. We are fortunate that the timing of the Klabin Puma Project allowed us to move our teams from one





large project directly to another. This keeps the continuity. We are focused on making sure that the engineering is solid, that our subcontractors have the guidance they need to work effectively, and that the manufacturing quality and schedule can be ensured.”

Improved tools and methods

Starepravo: “We recently completed an internal development program involving worldwide project teams to improve capabilities. During that program, we developed better systems and tools to help us manage risk and identify potential problems before they become real issues. We also are using new measurements to understand our true productivity – not just the traditional percent-complete scale. We address areas where we are slipping behind and take corrective actions with our customer before there is a chance to seriously impact our schedule, quality, or safety.

Leaving a legacy

Starepravo: “This is obviously an important project for ANDRITZ, our largest. My dream for this project is that we not only deliver what we have sold and make the customer happy, but also that we leave a positive legacy for Fibria and the country of Brazil.”

ABOUT JÚLIO CÉSAR RODRIGUES DA CUNHA

Early years

Born in Araguari, Minas Gerais State; 53 years old

Education

- Electronic Engineering degree
- Post Graduate in Pulp & Paper Process Fabrication
- MBA in Business Management

Work life

- First job as process control engineer
- Process engineer for paper mill and consulting engineers
- Process and Project Engineering management at VCP
- Project Director at Bahia Pulp
- Currently Project and Engineering Director at Fibria

Private life

- Married
- Hobbies include travel and having fun with family/friends

Most important lesson

- People are the key to project success
- Open and shared management, combined with committed and well-prepared professionals in the right positions, will overcome any challenge.

ABOUT JOEL STAREPRAVO

Early years

Born in Curitiba; 46 years old

Education

- BSc Information Systems
- MBA International Project Management
- Post-MBA in Negotiation
- PMP Certificate

Work life

- First job as process control supervisor at Rigesa (WestRock) paper mill
- Extensive experience in commissioning and start-ups (Veracel, CMPC, Suzano, Fibria, etc.)
- Engineering Manager (EIA)
- Currently Project Director for Horizonte 2

Private life

- Married
- Hobbies include biking, running, and movies

Most important lesson

- Commitment and communication are essential to the success of a project, encompassing all levels in a company. The organization as a whole should be aware of the project and be encouraged to participate.

ENERGY-EFFICIENT FIBER TREATMENT



with Durabond refiner plates

The cost of fiber and energy represent about 60% of a paper mill’s manufacturing cost. Optimizing refining action with the proper refiner plate technology can, therefore, have a significant impact on the bottom line. This TechTalk discusses the development of low-cost, energy-efficient fiber treatment in the refining process.

Energy is a large component of cost for the paper industry, accounting for about 16% of total production cost. When you add the cost of fiber (approx. 44%), these two factors constitute about 60% of a paper mill’s manufacturing costs. Factoring in the macro influences of CO₂ reduction schemes, renewable energy policies, and energy efficiency policies, the ability to save energy with a very low investment cost is an important factor in a mill’s profitability.

No-load savings

Effective fiber treatment in a refiner requires what we generally term as the expenditure

of Net Refining Energy. This is calculated as the gross refining energy reduced by the so-called no-load energy. No-load is the power consumed when the refiner is in “idle” mode (i.e., stock flowing through the refiner, motor at normal operating RPM, and refiner plates farthest apart so that there is no impact on fiber morphology).

At the proper “nature of refining,” this Net Refining Energy demand can be determined by the requirements of the paper machine relative to the fiber type used. Once fiber treatment is optimized, this portion of energy consumption is fixed. The no-load

energy, however, can still be optimized by utilizing its exponential dependency on rotational speed and rotor diameter (measured at stable and continuous flow with water at operational refining gaps) based on calculations in Figure 2.

$$\text{No-load power} = k \times \text{Diameter}^{4.25} \times \text{RPM}^3$$

▲ Figure 2. No-load equation.

In this equation, it is possible to reduce no-load power by reducing the active plate diameter or reducing the rotational speed (RPM) of the refiner. A versatile, but capital-intensive option to optimize no-load power is to reduce the refiner’s speed by installing a frequency converter. An option to optimize gross power consumption, which is also an option that requires no capital investment, is to reduce the active plate diameter of the refiner plate (Figure 3).

Ultimately, the amount of energy savings that can be achieved through active plate size reduction is limited by the accompanying drop in available edge length (change in the “nature of refining” towards higher in-

Product	Paper machine energy use [kWh/ADt]		Refiner energy use [kWh/ADt]	
	Final	Primary*	Final	Primary*
Glassine	900	2.727	400	1.212
Uncoated fine	640	1.939	144	436
Packaging	535	1.621	112	339
Newsprint	570	1.727	68	206
Tissue	1.000	3.030	44	133

◀ Figure 1. Best practice energy values (final and primary) for standalone paper mills in the world.

ADT = Air-dried metric tonne

* Primary energy assumes electricity generation, transmission, and distribution losses of 67%

tensity) and hydraulic capacity of the plates (lower pressure at same flow).

Durabond development

Pursuing minimal Total Cost of Ownership (TCO) for its customers, ANDRITZ began an intensive development program resulting in the Durabond plate family.

For any new refiner plate manufacturing method to be worthy of consideration, it must exceed the capabilities of current production methods and lead to improved performance. The Durabond family (Durabond and Durabond Light) accomplishes this. The bars on Durabond plate have zero side angles (no draught) and smooth groove surfaces to achieve the best hydraulic performance. A high ratio of bar height to width (thin tall bars) increases service life, while optimized bar and groove widths allow maximum available edge length. This makes it possible to operate optimally with a reduced active plate diameter. New bar materials allow for high wear as well as breakage resistance. These elements are all necessary preconditions for optimizing TCO.

Durabond plates outperform current manufacturing methods by providing:

- Tightly controlled and highly consistent bar heights
- High height-to-width bar ratios for long life
- Bar materials that achieve the best combination of toughness and wear resistance
- Smooth groove surfaces
- Zero bar side angle (“draught angle”)
- Superior balance due to minimal differences in segment weights
- Safe and easy installation of low-weight segments
- Zero pulp/dirt accumulation due to closed back design

A holistic approach

Over the last years, ANDRITZ has complemented its proven Magnus Refining Simulator, an aid in the development and fine-tuning of plate designs, by “dialing-in” to a mill’s specific requirements through a

Active plate diameter	Reduced plate diameter	Estimated power savings [kWh]		Annual power savings [kWh/a]	
		Final	Primary*	Final	Primary*
Inch	Inch				
46	43	43	130	339.012	1.027.206
42	39	50	152	394.200	1.194.426
38	35	35	106	275.940	836.098
34	31	42	127	331.128	1.003.318
30	27	27	82	212.868	644.990
26	23	33	100	260.172	788.321
20	17	32	97	252.288	764.433

Power savings calculations are based on 90% availability
 * Primary energy assumes electricity generation, transmission, and distribution losses of 67%

◀ Figure 3. Energy reduction potential: final and primary.

proprietary Fiber Floc Analysis (Figure 4). This analysis guides a specialist in tailoring the bar and groove dimensions of the Durabond plate to a mill’s specific pulp, which in turn allows minimizing the plate diameter at optimum fiber quality. By addressing fiber treatment and energy savings at the same time, the Durabond solution is truly a holistic approach to lowering TCO.

Durabond manufacturing

The innovative concept behind Durabond manufacturing is to disassociate the materials for the refining bars from the materials for the segment base plate. This allows the use of new materials (i.e., work-hardened steel) and new manufacturing methods to create a refiner plate with minimal weight, maximum toughness, and the highest repeatable pre-

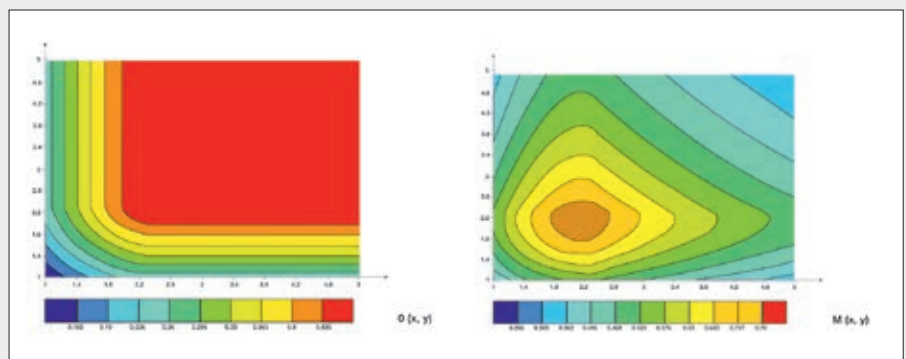
cision. Precision lasers are used to cut bars from work-hardened stainless steel. These bars are then inserted into the laser-cut slots in the base plate (Figure 5).

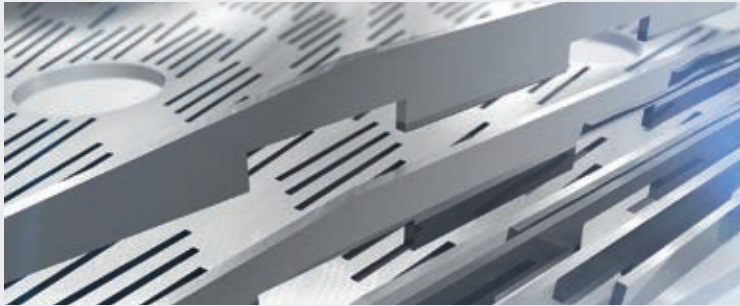
Laser technology represents the highest standard in accuracy and repeatability. This is combined with low-temperature bonding techniques to ensure that distortions from warp and twist are eliminated. Proprietary bonding agents are used, which are safe and durable in elevated temperature applications such as TMP post refining. The modular construction method ensures the highest strength and sturdiness.

Regular and light versions

For disc refiners from 12-26" rotor size, Durabond refiner plate segments are produced in their regular shape (Figure 6), because seg-

▼ Figure 4. Fiber floc analysis.





◀ Figure 5. Durabond laser-cut bars.

ments for refiners of this size are comparatively small and lightweight. Segments for refiners with rotor sizes larger than 26" are usually more demanding and difficult to install because of their size and weight.

For these larger sizes, ANDRITZ developed a multi-segment design concept – Durabond Light – with the maximum weight of any segment at 20 lb (Figure 7).

Durabond Light segments are mounted on a reusable base plate, which is delivered with the first installation (Figure 8). This makes the changing of refiner plates safe and easy.

Best applications for Durabond

Since Durabond refiner plates feature specifically tailored bar geometries for maximum fiber quality development at minimum plate size, they work best in applications where fiber quality development is critical (e.g., tissue, printing/writing grades, TMP post refining, high-test packaging grades, etc.). The energy-saving characteristics of the plate design, however, are applicable in virtually all refining applications. With the exception of sauerkraut, hot stock, and deshive refining, all raw materials and qualities can be processed and optimized with Durabond. With the flexible mounting ca-

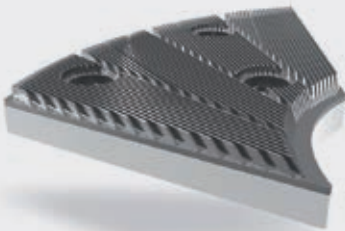
pabilities, Durabond plates can be installed on every single- or double-disc refiner in the market.

CONCLUSION

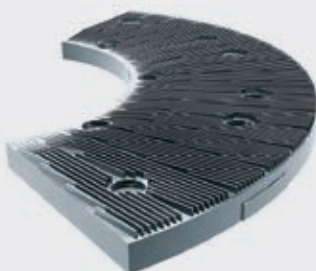
Focusing solely on energy efficiency in refiner plate applications limits the likelihood of sustainable success. Pursuing the best fiber treatment and energy efficiency combined should, therefore, be the goal. This involves detailed refining system audits by qualified product specialist, analyses, and Magnus simulations. The result will be a customer-specific optimum bar and groove configuration at minimum plate diameters. In this way, Durabond will sustainably improve the bottom line of paper mills.

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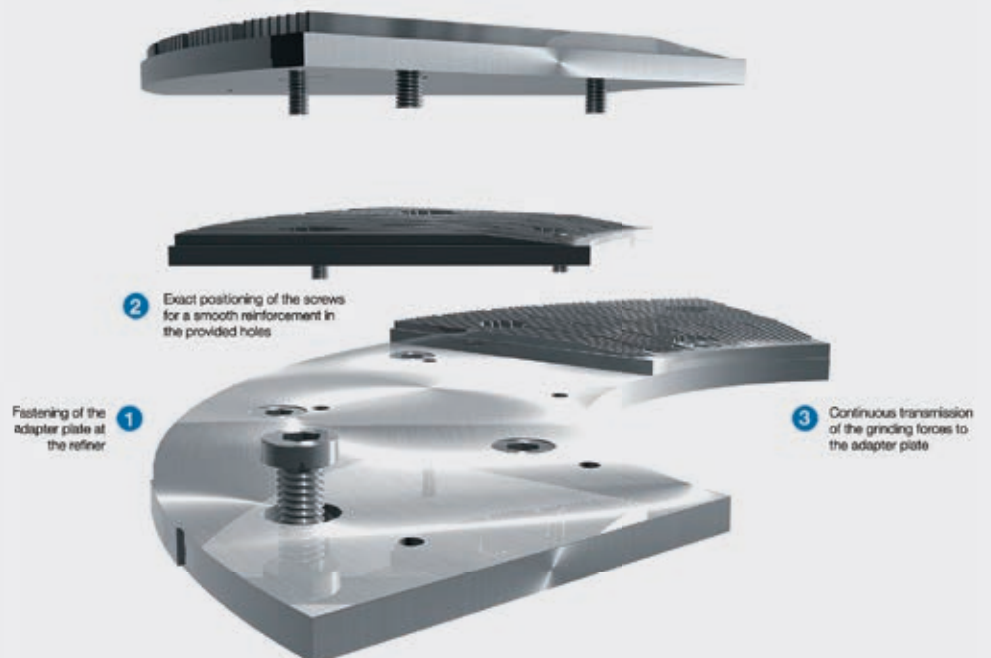
▼ Figure 6. Regular Durabond segment.



▼ Figure 7. Durabond Light segment.



▼ Figure 8. Durabond Light mounting method.





Iggesund Paperboard's mill in Workington, UK will soon celebrate the 50th anniversary of its first production run. But, this is a company that focuses mainly on the future. Following the latest in a line of investments, it recently restarted its board machine after ANDRITZ rebuilt the press section – increasing capacity 10% and reducing energy consumption by almost 10%.

Europe's folding boxboard market is in transition with new machines starting up. "The supply/demand situation has changed since we decided to rebuild the press section of BM2," admits Ulf Löfgren, Mill Manager at Workington. "But the investment is still quite valid. We wanted increased volume and consistent quality with reduced energy consumption. Our strategy is to focus on the premium segment and we have a very good product with good quality."

Sweden's Holmen Group, parent company of Iggesund Paperboard, has been investing progressively in Workington's future for

years. On BM2 itself, the mill previously had upgraded the wire section. At another time, ANDRITZ installed a new hood for the Yankee cylinder. Iggesund also invested in a new bio-fuel boiler (an ANDRITZ unit) in 2011, switching from natural gas to biomass energy. Even after these investments, the work continues. As Löfgren says, "We are in a good place, but you must always improve. It must be good. It must be brilliant!"

Tonnes of quality

As part of the pre-project analysis, ANDRITZ sent a team of experts to assess different options on the machine. ANDRITZ's Roland

Scheiflinger, Vice President Paper and Board, believes this analysis convinced the Iggesund team that the press section needed to be upgraded before anything else, because there would be little point in increasing capacity elsewhere if the press section remained a bottleneck.

And removing bottlenecks to increase production is a genuine priority at Workington. The infrastructure at the mill is set up for about 250,000 t/a of packaging board production. Production of cartonboard reached its peak in 2008, when Workington was operating two board machines. The mill's on-site pro-

It must be good.

IT MUST BE



duction of mechanical pulp for their board's inner layers is sized to support this level of production. The future target of increasing BM2's capacity will bring the mill's pulp and board production back into balance.

"It is extremely important to get tonnes onto the market," Löfgren says. "That is of great value to us."

Indeed, Workington could have gained additional capacity by upgrading other parts of BM2 before the press section. But maintaining, and even improving, product quality was also key. Löfgren explains it in this way: "The press section is a critical part of any machine, impacting efficiency, economics, and quality. Not only was the press section on BM2 a bottleneck, upgrading it also offered the best potential for a boost in product quality all the way down the machine."

As the UK's only producer of paperboard using virgin fiber, Workington does not compete with other UK mills, but rather with producers of solid bleached board and folding boxboard around the world. "In the last decade, our strategy has been to move up the quality chain and focus on premium segments," Löfgren says. "In these premium segments, product quality needs to be the same on Monday morning as it is on Saturday night."

Workington produces the Incada brand of packaging board, which is available only in the GC1 and GC2 qualities. Incada was re-specified and re-launched in 2013, and is now among the most recognized folding boxboard brands in Europe, along with Iggesund's Invercote brand. Incada is sold for high-quality packaging of cosmetics, pharmaceuticals, confectionery, and premium or luxury items.

Talking shop

In planning the project, ANDRITZ and Iggesund Workington spent time discussing the best configuration for the press section: two shoe presses vs. the combination of a long-nip press (LNP) with a shoe press. According to Scheiflinger, "two shoe presses would give more uniform dewatering and better bulk, plus higher throughput. On the other hand, the combination of an LNP with a shoe press would provide both stiffness and dryness. In either case, these would be followed by a smoothing press."

Gary Pickering, Head of Workington's Project Department and Project Manager for this rebuild, says, "We had been looking at press section options for two years. At first, we were only considering the pick-up roll, but the scope expanded and every time it did, there was a justification for it. In the end, we

BRILLIANT!

replaced everything and opted for the combination LNP and shoe press.”

Scheiflinger believes that the work his team did at the front-end showed Workington people that ANDRITZ really understood the machine. Löfgren concurs. “Our decision to award the order to ANDRITZ was based on the work they did in the pre-decision phase,” he says. “They worked closely with us and showed us that they wanted the project. We felt we would be able to work with them in a good atmosphere of cooperation and partnership. We have a lot of confidence, trust, and belief in ANDRITZ. We were in the same boat together. It has been a successful project.”

Scheiflinger sums it up: “We tried to be a very proactive partner, not just a supplier. We didn’t just want to deliver hardware, but we wanted to improve the performance of the machine.”

Pressing matters

ANDRITZ installed a complete new press section including a long-nip jumbo press with large-diameter rolls, an energy-efficient PrimePress X shoe press in the second nip, and a smoothing press. The delivery also included ANDRITZ’s state-of-the-art PrimeFeeder vacuum system for ropeless tail threading from the press section to the dryer section. Erection services, commissioning, start-up, and optimization were all part of the package.

“In addition to the press hardware,” says Barbara Freyler, ANDRITZ Director of Order Execution, “we supplied new drives for the wire and press section, the motor control center, multi-motor integration with BM2’s existing drive system, an ANDRITZ FibreSolve broke repulper under the machine, all the power and data cabling, field instrumentation, and electrification.”

According to Scheiflinger, there are sev-

eral technical advantages to the installation at Workington. “First, the shoe press is a very low-maintenance design and gives the mill flexibility in choosing the belt supplier. Second, the hole design in the Uhle boxes was a big plus and the simplified vacuum system for the wire and press section allows the existing vacuum pumps to be controlled individually. Finally, the automation includes our state-of-the-art PrimeControl system which features ANDRITZ-written software on PCS7 hardware from Siemens.”

Workington working

The plans looked good on paper. How did everything go in reality?

Löfgren says, “The project went very well. We met all of our major milestones. A lot of praise and credit goes to the ANDRITZ team – they were excellent. The machine achieved the target quality and produced saleable board quickly after start-up.”

“The project went very well. We met all of our major milestones. A lot of praise and credit goes to the ANDRITZ team.”

Ulf Löfgren
Mill Manager; Iggesund Paperboard, Workington mill



▲ The ANDRITZ PrimePress X shoe press is a very low-maintenance design that gives the Iggesund Workington mill the required bulk and dryness for its premium board products.

“We have gained speed on all grades, including the higher grammages where we did not think we would.”

Gary Pickering
Head of Project Department; Iggesund
Paperboard, Workington mill



“We have gained speed on all grades, including the higher grammages where we did not think we would,” Pickering says. BM2 was press limited to about 450 m/min. It is now mechanically designed to run up to 800 m/min, although speeding up the machine largely depends on future upgrades.

Commenting on the new vacuum system, Pickering says, “We were worried that we might not have enough vacuum capacity. With the new design, we can run with one spare pump. It is working even better than we expected.”

The last word goes to Mill Manager Löfgren: “ANDRITZ has done a great job. If anything, they have strengthened their position.”

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Pickering adds: “There was a sheet on the reel in well under a half day. It was a big achievement for all of us because it was a tough timescale.”

According to Freyler, “Our teams worked as one and never lost sight of the main goal. We learned from each other and about ourselves.”

Many of the results of the upgrade are al-

ready evident, while others will only be seen in the future. “Our customers want lighter weights,” Löfgren says, “so we are pushing to get the desired bulk with lower grammage. We believe we now have the foundation to do this.”

Scheifflinger adds, “Board stiffness has been increased at all grammages, while the bulk remains similar. That was the goal.”



▲ ANDRITZ installed a new press section on Iggesund’s BM2, including a long-nip jumbo press with large-diameter rolls, an energy-efficient *PrimePress X* shoe press in the second nip, and a smoothing press. The delivery also included ANDRITZ’s state-of-the-art *PrimeFeeder* vacuum system for ropeless tail threading from the press section to dryer section.



▲ (L to R): Ulf Löfgren, Mill Manager, Iggesund Workington Mill; Barbara Freyler, ANDRITZ Director of Order Execution; Roland Scheifflinger, ANDRITZ Vice President Paper and Board, and Gary Pickering, Head of Workington’s Project Department.



Gerhard Schiefer

Head of ANDRITZ AUTOMATION

SMART Simulation as a part of the design flow.

In the context of Industry 4.0, “simulation” is one of the buzzwords. It is typically used in the context of process industries, for example the pulp & paper industry, to describe systems that model the process to virtually train operators before the actual plant is started up. But, are there new uses and new opportunities for simulation technologies?

Simulation technology has been utilized in certain industries for some time. We are all familiar with flight simulators, for example, which are used to train military and airline pilots. The simulators can be quite realistic – presenting various scenarios to trainees in a safe, virtual environment so they can learn to master critical situations.

In a similar way, ANDRITZ’s IDEAS dynamic simulator is a cutting-edge tool in pulp and paper mills. It produces an exact virtual model of the customer’s process and the operator interface. Typically, IDEAS is employed to verify

control loops in a plant’s distributed control system and then act as an operator training tool. The results of using simulation are well documented – faster start-ups, quicker response to process disturbances, and faster ramp-ups to full production.

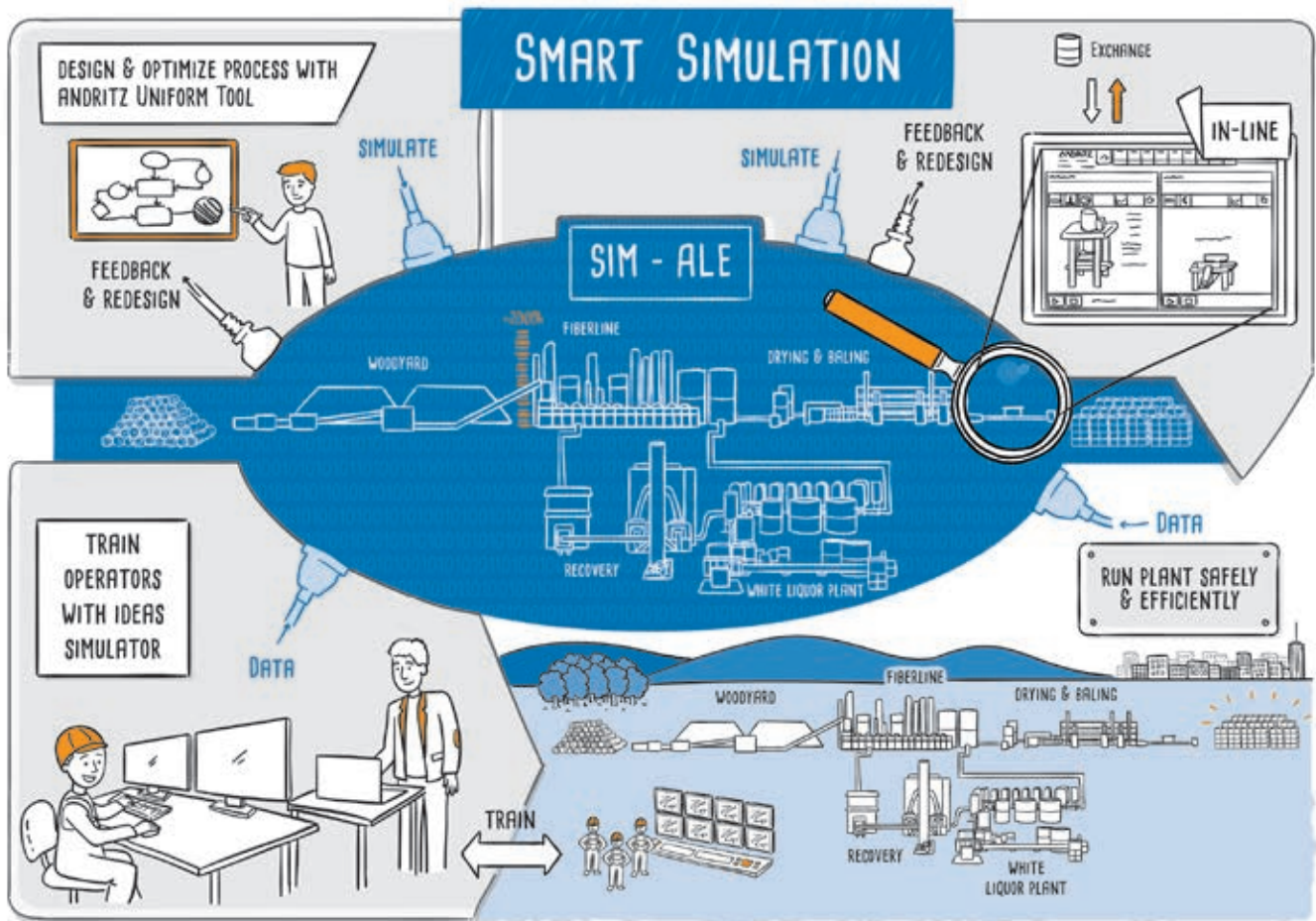
In addition to this familiar use of simulation technology, what are the latest developments? One development is the extension of the IDEAS Simulator so that it can be deployed as a certified operator training system. This has been utilized at the Zellstoff Pöls mill in Austria to carry out the recurrent training required by the mill’s insurance company to certify safe operation.

SMART Simulation: quality enhancement and risk reduction

Another new development is the use of simulation technology as a design tool. For example, ANDRITZ is implementing SMART Simulation upstream in the design process to dynamically and digitally verify the design. For process design, we use the SIM-ALE platform. For machinery design, we use the IN-LINE platform.

SIM-ALE for process design

Within ANDRITZ, we have a common computer-assisted engineering system for process, functional, automation, and instrument design that we call the ANDRITZ



Uniform Tool. In order to simulate the functional specifications being designed in this engineering tool, we developed the Simulated ANDRITZ Logic Engine (SIM-ALE) to simulate the functional behavior of the process in combination with our IDEAS system that simulates the process itself. This combination gives us the ability to verify the effectiveness of our design very early in our workflow – reducing downstream errors and expensive rework.

IN-LINE for machinery design

With our IN-LINE simulation tool, the functional behavior of a machine is tested against the application design prior to man-

ufacturing. This eliminates major design flaws, improves the overall quality of the machinery, and shortens the time for commissioning and start-up. The IN-LINE tool runs on virtual machines simulating the operator interface and the real machine. All of the machine’s inputs/outputs are included, as well as the actual operator interface, so that different operating scenarios (including failures) can be simulated and tested.

For example, when we apply our IN-LINE design verification tool to our bale handling machine (dried pulp bales), we can simulate the actual bale transfer. All sensors and actuators are shown in the simulated user

interface. A sensor or machine error can be simulated to verify how the machinery stops the bale packing process and alerts the operator. By opening the alarm screen, detailed information about how to eliminate the fault can be shown. Once this design is perfected and verified, the design is locked and passed to manufacturing for commercial release.



Watch our video

WINTER WARMTH

from the forest

Environmental concern is deeply embedded within Sweden's DNA. ANDRITZ recently added to this environmental commitment by supplying a biomass combined heat-and-power (CHP) plant to keep residents of the town of Mjölby warm in the winter – using renewable fuels from local forests.



With a workforce of just 65, Mjölby-Svartådalen Energi (M-SE) is a lean company that supplies district heating and electricity to the people in Östergötland County, Sweden. In addition, the company is impressively green, as exemplified by its slogan “Lokalt producerad energi från skog, vind och vatten” (“Locally produced energy from wood, wind, and water”).

Producing energy and heat from renewable sources is a carefully devised strategy. Christer Kjellberg, Head of Projects at M-SE, says, “It is the company mission to produce as much energy, electricity, and district heating from renewables – hydro, wind, and wood – as we can. Last year, over 90% of our output was locally generated from renewables. We are setting records in this region, and even in Sweden.”

Kjellberg was talking to SPECTRUM in M-SE’s offices overlooking the brand new plant supplied by ANDRITZ. Inside the boiler house is a 35 MW EcoFluid (bubbling fluidized bed) boiler along with all the attendant infrastructure and automation technology.

In the beginning, district heating was supplied to the 26,000 residents of Mjölby by oil-fired boilers. In the mid-1980’s, the first biomass-fired boiler (12 MWth) was purchased. Small biomass-fired boilers were also purchased in the late 1990’s (9 MWth) and in 2008 (5.5 MWth). The investment in a new boiler was driven not only by the age and relative efficiency of the existing boilers, but also by the desire to reduce dependence on fossil fuels and to lower the overall cost of producing district heating. “Our existing boilers were becoming less efficient, and we needed more capacity,” Kjellberg says. “More importantly, by adding CHP capabilities, the income we produce from power production can be used to offset the district heating production cost.”

A decision had to be made

It was 2010 when it became very clear that the existing boilers were at maximum capacity. “With the units being over 30 years old, it was time to look at something new,” says Kjellberg. “We have always been able to keep up with local heating requirements thanks to our pipeline link to a CHP plant in Linköping, 35 km away. But the Mjölby plant was clearly being put under more and more pressure.”

M-SE’s management had already conducted feasibility studies for a biomass CHP plant beginning in 2008 with a pre-study. “We did a lot of work and had many discussions,” Kjellberg explains. “It was in 2012 when serious discussions were taking place and then the final decision came in June 2013.”

M-SE issued a tender to six companies for a new



biomass power plant that would use wood chips, forest residues, and sawdust as fuel. Design capacity was to be 35 MW for heat, and 10 MW of electricity. "We knew what we wanted from the start," says Kjellberg. "We provided a scaled-down sketch of how we wanted the new plant to look and made a 3D model of the building before we sent out the tender."

During the tender process, M-SE visited two important ANDRITZ references in Sweden (Söderhamn and Bollnäs). ANDRITZ was selected to supply almost the complete plant except for the ground and civil work for the foundation, as well as an HV cubical after the turbine. The contract was signed on September 12, 2013. The ANDRITZ teams in Austria and Finland supplied the boiler and the external fuel systems, and ANDRITZ AUTOMATION in Austria delivered the low voltage equipment and the ABB control system.

"Everything that is visible above the ground in the new plant came from ANDRITZ," says Christian Lackinger, ANDRITZ Project

Manager. "The rest was civil works carried out by a Swedish company. We delivered the EcoFluid BFB boiler, fuel handling system, flue gas cleaning system, steam turbine with auxiliaries, and the electrical systems."

Renewable, sustainable fuel

The fuel for the plant comes from within a 30 km radius and is predominantly in the form of waste from the forest, but also includes wood chips, bark, and sawdust. Occasionally logs are bought and a local contractor produces chips from the logs in the CHP plant's woodyard.

The fuel handling system supplied by ANDRITZ includes equipment to receive 400 m³/h of biomass, all screening, storage up to 4,000 m³, and conveyor systems to feed the boiler.

From rock to clay

"The actual construction of the plant was quite a challenge," says Kjellberg. "The ground here ranges from hard rock to bottomless clay, and there was a challenge building a new plant so close to the exist-



ing one. In some places we had to blast out hard rock and in other places we had very soft clay, so we had to insert numerous piles down to 20 meters to support the civil construction."

All challenges were overcome with excellent cooperation, according to Lackinger. We started cold commissioning in May 2015, with hot commissioning following three months later," he says. "The plant was fully taken over by M-SE in July 2016 after good collaboration with our start-up team."

"Our plant operates seven months of the year, and ran at full load for the first time last winter," says Production Manager Anders Ejhed. "Start-up went well. It took us some time to tune and optimize the operations, mostly focused on getting the biomass fuel mix right."

Ejhed explains there were things for his team to learn. "The bubbling fluidized bed boiler was new technology for us," he says. "ANDRITZ people have been here to support us at all times. The downtime during the summer months was a perfect opportunity for us to iron out any problems with the fuel, adjust the boiler, and thoroughly train our team at the site."

“By adding CHP capabilities, the income we produce from power can be used to offset the district heating cost.”

Christer Kjellberg
Head of Projects
Mjölby-Svartådal Energi





◀ Piping system.

L to R: Anders Ejhed, Production Manager; Christian Lackinger, ANDRITZ Project Manager; and Christer Kjellberg, Head of Projects. ▼



Mjölby's biomass fuel comes from a 30 km radius. ▶



Flexibility - a major feature of Mjölby

One of the main features of the new Mjölby plant is the flexibility to adjust the electrical output from the turbine according to where the energy output of the boiler is needed most, or is most economically viable. Lackinger explains, "The main target is to provide district heating, but M-SE installed a turbine to also produce electricity. From the total fuel value of the wood chips, it is possible to produce 23 MW for the district heating network and 10.8 MW of electricity. If you put all the steam to the turbine, the ratio of electricity-to-steam is about 1:2. In

most plants, if you reduce electrical output, you also reduce district heating energy. The Mjölby plant is a bit different. We direct part of the steam to a heat exchanger that converts this steam input directly to district heating energy. So, M-SE can produce down to about 2 MW of electricity and up to about 31 MW of district heating energy at the same time. This allows them to adapt to heating requirements from the community, fuel mixtures, and the need for electrical energy."

So what's next for the Mjölby plant? Kjellberg says, "We should be running at full capacity

after firing up in October for the winter. We expect the plant to operate at around 90% efficiency, and we have plans to improve this even further by installing a flue gas condenser. We already have the infrastructure in place to install it. This will be our next investment, which will take our efficiency to around 98%."

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Highlights

RECENT ORDERS

COMPLETE LINES AND SYSTEMS

Carta Fabril, Anápolis, Brazil

PrimeLineST W22 tissue machine including steel Yankee and steam-heated hood
World's largest steel Yankee (22 ft diameter) for tissue

Bashundhara Paper Mills, Dhaka, Bangladesh

PrimeLineCOMPACT VI tissue machine including stock preparation, machine approach, and automation

Dong Hai, Ben Tre, Vietnam

3 complete stock preparation lines and paper machine approach system
Repeat order (PM1 completed last year)

JSC Volga, Balakhna, Nizhnyi Novgorod Region, Russia

Complete Advanced Thermo-Mechanical Pulp (ATMP) line

Helsingør Kraftvarmeværk, Helsingør, Denmark

Biomass boiler island for CHP plant
Scope from fuel silos to boiler outlet

UPM, Kymi, Finland

Equipment for upgrades to fiberline, white liquor plant, and evaporation plant

Suzano Papel e Celulose, Mucuri, Bahia, Brazil

Fiberline upgrade; evaporation plant retrofit

Stora Enso, Kemi, Finland

Fiberline modernization including new DD Washer
Conversion from single-stage to two-stage oxygen delignification

Sappi North America, Skowhegan, Maine, USA

High-capacity debarking line and woodyard equipment
Includes extra-large (XXL) HHQ-Chipper and ChipperEKG condition monitoring

EQUIPMENT/UPGRADES

Heinzel Group, Laakirchen, Austria

Conversion of SC paper machine to lightweight containerboard (including new film press and PrimeDry Steel cylinders), new OCC line, approach system rebuild, sludge system, and rejects handling
This will be ANDRITZ's widest GapFormer and two-layer headbox (8.5 m)

Shandong Bohui Paper, Zibo, Shandong, China

Upgrade of BCTMP line
3rd major rebuild project of competitor's technology

Metsä Tissue, Kreuzau, Germany

FiberFlow Drum pulper for tissue

Cartulinas CMPC, Planta Maule, Chile

Bleaching stage upgrade

Caima Indústria de Celulose, S.A. Constância - Sul

Fabrica Constancia, Portugal
Cutter/baling line rebuild

Naberezhnye Chelny Paper Mill

Naberezhnye Chelny, Russia

PrimeCoat Size size press, PrimeReel Standard pope reeler, machine drives, and two pulpers
Follow-up order

Fibra, Jacaré mill, São Paulo, Brazil

Duct Stripper technology for two evaporation plants
1st in Brazil for lamella evaporation plant; 1st in world for tube-type evaporation plant

Sappi Southern Africa

Sappi Saiccor Mill, Umkomaas, South Africa

Partial rebuild of economizer section of a SulfittePower boiler

BMC Moerdijk, Moerdijk, Netherlands

Pressure parts for a boiler retrofit

Propower, Eisenhüttenstadt, Germany

Retrofit and overhaul bed material cooler for ANDRITZ power boiler



▲ The steam drum for the largest recovery boiler in the Americas is shown being lifted into position at Fibria's Horizonte 2 construction site. The drum weighs 200 t and the lift was 70 m high (See SPECTRUM article page 25).

RECENT START-UPS

COMPLETE LINES AND SYSTEMS

Vinda Paper, Sanjiang, Xinhui, Jiangmen, China
Stock preparation line

Nine Dragons Paper
Dongguan, Guangdong, China
AhiCleaner plant

Sun Paper, Yanzhou, Shandong, China
OCC processing line, rejects handling, stock preparation, machine approach, pulper

Guangdong Shaoneng Group
Shao Guan, Guangdong, China
PrimeLineCOMPACT II tissue machine with steel Yankee, stock preparation, automation, drives
Part of furnish will be mill's bamboo pulp

St. Croix Tissue, Baileyville, Maine, USA

PrimeLineTM W8 tissue machine
2nd machine (see SPECTRUM article page 6)

FRITZ EGGGER, Gagarin, Russia

New evaporation line for MDF plant

Walsin Lihwa, China

Equipment for zero-effluent mixed acid pickling process (metals)
Zemap evaporator – first of its kind

Smurfit Kappa, Piteå, Sweden

Capacity upgrade for evaporation plant

EQUIPMENT/UPGRADES

Iggesund Paperboard (Workington)
Workington, Great Britain

Board machine rebuild with new press section
Turnkey delivery excl. civil work (see SPECTRUM article page 32)

Zellstoff- und Papierfabrik Rosenthal
Blankenstein, Germany

Lime kiln upgrade with LimeFlash lime mud drying technology

Electricity Authority of Turkish Republic of Northern
Cyprus, Girne, Northern Cyprus

Retrofit project for two 60 MW oil-fired power boilers: engineering, supply, installation, and commissioning of superheaters and economizers

DID YOU KNOW THAT...



... ANDRITZ offers a fully automatic control system for your refiner?

The Hydraulic Commander replaces outdated hydraulic systems and mechanical gap control and can be easily retrofitted to any brand refiner. It monitors and controls refining gap, hydraulic pressure, and specific output.

Watch the video at:

<http://www.andritz.com/hydraulic-commander>

... ANDRITZ will be exhibiting at Tissue World Milan?

Tissue World Milan is the world's largest tissue exhibition and meeting point. Dates of the exhibition are 10-12 April 2017. It is a great opportunity for tissue producers to network, exchange ideas, and see the latest technologies.

Visit ANDRITZ at:
Hall 3, Booth F 680



... the world's largest DD Washer drums are on their way to Brazil?

ANDRITZ invested in specialized equipment to manufacture these large drums for the Fibria Horizonte 2 project. The drum length is 10 m and the diameter is 5.5 m. The drums will be installed in the brownstock and post-oxygen washing positions on Fibria's giant (1.95 million t/a) fiberline being constructed at Três Lagoas.

Get more information about DD Washers at:
www.andritz.com/dd-washer

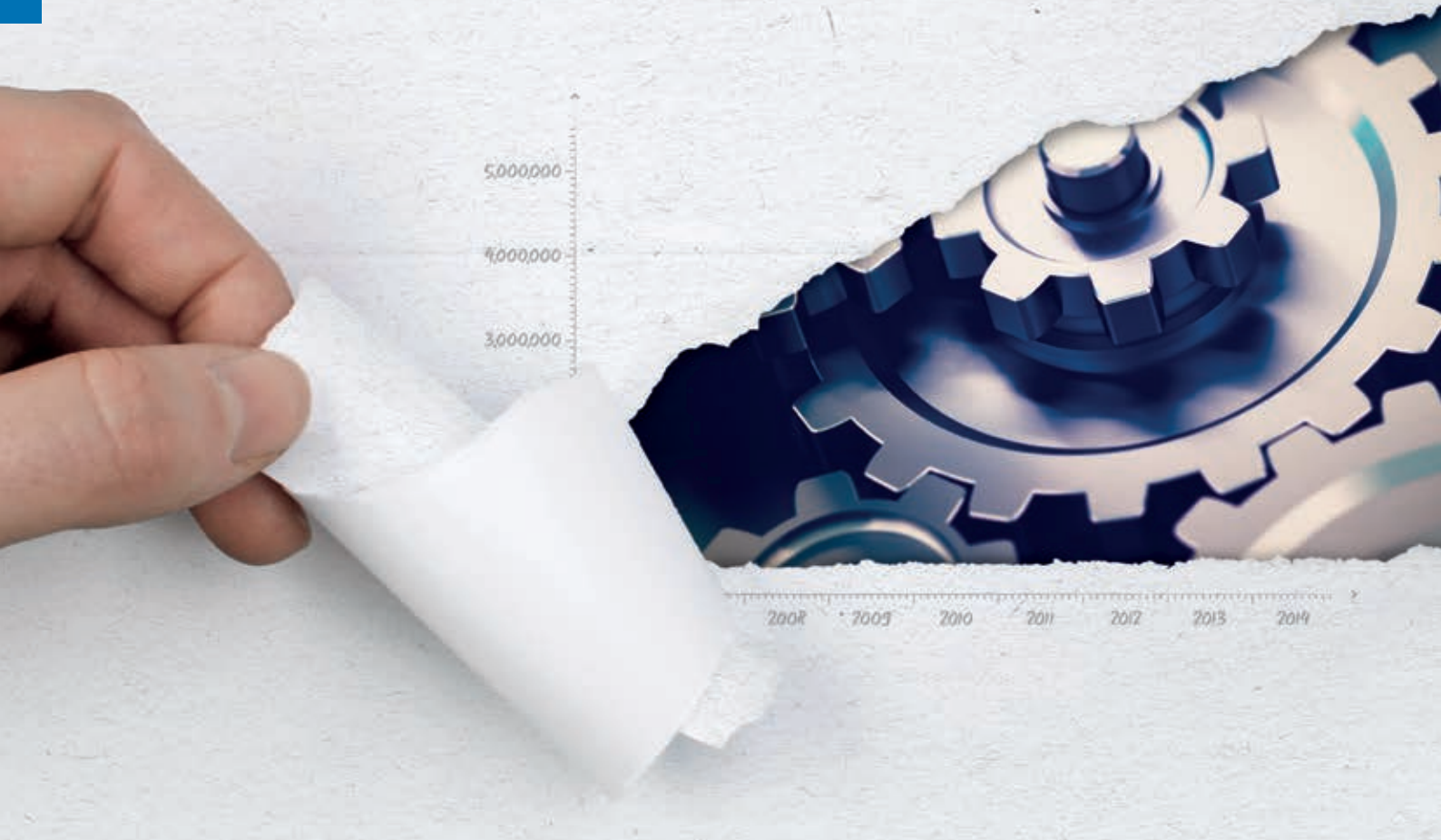
... there is a service to improve the availability and performance of your wash press?

No matter who the original manufacturer was, ANDRITZ offers a range of wash press service designed to troubleshoot, remove bottlenecks, solve outlet consistency issues, improve pulp quality, reduce COD loading, replace worn parts, assist during shutdowns, and upgrade pulp feeds and press rolls.

Get more information at:
www.andritz.com/fiberlineservice



Here's a fresh perspective on improving your bottom-line efficiency.



We focus our technology and services on your bottom-line efficiency, so that you can profit in virtually any market.

As your partner, ANDRITZ tries to ensure that everything we do helps you increase your efficiency and lower your costs. You can

benefit from our technological leadership. Our solutions increase throughput, reduce waste, improve yield, substitute less costly raw materials, generate power, reduce energy costs, and keep your equipment running longer. We are your tech-

nology and service partner. When you need a fresh perspective on raising your bottom-line efficiency – let ANDRITZ open up new possibilities for you.