



SPECTRUM

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IDENTICAL TWINNS

Corelex Shin-Ei Paper // 23

CLEANER. LONGER. STRONGER.

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NEVER STANDING STILL

Continuous improvement has become
a way of life at Zellstoff Stendal in
Germany // 14



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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On the cover: Never standing still (page 14), Cover/page 14: Rocksweeper - shutterstock.com

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Never standing still

We love how Adolf Koppensteiner, Managing Director at Zellstoff Stendal, phrases it: “A mill is never totally up to date. If you stand still, you go backwards.”

When Koppensteiner came to the mill in 2013, he started a “continuous improvement program” to reach certain world-class goals for availability and efficiency. You can read about Stendal’s progress, and ANDRITZ’s contribution, beginning on page 14. ANDRITZ has been a technology and service provider for Stendal since the mill started up in 2004, providing technical services, rebuilds, upgrades, and modernizations in the woodyard, fiberline, and chemical recovery areas to help keep the mill updated and efficient.

This focus on continuous improvement is a theme that runs through most of the stories in this issue of **SPECTRUM** – no matter where in the world our customers are

operating. In Russia, we read about a mill using liquor from its recovery island to process semi-chemical mechanical fiber (page 6). In Finland, another mill made significant improvements to its fiberlines and pulp drying operation (page 10). Then in China, another mill improved its recycled fiber processing and deinking in order to make a high-quality top layer for its duplex board (page 20).

You no doubt have discussed the buzz around *Industrie 4.0* (as it is known in Germany) or the Fourth Industrial Revolution (as it is referred to in other parts of the world) and perhaps your company is moving to be a

part of that “revolution.” *Industrie 4.0* has the vision of a SMART Factory (or Mill) – a place where everything is connected in an intelligent network. A practical example might be machinery that can predict a failure before it happens, or signals embedded in a parent roll that automatically trigger the setup of roll finishing equipment based on the grade and customer.

Within ANDRITZ, we are employing some exciting technologies to help us continuously improve. We have a SMART Simulation system under development that will speed up the process of converting engineering designs into actual equipment. The software includes “virtual verification” to eliminate errors and avoid rework later.

Customers can also save considerable money with our Optimization of Process Performance (OPP) services that analyze large volumes of mill production data to detect abnormalities in operations or opportunities for savings (for

example web breaks or over-consumption of bleaching chemicals) in order to take corrective actions.

The beauty of building an intelligent network in your mill is that it gives a solid platform for continued collaboration. The ability to link SMART data about the process with virtual plant models to make real-time optimum decisions is exciting. It is a field that is growing rapidly. SMARTer tools are a worthy goal to pursue together.

Sincerely,



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

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

Joachim Schönbeck

Humbert Köfler

NEWS

VST gives new direction to dewatering almost anything

ANDRITZ engineers have proven that designing a screw thickener in a vertical, instead of the traditional horizontal, position has certain advantages. First, the filling degree is 100% so that the entire dewatering area is used. Filling is not limited by pumping, but automatically achieved by gravity all around the screen basket. Next, there is virtually no limitation to the material that can be dewatered – all kinds of pulp and even pretreated sludge with flocculant.

The ANDRITZ Vertical Screw Thickener (VST) is designed to accommodate different screw configurations so that a variety of outlet consistencies of 20-35% or more can be achieved.

The vertical advantages of additional dewatering force (thanks to hydrostatic pressure) and very even dewatering around the circumference of the baskets are significant. The physical benefits are up to 50% more specific production than a classic screw press, or higher output dryness at the same specific production. Plus, the vertical configuration saves precious space on the mill floor.

Find out more about the Vertical Screw Thickener at:
www.andritz.com/dewatering



Unique wire and felt tracking uses air to its advantage

A precise, reliable wire and felt guide system is critical to paper machine operation. A wire tracking system has to be smooth, precise, has to offer low maintenance. Traditional electro-mechanical tracking systems can have many parts that are prone to high maintenance requirements and costs. Plus, they perform an MD movement that is failure-prone.

ANDRITZ has something better than the electromechanical solution. The Wire & Felt Guide has a pivoting saddle to which the bearing housing of the wire tracking roll is bolted. The pivoting of the saddle is controlled by proportioned air bellows to prevent the wire from tracking off-center.

The ANDRITZ Wire & Felt Guide can be installed on the wire section of virtually any paper, board, or tissue machine. It can also be installed in the cellar of the dryer felt section. The functionality and success of this system have been proven in 65 installations to date.

Smooth operation, consistent and precise centering of the wire or felt during operation, and very low maintenance attention required – those are the benefits of the Wire & Felt Guide.

For more information, email us at
paper-service@andritz.com



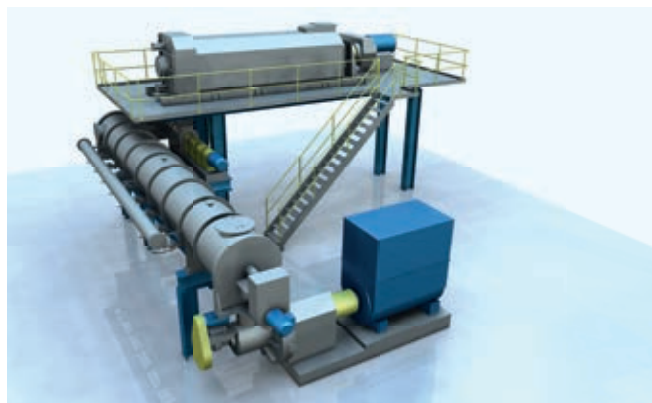
Ultra High Dispersing: increased dispersion efficiency and steam savings of 25%

Dispersion is often a necessary step when producing recycled fiber pulps. The heat and shearing action dissolves any contaminants remaining in the stock to the virtual non-detect level. Traditional dispersers operate in the range of 25-30% feed consistencies.

ANDRITZ's patented Ultra High Dispersing significantly lowers steam demand (up to 25%) by operating at a feed consistency of 40%. This lowers bleaching chemical costs as well, contributes to a brightness increase, lowers COD, and increases dispersion efficiency (lower dirt count and stickies).

In the ANDRITZ design, the plug screw feeder provides the additional dewatering needed after the screw press. The conical zone in the feeder provides a large dewatering surface. With this design, no additional equipment is needed to reach the 40% feed consistency level. This equipment can also be retrofitted to existing disperser installations.

Find out more about Ultra High Dispersing at:
www.andritz.com/dispersing



Puma springs to life in Brazil!

Klabin's Puma Project (our cover story in SPECTRUM No. 31) is a greenfield pulp mill – 1.5 million t/a capacity – near Ortigueira (Paraná state). The speed with which this project has progressed is exceptional. The project gets its name from the elusive big cats which were spotted during the pre-feasibility studies.

ANDRITZ played a major role in the PUMA Project. "We are using the best available world-class technologies to maximize yield and minimize emissions and effluents," says Francisco Razzolini, Klabin's Project Director. ANDRITZ delivered the woodyard, fiberline (for softwood and hardwood), and white liquor plant.

All the ANDRITZ equipment started up on time to help Klabin meet its fast-track schedule. When fully ramped up, the mill will essentially double Klabin's capacity, with the added dimension of the production of fluff pulp.

You will be able to read about the Puma Project start-up in detail in the next issue of Spectrum.



GREEN LIQUOR

in white Arctic

Advanced green liquor pulping technology plays a major role in the new semi-chemical line delivered by ANDRITZ to a mill in Russia. Due to the mill's location close to the Arctic Circle, harsh winter conditions were one of the main challenges in the project.



JSC Arkhangelsk Pulp and Paper Mill (APPM) is one of the leading enterprises in Russia and ranks high in the production of container-board, printing paper grades, and market pulp. APPM is part of an Austrian-German group of companies, Pulp Mill Holding GmbH, which has facilities for the production of paper, cardboard, and packaging products in Russia and Ukraine.

APPM is located in Novodvinsk, not far from Arkhangelsk, a port town on the White Sea (nearly 1,000 km northeast of St. Petersburg). The winters are long and extremely cold. Sourcing competent subcontractors to work on mill projects is definitely a challenge, according to Pavel S. Smirnov, APPM's Head of Mill Development. "In spite of these conditions, ANDRITZ did an excellent job," Smirnov says. "With the new line, our pulp production capacity has doubled and our operating costs, energy consumption, and wastewater volumes have been substantially reduced."

Pandias retired

The old Semi-Chemical Pulp (SCP) line produced a hardwood semi-finished product using two Pandia-type digesters. "The plant was outdated and produced only 500 t/d," says Smirnov. The semi-chemical pulp cooking process for the old Pandia systems was Neutral Sulphite Semi-Chemical (NSSC). Sodium sulphite containing a small amount of white liquor was used as the cooking liquor. The cooking process was carried out in six cooking vessels for each Pandia digester.



▲ Vacuum table washers in new ANDRITZ advanced Green Liquor plant.

From NSSC to GL

The new ANDRITZ line features Green Liquor (GL) semi-chemical pulp cooking technology. In contrast to NSSC, the ANDRITZ system uses green and white liquors coming from the kraft pulping line as the cooking liquor, according to Peter Bräuer, Director of Technology and Processes for ANDRITZ's Pulping and Fiber Division.

"A major advantage of the GL process is the ease of chemical preparation and chemical recovery when there is kraft production and SCP production at the same location," Bräuer says. "As a result, capital and operating costs are significantly reduced."

The new line is designed to produce 1,000 t/d of SCP using birch and aspen. ANDRITZ deliv-

ered the process technology, the main fiber-line equipment, piping engineering, and auxiliaries such as pumps, field instrumentation, and automation/electrification. APPM was responsible for the civil work, steel structure, erection, piping, and insulation extrusion. ANDRITZ process technology included chip washing, the cooking plant with continuous steam-phase digester, MC blowline refining, pulp washing with vacuum table washers and screw presses, LC refining, and automation systems.

Yielding benefits

"In our old SCP production, the yield was 74-78%," says Aleksandr Dernov, Deputy Chief of Unit Shops. "With the ANDRITZ system, we achieve increased yield of 80-82%. If we lower the semi-finished product yield just a little, we



“We jointly accepted challenges and we were jointly successful.”

Pavel Smirnov
APPM's Head of Mill Development

achieve high stiffness, compression resistance, burst strength, and tensile strength. The SCP we make now is of very good quality and has enabled us to increase the strength of our containerboard.”

“The GL process is ideal for mills wanting to incrementally increase pulp production and who can ‘borrow’ some green and white liquor from their kraft process,” says Hannu Råmark, Technology Director for ANDRITZ’s Fiber Technologies Division. “The use of green and white liquor does not require any additional processing steps in the mill’s chemical recovery systems. The green liquor comes from the smelt tanks after the recovery boiler, and the white liquor comes from the recausticizing plant. The spent liquor from the digester is recovered in the kraft mill’s traditional chemical recovery systems and reused in the cooking process.”

The GL process

GL technology combines two complementary technologies in which ANDRITZ excels – chemical and mechanical pulping. First, the wood chips are lightly cooked in hot green/white liquor to weaken the wood structure (chemical). Then the chips are processed into

fibers in the medium- and low-consistency refiners (mechanical).

At APPM, hardwood chips are first washed, then fed to the digester with TurboFeed chip feeding system, and then cooked in a steam-phase digester which is similar in design to the large continuous cooking units found in kraft mills. After the digester, the semi-cooked chips are defibrated in MC blowline refiners, before deshriving takes place in LC refiners. The pulp produced is then washed on vacuum table washers and dewatered in screw presses before going to tank storage. Post-refining is accomplished by LC refiners before the pulp goes to the mill’s two board machines. BM1 produces kraftliner and BM2 produces corrugating medium. While the digester handles the full capacity of 1,000 t/d, the process is split in two parallel lines for refining and washing. This provides flexibility to accommodate periods of high production or those periods when lower production is needed.

Effective and simple solution

When APPM decided to focus on pulp production as part of its modernization plan, management had to consider all the technical and commercial factors. “The technologically

advanced ANDRITZ system had the perfect balance that we needed – including the liquor balance,” Dernov notes.

Dernov explains that green liquor cooking from ANDRITZ was the best alternative for delivering the highest results. “Projects from several equipment suppliers were considered,” he says. “ANDRITZ’s green liquor cooking option demonstrated the best results. We have limited capacity for the production of both green and white liquors. The ANDRITZ solution was more efficient and simpler. It was certainly a huge step up from our old Pandia systems.”

Harsh climate

The project started in 2012. The old sulphite mill was demolished and a new building was erected in its place for the ANDRITZ equipment. Much of the civil work for the building foundations was done in harsh climatic conditions, delaying the timetable a bit. ANDRITZ teams were on site to work closely with the different phases of the building and assembly.

Günther Glück, Senior Project Manager, gives an ANDRITZ perspective. “Teams from APPM and ANDRITZ worked closely together

The 30 m high steam-phase digester was installed first and the building was erected around it. ▼



▼ MC blowline refiners after the digester.





“With the ANDRITZ GL technology, semi-chemical pulps of very high quality and increased yield of 80-82% can be obtained at optimized cooking conditions.”

Aleksandr Dernov
APPM's Deputy Chief of Unit Shops

er,” he says. “For example, we erected the 30 meter high digester first and the building housing was constructed around it. It was certainly a challenge, especially during winter months. Crews had to use chemical processes to help the concrete set up quicker.”

Due to the mill's geographic location, it was challenging to find local skilled subcontractors. “To keep to the construction terms, we had to bring in contractors from other cities, including Moscow and St. Petersburg,”

Dernov remarks. “Thanks to the collaboration and patience of the ANDRITZ team, we are now fully operational and achieved our goals for this modernization.”

The APPM and ANDRITZ team achieved a very fast and smooth start-up of the new fiberline in June 2015. Full production was achieved in less than one month. The grand opening of the new plant was showcased during the mill's 75th anniversary celebration in August.

Modernization program ongoing

“Start-up of the new SCP plant heralded completion of another significant milestone in the large-scale modernization of our card-board production capabilities,” says Smirnov. “We are now negotiating a rebuild of BM 2, and there are several other large projects in the pipeline including a new evaporation plant.”

Together with the ANDRITZ team, APPM was able to achieve all the production figures that were promised. “If I had to describe ANDRITZ's performance in one word – professional,” says Smirnov. “Excellent management and excellent cooperation with a team spirit. What stands out in my mind is their flexibility and hands-on approach.”

Building a plant during the harsh, cold winter near the White Sea had its challenges, but Glück shares Smirnov's view about teamwork. “APPM committed a team which offered support at all levels,” he says. “They were flexible and professional at all times. This mill is a showcase in Russia, synonymous with innovation and progress.”

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“A job well done – professional.” Pavel Smirnov, APPM's Head of Mill Development (right), with Günther Glück, ANDRITZ Senior Project Manager. ▼



Kymi:

**HIGHER CAPACITY
MORE FLEXIBILITY
LESS ENERGY**

UPM's recently completed EUR 160 million investment project resulted in about a 25% increase in pulp production at the Kymi mill in Finland. ANDRITZ helped modernize the softwood fiberline and delivered a new pulp drying line. The results are impressive.

With its investment in the KYMI-700 project (the "700" means increasing pulp production to 700,000 t/d from 530,000), UPM made substantial progress towards its target to boost its existing 3.3 million tonnes of pulp capacity by 10% over the next three years.

The Board approved the investment in February 2014. Within a couple of weeks, UPM had negotiated commercial terms and selected suppliers for the project. ANDRITZ

was chosen to deliver a complete new pulp drying line and to modernize parts of the softwood fiberline.

The ramp-up of all systems, according to Tero Ojala, Project Director, has been very good. "The debarking plant started in June 2015, the modernization of the softwood line was completed in August, and the new pulp drying line started in September, ahead of schedule," Ojala says.

"Pulp production has exceeded our expectations and the quality of pulp, which was already excellent, has improved," says Markku Laaksonen, Mill Director. Laaksonen has long experience with UPM, including working at the Fray Bentos mill in Uruguay during start-up, and was appointed Kymi's Mill Director in 2014.

Achievement within UPM

The Kymi mill is now among the most mod-



ern pulp mills in Finland, thanks to this project and also a huge investment (EUR 360 million) in new chemical recovery systems in 2008. ANDRITZ delivered the evaporation and the white liquor plants for that project.

Finland's Prime Minister Juha Sipilä officiated at the proceedings when the KYMI-700 investment project was inaugurated, along with UPM President and CEO Jussi Pesonen. Sipilä noted that UPM's investment supports the government's goal to establish Finland as a pioneer in the bioeconomy, circular economy, and clean-tech solutions by 2025.

In his speech, Pesonen thanked the project team and all of the Kymi personnel, suppliers, and partners for an excellent achievement. "The UPM Kymi pulp mill expansion was a success," Pesonen said. "We reached record-high pulp production in December."

Safely navigating modernization challenges

"The main challenge for us during the project was that we were doing the modernization in an operating mill," says Günther Leitner, ANDRITZ Project Manager for the pulp drying plant. "Everything we did was alongside normal production, and real estate was at a premium."

The new drying line was installed in an old paper machine hall. "Since we were using an existing building, the layout is tighter than we would have preferred," explains Laaksonen. "During construction, we had a large operating paper machine on the other side of the wall. The civil work required some explosive charges to make way for the new foundations and we were concerned what the impact would be on the paper machine. But all the work was completed with no stops and no unusual breaks on the machine – which was quite an accomplishment."

"We had an excellent safety record," Ojala says. "With 800 people on-site (and 1,500





▲ Twin Wire Former dewatering machine.

during the one-week annual shutdown), it was quite remarkable that there was only one lost-time accident during the entire project – which comprised over 1,000,000 working hours.

Pleasant surprises in the fiberlines

ANDRITZ technology and equipment were used to modernize parts of Kymi’s softwood fiberline. There were also small improvements to the hardwood digester, according

to Jouni Konsti, ANDRITZ Project Manager for the fiberline portion.

“The improvements were relatively small in terms of scope and cost, but the result has been quite a pleasant surprise,” says Laaksonen of UPM. “We are achieving higher production with less rejects.”

A unique swinging pulp dryer

The new pulp drying plant was the largest

part of the KYMI-700 investment. “Kymi was able to demolish its old Rauma Repola pulp dryer (installed in 1964) which had a maximum capacity of 500 t/d,” says Jari Vetola, ANDRITZ Senior Sales Manager. “They were definitely limited in pulp drying capacity. If the paper machines are down for any reason, it would place a huge burden on the pulp drying plant. With the ANDRITZ plant, Kymi can run a combination of hardwood and softwood pulp to the maximum to keep production flowing smoothly.”



◀ ANDRITZ modernized several areas of the softwood fiberline at Kymi as part of the KYMI-700 project.

Why ANDRITZ? “The last big investment UPM made with ANDRITZ was at Fray Bentos (see SPECTRUM Issue 17),” Laaksonen says. “We are very familiar with that drying plant, which has been running very well. When it comes to handling long fiber pulp at high speeds and production levels, no supplier has much experience. We felt that the ANDRITZ solution was the best, even though this would be their first line for a mill that swings between hardwood and softwood pulps as frequently as we do.”

“These daily swings from softwood to hardwood pulp are quite unique in the industry,” Leitner confirms. “This requires our equip-



▲ (L to R): Jari Vetola, ANDRITZ Senior Sales Manager for pulp drying; Tero Ojala, UPM Project Director; and Jouni Konsti, ANDRITZ Project Manager for the fiberline.



▲ Airborne sheet dryer and cutter/layboy in the new drying plant.

ment to be quite flexible. There were some challenges in ramping up the plant, but that was mostly due to the very wide operating window that the mill requires, and not the fiber source itself.”

The pulp dryer started up on schedule, with production runs even a couple of weeks before the scheduled time. “We had the normal issues that you have when you dismantle old equipment and install new sys-

tems in a mill that is running,” ANDRITZ Commissioning and Start-up Manager Johannes Jammerneegg says.

A Finnish “good”

According to Ojala, “The project and collaboration went very well. We worked well together and succeeded together. The ramp-up was faster than expected, enabling us to reach our targets.”

“We are Finns, so when we say something is ‘good’ that might mean more in another language,” Laaksonen laughs. “The project was brought in on schedule, on budget, and safely. So, I would say this project with ANDRITZ has been very good.”

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▲ Tero Ojala, UPM Project Director (left) with Markku Laaksonen, Kymi Mill Director.



▲ At the Kymi mill, the company logo is embossed on the wrapper of every pulp bale. The griffin logo (representing the guardian of Northern forests) was designed by Hugo Simberg in 1899 and is the oldest continuous company logo in Finland. Markku Laaksonen, Mill Director holds an embossed logo wrapper.

Stendal:

NEVER STANDING STILL

Unless it's a newly-built mill, it's rare for a SPECTRUM article to cover diverse process areas from the woodyard to the recovery island to the fiberline. And yet, this article will do exactly that, because ANDRITZ is involved throughout Mercer International's Stendal mill in Germany.



It was during our visit to the mill in March 2016 that Zellstoff Stendal hit a production milestone – seven million tonnes of pulp. Significant progress, considering it took 735 production days to reach the first million tonnes, but only 553 days to make the last million.

Adolf Koppensteiner was Mill Manager at Mercer International's other German pulp mill, Zellstoff Rosenthal, before he became Managing Director at Stendal in 2013. He immediately went to work spearheading a program to establish "world class" mill availability by 2018. He explains, "It is a continuous improvement program. A mill is never totally up to date. If you stand still, you go backwards."

In 2014, Stendal set a new annual production record of 672,000 tonnes of NBSK. It's current environmental permit is for a maximum of 675,000 t/a. In 2015, production reached 1,912 t/d – also a new record. Koppensteiner describes the progress as "huge steps forward".

ANDRITZ has been a technology and service provider for Stendal since the mill started up in 2004, delivering the major chemical recovery systems for the mill – evaporators, recovery boiler, and recausticizing equipment. That relationship has continued, with ANDRITZ providing technical services, rebuilds, upgrades, and

modernizations to help keep the mill updated and efficient.

Knife skills

Starting in the woodyard, ANDRITZ has been busy rolling out its PartnerChip concept. PartnerChip (from ANDRITZ Iggesund Tools) combines technology, expertise, and high-quality chipper knife replacement to improve efficiency and profitability of the chipping operation. In Stendal's case, ANDRITZ performs chipper knife replacements (the well-known TurnKnife system) and has installed a ScanChip analyzer in the line.

Steffan Ratzlow, Stendal's Fiberline Manager, explains, "The more homogenous our chips are, the better our cooking plant performs. But the longer the knives are in place, the more problems we had with homogeneity. It used to be that knife changes were difficult and risky."

With TurnKnife, knife changes are much easier and safer, leading to higher uptime and better chip quality. To determine the optimum time for knife changes and to verify consistent chip quality, the ScanChip analyzer is a real asset. "ScanChip can quickly analyze a larger sample of chips than the previous scanner we had," says Ratzlow. "It is good. I have no complaints."





▲ The ANDRITZ ScanChip analyzer monitors chip quality and helps the mill determine the optimum time for chipper knife changes. Josef Ertl, ANDRITZ Product Manager (right), pours chips into the analyzer as Steffan Ratzlow, Zellstoff Stendal's Fiberline Manager, looks on.



▲ The Diagonal Screens that ANDRITZ tailored for Zellstoff Stendal's batch digesters minimize production losses and reduce downtime.

The next goal, Ratzlow adds, is "more intensive cooperation so that we can couple ANDRITZ's on-site services with research and development to find new solutions."

Continuous thinking about batch

An example of combining on-site expertise with R&D can be found in the steps taken to improve the availability and productivity of Stendal's 10 batch digesters. Even though the units were supplied by another company, the technical specialists at ANDRITZ thought that Stendal might benefit from installing a tailored version of the Diagonal Screen that is so popular in ANDRITZ continuous digesters.

Walter Scholz-Sommerbauer, ANDRITZ Key Account Manager for Stendal, explains that Diagonal Screens are often installed in digesters running over-design or with plugging issues. "This screen design increases circulation and extraction flows because of the unique contour of the slots and the significantly larger open area compared to a perforated round-hole screen," he says. "The Diagonal Screen keeps fibers and chips from entering the slots. We believed that Stendal could use our design, tailored for their batch digesters, to minimize production losses and reduce downtime for acid washing, maintenance, etc."

Dirk Würsig, Mechanical Maintenance Engineer on Stendal's fiberline, says, "It is my understanding this is a completely new screen development for batch digesters that ANDRITZ tailored for our operation here."

An interesting aspect of this contract was the financial side. Instead of charging a fixed price for the equipment, ANDRITZ agreed to a price-plus-performance bonus structure. Koppensteiner says, "We are prepared to pay a fair price for a fair result. This way, it is a win-win situation that rewards both partners for improvements. We are doing the project together."

Wash press renewal

Having ANDRITZ improve performance of equipment from other OEMs extends to other parts of the fiberline, too. Stendal wanted a pair of new rolls for their wash press to replace the older ones, which could then be reconditioned to serve as replacements for the next worn pair.

Instead of immediately contacting the OEM, Stendal decided to look into ANDRITZ's expertise in this area. The main problem was the surface damage on the rolls caused by some mechanical characteristics of the wash press. Harald Fichtl, Production

“ This way, it is a win-win situation that rewards both partners for improvements. ”

Adolf Koppensteiner
Managing Director, Zellstoff Stendal





▲ Standing in front of the wash presses, Dirk Würsig, Mechanical Maintenance Engineer at Zellstoff Stendal (left), discusses fiberline upgrades with Walter Scholz-Sommerbauer, Key Account Manager for ANDRITZ.



▲ To remove bottlenecks and upgrade the evaporation plant, ANDRITZ delivered new equipment on a tight deadline. The 20% increase in evaporation capacity also allows the recovery boiler to burn higher solids black liquor.

Manager, says that Stendal wanted to address the problem of roll surface damage and he was aware that ANDRITZ had experience with its own wash press, including the technology to achieve durable and long-lasting rolls. As Gerhard Wulf, Technical Manager at Stendal, puts it, “ANDRITZ presented a design with more robust construction which we believe will solve the problem.” ANDRITZ delivered the new rolls in time for the April 2016 shutdown.

Evaporation “win-win”

ANDRITZ’s biggest upgrade project so far has been the expansion of the mill’s evaporation plant. The new equipment installed by ANDRITZ included a new evaporator vessel, three preheaters, a new surface condenser, a flash tank, a vacuum pump, and major vapor ducts.

According to Tapio Lintunen, Senior Project Manager for ANDRITZ, the technical challenge was to reconfigure the system – which was operating significantly above design capacity. “Where there were previously eight evaporator bodies arranged in six effects, we designed a nine-body system with a new unit as the new sixth effect.”

Fichtl explains, “The old plant was a bottleneck, even though we were running it at about 120% of design capacity.” In addition to eliminating the bottleneck, the recovery boiler can now burn higher solids. A 20% increase in evaporation capacity also means reuse of more condensate and less COD into the River Elbe. “It’s a win-win for the environment, the government, and the company,” Koppensteiner adds.

Lintunen notes that an interesting – and challenging – part of this project was in the timing.

Not only was the delivery deadline tight (six months from order to installation), the start-up had to occur during two short shutdowns at the mill (12 days in April and two days in October 2015). “All of the tie-ins and connections to existing equipment had to be completed during the two-day shut in October,” he says.

Adding to the drama, shipment of the new surface condenser, which had to be installed during the April shutdown, was delayed by a car crash and fire on the highway. This

Harald Fichtl, Zellstoff Stendal Production Manager ▶





▲ Ronald Zierau, Project Manager for Zellstoff Stendal (left), walks through the upgraded evaporation plant with Tapio Lintunen, ANDRITZ Senior Project Manager.



▲ Patrick Ludwig, Production Engineer for Zellstoff Stendal (left), discusses improved performance of the ANDRITZ CD Filter (white liquor filter) after the upgrade with Walter Scholz-Sommerbauer, ANDRITZ Key Account Manager.

resulted in the condenser arriving 36 hours late. But as Lintunen explains, “Stendal was very cooperative and helped us a lot. They contacted authorities to speed our journey. We were able to complete the installation on time.”

October 2015 was also eventful as the timing was tight. “The mill gave us 14 extra hours, so with careful hourly planning we were able to start work early and end on time.”

“Timing was a key factor,” says Stendal’s Project Manager Ronald Zierau. “There

were 175 tie-ins involved. “We did all the tie-in work we could in April knowing that the October shut would be very short. We had very good cooperation with ANDRITZ and the subcontractors.”

With the reconfigured evaporation plant up and running, Fichtl says, “We have had no losses since the project started up. It was a very smooth start-up.”

Wulf, says that it was not just about having the right equipment, but that ANDRITZ support was also a key factor. “We do not have

a large projects department,” he says. “Our people do projects alongside their normal jobs. The support we get from ANDRITZ helps us. Both the equipment and the team were right.”

Upgrade in white liquor filtration

ANDRITZ also upgraded the CD filter in the white liquor plant, making it possible to use 12 discs instead of the current 10, which Fichtl confirms will happen. The upgrade also moved the location of the suction head outside the unit. “This makes maintenance much easier and we don’t have to take downtime,” says Patrick Ludwig, Production Engineer at Stendal. “The installation of the upgrade was very professional. It was necessary to do it within a very specific time window and it went without a hitch. I am happy with the performance of the CD filter.”

Raising high-performance even higher

According to Jan Peter Daum, Stendal’s Recovery Manager, their recovery boiler is operating stably, with no fouling or plugging, and with the lowest residual oxygen content in the world for any boiler running at high load – 25 tds/d/m² – without exceeding environmental regulations. In addition to delivering

“Both the equipment and the team were right”

Gerhard Wulf
Technical Manager at Zellstoff Stendal





▲ In addition to delivering the recovery boiler when the mill was built, ANDRITZ has remained involved by providing services to improve the boiler's performance even further without major upgrades. Examining systems in the boiler are (l to r): Jan Peter Daum, Recovery Manager at Zellstoff Stendal; Pertti Immonen, ANDRITZ Service Engineer; and P. Raymann of Zellstoff Stendal.



▲ Zellstoff Stendal has a continuous improvement program to establish world-class availability. As Adolf Koppensteiner puts it, "If you stand still, you go backwards."

the boiler, ANDRITZ has remained involved by providing smelt pumping services and small repairs or small upgrades.

Even with a high-performing 4,150 tds/d boiler, Stendal recently entered into a six-year contract with ANDRITZ to improve performance further without major upgrades. ANDRITZ will continue to provide the smelt pumping service, but will add shutdown inspections and audits with ANDRITZ specialists. As Daum puts it: "This is extreme micro-tuning. We want a long-term partnership so both sides have security and can set performance goals. Our task, together, is to take the existing plant and get the best out of it, without making big investments. With ANDRITZ, we are analyzing what potential the recovery boiler might still have. We only know our own mill and boiler. ANDRITZ knows how other mills around the world operate their boilers and have solved specific problems."

As Scholz-Sommerbauer says, his company's aim is to "plan more proactively and give us a deeper understanding of our customer's needs so we can apply the best ANDRITZ technologies."

Koppensteiner points out that while such a long-term contract may be unusual, "It is normal if you are satisfied with your partner, and if your partner can give you something extra. We are certain that we can still improve our relationship, which will lead to more progress."

A chance to learn

Summing up the relationship between Zellstoff Stendal and ANDRITZ, Jean-Marie Staron, Stendal's Director of Central Purchasing,

says "We have been learning from each other and getting closer. ANDRITZ is very professional, reliable, and trustworthy. It's a good partnership."

The final word goes to Koppensteiner. From ANDRITZ, he says "We get support in critical situations, but also in projects. ANDRITZ for us is a partner where we have a chance to learn."

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Jean-Marie Staron,
 Zellstoff Stendal Director
 of Central Purchasing. ▶



HIGH- QUALITY FIBER

perfect for
top layer

Until late 2015, Dongguan Jianhui Paper imported virgin fiber to produce the top layer of its high-quality coated board products. Today, recycled fiber has been substituted for costly virgin fiber thanks to a new 3-loop deinking plant supplied by ANDRITZ. The lower-cost fiber meets all expectations of customers and mill management.

This was good timing for such an investment," says Li Guihua, Chairman of the Board and General Manager of Dongguan Jianhui Paper when referring to the EUR 13.8 million his company put into a new deinked pulp (DIP) production line. "Even though it was made to enhance our competitiveness and lower our overall cost, we had also the advantage of our currency against the Euro."

Dongguan is a major industrial city at the Pearl River Delta in Southern China. Dongguan Jianhui Paper is a rather new company, established in 2002. The mill site is strategically located in the midst of convenient water sources and a good land transportation network. First production of coated board products began in 2004. A second machine followed in 2005. Development has been fast. After some up-

grades, capacity surpassed 800,000 t/a. The installation of a third 600,000 t/a line boosted total capacity to 1.4 million t/a.

Top quality, high standards

According to Mr. Li, his company's capacity for the production of coated board ranks second in the Pearl River Delta, and very high in the whole country. "Most important, our quality ranks at the top, if not the very best," he says.

Dongguan Jianhui Paper produces a variety of high-end duplex coated boards (230-450 g/m²) and kraftliner (110-230 g/m²). The leading product, the "Jianhui" brand of grey back duplex board, has been highly appreciated by customers at home and abroad since being launched. The company has been chosen as an enterprise with National Quality Level "A" trust.

With quality certain, Dongguan Jianhui Paper set its sights on optimizing costs. A major cost factor was the import of virgin fiber for the top layer, fiber imported from Indonesia, Canada, and Brazil.

In technical discussions, representatives from ANDRITZ showed the results of mills using 3-loop DIP systems to produce pulp that achieved the brightness and quality needed for top layer production. The ANDRITZ 3-loop system – including drum pulping, three flotation stages, two dispersing stages, screening/cleaning systems, and sludge handling – is state-of-the-art.

To replace the virgin top layer, Dongguan Jianhui Paper is now using a combination of OMG, SOP, MOW, and some white trim. About 40% of the furnish is sourced locally. ▼



“ Everything has proven to be as good as expected and promised.”

Li Guihua
Chairman of the Board and
General Manager of Dongguan Jianhui Paper

Due to the high quality standards at the mill, choosing the right supplier for a DIP system was a careful and meticulous process. The expectation was to get good quality stock with the most economical fiber, and also to lower energy consumption and fresh water consumption. "As this is our top product line, we had to be sure that we invested in the best," Mr. Li explains. "We evaluated the situation carefully before committing. The best technologies, project execution, reliability, and quality were all under consideration and comparison. We selected ANDRITZ."

ANDRITZ has many well-running DIP references in China and around the world, and nine 3-loop systems in China – far more than any other supplier. One important reference in China, was a 3-loop DIP plant with 550 t/d capacity producing pulp for a new LWC machine.

"ANDRITZ has the most complete and advanced deinking system in the world," Mr. Li says. "They not only offer a competitive price, but also good quality and a package of services that we considered as being the most superior."

Now that the equipment has been installed and put into use since November 2015, "everything has proven to be as good as expected and promised," Mr. Li says.

Results exceeding expectations

"This customer set high standards, and we worked hard to meet their requirements," says Liang Wen, Project Manager for ANDRITZ China. "After the erection of the system, our commissioning, start-up, and training have been successful. Final brightness is ISO 80-82% which meets the requirements for the top layer. Pulp cleanliness and other fiber properties are exceeding their expectations."

Capacity of the new line is 200 bdmt/d. To replace the virgin top layer, Dongguan Jianhui Paper is now using a combination of Old Magazines (OMG), Sorted Office Papers (SOP), Mixed Office Waste (MOW), and some white trim. About 40% of the furnish is sourced locally. The remainder is imported from Japan and the USA. The exact furnish mix is determined by quality, price, and supply, so there is some flexibility in sourcing. According to Mr. Li, using recovered fiber as the raw material cuts operational costs by about EUR 7-11 per tonne of product produced, giving a very good payback time.



▲ Chen Bo, Vice General Manager of Dongguan Jianhui Paper

Three-loop design

Due to impurities in the recovered fiber raw materials, DIP systems require a series of process stages (or loops) in order to remove and/or reduce the impurities without harming the fiber material, according to Andreas Gorton-Hülgerth, General Manager of the Pilot Plant for ANDRITZ’s pulping and fiber organization. “A critical parameter in the system design is the type of ink and the printing process used in the raw material mix,” Gorton-Hülgerth says. “Office papers have what we call a ‘hard’ ink that is fused onto the paper surface. Magazine papers have a ‘soft’ ink that is printed on the coated surface.”

Disintegration without destroying the fibers is the main task of the FibreFlow drum pulper. Following the pulper is a cleaning stage that removes heavy particles to reduce the wear on downstream equipment.

Due to contaminants in recovered fiber, stock preparation systems require a series of process stages to remove impurities without harming the fiber material. Shown here is the ANDRITZ four-stage cleaner plant. ▼



Although ink detachment is not fully completed in the first loop, the flotation equipment removes the “soft” inks and dirt particles. With the exception of ink and very small dirt particles, the removal of contaminants is completed in the first loop. A heated and pressurized dispersing system then detaches ink particles and reduces the size of other impurities.

The second loop is mainly for removing detached “hard” inks. A second disperser handles the most resistant ink particles as well as some very small stickies and dirt. The final flotation stage removes the remaining dirt and ink particles. Thickened pulp is sent to a reductive bleaching stage to achieve high final brightness.

“ANDRITZ supplied all key equipment and also the basic and detailed engineering,” says Chen Bo, Vice General Manager of Dongguan Jianhui Paper. “They prepared 3D drawings that we found very useful and supervised the erection. They also took responsibility for the commissioning and start-up. The design of the whole system was excellent. ANDRITZ’s experience in commissioning deinking systems was impressive.”

Dongguan Jianhui Paper has worked with ANDRITZ for several years and has purchased refiners, pumps, mixers, and other equipment. “When it comes to deinking, we wanted pulp of high enough quality that would also meet our targets for cost reduction. That has not been a problem with this system.”

The cooperation between Dongguan Jianhui Paper and ANDRITZ has been “a pleasure” according to Mr. Li. “ANDRITZ people are very responsible,” he says. “They worked with a positive attitude all the way from pre-sales throughout the project and they have been very helpful in optimizing the system. These are the things with which we are the most satisfied.

Both Mr. Li and Mr. Chen say that if they had to redo this project, their decisions would be much the same. “There could be some improvements in the cleaner plant and reduction of foam,” they offer as feedback. “But not much to change.”

Young company full of energy and power

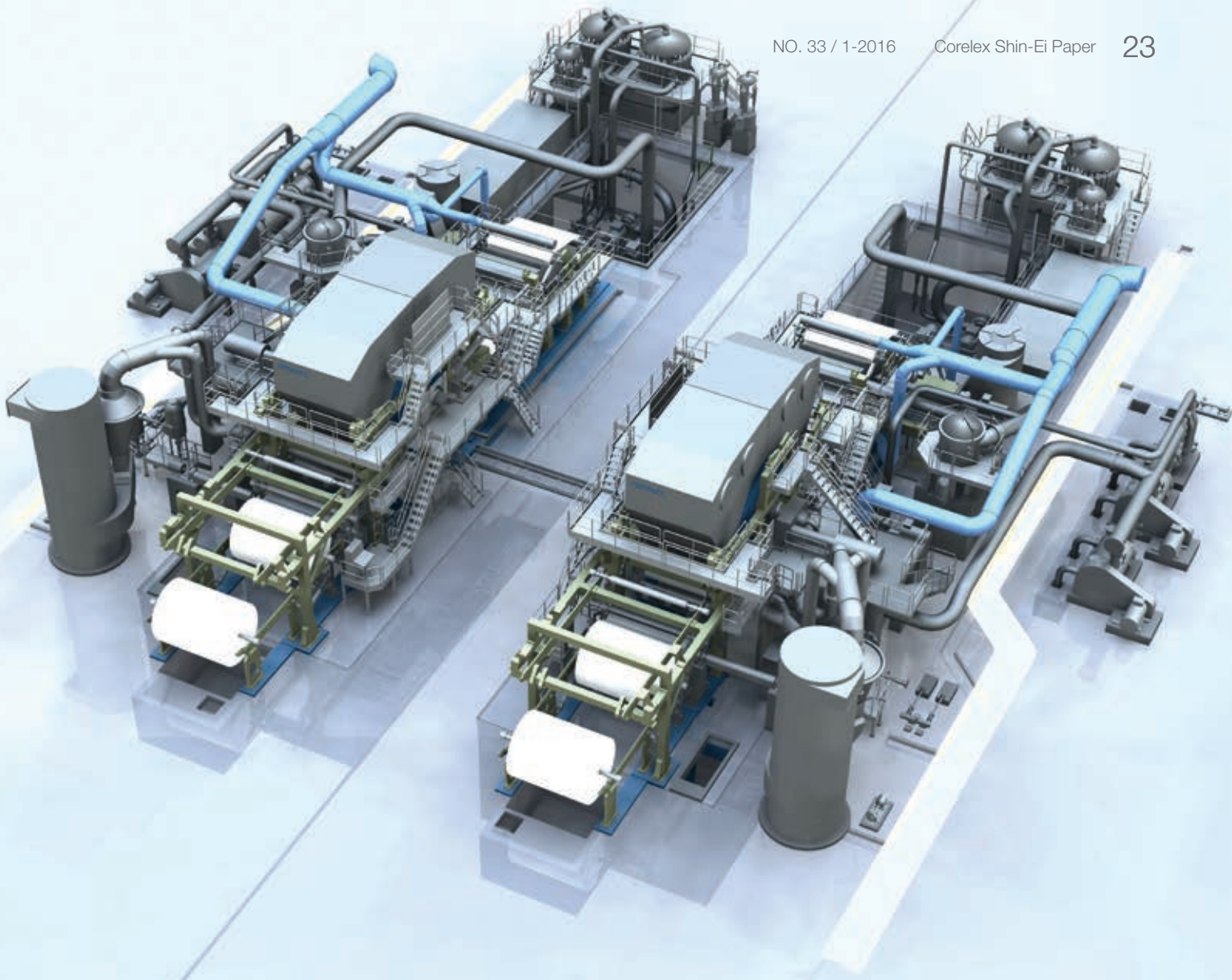
Dongguan Jianhui Paper is investing to meet stringent environmental standards on all equipment in the future. “Our company pays attention to environmental protection,” Mr. Li says. “We are determined to improve the environment.”

What makes Mr. Li most proud when talking about Jianhui? “The people, especially the middle level management with their experience and expertise,” he says. “Our company is young, and so are the leaders. This is a company full of energy and power.”

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The ANDRITZ 3-loop system – including drum pulping, three flotation stages, two dispersing stages, screening/cleaning systems, and sludge handling -- is a state-of-the-art system for top layer production. Shown here is a SelectaFlot flotation deinking stage. ▼





Identical COMPACT twins?



HAI!



▲ The two identical *PrimeLineCOMPACT* machines are designed for a speed of 1,800 m/min and for a paper width of 2.8 m.

“Hai” is Japanese for the English word “Yes!” Corelex Shin-Ei recently started up two identical ANDRITZ tissue machines at its greenfield mill near the base of Mount Fuji, 95 km from Tokyo. According to the President of Corelex Shin-Ei, the machines are “Robust. Efficient. Environmentally friendly. Easy-to-use.”

The Corelex Group started as a machinery company, San-Ei Regulator, known today as Corelex San-Ei. In 1969, the decision was made to go into papermaking. That was the beginning of Corelex Shin-Ei. Today, the company makes toilet and facial tissue from recycled paper in Japan. There are also mills in Vietnam that sell toilet and facial tissue products to the local market.

“Our first product was Kurochiri, known as black tissue (although it was a gray in color), because it was the simplest and the least expensive kind to produce,” says Satoshi Kurosaki, President of Corelex Shin-Ei. “It was produced from recycled newspapers and magazines. No deinking, just a pulper and a tissue machine.”

This tissue machine, which had a suction former and cylinder design, was upgraded. Maximum speed was 1,050 m/min, and Yankee diameter was 12 ft (3.66 m). “In 2014, we made the decision to consolidate our production into one greenfield tissue mill,” Mr. Kurosaki says. “There were financial incentives, since we paid rent for

the location of the old mill and we paid taxes for a location in Fuji City center.”

The greenfield mill is in Fuji City (eastern Shizuoka Prefecture), nearly at the base of Mount Fuji. It was constructed with three factors in mind: efficient production, the environment, and disaster management for the local region.

Strict noise control

“We make every effort to adhere to all environmental requirements, and this mill has virtually zero emissions,” Mr. Kurosaki explains. “The most challenging for us are the noise regulations. There is a residential district right next to our mill. We are not allowed to make more than 45 decibels of noise during night-time. For comparison, this is equivalent to the noise of a Toyota Prius hybrid car at idle.”

Due to the modern facility and practically zero emissions, the mill looks and operates like a modern office building. In addition,

trees have been planted to maintain the aesthetic beauty of the area, where Mount Fuji dominates in the background with its snow-capped peak.

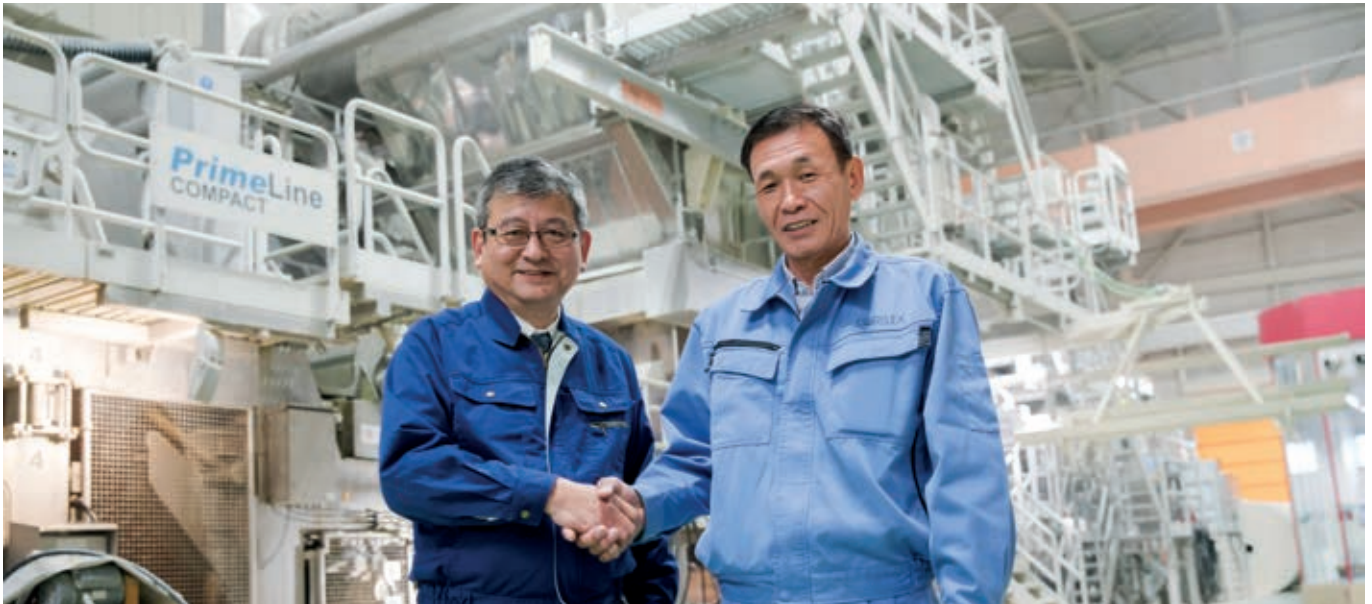
Open for emergency relief

The Pacific Ocean is only four kilometers away from the mill gate. Since Japan is vulnerable to earthquakes and tsunamis, the mill is purpose-built to sustain such forces. Multiple steel stairwells provide access to the terrace surrounding the offices upstairs. “The evacuation space is 28 m above sea level and is easily accessed,” Mr. Kurosaki says.

Corelex Shin-Ei signed a disaster management agreement with other entities, including the city of Fuji so that the mill can serve as a refuge shelter for local residents if something happens. The offices can be quickly transformed into a civilian crisis center with sustainable reserves of food and water.

Yankee – the heart of a tissue machine

“Before making the decision about the tissue



▲ (l-r) Toshio Okunishi of ANDRITZ and Takemi Tanaka of Corelex.

machines, we visited several suppliers,” says Takemi Tanaka, General Plant Manager. “We got a good reference for the ANDRITZ Steel Yankee delivered to Corelex Doh-Ei Paper, one of our group’s companies, in 2012.”

Doh-Ei Paper replaced a cast iron Yankee with an ANDRITZ Steel Yankee in order to get higher drying capacity and energy savings. According to Toshio Okunishi, Group Manager for ANDRITZ in Japan, the performance of an ANDRITZ *PrimeDry* Steel Yankee is better than the performance of a cast iron Yankee of the same size. “Steel Yankees have an evaporation rate 10-15% higher than cast iron, which results in 8-10% better throughput,” Mr. Okunishi says. “Steel Yankees are considered safer than cast iron due to the

elasticity of the steel. We use state-of-the-art manufacturing methods to ensure safety and quality.”

COMPACT solution

“During the tender phase for the new tissue machines, we had a lot of constructive discussions with ANDRITZ engineers, and they proposed various possibilities to improve our production efficiency,” Mr. Kurosaki says. “We consider ANDRITZ to be a reliable supplier.”

ANDRITZ supplied two identical *PrimeLineCOMPACT* tissue machines with Steel Yankees. For the new recycled fiberline, ANDRITZ also delivered two Speed Washer units and a CompaDis disperser.

The 2.8 m trim ANDRITZ machines have maximum design speeds of 1,800 m/min. They are equipped with *PrimeDry* Steel Yankees with 15 ft (4.57 m) diameters. The machines produce high-quality tissue from recycled fiber for the production of core and coreless toilet paper rolls and facial tissue paper. The coreless tissue roll is a unique patent developed by Shin-Ei Paper.

According to Mr. Okunishi of ANDRITZ, the *PrimeLineCOMPACT* machine design is ideal for customers who appreciate a standardized, modular approach. “The idea behind COMPACT is to combine cost efficiency with proven quality,” he says. “The key to its cost efficiency is the level of standardization, which reduces engineering hours, manufacturing hours, installation time, and even transport costs. COMPACT ensures a certain production quantity and high quality in a streamlined, cost-effective package.”

The highlights of the twin *PrimeLineCOMPACT* machines at Shin-Ei Paper are the fully automated raw material handling and the Steel Yankees with head insulation to conserve energy. For each machine, a single-layer headbox feeds stock to a *PrimeForm* CrescentFormer that has a very high dewatering capacity. Whitewater flow from the former is controlled by special guide vanes so that the energy of the water jet is broken

▼ Parent rolls of tissue.





▲ Tissue on the reel – TM1 produces heavy weight toilet tissue; TM2 produces lighter weight toilet tissue and facial tissue.



outside the machine. This improves the web section's housekeeping.

The press section consists of a single suction press to dewater while maintaining high product quality. Beginning at the creping doctors, the sheet run is equipped with threading and sheet support equipment.

Head insulation around the Steel Yankee conserves thermal energy during the production process. Potential steam savings is in the range of 2-5%. In addition to energy savings, the insulation produces less contamination due to its even surface.

A new kind of “converting”

The raw material for the greenfield mill comes from areas within 150 km from Fuji (e.g., Tokyo, Nagoya, and Niigata). “Of course we prioritize neighboring areas when collecting waste paper,” Mr. Kurosaki explains. “These are mainly collected by third-party companies, but we pick up papers containing potentially sensitive information ourselves from local governments, because we have the clearance to do this work. Technically speaking, we are converting discarded government documents into disposable tissue!”

Every project has challenges. “There were some delays during erection, but I appreciated ANDRITZ’s effort to resolve the issues thor-

oughly,” Mr. Tanaka says. “We put our heads together and arrived at the right solutions, and worked cooperatively through the issues.”

“Every problem is an improvement opportunity,” Mr. Kurosaki says. “Sometimes we feel that European suppliers could be more flexible with some details. Their approach – which is maybe a cultural difference – might be a reflection of the confidence they have in their excellent technologies.”

The need for speed in Japan

With the new mill taken into use, several old tissue machines were shut down and their production has been integrated into the two high-performance tissue machines.

The start-up of the twin ANDRITZ machines took place in spring 2015. Since then, the machines have reached speeds up to 1,900 m/min (1,800 m/min design) on 100% recycled fiber. “We can be proud of this, the fastest in Japan,” Mr. Kurosaki says. “The machine in San-Ei’s Kawasaki mill runs up to 1,600 m/min, and machines producing toilet tissue with virgin pulp in Japan are also running at 1,600 m/min.”

The grade mix for the two machines is split such that TM1 produces heavier weight toilet tissue, while TM2 produces lighter weight toilet and facial tissue products. “In addition to the speed, we are producing high-quality products from lower quality raw materials,” says Mr. Tanaka. “With ANDRITZ tissue machines, we are running at the highest speed level in Japan even utilizing recovered fiber. It is amazing. I say with pride that we are the most vibrant company of our size, and we will keep developing.”

Mr. Tanaka has a very high opinion of the user-friendliness of the *PrimeLineCOMPACT* machines. “The functionality of the automation systems is excellent,” he says. “Everything is digitized and PLC controlled. The line is very easy to operate even for new or inexperienced employees. We have only three operators per shift, thanks to the advanced ANDRITZ automation.”

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“Robust. Efficient.
Environmentally
friendly. Easy-to-use.”

Satoshi Kurosaki
President of Corelex Shin-Ei



ANOTHER WAY TO LEAD

Interview with
Päivi Salpakivi-Salomaa
VP, Environment and
Responsibility UPM

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*The goal is to combine ecology,
technology, and business opera-
tions in a sustainable way.*



*“That is our mission.
But, it’s not Mission
Impossible!”*

UPM has a strong environmental track record. As with all companies, the social and sustainability aspects of its business have taken on increased importance and are linked to everything that the company does. Recently, UPM accepted a special invitation to join UN Global Compact LEAD, the first forest industry company (and the first Finnish company) to be invited. LEAD companies commit to continued development and serving as a front-runner by implementing the Blueprint for Corporate Sustainability Leadership – and to share their experiences with other companies.

Background

P. Salpakivi-Salomaa: “I have a forestry background with many years’ experience in sourcing, forest management, harvesting, etc. As we began receiving much more feedback from customers, government agencies, and NGOs about the origin of our wood and for protection and certification globally, we needed to have a response to these inquiries. This prepared me well for the work I do now – which is managing risks and developing solutions for operational issues regarding environmental, social, and economic responsibility whether it be in sourcing, production, or our end customers.”

A new way of combining our knowledge

P. Salpakivi-Salomaa: “My goal is to combine

ecology and technology and business requirements in a meaningful and productive way. Our organization is skillful in all three, but sometimes these skills are separated. Those who develop technology, those who deal with ecological issues, and those who run business units sometimes narrow their focus. A deeper understanding of this combination of requirements will lead to better results – not just for our business, but also for our world.”

Mission – not impossible

P. Salpakivi-Salomaa: “UPM, through its Biofore vision, is making a contribution to solving some of the global mega-trends. For example, the world’s population is growing and there will be a scarcity of natural resources. If you base your business on non-renewable resources, you will reach a limit. But with renewables, you can grow your business if you do it in a sustainable way. That is the mission. But not Mission Impossible!”

UN Global Compact

P. Salpakivi-Salomaa: “UPM has been a part of the UN Global Compact since 2003. Today, about 8,400 companies from 162 countries have subscribed. The Compact focuses on four areas: human rights, labor, environment, and anti-corruption. Then in

2015, the UN created its LEAD concept to work with an exclusive group (about 50 companies) who are committed to providing leadership, inspiration, and examples of best practices.”

How does UPM benefit?

P. Salpakivi-Salomaa: “The challenge in environmental and corporate responsibility is to answer the shareholders’ question: you invest in these programs and issues, but do you get something back? The LEAD companies have a strong belief that there is a payback and we do, too. It is part of our whole strategy to create value from the forest in a profitable, responsible, and sustainable way.

As a LEAD company, we have access to advanced and innovative approaches to corporate sustainability by collaborating with other global companies (some of which are our customers and suppliers) who face similar challenges but in different sectors. We have the opportunity to engage with not only these companies and the UN, but also with investors, business schools, and other agencies. In return, we are challenged to ‘walk the talk’ by moving sustainability issues from the backroom to the boardroom. And, to demonstrate leadership by example in our sector.



We have recently renewed our long-term targets for economic, social, and environmental responsibility. We are also revising our code of conduct and governance. Practically speaking, our involvement in LEAD is a continuation of what we have already been doing.”

Getting oriented

P. Salpakivi-Salomaa: “Every company has to find its own way along the sustainability path. One of my passions was Orienteering (navigation race using a map and compass to go from point to point in unfamiliar terrain). I was on the Finnish international team for 15 years. What I learned from Orienteering is that it is never a good idea to just follow the runner ahead of you – even if it is easier. You need to know yourself where you are, and where you are going. Because the competitor ahead of you at the moment might just be lost.”

Getting suppliers involved

P. Salpakivi-Salomaa: “Our first focus is obviously on our own operations, but even here there are several key touchpoints where supplier/partners are involved. For example, we are committed to responsible sourcing, which means that everything in our value chain should take into account social and environmental considerations. We focus on these details and expect our suppliers to do

the same. We audit suppliers to ensure they are demonstrating transparent reporting and a harmonized way of integrating human rights, safe work places, labor practices, environment, and anti-corruption. We, of course, hope that all of our suppliers will work to the principles of the UN Global Compact and have their own programs for corporate responsibility.

In terms of a suppliers’ ‘wish list’, resource efficiency is a very important driver for UPM. We truly hope that maximizing resource efficiency remains as a top priority for ANDRITZ’s R&D. Any and all technologies that increase yield while reducing waste are welcome. Critical and costly areas like energy and water consumption are extremely important at our mills. Reducing our impact on fresh water sources, for example, is not only good for our world, but also good for our business.

Technology suppliers certainly support us in our production processes and contribute greatly to our reduced environmental impact at the mill level. All of the systems from the woodyard to the finished pulp or paper product have an impact. For example, at our mill in China we send no solid waste to landfill.”

ABOUT PÄIVI SALPAKIVI-SALOMAA

Early years

Born 1957, lived childhood summers on an island in the woods

Education

- MSc in Forestry and Agriculture
- Belongs to One Planet Leaders

Work life

- First job in Wyoming, USA as a backpacking consultant
- Extensive experience in forestry and forest industry
- Currently Vice President, Environment and Responsibility, UPM

Private life

- Married, with three adult children
- Hobbies include long-distance walking and reading

Passion

Understanding the interaction between human activities and nature

Most important lesson

The same functional rules of ecosystems are global; only scale and intensity differs

A fresh perspective on ...

SUPPLIER CONDUCT AND ETHICS



Sooner or later, every company that develops its supply and value chains on a global scale is faced with the challenge of ensuring all suppliers understand and comply with shared core principles of how to conduct ethical business.

ANDRITZ works hard to align its principles with those of its customers, and equally hard to precisely define our expectations about

compliance with our own suppliers. To ensure that our supplier network understands and shares our values and principles, we created a “Supplier Code of Conduct and Ethics.”

Supplier management is a critical step in improving efficiency, maintaining margins, and improving the sustainability of our business through enlightened procurement practices.

An enhanced focus on compliance and ethics is a core part of Supply Chain Management (SCM) and is also on the agenda of many pulp and paper producers.

In simple terms, SCM is the management of materials, information, and finances in the end-to-end processes that define how our products and services are created and delivered to customers around the world. Materials include



FACTS & FIGURES

ANDRITZ GROUP purchasing volume

The value of items purchased by the ANDRITZ GROUP in 2015 amounted to 4.3 billion Euro. ANDRITZ buys most of its materials, goods, and services in regions where it has its own manufacturing facilities. The share of products and services procured in Europe and North

America totaled about 76% with the remaining 24% coming from emerging markets. Given the volume of purchases, ANDRITZ makes a significant contribution towards local economic value-added. By selecting localized suppliers, transportation routes are shortened and CO2 emissions are reduced.

Material consumption

The breakdown of materials and services consumed by the ANDRITZ GROUP in 2015 is as follows:

- 77% for mechanical/electrical components, erection work, installation, infrastructure, and investments
- 14% in logistics, mechanical engineering design, service and consulting, IT, and business travel
- 9% for cast and forged parts, metal sheets, screen baskets, steel fabrication, and conveyor technology sectors

not only goods manufactured in ANDRITZ facilities, but also the movement of goods from a sub-supplier to a customer. Information involves transmitting orders and updating the status of delivery. Finance consists of credit terms, payment schedules, consignments, and ownership arrangements.

ANDRITZ's global SCM activities have merged with other internal continuous improvement programs to focus on the end-to-end process steps. Our experience has been that it opens up new opportunities to utilize assets better, uncover new resources, and reduce costs.

Supplier Code of Conduct and Ethics

The ANDRITZ Code of Conduct and Ethics extends to all suppliers who wish to do business with the company. It is designed to let our suppliers know our expectations with regards to such topics such as quality; reliability; human rights and working conditions; environmental responsibility; sustainability;

integrity; export controls; intellectual property rights; and data protection.

The Code of Conduct and Ethics sets the minimum requirements for a supplier to do business with ANDRITZ. In order to qualify as an "ANDRITZ supplier" each company must answer compliance- and sustainability-related questions and accept the Supplier Code of Conduct and Ethics by signing a legally binding document. Suppliers must update and reconfirm their data once a year.

ANDRITZ has a Group Procurement management function that plays an important role by focusing on providing procurement-related expertise, processes, and tools to support purchasing professionals in the business areas with their work. This involves optimizing the supplier structure, the internal and external processes, and the utilization of "best cost" sourcing countries.

In addition, the Group established a global Supplier Compliance and Sustainability office. To assist in managing supplier relationships, a specially developed tool (part of the Supplier Relations Management System) helps the compliance officer continuously monitor existing and new suppliers in terms of their corporate social responsibility aspects, and to manage the implementation of the Supplier Code of Conduct and Ethics.

After screening and analyzing this information, ANDRITZ's procurement group decides which suppliers to approve. ANDRITZ gives preference to suppliers who demonstrate that they can be long-term, reliable partners. Since the sourcing is extremely global, this procurement activity makes a contribution towards maintaining and strengthening ANDRITZ's ability to compete anywhere in the world.

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ERE & RE

POSITIONED LOCATED

—
for success

Sometimes, companies need to reposition themselves to meet changing requirements and future challenges. Sun Paper repositioned a pulp mill ... literally ... from Laos to China. With location and fiber mix changing, ANDRITZ needed to demonstrate the utmost flexibility.

“The main factor for the change in location was that we wanted to expand our market share into new areas, such as viscose pulp for the clothing industry,” says Liu Yanbo, Sun Paper Project Director. “It was a logical extension to our previous investments in China.”

Originally in 2011, Sun Paper Holding Lao Co. ordered woodyard, fiberline, pulp drying, and white liquor production systems from ANDRITZ for a greenfield project in Laos. “The selection of the main supplier was quite easy, as ANDRITZ benefits were so favorable,” Mr. Liu says. “Their strengths are their knowledge of advanced pulp technologies coupled with high-quality equipment and experience executing projects in different cultures.”

ANDRITZ completed the engineering and manufactured the equipment. Shipments were made to Laos in the summer of 2012. At that point, Sun Paper suspended the project.

Rethinking requires flexibility

After resetting its strategy and location, the project continued in late 2014. Zoucheng (Shandong Province) in China was the cho-

sen location. The new mill is about 30 km from Yanzhou, where Sun Paper’s large mill complex and headquarters are located. Following an amazingly rapid erection phase, the mill start-up was in late 2015.

Naturally, the change in the mill’s location and raw material supply caused some extra challenges. ANDRITZ consulted with its customer to adjust for a new environment. The key for Sun Paper was to have flexibility – in fiber source and in end product.

“The Laos mill was going to use plantation eucalyptus and acacia solely,” Jorma

Olkkonen, a senior fiberline project manager and ANDRITZ overall Project Director, explains. “The decision to include long fiber required us to make some changes to our woodyard and fiberline systems to obtain the required process values.”

Today, the Zoucheng mill is planning to swing pulp production from hardwood to softwood – and from dissolving to kraft. Design capacity is 850 t/d dissolving or 980 t/d bleached kraft pulp. The fiber sources are eucalyptus and acacia that are chipped off-site and transported to the mill, as well as softwood chips from different sources.





▲ Following the new continuous digester are multi-stage DD Washers for brownstock washing and post-oxygen washing, and a single-stage DD washer after every bleaching stage.

Solid foundations with long-term partnership

ANDRITZ was able to dedicate a project team who had a long history of cooperation with cooperation with Sun Paper and had established solid and excellent relationships. "I have known Jorma Olkkonen almost 20 years," Mr. Liu says. "We have worked on several projects together. I have learned to trust his skills and expertise. His

experience in managing large projects successfully was very important for us."

"Our long-term partnership ensured good cooperation during the project execution here in Zoucheng," Olkkonen says. "This has made it possible to fast-track the project with efficient erection, commissioning, start-up, and optimization."



▲ Almost 20 years being colleagues and friends, a sustainable relationship based on respect and understanding Yanbo Liu (left) and Jorma Olkkonen (right) stand in front of the ANDRITZ digester.



▲ The mill plans to swing between kraft and dissolving pulp depending on market demands and fiber availability. Twin vessels in the continuous cooking plant (a pre-hydrolysis vessel and a traditional digester vessel) make this flexibility possible.



▲ ANDRITZ provided the basic engineering and chip screening technology ensuring that incoming chips are of optimum size for the cooking plant. Oversized chips are treated in a new ANDRITZ rechipper.



▲ ANDRITZ's delivery of the pulp drying plant (1,200 admt/d of kraft or 950 admt/d of dissolving pulp) has some advanced and innovative energy-saving technologies to reduce operating costs.

A fiberline with flexibility

ANDRITZ's scope for the Zoucheng project included woodyard equipment, the complete fiberline, the white liquor plant, and the drying plant.

ANDRITZ provided the basic engineering and technology for the receiving hopper for market chips and a scalping disc screen before the new gyratory chip screen. The chip screen, with a capacity of 700 m³/h, ensures that incoming chips are of optimum size for the cooking plant. Oversized chips are treated in a new ANDRITZ rechipper. Fines are burned in the boiler.

The mill plans to swing between kraft and dissolving pulp depending on market demands and fiber availability. Twin vessels in the cooking plant (a pre-hydrolysis vessel and a traditional digester vessel), plus a streamlined chip feeding system, make this flexibility possible. The continuous cooking plant includes a Diamondback chip bin for uniform heating of the chips and uninterrupted feed to the pre-hydrolysis vessel (PHV). A patented TurboFeed chip pumping

system transports the chips to the top of the PHV, which then feeds the digester itself.

The high cellulose purity required for dissolving pulp is achieved by pre-hydrolysis kraft cooking. The process begins in the PHV by auto-hydrolysis, which removes most of the hemicelluloses prior to normal kraft cooking. The PHV integrates well with the digester for swings from kraft to dissolving pulp. "Smooth transitions are essential to the mill's productivity and efficiency," notes Olkkonen. "The same fiber source is handled in different ways to make entirely different products."

Following the digester are multi-stage DD Washers for brownstock washing and post-oxygen washing, and a single-stage DD washer after every bleaching stage. The screen room is equipped with pressure screens (ModuScreen), as well as a knot separator, knot washer, and reject washer.

White liquor production

The mill's new white liquor plant has capac-

ity to produce 4,800 m³/d of white liquor. The LimeKiln can produce 400 t/d of reburned lime. "Included in our delivery was the LimeGreen filter for removing nonprocess elements and a LimeFree centrifuge for dewatering green liquor dregs," Olkkonen says. "A LimeSlake system is used for slaking the lime mud in the recausticizing process."

White liquor is filtered through a pressurized disc filter (LimeWhite). A LimeDry unit is the latest technology for lime mud dewatering and washing. It provides large-volume filtration in a small footprint. The kiln itself is equipped with a LimeFlash head where lime mud is flash pre-heated prior to burning it in the kiln. Since kiln exit gases are recovered to flash dry the mud, energy is saved.

Efficient drying and baling

ANDRITZ's delivery of the pulp drying plant (1,200 admt/d of kraft or 950 admt/d of dissolving pulp) has some advanced and innovative energy-saving technologies to reduce Zoucheng's operating costs, according to

FUTURE INVESTMENTS and the environment

Interview with Ying Guangdong, Vice President, Sun Paper Group

"Sun Paper is very pleased with this project, and we can see a bright future for our company. We have new investment plans in the near future both in Laos and in the United States.

"We have had a strong relationship with ANDRITZ for nearly 20 years. We rely on ANDRITZ to continue with its innovations, advanced technologies, quality products, and services. R&D plays a pivotal role in maintaining an edge.

"China is today experiencing an oversupply in industry, even the paper industry. Growth is predicted to be slower but the Chinese markets will adapt accordingly. The three decades of rapid growth in China have had impacts. Our future will be more environmentally focused. Generating sustainable products that meet our environmental commitments will be vital.

"As has been previously announced, we are engaged in discussions with the state of Arkansas to build a greenfield mill in the USA. Environmental permitting will take up to eight months, and we expect to have the mill operational in 2019. Within the next five years, our breakdown of production will be 40% paper, 30% consumables, and 30% biomaterials."



◀ Ying Guangdong, Vice President, Sun Paper Group

Klaus Pöschl, Director of Sales for pulp drying systems at ANDRITZ. For example, dewatering is performed in an energy-efficient Twin Wire Press that minimizes vacuum requirements in forming and dewatering. An airborne sheet dryer, a high-speed cutter/lay-boy (sheet width 4.7 m), and one automated baling line complete the package.

"Commissioning and start-up were extremely efficient and successful," Pöschl says. "The plant was in commercial operation only two months from the beginning of the commissioning phase. The start-up was excellent with a steep ramp up curve."

Punctual performance, detailed planning, great results

The start-up of the new plant took place late 2015. Fine-tuning and optimization are continuing.

"The good results and experiences derived from this project make us more confident making investments anywhere in the world,"

Mr. Liu says. "Sun Paper has a reliable partner in ANDRITZ. We have done projects for kraft and mechanical pulps, as well as stock preparation systems and even tissue machines."

According to Mr. Liu, "Runability has been excellent with only scheduled shutdowns. We are also able to exceed the new envi-

ronmental regulations set by the environmental regulators."

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The mill's new white liquor plant from ANDRITZ has capacity to produce 4,800 m³/d of white liquor. The LimeKiln shown here can produce 400 t/d of returned lime. ▶



SCREENING DEVELOPMENTS IMPROVE YIELD

and quality from OCC/Mixed Waste furnishes

Recycled fiber processors are constantly faced with the conflicting challenge: how to process highly contaminated furnishes to optimum levels of cleanliness while still minimizing yield losses. This TechTalk discusses some recent and proven developments in coarse screening that help improve the situation.

Recycled fiber applications pose difficult challenges. Each sub-process must operate at the highest (optimum) efficiency in order to remove the maximum amount of contaminants – while still yielding good fiber at a cost that makes the application economically attractive.

Virtually all mills today are faced with furnish degradation with increased debris levels. Debris is more prevalent in OCC and Mixed Waste furnishes. Some mills try to manage debris removal in the pulping loop through double or continuous detrasching. There are other solutions that require minimal or

no capital and leverage the mill's existing assets.

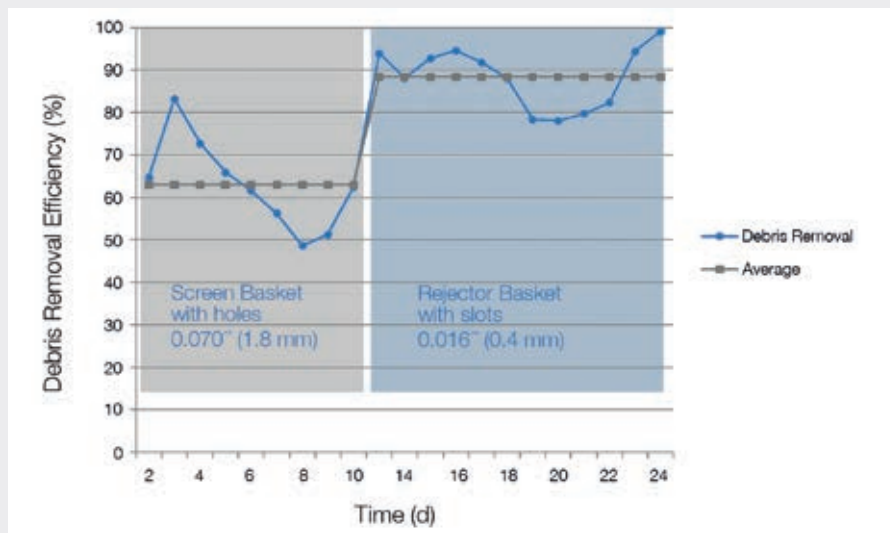
More vs. less

Recycled fiber processing balances the desire to remove more and more contaminants (which suggests installing more equipment) with the critical need to improve yield (which suggests less equipment in order to minimize potential points of fiber loss). What can a mill do to improve this situation? One approach is to optimize the Coarse Screening loop.

The Coarse Screening loop

Virtually all recycle mills incorporate a Coarse Screening loop into their flowsheet. There are several ways to configure a Coarse Screening system; however, the basic functions remain the same:

- Screening for debris removal
- Deflaking to minimize fiber loss
- Rejects separation and the concentration of plastics



▲ Figure 1. The primary benefit of converting from holes to slots in the coarse screen basket is to increase coarse debris and stickies removal early in the process to take the strain off downstream equipment. This graph illustrates the typical stickies reduction results from a hole-to-slot conversion.

These steps can be performed using a variety of equipment; however, the goal is to minimize

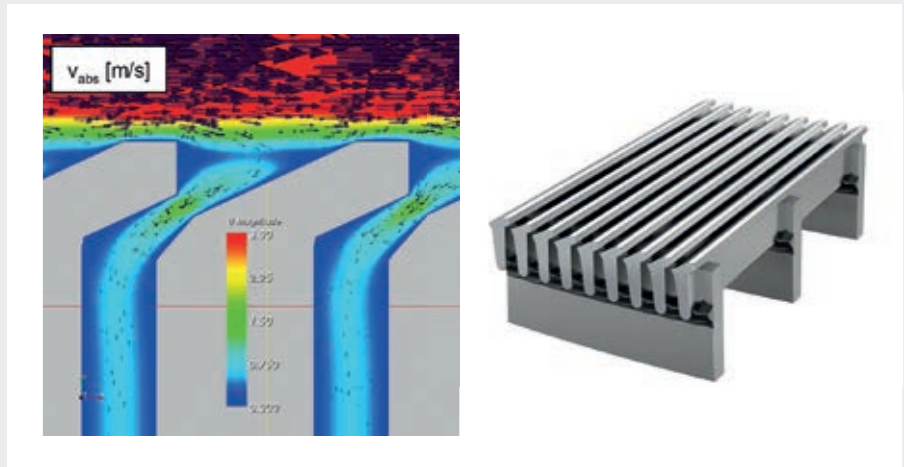
the amount of equipment to lower the mill's operating and maintenance costs.

Screening for debris removal

OCC systems have high debris loading. Many mills are converting from screen baskets with holes to baskets with slots to increase removal efficiency.

Early coarse screen baskets had drilled holes typically ranging from 0.055-0.079 inch (1.2-2.0 mm) depending on the furnish. These baskets were good for removing large and coarse debris, but poor for removing smaller debris and stickies. This increases the burden of higher debris levels in the incoming feed to downstream equipment, which is being tasked with achieving excellent removal efficiencies with very little fiber loss.

More recently, screen baskets with slots, typically 0.016-0.030 inch (0.4-0.75 mm), have been utilized. However, these slots typically have the same wire/profile shape as those in fine screens, even though the role of the coarse screen is primarily "barrier screening" to protect downstream equipment, as opposed to the "probability screening" function of a fine screen.



▲ Figure 2. Flow analysis of ANDRITZ Bar-Tec Rejector wire. Cross-cut of a Bar-Tec Rejector profile.

Enter the ANDRITZ Bar-Tec Rejector basket for effective removal of coarse debris with lower energy requirements. The Bar-Tec Rejector is the only basket in the market today with a wire profile for the Coarse Screening loop.

Increased angle of repose. Computational Fluid Dynamics (CFD) analyses were performed to optimize the Rejector's turbulence and passing velocities. Conventional wire

profiles require debris to make a 90° turn in order to be accepted. The Rejector requires the debris to make a 120° turn – a more difficult path for the debris to take. There is also a unique channel that greatly improves debris removal and improves basket life.

Reduced energy to clean the slots. Conventional wire profiles, upon completion of the negative rotor pulse to clean the basket, draw the accepted stock/water back through the basket in a flow that is perpendicular to the feed pulp stream. This increases energy consumption. The back flush flow in the Rejector is in the direction of the rotor rotation, improving the negative pulse effectiveness and minimizing energy consumption.

Increased area for chrome. The Rejector wire has significantly more land area (the top of the wire) for the addition of chrome, which increases basket life.

Smaller slots for stickies removal. Although the Coarse Screening loop is typically not the place where stickies are removed, the slot size, profile height, and angle of repose of the Rejector allow for substantial stickies removal. With fewer stickies in the accept pulp, there will be reduced stickies in the feed to the fine screens.

Improved energy efficiency
A variety of different rotor types can be used in the Coarse Screening loop. For simplicity,

	Drilled baskets 0.051" (1.3 mm) hole Profiled	Bar-Tec Rejector basket Slot 0.020" (0.4mm)
Rotor	S Type-3 vanes	LR DRUM 300
Tip speed	23.2 m/s	23.2 m/s
Capacity per screen	~ 227 t/d	~ 417 t/d
Diff. pressure (psi)	3.5-4.0	2.7
Power consumption	60-63% on 200 hp	54% on 200 hp
Consistency feed accept	2.5% 2.4%	2.5% 2.3%
Debris removal	42%	69%
Screens required	3	2
Power savings	none	Shut down a 200 hp motor ~ USD 60,000 / yr
F-A freeness drop	Normal 50-80 ml	none

▲ Figure 3. Linerboard Results. This mill replaced the OEM wear components in three screens with the Bar-Tec Rejector basket and an optimized rotor design. This increased the capacity so dramatically that the mill was able to shut down one screen. Note the debris removal increase and power decrease.



▲ Figure 4. DRUM 450 Dolphin rotor for coarse screening. The rotor creates optimal pressure pulses (positive pulse for debris removal efficiency and negative pulse for cleaning to minimize plugging).

these rotor types can be categorized as being “open” or “closed.” While ANDRITZ supplies different rotor types for all OEM screens and applications, the most popular for many applications is the low-energy DRUM 450 Dolphin rotor.

The DRUM 450 Dolphin rotor is specifically engineered for coarse screening. It is a closed design that is ideal for eliminating fiber hang-ups. This DRUM 450 Dolphin rotor

is specifically designed for maximum capacity as the arrangement of its foils prevents debris from being trapped between the rotor and the basket.

It has been documented that the DRUM 450 Dolphin rotor can achieve 15-30% energy savings compared to a conventional foil rotor. This is mainly accomplished due to the creation of optimal pressure pulses, allowing the rotor to operate at lower tip speeds.

The foils on the DRUM 450 Dolphin body are streamlined to minimize drag and the “pumping effect” that disturbs stock flow inside the screen. The foils also create a strong negative pulse for effective cleaning of the screen basket, which minimizes plugging even with highly contaminated furnishes. The foils themselves are individually replaceable to reduce maintenance costs.

Rebuildable cylinders save time and money

To reduce maintenance costs, ANDRITZ offers in-mill rebuildable screen baskets. Only critical wear components are replaced. The Bar-Tec U-Tune basket design can be used in coarse and fine screens from virtually every OEM. It is especially useful in high-pulse OCC applications since it can be easily rebuilt at the mill site.

The Bar-Tec U-Tune is constructed with two screen liners joined by a patented and remov-

able middle ring. This provides the option of having different profiles or even different slot sizes in the feed and reject sections of the basket, or to replace the part of the cylinder (top or bottom) that is damaged. The cage, rings, and flanges are reusable and rebuild time is typically less than two hours.

IN SUMMARY,

most recycle mills are looking for ways to optimize their Coarse Screening capabilities with minimal capital and operating costs. Much can be accomplished with no-capital solutions such as the ANDRITZ Bar-Tec Rejector basket and the DRUM 450 Dolphin rotor. Operating and maintenance costs can be further reduced with the Bar-Tec U-Tune rebuildable basket design.

The results will be increased debris removal, reduced power consumption, lower overall wear parts costs, and minimal fiber loss – for both brown and white furnishes.

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Figure 5. DRUM 450 Dolphin increased throughput plus energy savings. The size and placement of the foils on the rotor achieve excellent runnability at high consistencies and increased capacities. ▼

Slot Width	Rejector 0.024" (0.6 mm)	Rejector 0.024" (0.6 mm)	Change
Pressure screen	UV500	UV500	
Rotor	OEM drum rotor	DRUM 450 Dolphin	
Rotor tip speed	18.5 m/s	18.5 m/s	
Capacity	480 bdmt/d	560 bdmt/d	+ 17%
	850 m ³ /h	970 m ³ /h	+ 14%
Power consumption	48% (120 kW)	39% (97.5 kW)	- 19%
Specific power consumption	6 kWh/bdmt	4.2 kWh/bdmt	-30%
Energy savings	none	USD 22,680/y	22.5 kW * 24 h/d * 350 d/y * USD 0.12/kWh

Figure 6. The Bar-Tec U-Tune in-mill rebuildable screen cylinder. ▼





Gerhard Schiefer

Head of ANDRITZ AUTOMATION

“A revolution is evolving.”

It seems that everyone in manufacturing is talking about *Industrie 4.0*, a term coined to describe ways to make Europe more competitive. There are similar “re-industrialization” efforts in the USA and other countries. What do CPS and IIoT have to do with producing pulp, paper, and power?

Industrie 4.0 is a German initiative that identifies with the Fourth Industrial Revolution to safeguard a sustainable advantage for its manufacturing companies to remain globally competitive. *Industrie 4.0* promises manufacturing efficiencies like we have never experienced before, based in part on the expanded use of **Cyber-Physical Systems** (CPS – hardware systems with embedded software).

Another closely related concept is the **Industrial Internet of Things** (IIoT) which has many variations – from GE’s “Industrial Internet” to Cisco Systems’ “Internet of Everything.” The Industrial Internet Consortium (IIC) with its nearly 200 members in 12 countries is working to accelerate the adoption of Internet-connected technologies across industries.

From a mill’s perspective, the technologies in play here are not new. That is why I would call it an “evolution – not a revolution” driven by new and innovative combinations of these technologies. What is new is the massive increase in computer performance – more computing power in smaller packages. Existing technologies can be linked, and very large data volumes can be analyzed and understood, to considerable benefit. For example, a smartphone today has enough computing power to handle the basic control of a paper machine.

The world of devices is going to become more connected. We at ANDRITZ consider this a real opportunity to make our equipment a source of data and information for improvement purposes and to add value to customer operations. We have been offering some of these solutions for a while now. We just didn’t call them “*Industrie 4.0*” but rather smart industrial solutions.

A very good example is our Optimization of Process Performance (OPP) service. Here, a large volume of production data is collected by the many sensors and distributed control systems in a mill – and statistically analyzed by our OPP software to detect abnormalities or opportunities for improvement. By doing so, it is possible to foresee probable incidents (e.g., web breaks) or reduce consumption (e.g., energy, chemicals) to improve asset performance and lower costs.



Within our own engineering and manufacturing development at ANDRITZ, we are using Smart Simulation to help us design, virtually verify, and implement process automation systems in your mill quicker and with less rework. Our Simulated ANDRITZ Logic Engine (Sim-ALE) will take us from functional design in engineering to a completed project in a totally integrated way, with the added value of training operators long before the production equipment is started up.

We have three main technology focal points in automation:

1. to conduct measurements with compact and wireless sensors at points that cannot be measured at the moment (e.g., rotating parts);
2. to make information for operation and maintenance available where it is needed; and
3. to use data compression and analysis of large volumes of data so mills can operate with even greater efficiency.

This requires that supplier and customer come closer together. I can imagine a time when mills stop buying machines and start buying operational and production services (e.g., a certain paper production volume per day, or a certain dewatering capacity per hour). This is already happening in other industries. GE, for example, doesn’t sell jet engines to some airlines – but rather “thrust by the hour.”

Karlstads Energi AB is serious about district heating. The last thing the 89,000 people in the municipality of Karlstad need during a severe cold snap is to run out of heat. Their new ANDRITZ BFB biomass boiler ensures sufficient electricity and heat for years to come.

The municipality of Karlstad in Sweden has a long history of generating its own electricity and district heating. It also has a number of firsts under its belt: the first city in Sweden to have district heating and the first city with a biomass-fueled Combined Heat and Power plant (CHP), which was fed by residue from a nearby sawmill as early as 1948.

More recently in the 1970s and 1980s, oil was the fuel of choice for Karlstad's boilers, mainly due to lower prices. But, corresponding with a relocation to a new site in Hedvågen on the outskirts of the city in 1986, a move was made to waste-to-energy production. Following that in 1992, a biomass CHP plant (Heden 2) was started up.

The decision was made by Karlstads Energi and the local municipality in 2012 to go with totally fossil-free fuels in the total production

mix for district heating – generating power and steam using local biomass. The company now supplies electricity to the national grid, and most importantly, district heating to the municipality that is totally fossil-fuel free.

ANDRITZ was chosen as the main technology supplier for Karlstads Energi's latest project, Heden 3. The project includes a Bubbling Fluidized Bed (BFB) boiler capable of generating 127 t/h of steam equal to 88 MW of thermal power.

Committed to renewal

Johan Thelander was Karlstads Energi's Project Manager for Heden 3. "We are committed to renewing and updating the equipment at our power plants," Thelander says. "We have a cycle of about 22 years where we make a complete replacement. This is mostly due to the operating wear and tear on the equipment, but it also enables us to keep

ahead of changes, for instance in climate or population growth, which will require more power and heat."

According to Thelander, "We have a zero tolerance for not meeting the heat demand on the district heating grid at any given moment. That just does not happen. We make sure we have options for whatever scenario is thrown at us."

And scenarios do come. In 2010, the region saw back-to-back winters that pushed the plant hard. Thelander says, "2010 was a dramatic year – two bad winters in a row. We set a production record with big volumes during the very low temperatures. We suddenly became very busy."

Technology and performance winner

With unpredictable weather patterns, volatile fuel prices, and ever-changing customer

THE HEAT

(and it is fossil-free)



demands, the Heden 3 project had to be a winner in terms of its technology and performance. There were also rewards in the form of green electricity certificates, as well as lucrative rebates for reduced NOx emissions, which provided commercial benefits. Going fossil-free with the best environmental technology would produce economic, social, and environmental benefits. There is the added advantage that all the biomass fuels are locally sourced.

Thelander says, "We projected the income from the green certificates and we could see a really good result, so in 2012 we conducted a feasibility study and started discussions with the Karlstad city council. We carried out the usual project risk analysis, discussed with all parties involved, had a series of discussions with the authorities, and managed to do all this in a relatively short time."

"When we got the decision approved, we spoke with a number of technology suppliers and looked at their various reference sites," says Thelander. "But I have to say that ANDRITZ was the supplier that really seemed



▲ Heden 3's housing was designed in the shape of a wave to represent the "new wave of the bio-economy."

to 'get it' by really understanding our needs and what our requirements were. But it turned out there was some pioneering new technology needed to maximize the power plant's efficiency to the desired level."

Trailblazing with pioneering technology

According to Markus Slotte, Area Sales Manager for ANDRITZ's Power Boilers in

Scandinavia, "During our discussions, it became clear to us that a high priority for Karlstads Energi was to increase the electricity-to-heat ratio from the plant to be able to produce as much electricity as possible at a given district heat demand. For this, we worked with them to develop a tailor-made solution to boost the electrical output without increasing the steam parameters in the plant."

IT IS ON...





▲ Shown is a fuel discharging system at the bottom of one of the day silos. The plant is equipped with two such systems for redundancy reasons.



The boosting of electricity production is accomplished with ANDRITZ's Cyclcx system (previously called a Heat Shift System). By utilizing certain features of the Cyclcx system, it is possible to replace the bleed steam from the turbine that was formerly used for preheating condensate and instead use this steam for maximizing the turbo-generator's electrical output.

"In addition to making the process more efficient, it also made the boiler plant design simpler, and improved control of the boiler process," says Slotte. "With the Cyclcx system, you don't need flue gas-to-air preheaters. This gives added flexibility and simplifies the layout. Also, it was possible to use a low-dust catalyst after the bag filter, which is a very cost-effective way to reduce NOx emissions."

The plant has a flue gas condenser system after the flue gas fan, and a combustion air humidifier upstream from the combustion air fans. This way, the latent energy in the flue gas is recovered and transferred to the district heating water. "This plant is really optimized for maximum overall efficiency as well as electric output," says Slotte. "It produces as much district heat as possible, and then uses the remaining district heat load demand to produce as much electricity as possible."

Win-win-win

ANDRITZ delivered the complete boiler island, from fuel bin to flue gas fan outlet. The BFB design is efficient at burning wood-based fuels including forest residuals, saw-mill chips, and bark.

The new plant has created a number of win-win scenarios when it comes to NOx emissions and puts Karlstads Energi right up there with the top producers in the country. Thelander says, "We are now one of the top five plants in Sweden for efficiency. This year we will be below 10 mg/MJ of NOx emissions, which rewards us with about SEK 3 million (EUR 300,000). ANDRITZ really helped us to achieve this with the Cyclcx and Selective Catalyst Reduction systems."

The project ran very smoothly. "We were spot on with this installation from the very beginning," Thelander says. "We are also delighted that the overall project came in at about 15% lower than we budgeted for."

"The installation and commissioning was challenging in that there were a number of suppliers



▲ Hannu Ylönen, ANDRITZ Project Manager for Heden 3

on-site at the same time," says Hannu Ylönen, ANDRITZ Project Manager. "Making sure that work was conducted safely and that everything came together took considerable planning and good collaboration with Johan's team and the other suppliers."

Ylönen noted the project flow and on-site cooperation with the customer's team. "Karlstads Energi was well organized and the project was conducted in a very friendly and constructive atmosphere. Suppliers and subcontractors worked well with each other. I would like to take this opportunity to thank the whole project team."

3D modeling for project management

Karlstads Energi decided to bring in some state-of-the-art project management tools to make sure that any potential interferences or clashing scenarios were seen way in advance by the use of 3D modeling. "The 3D modeling was a real plus for this project," says Thelander. "We combined the 3D models from all the suppliers into one common 3D model and could see where all their different pipes, wires, and hardware were to be positioned. By doing this in a virtual way, we could sit together and make adjustments before the installation began. It was also a fantastic tool when it came to the health and safety of the project."

The results

Heden 3 started production in the summer of 2014 and Karlstads Energi took over the full running of the plant on December 23, 2014. Johan Svartvik, Plant Manager, says, "It has been over



▲ (Left to right): Johan Svartvik, Plant Manager; Markus Slotte, ANDRITZ Sales Manager; and Johan Thelander, Project Manager, for Karlstads Energi inside the biomass boiler building.



▲ The feedwater tank in the ANDRITZ BFB boiler.

a year now since we took over the full running of the plant, and the availability of the boiler has been at 99%. There have only been minor stops, and none of them to do with the boiler. Really, it has performed well from day one.”

The fuel for the plant all comes from the local area. About 80% comes in the form of forest residuals (seasoned branches and tops) as well as residue from local sawmills. There are occasionally some logs which have to be chipped. The plant also takes rejected logs from Stora Enso’s Skoghall Mill located near Karlstad.

“We are very pleased with the ease of stop and start, and the maintenance is straightforward,” says Svartvik. “There was a big learning curve, but from the start it was our baby. Our veteran operators have a lot of expertise here, and we have several new people, so nothing has phased us so far.”

And how is Heden 3 performing in terms of output? Says Thelander, “Today we are running at full load, which is about 89 MW. No problems. With the ANDRITZ technology, we have the functionality at this plant to always optimize depending on the fuel.”

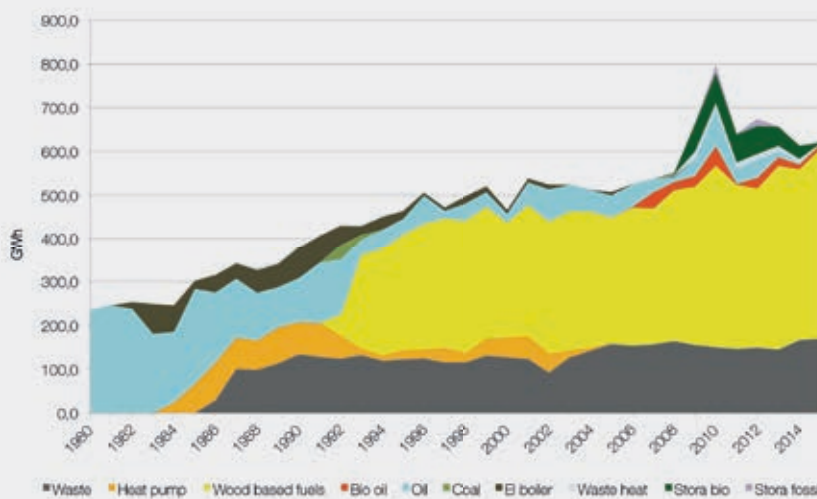
When the guarantee period is over, Karlstads Energi will look to push production a little further. “We have already reached 93 MW during a performance test,” Thelander says. “We can certainly push the boiler a little bit harder. We will only be limited by the capacity of the turbine.”

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ANDRITZ delivery to Karlstads Energi

- Complete biomass boiler (including boiler house)
- Bag filter and SCR catalyst
- Cyclax system
- Solid fuel feeding and ash removal systems
- Water treatment plant
- Reserve condenser for district heating
- Complete automation/electrification/instrumentation
- HP steam distribution to turbine and pressure reduction stations for emergency condenser/process steam

The Evolution of Heat Production: Karlstads Energi



▲ This chart illustrates the changes in fuel sources for Karlstads Energi’s Heden plant. The benefits of applying high steam parameters and the Cyclax system are higher electricity-to-heat ratios (28.2 MW / 52 MW = 0.54). The downstream flue gas condenser ensures a very high overall efficiency of 116% (calculated using the effective heat value of the fuel and excluding auxiliary power consumption).

CLEANER. LONGER. STRONGER.

ANDRITZ recently modernized the 1980s vintage Rauhalampi power plant in Finland so that it would meet more stringent emissions standards to be enacted in 2020. In addition, upgrades to certain boiler subsystems will extend the lifetime of the boiler.

Jyväskylän Energy Group (JEG) is the electricity, water, and district heat provider for the city of Jyväskylä (about 270 km north and slightly east of Helsinki). The Group employs about 250 people. Electricity generation began in 1902. District heating with wood chips began in 1960. JEG has two power plants, the Rauhalampi plant being the older of the two.

The district heating network

In the Jyväskylä area, the building volume utilizing district heating is about 27 million m³. This represents about 4,600 customers. The network is about 435 km long and represents about 1,024 GWh of energy production. The Rauhalampi plant, which produces 85 MWe and 210 MWt, was commissioned in 1986. Keljonlahti, which is the larger of the two Combined Heat and Power (CHP) plants at 495 MW, was inaugurated in 2010.

“Our commitment to the environment is firm,” says Teemu Rönkkö, Vice President

of Energy Production. “We try to produce as much energy as possible with wood and peat sourced locally. In Finland, about 10% of electricity production is from renewable fuels. Here at JEG, the percentage is about 36%. Plus, 100% of the ash from our power plants is used as forest fertilizer or earthworks.”

Reducing dust and other particulates

“Our Rauhalampi plant uses peat, forest fuels (logging residue and stumps), and mill by-products such as sawdust and bark,” says Markku Ylitalo, Production Manager. “A small amount of oil is needed for start-up and we have the capability to burn coal if there is a shortage of other fuels.”

Water recirculation pump for flue gas condensing system. ▶



Rauhalahi's boiler was originally designed to burn pulverized peat, but was converted to BFB technology in 1993. "In the late 1990s, we began adding forest fuels to the mix," says Ylitalo. "Today, we burn a 50/50 mix of biomass and peat, all sourced domestically."

JEG's volume of energy production increased significantly with the commissioning of the Keljonlahti plant in 2010, but emissions per megawatt hour (NO_x, SO₂, and dust/particulate) have fallen steadily. Still, there is a new Industrial Emissions Directive (IED) from the EU that will require Rauhalahi to lower its emissions by 2020.

"The new IED was the driver for our investment project," says Ylitalo. "But we also wanted to take the opportunity to extend the life of the boiler."

In February 2014, the Board approved a EUR 30 million investment to upgrade the boiler at Rauhalahi. "With this investment, we will not only meet the new IED limits for SO₂ and flue gas dust content, but also extend the boiler's productive life to at least 2030," Ylitalo says.

"This was a rather large investment for a small energy company," Rönkkö says. "So we wanted to make sure we were getting the best, proven solution."

JEG worked with experts from Fortum to do some test burns in order to analyze the chemical

composition of the flue gas and the ash to be able to discuss in detail possible technical solutions from potential suppliers.

ANDRITZ power plant services

Kalle Aro, Product Manager for ANDRITZ's power plant services group, was part of the team that developed the technical solution for Rauhalahi, and then was Commissioning Manager when the contract was awarded to ANDRITZ in March 2014.

"To control dust emissions, we recommended a new electrostatic filter unit to replace the old system and the addition of a flue gas condenser to remove the sulphur oxides," Aro says.

"To improve boiler availability and efficiency, we advised replacing the old rotary flue gas air

preheater with our HTS unit. We also recommended replacing an old fin-tube hot economizer that was plugged most of the time, and adding some new boiler surface."

The HTS that Aro refers to is the ANDRITZ Heat Transfer System. HTS is a simple, closed-circuit water system for preheating combustion air indirectly using flue gases. It is much easier to operate and maintain than the old rotary preheater and keeps the flue gas outlet temperature constant regardless of the load. The gas-to-water heat transfer in the HTS is four times more efficient than air-to-gas transfer.

Timo Mäkinen, Plant Manager, who also served as Commissioning Manager for the project, comments about the HTS technology, "This

Outside view of Rauhalahi showing the flue gas condenser building. ▼



system is much simpler, steady-state, and makes it easy to operate the boiler. From a maintenance perspective, it keeps the flue gas above corrosion temperatures regardless of the load. Plus, our old hot economizers were often plugged, and that is not the case anymore. So, we now have much better efficiency and availability.”

For emissions control, ANDRITZ delivered an electrostatic precipitator (for dust) and a flue gas condenser for SO₂ removal. Hot flue gas is delivered to the bottom of the condenser. Inside, a large-volume fine water mist is sprayed into the flue gas which binds the sulphur and the rest of the dust into the condensate. Sodium hydroxide is dosed with the water to keep a consistent pH in the 4.5-5.5 range. Condensate is treated and the hot water passes through a heat exchanger before being recirculated through the condenser. After the flue gas condenser, the clean and cold flue gases are led into the 130 m high stack.

“This heat exchanger provides a big benefit to us,” Mäkinen says. “It is basically free heat that we use in our district heating network and also to warm combustion air before the HTS.”

Rönkkä agrees. “The flue gas condenser design was impressive – simple, but effective,” he says. “We love the idea of taking heat from the flue gas condenser circulation and transferring it to our district heating network. We added 20% or more – adding 30-50 MW of thermal production – without

using any more fuel. Our plant buildings are also heated by waste heat from the condenser condensate.”

Smooth and safe project

Site construction began in the summer of 2014. Construction activities were basically paused during the winter of 2014 and picked up again in the spring of 2015. Some of the construction coincided with the period that the power plant was operating. “This was challenging, both for safety and operational reasons,” Ylitalo admits. “But, we finished the project with no serious injuries and no lost-time accidents, which is a source of pride for us.”

Mäkinen also served as Commissioning Manager for the project. “We had 300 extra people on-site during this project as we were refurbishing our turbine-generator at the same time,” he says. “Still, we were able to work safely and keep to our schedules.”

The modernized plant was started in September 2015. After testing all the equipment and instruments Rauhalhti went into full production. The plant was taken over by the customer in January 2016 after a 28-day continuous run test where there was not a single interruption in production.

“Unfortunately for ANDRITZ, this has been a very mild winter season, with the exception of a couple of weeks of very cold temperatures,” Rönkkä says. “That has meant that we could not run the final performance test at full load.



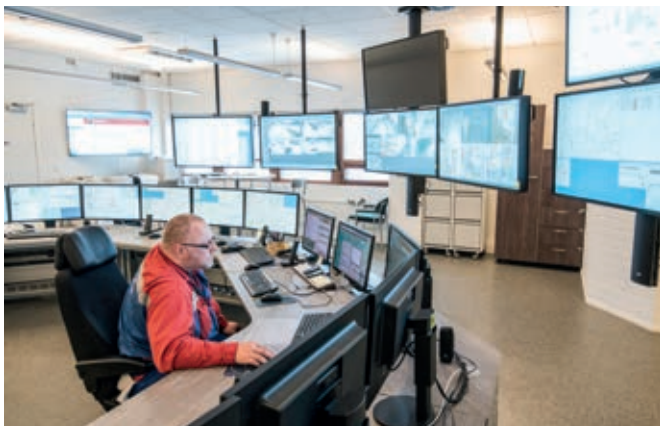
▲ Heat exchanger for transferring “waste” heat from the flue gas to the district heating network. Rauhalhti achieves 30-50 MW additional thermal energy with no increase in fuel consumption.

But we have every indication that the systems are performing perfectly. Our SO₂ emissions are practically zero and the dust/particulates out of the stack are near zero as well.”

“The cooperation with the ANDRITZ team has been very good,” Mäkinen says. “They are technically competent and have a good project organization. For us, this was a huge project. It was good that both we and ANDRITZ shared a common goal of showcasing some new and very promising power plant technology.”

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▼ Control room.



Timo Mäkinen, Plant Manager (left), with Kalle Aro, ANDRITZ Product Manager, in front of the flue gas condenser. ▼



Highlights

RECENT ORDERS

COMPLETE LINES AND SYSTEMS

Confidential Customer, China

All major production systems for new pulp mill: complete chip handling plant, fiberline, evaporation plant, recovery boiler, biomass gasification plant, white liquor plant, and NCG system. *World's largest ozone bleaching stage; largest High Energy Recovery Boiler in China*

SCA, Östrand, Sweden

Woodyard equipment, pulp dryer, upgrade of white liquor plant, and capacity increase of recovery boiler *Investment boosts pulp production from 430,000 to 900,000 t/a*

Nippon Paper Industries, Japan

Evaporation plant to replace old system for sulfite liquor

Confidential Customer, USA

Long-log debarking and chipping system supported by PartnerChip service *First EXL-size chipper to be installed in North America*

Confidential Customer, Russia

Wood processing plant with two-line woodroom

Arauco, Nueva Aldea, Chile

Basic condition monitoring and lubrication contract *To reduce unplanned shutdowns of rotating equipment*

Si Chuan Feng Sheng Paper, Sichuan Province, China

Stock preparation and disc filter/saveall systems for tissue machine

Guizhou Chitianhua Paper, Chishui, Guizhou Province, China

Two stock preparation systems; two *PrimeLineST* tissue machines
20 ft diameter Steel Yankees

Melhoramentos, Camanducaia, Minas Gerais, Brazil

Stock preparation and disc filter/saveall systems for tissue machine

Södra Cell, Mörrum, Sweden

7-effect evaporation plant

POSCO E&C, South Korea

Key equipment for a 50 MW BFB unit for greenfield waste-to-energy plant
Plant will generate electricity for 20,000 households and save 85,000 tons of CO₂ emissions annually

EQUIPMENT/UPGRADES

JC Segezha Pulp and Paper Mill, Segezha, Russia

Fiberline capacity increase: cooking and screening retrofit, new DD washer

Nordic Paper, Bäckhammar, Sweden

Lime kiln upgrade including LimeFlash and air pollution control

Daio Paper, Mishima, Japan

Continuous digester upgrade

Stora Enso, Sunila mill, Kotka, Finland

Upgrade of knot separation and screening
Part of program to modernize oxygen delignification process

Rottneros Bruk, Rottneros, Sweden

Flash dryer upgrade
50% capacity increase

Golden Phoenix (Xiaogan), Xiaogan, Hubei Province, China

Screens and spare screen baskets

Ji'An Group, Jiaxing, Zhejiang Province, China

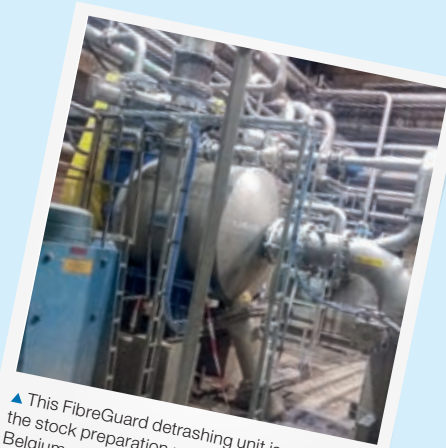
Flotation and rejects handling systems for OCC

Nine Dragon Paper, Taicang, Jiangsu Province, China

Stock preparation and approach systems for cartonboard

Cullen Grummit & Roe, Prince Rupert, BC, Canada

Appointed Automation Engineer of Record for Fairview Container Terminal Phase 2 Expansion



▲ This FibreGuard detaching unit is part of the stock preparation upgrade at VPK Paper in Belgium.

RECENT START-UPS

COMPLETE LINES AND SYSTEMS

Shandong Sun Honghe Paper Industry Zoucheng, Shandong Province, China

Woodyard equipment; complete fiberline for both kraft and dissolving; pulp drying plant; and white liquor plant

Klabin, Ortigueira, Brazil

Complete woodyard, fiberline, and white liquor plant for greenfield mill
Start-up exactly on schedule

Chen Loong Corporation, Taipei, Taiwan

700 bdm²/d OCC line

Shandong Huatai Paper, Dongying, Shandong Province, China

500 t/d DIP line rebuild (3 loops); virgin fiber and broke line rebuild

Natron-Hayat, Maglaj, Bosnia and Herzegovina

Millwide upgrade and virtualization of ABB DCS
First ANDRITZ millwide virtualization system start-up ABB 800xA

Zellstoff Pöls, Austria

Recovery boiler replacement
Fast-track schedule (world record) for type and size of boiler

EQUIPMENT/UPGRADES

Resolute Forest Products, Calhoun, TN, USA

Lo-Solids digester including TurboFeed; pressure diffuser for pulp washing; equipment for modification of existing fiberline

Chuetsu Paper, Takaoka, Japan

Modernization of oxygen stage and bleaching (5 DD washers) plus LimeFree centrifuge for white liquor plant

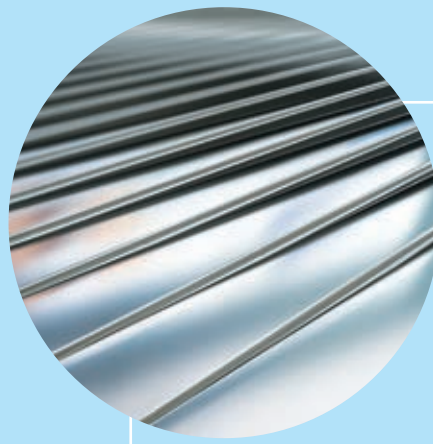
VPK Paper, Oudegem, Belgium

Stock preparation upgrade (pulping and screening)

Mondi, Frantschach, Austria

High-density concentrator in the evaporation plant

DID YOU KNOW THAT...



...there is a new “twist” to reach your full screening potential?

ANDRITZ U-Twist screen baskets allow us to twist the wire from top to bottom – without changing the slot width – to tailor the basket to your application requirements for high efficiency without jeopardizing runability.

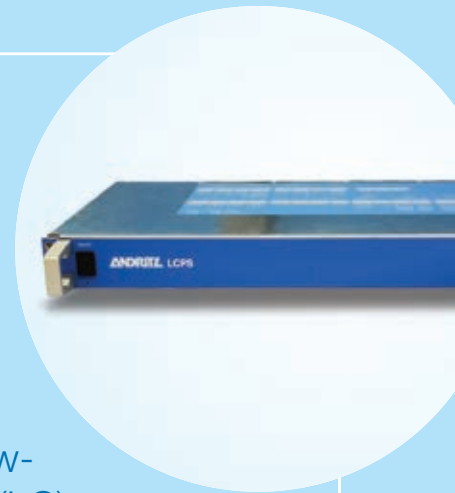
Get more information at:
www.andritz.com/u-twist-baskets



... there is a new-design FibreFlow drum for small capacities?

The FibreFlow drum is the world standard for continuous pulping of contaminated recycled fiber waste streams. The new design of the FFD225, with its reduced power requirements, is an economically viable solution for lines with low feed capacities.

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... we now have a new protection device for low-consistency (LC) refiners?

The LCPS ensures that there is never a moment when the refiner plates can touch or be destroyed – and can predict faults at an early stage.

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www.andritz.com/lcps

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