SPECTRUM

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MAGAZINE OF PULP & PAPER

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PT TEL modernizes in Indonesia
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ALTERNATIVE ENERGY
Special section – expert interview
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ANDRITZ
Pulp & Paper

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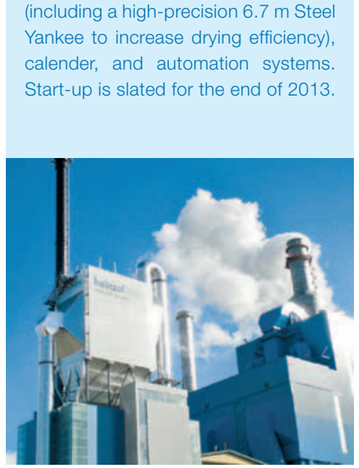
On the cover: A young student at the RSBI Lematang Lestari School holding a packet of Tessa brand tissue, which is made from PT TEL pulp. PT TEL invested several million dollars in the facility, computers, books, and uniforms. Read the complete story beginning on Page 10.

NEW MACHINE FOR ZELLSTOFF PÖLS

Zellstoff Pöls AG, Austria, selected ANDRITZ to supply a *Prime*Line plant for the production of specialty paper. The new machine (width: 5.4 m; capacity: 80,000 t/a; design speed: up to 1,200 m/min) will produce very high-strength packaging papers.

ANDRITZ will deliver the stock preparation, approach flow, paper machine (including a high-precision 6.7 m Steel Yankee to increase drying efficiency), calender, and automation systems. Start-up is slated for the end of 2013.



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ANDRITZ AG
Stattegger Strasse 18
A-8045 Graz, Austria
Phone: +43 (316) 6902 0
pulpandpaper@andritz.com
Editor-in-Chief:
Bjørn Hansen
bjoern.hansen@andritz.com
Project Manager:
Gudrun Hadolt-Rostek
gudrun.hadolt-rostek@andritz.com

Managing Editor:
Robert Puhr
robert.puhr@andritz.com
Editorial Board: Bjørn Hansen, Gudrun Hadolt-Rostek, Minna Heinonen, Robert Puhr, Manuela Wagner, Elisabeth Wolfond
Contributing Writers: Thomas Barbieri, Martin Koepenick, Robert Puhr
Contributing Photographers: Sandor Balla, Lars Behrendt, Andreas Hofer, Riku Isohella, Dong Jingyu, Andrew Klaver, Johannes Kraxner, Peter Melbinger, Guntur Primagotama, Christopher Rausch, Paul Redding, Thomas Wedderwille, Otmar Winterleitner
Graphic Design: Gudrun Hadolt-Rostek

You will see the use of both "tonnes" and "tons" in this publication: tonnes for metric units and tons for American units. Spectrum is published in five languages; English, Chinese, Russian, Japanese, and Portuguese.

WHERE DO WE GET THE ENERGY?

We are introducing something different with this issue of Spectrum: a special focus section. In this issue, the focus is on Energy. We are planning special sections on Low-Capital Solutions, Maintenance, Innovations in Pulping, and Minimizing Waste in the future. We hope you like the approach.

The Energy section has a series of quite compelling articles. Jim Lane, editor of the world's most widely read Biofuels daily, sets the stage. Then, we explore innovative ways our customers generate and/or conserve energy: a backwards running pump that becomes a mini-turbine to produce power from effluent flows; a boiler that burns household waste and sludge to free a mill from high natural gas prices; expansion of the bio-business arm of a major producer; a forming fabric that reduces energy loads; a lime kiln that burns 100% wood powder; etc.

To complement these stories, we travel from North America to Asia to South America and back to Europe to bring you case studies of customers partnering with us to use our technologies and services to the fullest.

Personal energy

An energy-intensive industry like Pulp & Paper has to have a serious focus on securing sustainable energy well into the future. Having ample energy – and the flexibility to choose fuel sources based on price and availability – are critical to many mills' survival. Security, sustainability, and flexibility are key words.

Another form of energy, less talked about but equally critical, is the "personal energy" required to succeed in this business. As we travel to ANDRITZ offices and customer sites around the world, we are amazed (and re-amazed) at the innovation, excitement, intelligence, and personal dedication of the people we talk with. Often, these people are working under extremely challenging macro conditions outside of their control. But they wake up each day excited to meet the challenges head-on – arriving at today's solutions that will lead to a more successful tomorrow. What an inspiration!

With the summer season approaching for those of us in the Northern hemisphere, we hope you have the opportunity to take a deserved rest and recharge your personal energy sources for the challenges ahead.

Humbert Köfler
Member of the Executive Board
PULP & PAPER – Service and Units

Karl Hornhofer
Member of the Executive Board
PULP & PAPER – Capital Systems

◀ Karl Hornhofer (standing) and Humbert Köfler.

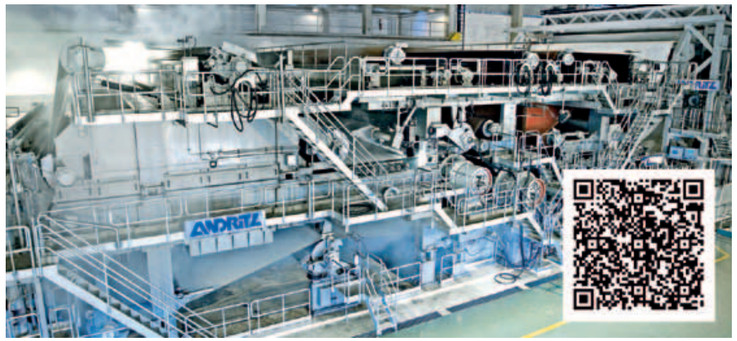
TWIN WIRE TECHNOLOGY FOR FLUFF PULP DRYING

A Japanese customer considering expanding its pulp products to include fluff pulp did extensive research to arrive at the best technical solution for drying this special pulp.

A fluff pulp sheet is higher bulk (lower density) than a regular pulp sheet, making it ideal for hygiene products. Another niche is the production of cigarette filters, which was of interest to this customer. Perfect fluff quality (minimal knots) can only be achieved by excellent formation and keeping the sheet density in the correct range.

After its research and pilot plant trials, the customer chose ANDRITZ Twin Wire technology over conventional dewatering technologies to achieve the desired formation and density with high dryness at the lowest operating cost.

The Japanese mill started up its new drying plant for market fluff pulp in November, 2011. The plant consists of the Twin Wire press, a heavy duty press, airborne dryer, and reel section – all from ANDRITZ.



20TH P-RC APMP FOR CHINA

ANDRITZ is currently installing its 20th mechanical pulping line in China based on its patented P-RC APMP process.

Worldwide, the total number of systems is 24.

According to Markus Pichler, ANDRITZ Senior Sales Manager (pictured at left), P-RC APMP (Pre-conditioning Refiner Chemical Alkaline Peroxide Mechanical Pulp) technology is primarily for hardwood species and annual fibers. These species are available in China and many other countries. The pulp quality, low specific refining energy consumption, and yield are exceptional.

ON-SITE REPAIR SAVES MONEY, TIME, AND ENERGY

A cartonboard mill in the Netherlands needed to improve the productivity of its sludge screw press: increasing outlet dryness by about 5%, saving energy, and reducing maintenance costs.

ANDRITZ brought its mobile on-site repair unit to the mill and in a tight four-day schedule: 1) dismantled the press, 2) reconditioned the screw flights, 3) upgraded the shaft geometry, 4) added wear shoes and rings to extend the period maintenance interval, 5) put in a new grease system for the outlet bearing, and 6) reassembled and started up the upgraded press.

The benefits for the mill included:

- Energy savings due to maximum dewatering
- Reduced disposal costs due to higher outlet dryness
- Longer life due to all-round wear protection
- Lower costs due to doing the repairs on-site

For more information, please contact pulppaper-service@andritz.com.

WORLD'S WIDEST; VIETNAM'S FIRST

The world's widest Steel Yankee, manufactured by ANDRITZ, has started up at a customer mill in Indonesia. The shell length is 7.4 m and the diameter is 15 ft (4.57 m). The Yankee is shown here leaving the factory.

Saigon Paper has started up the first ANDRITZ tissue machine in Vietnam. The unit is a *Prime*LineCOMPACT tissue machine with a *Prime*Dry Steel Yankee. Width is 2,850 mm and design speed is 1,650 m/min. The machine started producing tissue in March 2012.

FIRST CHOICE IN SECOND HAND SOLUTIONS

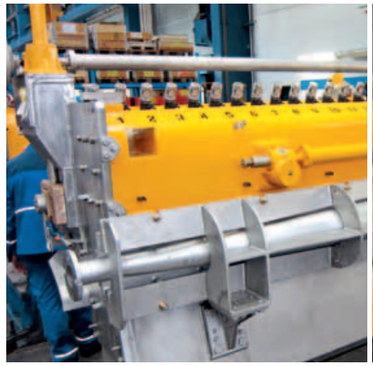
ANDRITZ is a well-known supplier of new technology. It is perhaps not so well-known that we broker, inspect, recondition, and install second hand equipment.

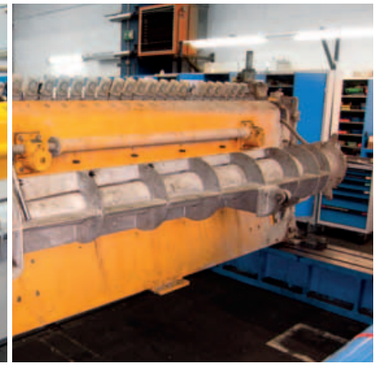
Not every mill has the budget for new equipment. Many customers ask for our help in obtaining used equipment, inspecting it, giving our opinion about its value, and reconditioning the equipment when needed.

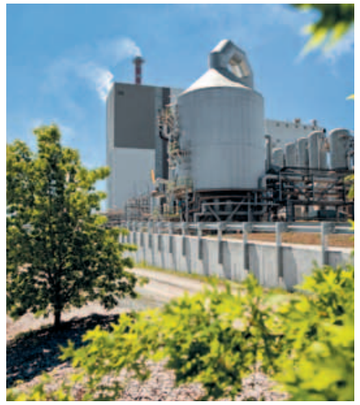
There is considerable inventory of used equipment sitting in mills. ANDRITZ has service centers around the world, staffed with people who are in mills daily. This global network gives us a big advantage in locating second hand equipment.

While the main advantage of buying used equipment is *price*, the main disadvantage is *risk*. As a manufacturer with nearly 160 years' experience, ANDRITZ experts know machinery and know the processes. We know what to look for to minimize your risk.

Global network + machinery expertise + process expertise. You can see why ANDRITZ should be your First Choice in Second Hand Solutions.







GREEN ENERGY THROUGHOUT A MILL

Just this year alone, ANDRITZ has been granted three patents for innovations to help pulp mills improve energy efficiency. Petri Tikka, ANDRITZ's Vice President of evaporation systems, explains the innovations this way, "Green energy can be generated in virtually every process area by optimizing the secondary heat balance. We identify these opportunities faster when we combine the knowledge of our different departments. For example, as evaporation experts, we were able to make suggestions in the cooking department which resulted in two of the three patents."

The recent patents are for:

- Evaporation: combination of mechanical vapor compression evaporation and multiple-effect evaporation in a single evaporator effect
- Cooking: a special DeVap digester evaporator
- Cooking: a digester steam evaporator combined with liquor flash

All three patents have the same goal: increase electricity surplus of a pulp mill.

Port Alberni **tops production**

The Port Alberni mill in Canada has been an important fixture in the community since 1947. Today it is a leading North American supplier of lightweight coated and directory papers. The TMP furnish is supplied by a single Twin 60 refiner line from ANDRITZ. A project to super-size the line challenged everyone involved.

When the TMP line at Port Alberni was first built in 1989, the chip feeding and the building were sized for two lines to allow for expansion. “Even though we now needed more tonnage to feed our paper machines, we did not have the capital for a second line,” says Jason Seabrook, Mechanical Pulping Manager. “We had to play the cards that were dealt us.”

The need for tonnage was sparked by a decision to shut down the groundwood mill and restart a paper machine. “We needed to lower our cost structure considerably and get extra production at the same time,” Seabrook says.

How Seabrook and his team were able to do that – and bring the project in under budget while setting a world production record for a single two-stage Twin 60 refiner line – makes an interesting story.

From the beginning

With capacity to produce 337,000 t/a of specialty papers, Port Alberni contributes greatly to Catalyst Paper’s position as one of North America’s largest mechanical paper producers. The TMP comes from a single pressurized ANDRITZ Twin 60 line (one primary and one secondary). Original motor size was 22,000 HP. Two ANDRITZ model 45-1B refiners with 4,500 HP motors handled the rejects. In 1995, a third reject refiner was added and the primary and secondary motors were upgraded to 26,000 HP each. Production averaged 520 t/d.

“We are achieving high production at low freeness with only two stages plus rejects. This has to be one of the most energy-efficient TMP plants in the world.”

Jason Seabrook,
Mechanical Pulping Manager, Port Alberni (left)

The Twin 60s had more to give, according to Larry Nemeth, ANDRITZ’s Manager of Upgrades for Canada. “They are hungry machines,” he says. “The more you feed them, the better they perform. The secondary refiner didn’t seem to want to stop, so the limit was the motor.”

No margin for error

“When we started this project in 2007, PM4 was down,” Seabrook says. “And, our cost structure was just too high. On one side, we decommissioned the groundwood mill. On the other, the company pledged to invest in the TMP plant so that PM4 could be restarted. There was a buy-in from everyone to save this mill.”

First decision was to replace the 26,500 HP refiner motors with 34,000 HP units to get the tonnage. This would mean increasing the loading from 20 to 26.5 MW per refiner with load-splitting. “We were banking on the ability to maintain a 50-50 load split between primary and secondary all the way up to 26.5 MW,” says Kelly Sasaki, Technical Specialist. “Of course, no supplier would guarantee that, because it had not been done before. But we had to take the risk.”

“We were banking on the ability to maintain a 50-50 load split between primary and secondary all the way up to 26.5 MW. We felt we had to take the risk.”

Kelly Sasaki,
Technical Specialist, Port Alberni (right)

Port Alberni’s TMP comes from a single pressurized ANDRITZ Twin 60 line (primary and secondary refiner). Original motor size was 22,000 HP. As part of the project, the motors were increased to 34,000 HP.

"The Twin 60s are hungry machines. The more you feed them, the better they perform."
Larry Nemeth,
ANDRITZ's Manager of Upgrades for Canada

Larry Nemeth (left) with John Woodfin, Maintenance Supervisor at Port Alberni.

◀ The plant normally runs 97-98% efficiency. Forced maintenance shuts are very rare.

With this decision in place, the Port Alberni team looked at each piece of equipment to see if it could handle the additional throughput. As Sasaki says, "ANDRITZ was very helpful during this phase. They provided us with a lot of information about the equipment and capacities. They were very upfront about the risks."

Nemeth recalls, "We went through everything – steam flow velocities, cyclone sizing, blowline sizing, everything – to see how far we could push. Most of the equipment could handle the throughput, albeit everything would be pushed to the limits. But there were some components (cyclone tops, Impressafiner motors, plug screw discharger, decker) that would have to be upgraded."

Keep in mind this is a one-line mill. "There is no margin for error," Seabrook says. "With a 4-5 hour inventory buffer most of the time, we operate in the 95% efficiency range just to keep up with the paper machines."

Step changes

"We knew that the ANDRITZ equipment was going to be applied beyond normal design parameters," Seabrook says. "We relied heavily on their experience, but we assumed the risk. We've been working with ANDRITZ for many years, so this is a relationship built on trust."

In the design phase, ANDRITZ and Catalyst determined what each piece of equipment could theoretically do. But as Seabrook says, "When you put the pieces into a system and start it up, new dynamics – steam flows, pulp quality, etc. – now come into play."

As Norm Webster, ANDRITZ District Sales Manager, puts it, "This line is sized to the max. It's like driving a car at top speed every day. So, yes, there were going to be some problems to solve."

"We had a very small internal team," Sasaki says. "All of us, including ANDRITZ, worked together to solve each problem as it came up."

In 2008, the mill took an extended shutdown to replace the motors and upgrade some of the line components. The refiners stayed in place.

The target from day one was to run a single two-stage line with rejects at high output (90%+ of maximum), low freeness, and high efficiency (95% or higher).

First the good news. "The new motors were rock solid," Seabrook says. "No more problems with stops/starts and vibration. We answered the question whether we could load-split the refiners as we were hitting 25-26 MW right from the start. We were off to the races and could sleep at night."

The first challenge was plugging of the screens. "We thought we were making bad pulp at start-up," Sasaki says. "But the wider foils we selected for the rotors, theoretically a better choice for our higher capacity, did not work well with the coarser pulp we produced at start-up. When we went back to narrow foils, the problems went away."

High precision rebuild

Second challenge: a primary refiner that was sticking and "going through plates like crazy" according to Seabrook. "We had ANDRITZ rebuild the refiner and that gave us a step change in performance," he says.

Nemeth offers some details, "The old Twin 60s are more complicated in that there are several large metal components sliding together. In some cases, because of the loose tolerances, the refiners will not self-align. This results in out-of-tram conditions, sticky plateholders, refiner instability, plate clashing, and sealing problems."

The solution was an ANDRITZ high precision rebuild, where the majority of refiner parts are machined to the drawings and assembled, but the critical parts are precisely measured to fit the exact machine. "The result is a refiner that is in-tram from the factory with no more sticking," Nemeth says.

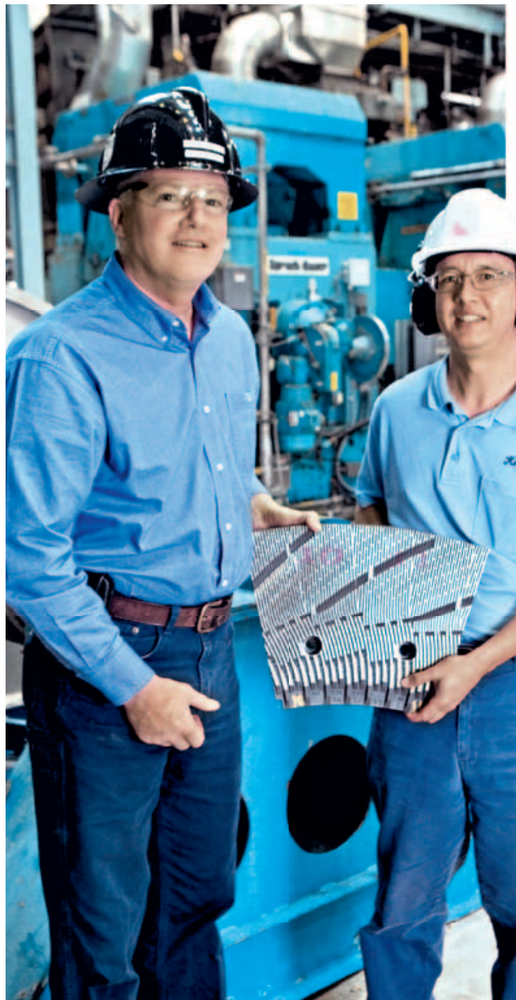
Commander conquers clashes

The next challenge: "We were making the tonnage and setting records, but were chewing up plates," Seabrook says. "We worked with ANDRITZ on plate design and changed the taper on the plates. The loading immediately steadied right out. That was a huge benefit."

"We reached a record production of 650 t/d with this setup," Sasaki says. "The process was stable and had the quality to go with it. But we were experiencing too many clashes. The culprit was the old hydraulic system. We needed a state-of-the-art system."

▲ Port Alberni was the first in North America to install the ANDRITZ Refiner Commander. The plate positioning sensors and dual servo split the Twin refiner's hydraulics into two separate loops which are controlled independently. "The result is less clashing, better performance, and phenomenal plate life," says Sandy Shearer, CTMP #1 Operator.

"We worked with Catalyst to find the correct plate design, and changed the taper on the plates. The loading immediately steadied right out. That was a huge benefit."
Norm Webster,
ANDRITZ District Sales Manager (left)
with Kelly Sasaki



Port Alberni was the first in North America to install the ANDRITZ Refiner Commander. "I admit that I was nervous about being the first to try something for a single line," Seabrook says. "It was all or nothing."

Webster explains the concept, "In theory, the sliding plateholders on each end of a Twin refiner should move the same distance toward the non-rotating plates. In practice, if the plateholders are not parallel, one side will stick. This means the other side has to move further. Since hydraulic oil follows the path of least resistance, it will move to the side with the least resistance, forcing a clash into the non-rotating plate."

The Refiner Commander's plate positioning sensors and dual servo splits the Twin refiner's hydraulics into two separate loops which can be controlled independently. "You get far less clashing, better performance, and phenomenal plate life as a result," Webster says.

"The last two plate changes (10 weeks between changes) look like there was zero clashes," Sasaki says. "Even with the loading we put on these refiners."

More to go

As Seabrook says, "We haven't hit our peak yet. The target is to run at 650 t/d at 70 CSF. Our best day has been 659 t/d and our best week has been 637 t/d at an average 75 CSF. Some of our paper specs have changed, so there are days when we don't need as much tonnage. We still load our motors to produce at 65 CSF, making better quality."

Lower costs, higher performance

"There has to be a big benefit to justify taking a big risk," Seabrook says. "In my opinion, this project saved our mill – that is a huge benefit."

The Port Alberni line normally runs 97-98% efficiency (with inventory curtailments removed). Forced maintenance shuts are very rare. "We are achieving high production at low freeness with only two stages plus rejects," Seabrook says. "This has to be one of the most energy-efficient TMP plants in the world. The higher we run the refiner, the more efficient we get."

FIND OUT MORE AT
www.spectrum.andritz.com

Growing, growing, growing

PT TEL's pulp from fast-growing Acacia mangium fuels growth in specialty paper markets, which in turn delivers growth in jobs and brightens the future for the local community.

◂ Recent modernization of the woodyard and fiberline by ANDRITZ have helped PT TEL debottleneck and raise quality. Shown here is part of the woodyard.

▲ Syafred Aziz, Unit Head for Land Management at PT TEL, holding a young Acacia mangium tree.

◂ Students at the RSBI Lematang Lestari School, where PT TEL invested several million dollars in the facility, computers, books, and uniforms.

In less than two decades, Tanjungenim Lestari Pulp and Paper (PT TEL) of South Sumatra, Indonesia has delivered over 5,000,000 tonnes of bleached market pulp, which is converted into a wide range of tissue, printing and writing, and specialty paper grades.

One specialty paper manufacturer produces premium photographic paper with PT TEL Acacia in the mix. Tissue brands in Japan value the fiber because it allows them to pack the same number of facial tissues in a box half the size of competitors. PT Graha Kerindo Utama (Grace), producer of Tessa, Indonesia's leading tissue and toweling brand, is also a major customer.

Says Hiroyuki Moriyasu, PT TEL Vice President and Director, "Our pulp from plantation grown Acacia mangium now compares favorably to eucalyptus across many grades."

Running more efficiently

Says Jiro Suzumori, PT TEL Technical Director, "Pioneering Acacia mangium plantations in the early 1990s required us to adapt traditional processes. We are adapting again with the recent modernization projects in our woodyard and fiberline, in which ANDRITZ played a key role. We raised pulp quality due to greater process stability and have debottlenecked our operations."

Adds Kanji Hagiwara, ANDRITZ Sales Manager for capital systems out of Japan, "A high level of trust and cooperation between PT TEL and ANDRITZ allowed us to meet benchmarks ahead of schedule. Together we identified additional ways to optimize the woodyard, and are embarking on a new project to lift daily production to a higher level."

Origins of PT TEL

PT TEL represents a coming of age for the forest products industry in Indonesia, where no tropical hardwoods are part of the mix. In 1991, the first specially engineered Acacia mangium seedlings were planted nearby by sister company PT Musi Hutan Persada, now comprising 190,000 hectares about 120 km inland from Palembang. Acacia has unique characteristics that make it a robust grower in poor soil.

The mill is owned by Marubeni of Japan. It started commercial operation in 2000 to meet the robust demand for market pulp in Asia. The Muara Enim location offers abundant water, a minimal distance between the plantation and the mill, with access via a dedicated railway line to a deep-sea port. Production is 490,000 admt/a of bleached Acacia kraft pulp.

Debottlenecking project

Clear goals were defined to open the way for smooth, stable operations. The focus was on optimizing PT TEL's woodyard and fiberline: identifying and eliminating the key bottlenecks and optimizing the processes to improve stability. With this in hand, PT TEL could raise production.

In the woodyard, ANDRITZ supplied its RotaBarker debarking system instead of a conventional drum debarker. The RotaBarker is a dry debarking process better suited for Acacia. It releases bark from the logs and immediately discharges the bark, eliminating the need for an additional bark separation roller conveyor before chipping. This considerably reduces wood losses compared to conventional processing lines.

According to Ilkka Manninen, ANDRITZ Sales Manager for wood processing systems, "We customized the RotaBarker in order to handle the Acacia logs more gently. This minimizes wood loss without sacrificing debarking efficiency. The efficient separation of bark eliminates the roping effect of Acacia bark which typically

"Our pulp from plantation Acacia mangium is of high quality and easily adapted to many paper grades."

Hiroyuki Moriyasu,
Vice President and Director,
with examples of products made
from PT TEL pulp.

◀ Acacia logs being delivered for debarking and chipping.

"We customized our RotaBarker to handle the Acacia logs more gently. This minimizes wood losses without sacrificing debarking efficiency."

Taisto Salakka,
ANDRITZ Project Manager for the woodyard modernization

occurs with conventional drum debarking lines. Now, we are exploring ways to push yield even higher."

Boosting chip quality

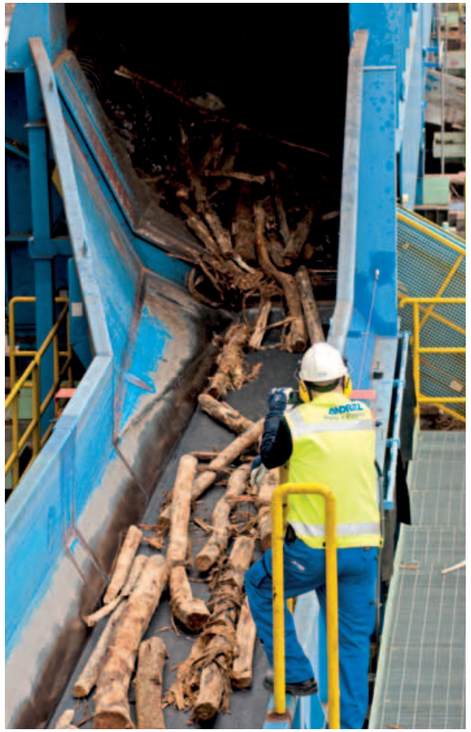
The mill has three debarking lines and four chipping lines. Chip quality was an issue due to bark content in the chips and a high quantity of oversized chips, associated with the rainy season. Poor chip quality had a negative impact on the continuous digester.

To ensure a consistent flow of more uniform chips, ANDRITZ installed a horizontally fed HHQ-Chipper. According to Taisto Salakka, ANDRITZ Project Manager for the woodyard modernization, "This 16-knife unit is well suited for log lengths from 2-6 m. The geometry of the infeed spout allows for the simultaneous chipping of multiple logs. Chips exit gently from the side of the chipper without mechanical impacts, which minimizes the production of pins and fines."

Suzumori sums it up this way, "ANDRITZ proposed the lowest wood losses and better control of chip quality, and they delivered on this promise. We are now going to take additional steps together to further optimize the woodyard so that our pulp production can be increased."

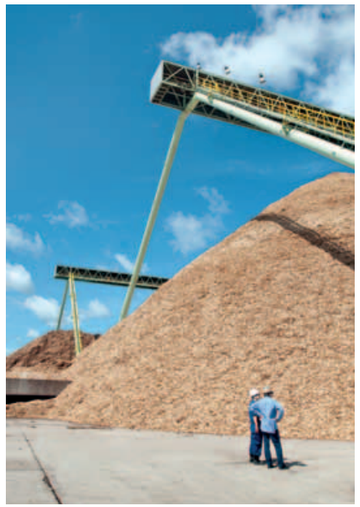
Smoother pulp production – efficiently

The focus in the fiberline was to improve



▲ Ilkka Manninen, ANDRITZ Sales Manager for wood processing systems, at the RotaBarker. The efficient separation of bark eliminates the roping effect of Acacia bark which typically occurs with conventional drum debarking lines.

Before the modernization, chip quality was an issue due to high bark content and a high quantity of oversized chips associated with the rainy season. ANDRITZ and PT TEL are working as partners to optimize the woodyard so that pulp production can be increased. ▼



chip pre-steaming and debottleneck the bleaching operation by reducing Kappa variations during cooking. (Kappa being an indication of the residual lignin in pulp to determine how much bleaching is required).

The biggest problem PT TEL was experiencing was its requirement for a low Kappa at the digester blowline. The stock to the bleach plant has to have a very low Kappa in order to maintain full production, due to capacity limitations in the ClO_2 generation plant. Since the Kappa control in the digester was poor, operators ran at very low Kappa just to be on the safe side.

ANDRITZ recommended a conversion of the digester to Downflow Lo-Solids Cooking technology and pre-bleaching with a new oxygen delignification system. The Downflow Lo-Solids would stabilize the cooking process. With the cooking process stabilized, operators could run at normal blowline Kappa numbers to improve yield. Two-stage oxygen delignification would reduce the requirements for chlorine dioxide.

Better pre-steaming

The digester chip bin level was not well controlled due to long conveyor transport time from the woodyard to the bin. Because of the poor chip bin level control, retention times were too short, leading to incomplete pre-steaming.

The solution was for ANDRITZ to install its Digester ACE optimization software to provide better chip bin level control, which would lead to a more consistent cook. As part of the system, the ANDRITZ Brain-

A Downflow Lo-Solids Cooking upgrade at PT TEL increased cooking stability and improved blowline Kappa control. It also set the stage for increased capacity, as steam consumption and white liquor consumption were reduced. ▶

"ANDRITZ's role in optimizing the digester and adding oxygen delignfication made a considerable difference. Our output is no longer limited."

Jiro Suzumori,
PT TEL's Technical Director

Jiro Suzumori (left) with Masato Tsuchitana, ANDRITZ Project Manager for the fiberline modernization in front of the upgraded digester.

Wave model-based controller uses its artificial intelligence to carefully control the digester operation.

Downflow Lo-Solids conversion

The Downflow Lo-Solids Cooking upgrade at PT TEL changed the cooking from counter-current to co-current mode in the digester wash zone. This increased cooking stability and improved blowline Kappa control. It also set the stage for increased capacity, as steam consumption and white liquor consumption were reduced. As with all Lo-Solids cooking processes, dissolved organic substances are extracted before bulk delignification occurs.

Masato Tsuchitana was ANDRITZ's Project Leader for the fiberline modernization. "Since the cooking zone is larger with Downflow Lo-Solids, alkali concentrations are reduced and cooking temperatures can be much lower," Tsuchitana says. "This decreased steam and white liquor consumption in the digester."

Two-stage oxygen delignification

The implementation of two stages of oxygen delignification allowed for significant (more than 40%) Kappa number reduction and lowered the amount of bleaching chemicals required. This eliminated the bleaching bottleneck without jeopardizing pulp brightness.

According to Suzumori, "ANDRITZ's role in optimizing the digester and adding oxygen delignfication made a considerable difference. Our output is no longer limited by bleaching issues, or chronic cooking inconsistencies. Now, we can focus on the next level of optimization."

Other updates

PT TEL also decided to upgrade its fiberline screening processes to increase capacity and reduce energy consumption. They selected to upgrade their screens with the Dolphin rotor from ANDRITZ. The Dolphin's proprietary foil shape enhances cleaning, and also reduces energy consumption in the screens.

◀ Jonnedi Parulian Pane of PT TEL (left) with Kanji Hagiwara, ANDRITZ Sales Manager for capital systems (Japan).

◀ A new two-stage oxygen delignification system from ANDRITZ (left and below) significantly reduced the Kappa number into the bleach plant and eliminated the bleaching bottleneck without jeopardizing pulp brightness.

▼ The pulp mill control room.

▲ The PT TEL mill has become part of daily life in South Sumatra, providing jobs and well-being for many people in the area.

Bales for rail

Currently, ANDRITZ is performing modifications to PT TEL's 7.8 m trim width pulp drying machine. ANDRITZ supplied the dewatering, drying, and cutter/layboy when the mill was built. According to Magnus Nilsson, Sales Manager for ANDRITZ's drying systems, "We are now modifying PT TEL's drying plant to improve energy consumption and increase capacity. At the front end, we installed a desuperheater to optimize the steam temperature into the dryer. We also put in preheating coils to conserve energy in the dryer while increasing capacity. As part of the modernization, new circulation air fans with a split-shaft design will be installed. These not only increase drying capacity; they are easier to maintain."

To control and expedite shipment to customers, PT TEL constructed their own onsite railway and port. Says Moriyasu, "In addition to making pulp grades to meet special needs of customers, we recognize the importance of delivery schedules. Reliability and quality delivery to customers is assured, because we control it."

Environmental priorities

PT TEL'S commitment to the environment is reflected by their ISO and FSC Chain-of-custody certifications. "We equate the health of our company with healthy markets, healthy employees, and healthy communities," Moriyasu explains. "We are especially sensitive to bio-diversity here."

As part of the recent modernization, PT TEL installed ANDRITZ's DTVG (dissolving tank vent gas) technology on its recovery boiler. The DTVG system is designed to collect odorous gases from the recovery boiler's smelt dissolving tank and burn them in the recovery boiler. As is customary in modern mills, electrostatic precipitators are in place on the recovery and power boilers as well as on the lime kiln. Gases from the bleach plant and chemicals preparation plant are scrubbed. Liquid effluent is processed through primary and secondary treatment systems.

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THE **ACACIA** STORY

Specially engineered acacia mangium from the plantation in South Sumatra, owned by sister company PT Musi Hutan Persada, produces fiber to sustain the PT TEL mill.

PT TEL pulp is known for a high density of short fibers, sought after by printing and writing customers looking for smoothness and high opacity in the sheet. PT TEL's pulp has gained a reputation for being extremely clean: attracting producers of digital printing grades, envelopes, and even Bible grades. Proof of the mill's quality includes the production of photo base paper as a regular application.

For tissue, PT TEL's pulp wins business because of bulk and strength, as well as the flatness of fibers. Tissue producers can achieve a soft feel for facial tissue, yet pack twice as many sheets in a much smaller box.

A young student at the local elementary school holds a tissue pack from Tessa, Indonesia's leading brand, made from PT TEL pulp. ▼

From **black** coal to **white** tissue

A major coal mining company, Fushun Mining Group, ordered a machine to start producing tissue – a totally new business for them. ANDRITZ delivered a turnkey plant from stock preparation to reel, including automation. Since the tissue business is a new venture for the mining company, support and service were important parts of the delivery.

“We were very satisfied with ANDRITZ’s good cooperation and performance during the project.”
Yan Tinggang,
General Manager of Hupo Paper

A chance for new mills

Fushun Mining Group (FMG) is a state-owned coal and oil shale company in China’s Liaoning Province. FMG has nearly 40 companies with about 40,000 employees engaged in coal mining and shale oil production.

The company’s history dates back to the early 1900’s when the South Manchuria Railway Company quickly expanded its system inherited from Russia and developed coal mines at Fushun.

With the demand for tissue products increasing about 10% each year in China, the officials at FMG saw an opportunity. Most of the tissue mills in Northeast China have been decommissioned since they began losing their competitiveness in the late 1990’s due to outdated technology and infrastructure. Now the region is a hot market for papermakers again.

“Since 2009, more than 400 small paper mills have been shut down, or their production has been limited, because of energy and environmental issues,” says Han Fang, Vice General Manager of FMG. “There is now a chance for new paper mills which can fulfill modern requirements for economy of scale, energy savings, and environmental safety.”

This is why FMG decided three years ago to step into a totally new business area – tissue production. The 60,000 t/a from the new ANDRITZ machine, which started up at the end of October 2011, is a good beginning for the two million t/a of paper production planned for the future.

The machine supplied by ANDRITZ has a wire width of 5.6 m and a design speed of 2,000 m/min. The furnish is virgin market pulp. Parent rolls from the machine are converted into tissue products at the mill site. A new subsidiary, Hupo Paper Co. Ltd., was established to operate the mill. Hupo Paper now has more than 700 employees.

“There is an opportunity here for new mills which fulfill modern requirements for scale, energy savings, and environmental safety.”
Han Fang,
Vice General Manager of
Fushun Mining Group

Han Fang (left) with Michael Pichler, head of ANDRITZ Paper and Nonwovens.

▲ Fushun Mining Group is a state-owned coal and oil shale company with about 40,000 employees engaged in coal mining and shale oil production – and now tissue production.

The *Prime*LineTM W8 CrescentFormer machine at Hupo Paper. The 5.6 m wide machine has a *Prime*Flow two-layer headbox and a *Prime*ProFiler F dilution control system. ▼

“For us, the most important factors when selecting a supplier for the stock preparation plant and the machine were the quality of the final product, the operational costs, and the advanced technology,” Han says.

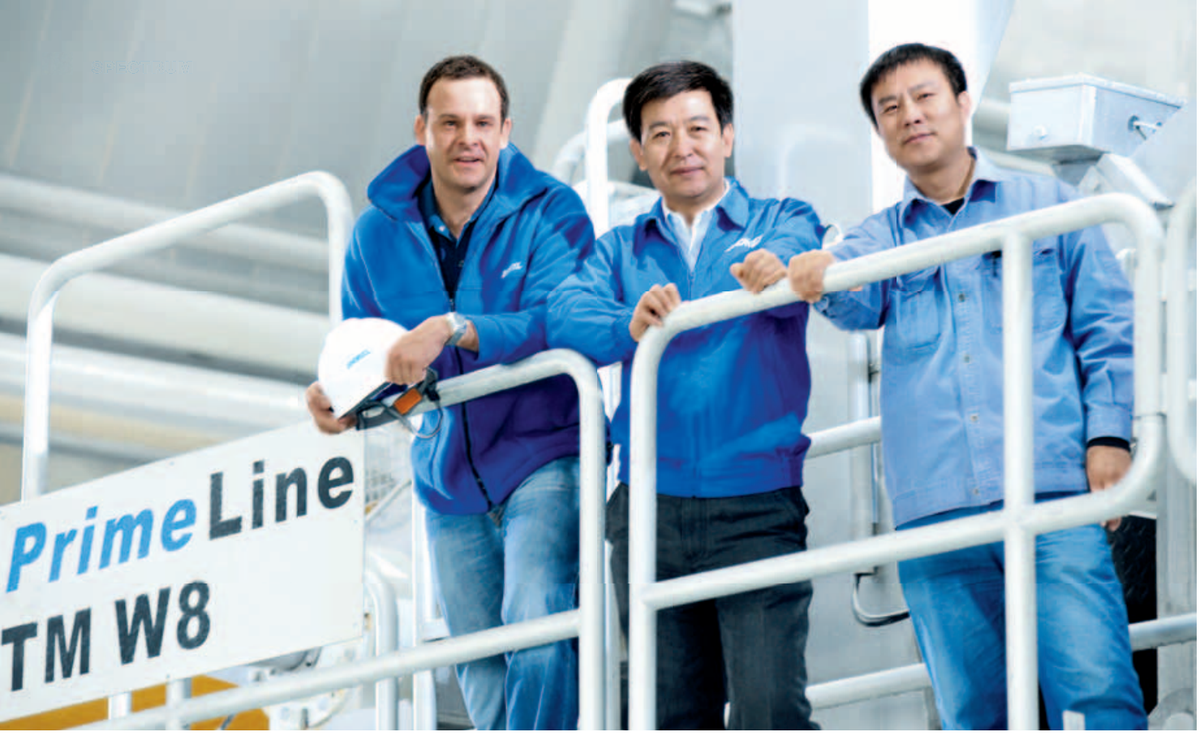
He notes that ANDRITZ has many references in China with good performance. “During the investigation phase of our project, we had discussions with all suppliers,” Han says. “We also visited several mills (Hengan and APP Suzhou among them) where the technology was delivered by ANDRITZ. We were impressed with the proven and reliable technologies and the good and stable paper quality.”

Wang Xicai, Chief Engineer at Hupo Paper, was also impressed. “The technical documentation that we received from ANDRITZ was very impressive,” he says. “It was very professional and comprehensive, especially the machine layout. This contributed to a smooth erection and start-up.”

“During the erection and start-up, ANDRITZ professionals really showed us compassion and patience in getting to know the new tissue machine,” Han says. “This helped us to develop our skills in producing high-quality tissue products. The equipment and cooperation with ANDRITZ was perfect.”

Yan Tinggang, General Manager of Hupo Paper, feels comfortable about the mill’s future. He is satisfied with the low operating costs, the environmental capabilities, and the fact that the stock preparation system was manufactured by ANDRITZ in China.

“Even with some small initial delays due to design changes and manufacturing schedules,” Yan says, “we were very satisfied with ANDRITZ’s good cooperation and performance during the whole project.”



"The output of the new machine is the best quality I have experienced in my career," remarks Han Biao, Vice General Manager of Hupo Paper. "The start-up went perfectly. With rare exceptions, the equipment was delivered on time, and the delays were mostly due to modifications."

Han notes that his company's plans include an additional machine within the next two years "depending upon market demand." Hupo Paper's products are being sold exclusively in Liaoning and the neighboring provinces.

ANDRITZ is local in China

"Fushun is adding to its mining business by moving into paper production," says Michael Pichler, head of ANDRITZ's Paper and Nonwovens, "and they do not have a long tradition of tissue making. They elected to buy equipment from an industry leader, and one with a strong base in China. ANDRITZ has an excellent record helping tissue newcomers like Hengan, Guitang, Hwagain, Chenming, and Nanning Phoenix start and operate their production units. Even the huge APP started in China with two machines from ANDRITZ in 1998."

Of course, when making an investment decision, price is an important factor. By standardizing machine modules and adding manufacturing capabilities in China, ANDRITZ has been able to reduce the cost of its *Prime*Line tissue machines in China significantly. "Only companies with a high local content have been able to reduce their costs to be able to offer these savings," Pichler says.

ANDRITZ has a facility in Foshan, Guangdong Province (see article about ANDRITZ in China in Spectrum Issue 16) with more than 1,200 employees focused on manufacturing, sourcing, engineering, and automation. The Foshan workshop offers Chinese customers fast response and is familiar with local customs and requirements.

"The ability to offer extended services is very attractive to newcomers to the paper industry," Pichler notes. "In addition, we are developing our Chinese operations to become a manufacturing base for global sales, which requires European quality and precision."

ANDRITZ delivered its first tissue machine to China in 1998, and has since sold an additional 20. "With our experience in managing projects in China, our experts know how to work with a newcomer to make sure that everything is seamless," says Bai Bingchen, Vice General Manager of ANDRITZ's tissue business in China. "We know how to provide sufficient training to support."

"The output of the new tissue machine is the best quality I have experienced in my career."
Han Biao,
Vice General Manager Hupo Paper

Martin Schratter, Start-up Engineer from ANDRITZ (left); Bai Bingchen, Vice General Manager for ANDRITZ China's tissue business (center); and Han Biao, Vice General Manager Hupo Paper.

According to Bai, the turnkey ANDRITZ plant was appreciated because everything from the stock preparation to the reel came from one company. "This makes it easier to start-up and operate, and enables us to provide fast and well-targeted services," he says.

"Sad to leave the project"

"We supplied Hupo Paper not only with the tissue machine, but also the stock preparation, including two virgin fiber lines and a broke line," says Martin Schratter, ANDRITZ Start-up Engineer. "We also delivered the approach flow and fiber recovery system for the machine, and auxiliaries like the lubrication and hydraulic systems."

The tissue machine is a *Prime*LineTM W8 CrescentFormer with a *Prime*Flow two-layer headbox and a *Prime*ProFiler F dilution control system. "The machine has a single *Prime*Press, a *Prime*Dry Cast Yankee, and a *Prime*Dry EquiDryF hood system with zone control," Schratter continues. "The reel is a hydraulically controlled *Prime*Reel equipped with the *Prime*TurnUp system for fully automatic reel changes."

Schratter says that from contract to start-up, everything went smoothly and according to the plan. "We were able to run the tissue machine from the first day with saleable paper quality," he says. "We are now in the optimization phase for reaching 2,000 m/min. This takes time, of course, but the progress has been excellent. Cooperating with the people at FMG was an amazingly positive experience. I became friends with many FMG people and it was a sad feeling to leave the project when it was over."

Proven technology with fast learners

ANDRITZ delivered well-proven technology in all areas of the plant. "There are some unique highlights at this mill, specifically the LC refiner which helps in optimizing the fibers to improve paper quality," says Schratter. Another highlight is the *Prime*ProFiler F dilution control system that improves basis weight cross profiles. The third area that Schratter mentioned is the heat recovery in the hood system, which reduces energy consumption significantly.

Hupo Paper did a great job in preparing everything for a smooth start-up, not only the fibers, but also all other resources and tools needed. The newcomers to tissue are learning fast. "One big challenge was that some of the operators had never seen a paper machine before," Schratter says. "It was really impressive to see how quickly they climbed up the learning curve. Within a few weeks, the operators were able to run the new machine independently."

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"The technical documentation that we received from ANDRITZ was very impressive. This contributed to efficient erection and a smooth start-up."
Wang Xicai,
Chief Engineer at Hupo Paper

▲ ANDRITZ supplied the stock preparation (two virgin fiber lines and a broke line), approach flow, and fiber recovery systems. Shown is the LC refiner which helps optimize the virgin fibers to improve paper quality.

The *Prime*ProFiler F dilution control device improves CD basis weight profiles. ▼

ANDRITZ delivered the production line – from stock preparation to the reel – turnkey. Parent rolls from the *Prime*Line machine are converted into tissue products at the mill site. ▶

ENERGY
INTERVIEW

Jim Lane is the dynamic and articulate editor and publisher of *Biofuels Digest,* the world's most widely-read biofuels daily. In addition to *Biofuels Digest,* he produces conference and publishes other digests and information reports. Jim is a sought-after keynote speaker at important biofuel conferences. In his spare time, he has authored nine books. Due to his hectic schedule, catching up with him was not easy – but he was gracious in giving his time and his perspective about current – and future – biofuels development.

Alternative energy: what are the alternatives?

Spectrum: How do you characterize the current markets?

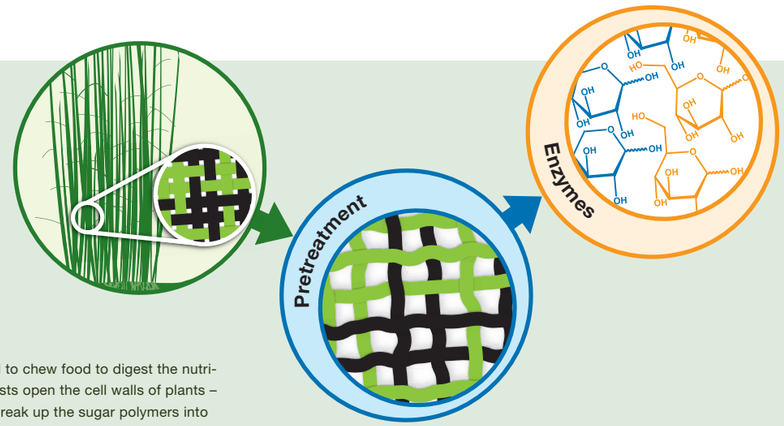
Lane: It appears we moved from a period of "irrational exuberance" to a period of "irrational in-exuberance." The economic recession put a real damper on enthusiasm. But now as oil prices march upwards, we see new life. The good news is that we're making significant progress. We've moved from "beakers in the lab" to "steel in the ground." No, not at the explosive growth predicted in 2007 (10 corn-starch ethanol plants in the US alone in a period of two years). But now with more sanity.

Spectrum: What are the hot geographies today for biofuel development?

Lane: Well, the first is easy: Brazil. But there are others that have been less well-covered. The soybean oil industry in Argentina remains white hot. Algae in Australia. Indonesia has continued its relentless march towards domination of the palm oil sector. And a couple of others: Chile and Korea for seaweed. India could get super-hot again for sugarcane – so could Angola and Pakistan, if they settled their politics. The US Southeast continues to grow in importance in advanced-biofuels (projects such as KiOr, Enerkem, Algenol, Bluefire, LS9, and BP, among others). And China, as is often the case, is the elephant in the room.

Spectrum: What are the hot feedstocks with the most promise?

Lane: The hottest right now is Municipal Solid Waste (MSW). Some large companies are investing in commercial-scale development of waste-based fuels – converting MSW to ethanol. MSW shows the best economics for the production of cellulosic ethanol, and wins the broadest support as a feedstock (even diehard corn-haters are generally happy with MSW-based biofuels). Plus, the feedstock contracts come with very long terms – enough to make even the most risk-adverse banker smile.



▲ Just as people need to chew food to digest the nutrients, pretreatment blasts open the cell walls of plants – allowing enzymes to break up the sugar polymers into simple sugars for conversion to biofuel.

Two bellweather projects are scheduled for completion this year. The 10 million gallon Enerkem project in Alberta and the 6 million gallon Fiberight demonstration project in Blairstown, Iowa.

Other hot ones: algae and corn stover. The big question mark is whether sugarcane bagasse will be opened up as a feedstock for advanced biofuels.

Spectrum: In your opinion, what are the hottest technologies we don't hear much about?

Lane: Hands down, the direct creation of fuels and/or low-cost sugars (using modified organisms, sunlight, CO_2, and water) – bypassing biomass as an intermediate. These are bio-industrial operations without being specifically in the business of biorefining. These are greenfield projects with a capital "G". A technology dreamed of, more than achieved. And skepticism runs deep that the technology can be scaled up. Of course, they said that about computers, too, which were famous for instability problems in their early days.

Spectrum: What is your take on cellulosic ethanol?

Lane: It's become a popular topic for enterprising journalists in the broader media. Counting the small gallonage of cellulosic ethanol, pointing to the RFS (US government renewable fuel standards), and laughing and telling jokes. But it depends on how you frame the question.

For example, the question, "How much RFS-qualifying cellulosic biofuel will be produced in 2012?" yields an answer of "less than 10 million gallons." This is about 490 million gallons short of the original targets set in 2007.

But the question, "How much RFS-qualifying advanced biofuel will be produced in 2012?" yields an answer of "more than 10 billion gallons." About 8 billion gallons over the original 2007 targets.

Which serves to remind, that when you read an article making super-pointed remarks about the cellulosic biofuels pool, but ignoring the overall advanced biofuels glut, it's generally a writer with an axe to grind.

Will cellulosic ethanol continue to spread its technology beyond the world of US companies and a handful of important EU players? The Nordic countries and Canada have been big supporters of advanced ethanol projects – their faith will be rewarded if the large projects underway come online by year's end and hit their operational cost and production targets.

Spectrum: What's in all this for the forest sector?

Lane: The forest sector is well-positioned to take advantage of the momentum, but it can't sit on the sidelines if it wants to get maximum economic gain. The same molecules that are used to make paper can be used to make chemicals of immense value.

Woody biomass (whether it is virgin or residue) is a key feedstock to make affordable fuel molecules. Even though it is economically more challenging, the production of "drop-in" fuels offers the least risk.

It should be "business as unusual" for the forest sector. There are competitive threats to the sector such as fully renewable bio-based plastics – and there are real opportunities such as drop-in fuels and bio-chemicals.

GREENHOUSE GASES

In comparison to gasoline, ethanol made from cellulose and produced with power generated from biomass can result in an 86% reduction in greenhouse gas emissions.

Corn-grain ethanol
19% reduction

Cellulosic ethanol
86% reduction

Source: US Department of Energy's Biomass Program

Illustrations on this page by Matthew Wisniewski of the Great Lakes Bioenergy Research Center. To view a complete copy of the GLBRC's 2011 Science Report, visit http://www.glbrc.org/sciencereport.

ENERGY
INTERVIEW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Brian Pfleger, a Project Leader at the Great Lakes Bioenergy Research Center in the USA, is working on producing hydrocarbons that could work in today's engines and fuel pipelines. ▼

There are building block chemicals that can be produced from sugars and subsequently converted to a number of high-value bio-based materials. The synthesis for the building blocks and their derivatives is a two-part process: transformation from sugars in feedstocks to building blocks will be primarily biological; conversion of building blocks to high-value materials will be primarily chemical.

Even though some are trying to downplay the potential, energy analysts and scientists know that the potential of biofuels is truly vast. The long-term impacts on the global economy appear to be pretty clear: lower net carbon emissions, more energy security, more efficient agricultural policies, and greater opportunities for sustainable development.

Spectrum: What questions should investors be asking?

Lane: The main question in evaluating any technology or business proposal is, "How real is this?" I use the acronym "SARA." Is it Sustainable, is it Affordable, is it Reliable, and is the feedstock readily Available? Affordability has to be without subsidies (meaning are the economics real in a real world?).

Spectrum: You talk of advanced biofuels as being a "system of systems." What do you mean by this?

Lane: Taking fungible, already aggregated crops and using them for industrial biotech may be an efficient way for a company to get into business, but it is fatally flawed for starting up an entire at-scale industry. Scale ruins relationships when a feedstock is shared. A more realistic method seems to be creating alternatives through a systematic approach – developing relationships with companies that are developing dedicated, low-cost, at-scale sources of sugars. This is what I mean by a system of systems.

The road to low-cost sugars can be divided into several pathways: Acid, Enzyme, Hydrolysis, Supercritical (splitting biomass into cellulose and sugar in supercritical water at high temperature and pressure), and Biosynthetic (combining an engineered photosynthetic microorganism with a modular, solid-phase bioreactor to provide a fermentation-ready feedstock). The jury is out on which one(s) will be most successful.

Spectrum: What are your top predictions for 2012?

Lane: My crystal ball sees it this way …

1 Advanced biofuels capacity will surge to 1 billion gallons globally (570 Mgy from Neste Oil alone).

2 Merger mania will continue (200 companies can't continue to march forward).

3 The momentum will shift to Asia (Indonesia and Malaysia for palm, Thailand or Vietnam for cassava, China for residues from forests, animals, and municipalities, Australia for algae and cane).

4 Oil and chemical companies will rule (venture capital is about maxed out in advanced biofuels and the players that are making a difference are a handful of visionary feedstock-side investors).

5 Aviation biofuels will continue to get hotter and hotter (more airlines will try small purchases to stimulate large-scale production) but there will be delays and frustration as the US government tries to live up to its 510 million USD commitment in military and aviation biofuels.

6 Ethanol producers will switch to higher-value molecules such as butanol or various organic acids (the path of least resistance in getting around the ethanol blend wall).

7 "Carbon capture and reuse" will be the new buzzword (it has been "carbon capture and storage," but we really need technologies that capture carbon emissions before they are vented into the atmosphere, and pipe CO_2 to processes for making products for a fast-growing world – that's where the action will be).

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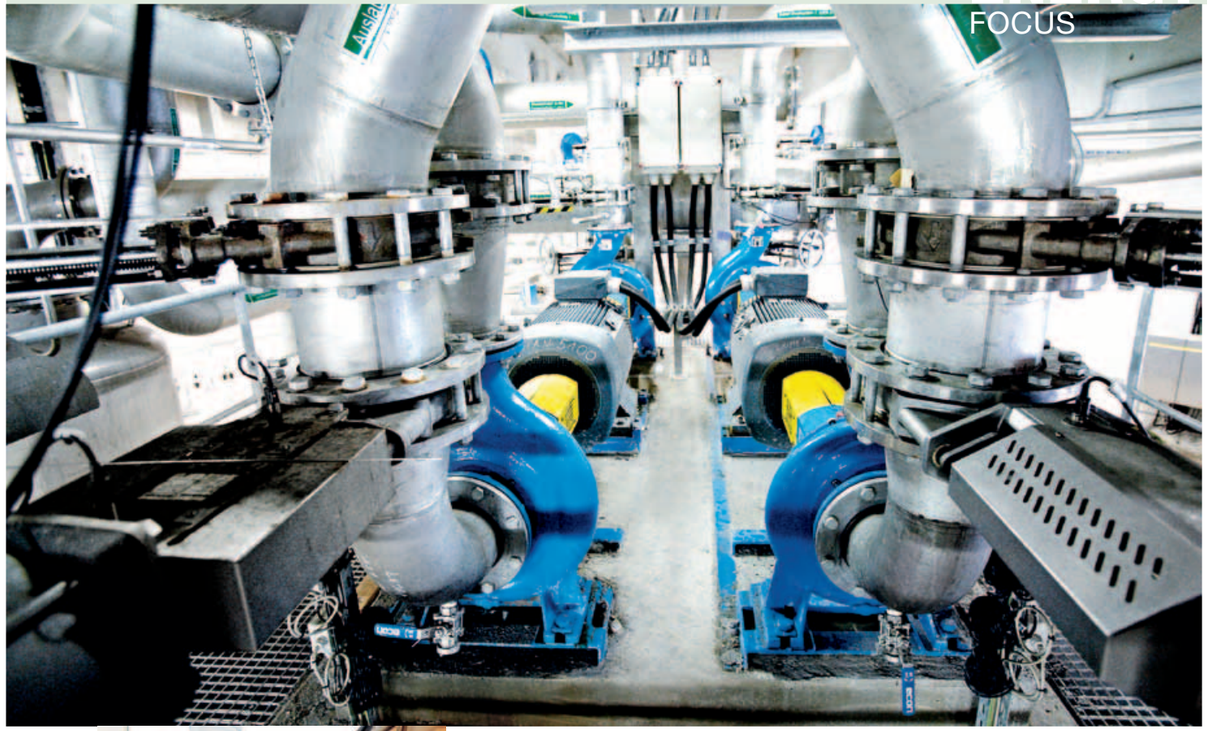


▲ Above: An innovative ANDRITZ pump-turbine absorbs the pressure surplus in LEIPA's micro-flotation process and converts it to electrical power to drive a booster pump. The turbine directly contributes 42% of the power required to drive the pump.

Below: Mario Liebetrau of ANDRITZ (left) with Detlef Schroth of LEIPA.

Running backwards **for energy savings**

A backwards running pump in the waste water treatment system at this mill in Germany is generating a very healthy Return on Investment (ROI) by conserving electrical power.

LEIPA papers, whether they are used for mail order catalogues or product enhancing packaging, are entirely made of recycled fibers. The paper mills at Schwedt and Schrobenhausen (both in Germany) utilize 900,000 tonnes of waste paper per year. The company's objective is to further improve and develop its recycled fiber-based paper grades to meet the needs and expectations of tomorrow's markets.

In concert, ANDRITZ is also developing its pump systems to meet the needs and expectations of mills like LEIPA's Schwedt facility – in a most innovative way.

The Schwedt mill has three paper machines, two for magazine papers and one for white top testliner. The raw material waste paper comes from Germany and across the border in Poland.

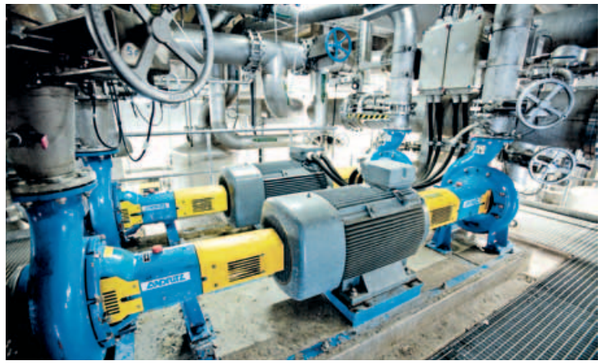
"The key words for us in this project are energy and fast," says Detlef Schroth, Head of the Water Facilities and Paper Laboratory at LEIPA Schwedt. "Energy generation, energy savings, fast ROI, and fast start-up."

Energy lost – recovered

Schroth is speaking of the installation of an ANDRITZ pump-turbine upstream from Schwedt's waste water micro-flotation

“We did the project and we achieved an ROI even faster than we expected. The cooperation has been very smooth.”
Detlef Schroth,
Head of LEIPA Schwedt’s Water Facilities and Paper Laboratory

Detlef Schroth (right) with Mario Liebetrau, Area Sales Manager for ANDRITZ pumps.



◂ Pressurized and air-saturated waste water is pressure-relieved in the feed pipe to a micro-flotation plant. The pump-turbine combination, mounted on the same baseplate so no generator is needed, transfers this excess energy to the booster pump motor.

plant. “Our waste water system requires us to increase the pressure of part of our effluent flow to saturate it with air bubbles,” Schroth explains. “This supports the growth of bacteria in the tank to aid in the water treatment. However, the high pressure required for the air bubbles must be reduced again before the micro-flotation basin – or the bacteria will not survive.”

In the past, this pressure reduction (from 6.5 to 1.2 bar) was done with a reducer valve and the energy was lost. “We wanted a way to make use of this energy,” Schroth says.

A consulting engineering company working with LEIPA suggested they contact ANDRITZ about a pump-turbine solution. ANDRITZ had previously delivered sludge handling equipment to the Schwedt mill. “I had worked earlier for another company that had quite a bit of ANDRITZ equipment, and I was impressed with the performance,” Schroth says. “So, this was a welcome suggestion.”

Energy savings with ANDRITZ

The idea of power recovery via a reverse-running pump is not new. “The pump-turbine combination comes from desalination plants where you need high pressures before the filter membrane and then after the membrane you don’t need the pressure,” says Mario Liebetrau, Area Sales Manager for ANDRITZ’s Pumps Division. “Our design is the same concept, only for smaller pressures.”

In a pump-turbine, one pump runs normally while the other runs as a turbine – absorbing the 5.3 bar pressure surplus after the waste water saturation tank and transferring this excess energy to the booster pump motor. The pump-turbine combination is mounted on the same baseplate and no generator is needed. Of the total shaft power of 127 kW required to boost the effluent, the turbine part of the combination contributes 53 kW, recovering and reusing 42% of the power.

An easy decision

“Our objective is to conserve energy, but naturally we look at the price, quality, service, and supplier reputation as well,” Schroth explains. “ANDRITZ succeeded in all categories. We did the project and we achieved our ROI even faster than expected.”

The schedule was rapid. Eight months after contract signing, the pump-turbine was started up.

According to Schroth, “The pumps work beautifully. They run constantly and the energy recovery has been significant. Plus, the cooperation between our teams has been very smooth. This was also the case with the four ANDRITZ presses we purchased in the past.”

Tools for energy saving – a growing business

ANDRITZ built its first centrifugal pump 150 years ago. Some of its main markets are pulp and paper, sugar, and power (cooling water pumps). About six years ago, the company increased its focus on standard

“With energy costs rising, solutions that save energy, or actually generate energy like the pump-turbine, are in demand.”
Mario Liebetrau,
Area Sales Manager from ANDRITZ

Mario Liebetrau of ANDRITZ (right) with Detlef Schroth of LEIPA.

pumps for the water market. With the 2010 acquisition of Ritz and Ritz Atro, it has increased its market position in this sector.

“The business of small turbines, or micro-turbines has grown dynamically,” Liebetrau says. “With energy costs rising, solutions that save energy, or as with the pump-turbine, actually generate energy, are in demand. The energy generated per pump ranges from 10 kW to 2 MW.”

The installation at LEIPA Schwedt is not ANDRITZ’s first pump-turbine. “It is a proven design and we are in an excellent position to deliver these units for energy recovery,” Liebetrau says.

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Multi-fuel = multi-savings at Maxau

A unique hydrid-design CFB boiler in Germany burns biomass, mill sludges, coal, and refuse-derived fuels – giving the mill tremendous flexibility in selecting the lowest cost fuel to power its groundwood mill and paper machines. AE&E delivered this unique boiler.

"Energy costs are very high here. Without self-generated power, making paper here does not make economic sense."
Joachim Grünewald,
Mill Director

Stora Enso's Maxau mill, on the Rhein River near Karlsruhe in southwest Germany, produces SCA and SCB publication papers. The two machines, with design capacity of 540,000 t/a, and the groundwood mill are the highest energy consumers in Maxau's process. As Joachim Grünewald, Mill Director, explains, "Energy prices in Germany are the third highest in Europe. Without self-generated power, making paper here does not make economic sense."

But in 2007, the team at Maxau saw clouds forming on the energy horizon. According to Jürgen Glowatzki, Maxau's Project Manager, "We had a 95 bar steam network with three old turbines, two gas boilers, a gas turbine with heat recovery, and a bark boiler. The emissions of the gas turbine and bark boiler were not going to meet new regulations slated for 2012, so we needed a solution. Plus, we were 97% dependent on natural gas."

The recommendation from their engineering consultant was to build a multi-fuel boiler big enough to cover normal steam demand and run the gas boiler in parallel during the winter months. As the turbines were old, it was also recommended to install a new backpressure turbine with extraction (41 MW) to feed the low-pressure system.

Multi-fuel logic

The decision to go with multi-fuel was an important one. "Our sister mill in Belgium runs a boiler with 100% refuse-derived fuels (RDF), basically sorted household waste," Glowatzki says. "This is a cheap fuel source and helps reduce the load on landfills, but it would not be acceptable to the local community because of their fear of possible air pollution. Still, we felt that some percentage of the fuel could be RDF."

Other readily available fuels were purchased biomass, mill bark, paper-derived fuels (mill sludges), demolition wood from construction sites, and of course coal and natural gas. Being able to select and blend these fuel sources would give the mill flexibility it never had before.

"The business reason for the investment was to realize significant savings on the energy side," Grünewald explains. "If we can't run the power plant efficiently, we have to shut down paper production as well."

A challenging order

After Board approval of the 120 MEUR project, the Maxau team had technical discussions with three potential suppliers, including ANDRITZ. "Our desire was for a turnkey delivery," Glowatzki says. "The other suppliers could not accommodate our needs. ANDRITZ Energy & Environment was the most flexible and seemed to have a unique technical solution."

In November 2007, ANDRITZ and Stora Enso Maxau signed a contract for delivery of a PowerFluid boiler, internal fuel handling system, flue gas treatment (dry absorption within a fabric filter), ash handling system, feed water system, and auxiliaries.

Unique technical solution

Given the parameters of 55 kg/s of live steam at 520° C and 95 bar with high chlorine content in the RDF, Maxau and ANDRITZ knew it was going to be a real challenge.

"This was a hybrid boiler design never tried before. But, I was convinced that we could do it with ANDRITZ and have a good project together."
Jürgen Glowatzki,
Maxau Project Manager

Readily available fuels are biomass, mill sludges, refuse-derived fuels, coal, and natural gas. Being able to select and blend these fuels gives the Maxau mill tremendous flexibility. ▼

The PowerFluid HC is a hybrid design that burns both clean and dirty fuels at a lower investment cost. Shown next to the steam drum are Glowatzki (left) and Heinrich Kreuziger, ANDRITZ Warranty Engineer for the Maxau project. ▶

The "unique technical solution" Glowatzki refers to is a "hybrid" PowerFluid boiler. Unlike a stationary fluidized bed boiler, the bed material in a circulating fluidized bed (CFB) boiler flows with the flue gas through the furnace. The bed material is separated by a cyclone and returned to the lower furnace. CFB is the best technology for reaching complete combustion of various low-grade fuel combinations and minimizing emissions.

But there are several types of CFB. ANDRITZ had two designs: PowerFluid CC for clean conventional fuels (coal, biomass, etc.) and PowerFluid RC for dirty residue fuels. Because of the RC's configuration with an integral bed material heat exchanger, tail-end pass, and separate economizer, it is more expensive.

Maxau asked ANDRITZ for a third alternative – a boiler that could burn both clean and dirty fuels at a lower investment cost. The result of this challenge is the PowerFluid HC design – incorporating components from the CC and the RC.

"The fact that it was a hybrid design never tried before, and such a large size (200 t/h) might be perceived as a risk," Glowatzki admits, "but ANDRITZ was so competent, I was convinced that we could do it and have a good project together."

▲ The PowerFluid HC boiler has four feed lines to proportion fuels based on market price and availability. Natural gas is only used for start-up via the burners shown here. Emissions are well within targets.

Throttling back on gas

"Our starting point before the project was about 97% natural gas and 3% bark," Glowatzki explains. "We couldn't continue this way with gas prices continually rising." Maxau set three design points for the boiler: one at 100% coal, one at 100% biomass, and a third at what they thought would be the most likely scenario (34% biomass, 42% coal, 10% RDF, and 14% sludge).

"Right now, we can buy plenty of biomass, so we are running the boiler at about 70% biomass and the rest RDF and sludge," Glowatzki says. "Since we don't have to purchase much coal or natural gas, we are saving big money – about three million euro a month at the present time."

Grünewald is quick to point out, "This is a long-term investment. Today, we are generating power at a lower cost than planned, but we know that fuel availability and pricing will swing. It is very difficult to predict the future. At least the multi-fuel boiler gives us flexibility and options."

Converting challenges to opportunities

The PowerFluid boiler started up in March 2010. "The start-up was good, with excellent cooperation," Glowatzki says. "We were able to load the boiler faster than we anticipated utilizing the steam."

However, there was a slight disruption during the project. As Glowatzki recalls, "In the middle of the engineering, our management decided to shut down PM 7. With the machine going down, we would have up to 70 t/h extra steam in the system. We converted this problem into an opportunity by rebuilding two old turbines with condensing tails to use the extra steam to make electricity."

With all this, Stora Enso Maxau covers about 40% of its electricity demand. "After we complete modifications to the turbines, this will increase to 50% self-generated," Glowatzki says. "Every MW of self-generated power is about 40% cheaper than purchased power."

"Never walk alone"

"The project here at Maxau was my first big involvement with ANDRITZ," says Grünewald. "I have to say that the ANDRITZ team was very professional. During the erection time, we faced some scheduling difficulties not related to ANDRITZ. Still, we had clear and good communications with the project team, and it went well during the entire project."

The true test of cooperation is when there is a problem. "During the start-up we encountered some problems with the feeding of the biomass and refractory damage at different places inside the boiler," Grünewald continues. "There is a song that comes to mind, 'You never walk alone.' We never felt alone during the project. My impression is that they solve the problem first and talk about the costs later in a fair manner."

Performance-to-date

"Our fuels are not very easy to burn – a mixture of coal, biomass (not just clean biomass), RFD, and sludge from our water treatment and deinking," Glowatzki says. "The boiler is very flexible. We have four feed lines and can proportion them based on fuel availability. The PowerFluid boiler handles this perfectly with emissions well within targets."

Grünewald agrees. "We are happy with the boiler's performance," he says. "Our operators are still optimizing the boiler. The biomass we get from our own process (spruce bark) is wet and stringy. It has the potential to give us problems, although the boiler seems to tolerate its 50% moisture content. The same with our sludge, which we burn at 50% dryness content."

ANDRITZ also provided the ash handling system as part of its turnkey delivery. Ash is transported to nearby companies and is used in the manufacture of bricks. ▶

The ash from the boiler is transported to nearby companies manufacturing bricks. "We have to keep our RDF fuel quality at the right level, so as not to pollute the ash to the point where the brick companies won't take it," Grünewald says.

"The project was conducted with excellent spirit and cooperation," Glowatzki says, "and the follow-up support has also been very good. To date, this is the only hybrid PowerFluid in the world, but I would think this design has a lot of potential in the pulp and paper industry. It certainly works for us."

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Stora Enso's Maxau mill, on the Rhein River near Karlsruhe in southwest Germany, produces SCA and SCB publication papers. ▶

ENERGY
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The new E-Line forming fabric from ANDRITZ Kufferath can save 15-35% total drive load energy in the forming section and improve runability.

"We don't see any sheet sealing and we are getting uniform dewatering along the length of the forming section. We get the same dryness at the end, but with less energy consumption."
Wim Janssen,
Paper Production Engineer

Janssen is standing next to one of the machine's drives. On a paper machine, approximately 15% of the total energy consumed is in the forming section (the vast majority of this by the drives and vacuum system).

Roermond's E-Line fabrics improve sheet formation – and save energy too

There are a lot of factors that go into the selection of the right forming fabric, says the paper production engineer at Smurfit Kappa's Roermond mill. Energy savings is nice, but not if it detracts from formation or runability. The new E-Line fabric from ANDRITZ Kufferath helps on all fronts.

A trial of a new product is very risky for any operating mill, especially when the trial is on a key paper machine.

"When you do a trial, there is risk," says Wouter Lap, Manager Operations for Smurfit Kappa Roermond Papier in the Netherlands. "But in order to make improvements, you have to try new things. Our competitors are not standing still.

"But our main business at Roermond is to make paper – not do trials."

This particular trial looked especially promising, according to W.J.H. (Wim) Janssen, Paper Production Engineer at Roermond. It involved a new E-Line forming fabric that ANDRITZ Kufferath claims can save 15-35% total drive load energy in the forming section and improve runability.

"At the end of the day, it is all about runability of our machines," Janssen says. "But when you're running machines close to maximum drive load, some energy margin would be a good thing."

A leap of faith – with a partner

Janssen is quick to point out that trials can take a lot of time. From the first discussions with suppliers, to the trial itself and the analysis can take 18-24 months. "Always trials are a leap of faith," he says. "We just want to make sure we are leaping with a partner who will support us."

In this case, supplier trust was not an issue. ANDRITZ Kufferath had built a reputation supplying fabrics to Roermond "even before I started here 22 years ago," says Janssen.

The Roermond mill

On a paper machine, approximately 15% of the total energy consumed is in the forming section (the vast majority of this by the drives and vacuum system). As a key source of testliner and fluting (100-220 gsm) inside the Smurfit Kappa Group (and the largest production unit for these grades), Roermond runs at maximum sustainable production ("With a keen eye on costs," according to Lap) and uses 100% recycled fiber.

"We have good performance on the machine, and we are seeing savings in starch and energy consumption."
Wouter Lap,
Manager Operations at
Smurfit Kappa Roermond Papier

The three machines have been methodically tweaked to speeds well above their original designs. As a consequence, their drives are running close to their limits and have become sensitive to maximum load.

Energy consumption is a major focus at Roermond and inside Smurfit Kappa. "Our goal is for this mill to have minimum electricity consumption for each paper grade. So, we control the electricity consumption of our pulpers depending on the grade. This has been working very well for us."

From design to material selection

In response to rising energy costs, fabric suppliers have come up with new products to reduce energy consumption. "Our first efforts were to change the design to improve dewatering characteristics," says Andreas Henschel, Regional Manager for ANDRITZ Kufferath. "This decreases the vacuum required, reduces friction between the fabric and vacuum elements, and helps the sheet drain more. This is part of a solution, but not the complete story."

The next move was to change fabric materials. Fabrics from 100% PET (polyester) yarns reduce drag, but have relatively short lives. Combination fabrics – 100% PET in the machine direction and alternating PET/PA (polyamide) in the cross direction – run considerably longer, but use more energy. Still not the complete story.

For many suppliers, the story ended there. But after years of development, ANDRITZ Kufferath developed E-Line yarn technol-

Based on the initial results, PM3 (a 5 m wide machine running at 930 m/min) is now running a trial and E-Line is in the bottom position on all three machines at Roermond. ▼

▲ (Left to right): Andreas Henschel of ANDRITZ, Wim Janssen, and Henk Stals, representative agent for ANDRITZ Kufferath in the Benelux countries.

ogy. E-Line achieves about the same energy reduction (20%) as 100% PET, but the fabric lasts twice as long.

“E-Line fabrics have a performance life that meets mill expectations plus they have a low friction coefficient,” Henschel says. “They are good in machine positions where the mill wants to reduce power consumption, has a high number of vacuum-aided dewatering elements, or where the drives have reached their limits.”

In other words, a good candidate for a trial at Roermond.

First trial – PM1

The first E-Line trial was performed in the bottom position of PM1, a 5 m wide machine running at 720 m/min.

“We had been running a standard Microflex fabric (2.5-layer) for many years, so we have good data on its performance,” Janssen says. In July 2011, Roermond switched to the three-layer standard Hegoflex fabric. After a successful trial, it was decided to run a trial of the Hegoflex E-Line yarn technology in September. The E-Line trial ran until November.

“Meanwhile, the average grammage on PM1 was changed, which influenced machine speeds and had some consequences on the fabric loading,” Janssen reveals. “So this complicated our analysis a bit. It is always difficult to analyze these trials because there are so many variables involved. It is one thing to say that we reduced energy consumption, but you can only make that claim after looking at all the variables – not just the forming fabric itself.”

“We see some good results from E-Line,” Lap says. “But to make a real fair comparison, we need to do more analysis and more trials.”

Based on the initial findings, PM3 (a 5 m wide machine running at 930 m/min) is now running a trial and E-Line is in the bottom position on all three machines.

Figures and feelings

“It is very difficult to isolate what results are coming just from the forming fabric,” Janssen says. “So our evaluation is based not only on figures, but also on feelings.”

Henschel points out that Roermond has a very good data collection and storage system. Janssen and his team can go back over many years to isolate variables. In one analysis, they looked at vacuum and total power consumption for the standard Microflex against the Hegoflex E-Line. Power consumption was considerably less, giving the operators far more flexibility in operating the machine.

Things like formation and runability are as important as energy to Roermond. “Hegoflex is a completely different design than Microflex,” Janssen says. “It is thinner and has a much finer configuration. For us, the formation has improved on all grades and we feel that the quality is better. With Hegoflex, we don’t see any sheet sealing and we are getting uniform dewatering along the length of the forming section. We get the same dryness at the end, but with less energy consumption.”

Janssen and his team are analyzing data to confirm this, but they believe the Hegoflex fabric allows them to reduce the amount of starch they add to the sheet. “Since starch is very expensive,” he says, “this is a very important benefit in addition to the energy savings.”

On PM2, Roermond’s smallest machine, energy consumption is not a big issue. “The big issue here is that we have an open draw going into the press section,” Janssen says. “The fine structure of the Hegoflex makes it easier to release the paper sheet so we are seeing fewer breaks on the couch roll.”

Moving forward

“It is not only about production at this mill, but we also focus on costs,” Lap says. “Working with ANDRITZ Kufferath has resulted in a good balance of both: we have good performance on the machine, and we are seeing savings in starch and energy consumption.”

“I try to understand enough about the production of the fabrics (warps and wefts and open areas and materials) to evaluate what a supplier is telling me,” Janssen says. “But at the end of the day, it is about results – how the fabric performs on my machine.”

Janssen has a whole list of improvement projects to evaluate. “When I started here 22 years ago, I thought that, after a couple of years, everything would be optimized and life would get boring,” he says. “But we are coming up with improvement ideas much faster than we have the time to convert each idea into a solution. We are moving methodically, and in the right direction. Never a boring moment!”

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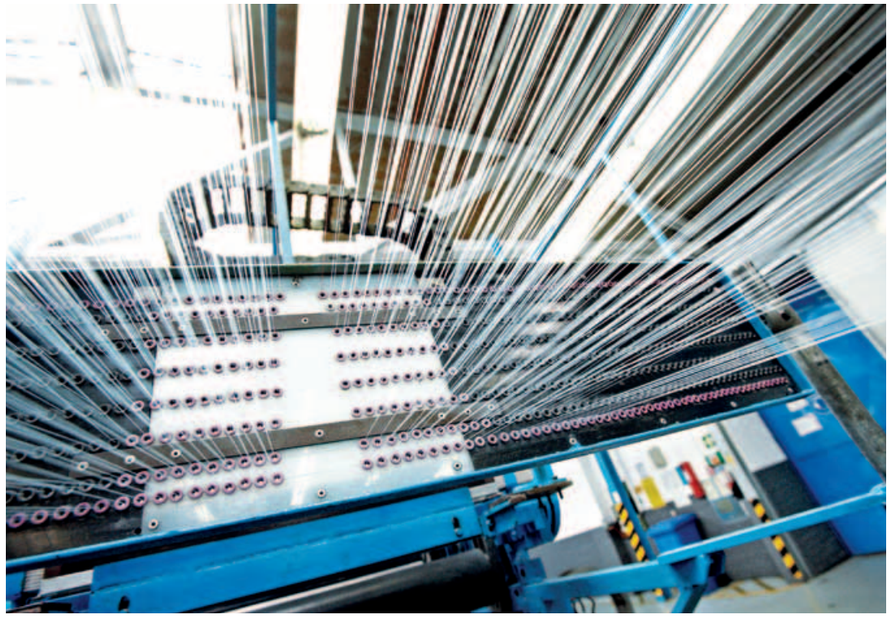
Close-up of a production loom at ANDRITZ Kufferath’s facility in Germany. ▼



SOME LINES ABOUT **E-LINE**

E-Line is an SSB (sheet support binder) fabric. SSB is the premier design across all fine and publication grades, and has successfully entered the packaging grade sector, as in the case of Roermond.

The development goal with E-Line was to create a fabric with lifetime that meets mill expectations, is dimensionally stable, and has a low friction coefficient on the bottom side. Reduced friction translates directly to reduced energy consumption.

E-Line fabrics have a similar energy profile to 100% PET, but the life of a fabric made from PA/PET combination. They are suitable for all grades of paper and all machines where energy costs are an issue. They can be operated the same way as the standard versions, no machine changes are required.

As we have seen with Roermond, each machine is different. Trials at other locations show significant energy reduction and cost savings in excess of 100,000 EUR per year.

◀ Inspecting an E-Line fabric during production at ANDRITZ Kufferath’s plant in Germany.

ENERGY
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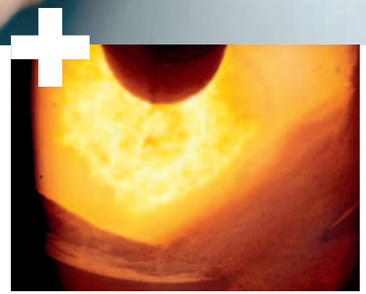


Wood powder replaces fossil fuels in Östrand's kiln

A unique lime kiln from ANDRITZ is part of an SCA investment project to reduce the carbon footprint of the Östrand mill. The economics of substituting wood powder for heavy oil are highly attractive. This gives the mill extreme flexibility in utilizing its biomass depending on market conditions.

▲ Above: The wood powder "fuel" used by the kiln. Particle size is important: not exceeding 1 mm in diameter.

Below: On its way through the rotating kiln, the lime mud slurry (calcium carbonate) gets increasingly hot. When it reaches a temperature of 1,100° C, it is converted into lime (calcium oxide).

BioLoop 2011

SCA has invested about 60 MEUR in the Östrand pulp mill's BioLoop 2011 chemical recovery system. The largest part of the investment is for a new lime kiln which is fueled with pulverized wood pellets. The new ANDRITZ LimeKiln is attracting attention in the industry, according to SCA's BioLoop 2011 Project Manager, Håkan Wänglund.

"All kraft mills want to improve their sustainability and reduce fossil fuel oil consumption," Wänglund says. "A lot of our colleagues around the world have contacted us to learn more about what we're doing."

The new kiln, which replaces two older kilns, enables Östrand to increase production of pulp while reducing emissions of fossil carbon dioxide by 80%. The wood powder that fuels the kiln is part of SCA's business chain in that the pellets are produced at SCA's BioNorr plant in Härnösand, 39 km north of Östrand. The same trucks that bring sawdust from the mill to the pelleting plant bring pellets back to the pulp mill to avoid empty runs.

The BioLoop 2011 project involved not only the new kiln, but also a new LimeWhite white liquor filter, a biofuel handling station, upgrade of a chip screen, and installation of four new combination burners so that one of the biomass boilers could fire wood powder.

"ANDRITZ was involved in each of these five projects," Wänglund says. "Schedules and budgets were met, and we are very happy with the results."

"A mill would be hard-pressed to find a better environmental project than this – reducing consumption of at least 17,000 m³ of fossil fuel oil per year."
Håkan Wänglund,
SCA's BioLoop 2011 Project Manager

Room to grow

Radically reduced environmental impact is one outcome of BioLoop 2011; the other is a boost of more than 10,000 t/a in the production of Celeste, a totally chlorine-free pulp.

"We had two kilns," Wänglund explains, "the oldest one operating since the 1950's. Together, they had a capacity of 420,000 t/a of pulp. We now have permits to produce 550,000 t/a, and our ultimate target is 800,000 t/a, so the kilns had become our bottleneck."

SCA had discussions with ANDRITZ and other kiln suppliers about whether to rebuild the existing kilns, replace them, or a combination of the two. "ANDRITZ gave us a solution that initially produces 557 t/d of burned lime to support current production, but can be easily expanded to 774 t/d to support our goal of 800,000 t/a of pulp production," Wänglund says. "At the same time we selected their LimeWhite (white liquor) filter to enable us to meet current and future production as well."

Markku Lankinen, Sales Manager for ANDRITZ's fiberline chemical systems business, explains how the increased capacity will come about. "The kiln dimensions (125 m long by 4.5 m diameter) will remain the same," he says. "When SCA is ready, we will put in a larger ID fan and make some modifications to the kiln feed by adding our LimeFlash technology, which runs with higher backend temperatures to boost production."

This expansion concept was also built into the recovery boiler that ANDRITZ installed at Östrand (Spectrum Issue 14, 2006). ANDRITZ came up with a unique solution to move the side wall of the boiler – instead of the conventional approach of moving the front wall – to retain the proper proportions

The ANDRITZ kiln at Östrand resembles a 125 m long rotating tube. It converts mud from the recausticizing process into lime that is reused in making cooking liquor for the digester. ▼

for gas flows through the superheaters and generating bank.

Why wood powder?

"First of all, using fuel oil isn't environmentally friendly," Wänglund says. "Also, oil prices are high and we have no control over them. We have biomass within our own business loop – giving us better control over supply, quality, and costs."

Wänglund and his team knew of a few mills in Sweden that are trying similar things – mixing bark powder with traditional fuels. "We visited with them to see what we could learn," Wänglund says.

Pellets from SCA's BioNorr plant are ground at the mill to become fuel for the ANDRITZ kiln. ▶

"The big question was whether the biodust fuel would accumulate or react with the reburned lime," Wänglund explains. "We also didn't know if it would be possible to run the kiln stably on 100% wood powder. No one had tried it really."

"From our perspective, the main issues were the uniformity of particles and getting a consistent flow to the kiln burner," says Lankinen. "We knew that moisture content would be important, as would a consistently small (1 mm) particle size to ensure that the powder would fire at the proper location in the kiln with a correctly shaped flame."

"After our discussions with ANDRITZ, we became convinced that it would work," Wänglund says. "Otherwise we would not have taken the risk."

An excellent start-up

"Lime reburning technology isn't exactly rocket science," says Henrik Grönqvist, ANDRITZ's Project Manager, "but the unique twist is that we modified the burners to run the kiln on pulverized wood pellets instead of the fuel oil that other lime kilns use."

Grönqvist and his team executed the contract for installation of the white liquor filter, the kiln, and the electrostatic precipitator for flue gas cleaning. The LimeWhite filter started up in August 2011, and the kiln started in October.

"It is always challenging and exciting to deliver something that has not been done before," Grönqvist says. "But the project has been successful and the start-up went very well. It was only a couple of days after start-up before we were able to move from firing with oil to firing with wood powder."

The new LimeFire burner has a different channel for each fuel (wood powder, oil, and NCGs collected from the mill). "Operators do not have to make any significant changes to the way they run the kiln," Grönqvist says. "They control the fuel amount based on the amount of production they need."

For the wood powder fuel, pellet grinding occurs near the firing end of the kiln. "The design minimizes the distance from silo to burner so the high-pressure fans can be most effective," Lankinen says.

▲ A view of the LimeDry filter for drying lime mud prior to burning in the kiln. ANDRITZ also delivered a LimeWhite filter to enable the mill to meet future targets for white liquor production.

◀ Henrik Grönqvist (left) and Markku Lankinen of ANDRITZ at the LimeDry filter.

40,000 tonnes of pellets replace 17,000 m³ of oil

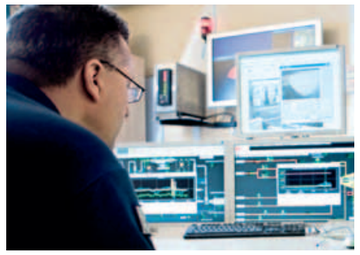
SCA Östrand is very happy with its decision. In the last month alone, the kiln operated on 100% wood powder, which is substantially better than the 90% internal goal. An added benefit is that the mill's use of wood pellets evens out SCA BioNorr's seasonal pellet business.

In the summer, wood pellets are not in demand for heating so supplying the Östrand mill with about 3,400 t per month of pellets evens out the pellet plant's production.

"A mill would be hard-pressed to find a better environmental project than this – reducing consumption of at least 17,000 m³ of fossil fuel oil per year," Wänglund says. "And with oil pricing as it is, the economics of burning wood powder from our own residuals is quite significant. Everybody wins, and so does the environment."

◀ The ANDRITZ kiln will initially produce 557 t/d of burned lime, but can be easily expanded to support Östrand's goal of 800,000 t/a pulp production. This same expansion concept was employed when the mill ordered a recovery boiler (shown) from ANDRITZ in 2004, which started up in 2006.

Operator in the power and recovery control room. ▼



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Part of the ANDRITZ team in front of the LimeFire kiln burner: Ilkka Aalto, Project Engineer (left), Markku Lankinen, Sales Manager (center), and Henrik Grönqvist, Project Manager. The burner has a different channel for each fuel (wood powder, oil, and NCGs). ▼

ENERGY
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Above photos courtesy of UPM

Bio-business moving forward for UPM

It was in 2008 that we last visited Petri Kukkonen of UPM. At that time, UPM was entering into a development program with ANDRITZ Carbona to prove out some of the key technologies for the production of drop-in transportation fuels from biomass. Let's see how the testing phase went and what is next on the horizon for the Biofore company.

As Jim Lane so aptly put it (page 20), UPM is one of those companies moving from "beakers in the lab to steel in the ground" with its announced project to build the first biorefinery producing wood-based biodiesel in Lappeenranta, Finland. This facility will use tall oil (the pitch and extracts from the black liquor while producing chemical pulp from softwoods) as the feedstock.

The Lappeenranta facility will produce about 100,000 tonnes of UPM's biodiesel (BioVerno) each year. Construction will take about two years. "There is not so much tall oil available in Finland," Kukkonen explains. "So this does not have anywhere near the long-term potential as our work in biomass-to-liquid (BTL) conversion. But it's a start and we are very happy after five years of development to bring this technology to commercial scale."

BioVerno is an innovation that serves as a drop-in (direct replacement) for diesel produced from fossil fuels – but with an estimated 80% reduction in greenhouse gas emissions.

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▲ UPM's planned biomass-to-liquid (BTL) facility using ANDRITZ Carbona technologies will use "energy wood" (forest residuals, trimmings, and stumps). The end product will be BioVerno, UPM's brand of advanced biodiesel fuel.

Gas or diesel

"Unfortunately, the front-end technology we've been testing with ANDRITZ Carbona is not applicable for the Lappeenranta project," says Petri Kukkonen, VP of Biofuels for UPM. "The ANDRITZ Carbona technology is for the gasification and gas conditioning of solid biomass (forest residuals, etc.). But the back-end technology will be basically the same that we will use when we build our BTL plant."

The Lappeenranta project, combined with the work UPM has already done with ANDRITZ Carbona, will yield proven designs for the production of both bio-gasoline and biodiesel in commercial scale. "Bio-gasoline is most suitable for North America, while biodiesel has a larger market in Europe," Kukkonen says. "The two combined have a very large market potential."

EU 2020 targets create demand for sustainable biofuels

The demand for biofuels is expected to grow by approximately 7% a year in the EU. "It is not just the impact on climate change or carbon emissions," Kukkonen says. "There is an increase in energy demand and the use of oil alone will be too expensive. The amount of energy extracted from oil is so enormous, however, that no one raw material will be able to replace it. Biofuels will definitely have their place."

The target of the EU Renewable Energy Directive is to increase the share of renewable energy in transport to 10% by the year 2020. In Finland, the corresponding target is even more challenging with an increase of 20%. The annual production of UPM's biorefinery at Lappeenranta will contribute approximately one-fourth of Finland's biofuel target.

By further processing crude tall oil, UPM will utilize its wood resources in a more efficient way without increasing wood harvesting. "We will have a cost-competitive and high-quality transport fuel that decreases emissions," Kukkonen says.

"We are very happy after years of development to bring this technology to commercial scale."
Petri Kukkonen,
VP of Biofuels for UPM

Next biorefinery in planning

The decision to construct a biorefinery in Lappeenranta does not affect UPM's other biorefinery plans. This includes a plan to build a BTL biorefinery either in Rauma, Finland, or Strasbourg, France. This biorefinery would use energy wood (forest residues, trimmings, and stumps) as raw material for the ANDRITZ Carbona gasification and gas cleanup technology. ANDRITZ also has the technology for biomass handling and drying.

According to Kukkonen, UPM will assess its plans after the EU has decided on its investment grants. The EU is expected to decide on the NER300 grants in the second half of 2012 and UPM has submitted its proposal for funding.

First round tests successful

In May 2007, UPM announced its cooperation with ANDRITZ Carbona for the design and supply of a commercial-scale biomass gasification plant. A story in Spectrum No. 17 ("From biomass to biobusiness") details the partnership and the testing of concept at the Gas Technology Institute (GTI) in the USA.

"The goal of our project was to develop a technology platform that we could duplicate for multiple sites," Kukkonen says. "This development work was successful."

According to Kari Salo, Managing Director of ANDRITZ Carbona, "We completed 10 test campaigns at GTI over the past two years which enabled us to finalize the design of the plant. We fine-tuned our feed system, gasifier, gas conditioning, and gas cleaning. All the components were tested as a complete system, including the supervisory control."

ANDRITZ Carbona learned a lot over the last two years of development work. As Salo explains, "First, we got good design data at operating pressures to modify the feed system. Then we perfected the ability to efficiently gasify biomass with oxy-

A technician at UPM's Lappeenranta, Finland center conducts tests on biodiesel. UPM is building the first biorefinery producing wood-based bio-diesel, using tall oil as the feedstock. ▶

Dried biomass from UPM forests was used as the fuel source for the extensive tests conducted by ANDRITZ Carbona at the Gas Technology Institute (GTI) in the USA. ▼

◀ New testing will soon begin at GTI to prove out the technology for producing bio-gasoline from wood. UPM will provide the energy wood, ANDRITZ Carbona will provide the technology to convert biomass to clean syngas, Haldor Topsøe will provide the technology for processing syngas into gasoline, and ConocoPhillips will conduct the fleet testing of the drop-in bio-gasoline.

Photos on this page courtesy of UPM

gen instead of air. Oxygen-blown syngas (the product from gasification) typically has two to three times the calorific value of air-blown."

The next important learning was how to reform and clean up the syngas. Because the mixture in a bubbling bed gasifier is fuel-rich (meaning oxygen is controlled to avoid complete combustion), instead of producing CO_2, a gasifier produces mostly CO. And, the hydrogen in the fuel is converted mostly to H2 rather than H_2O.

"A characteristic of the downstream process is that the catalyst is very sensitive to contamination," Salo says. "This requires a very pure syngas, so gas cleaning becomes extremely critical."

Like Salo, Jim Patel (Salo's partner at ANDRITZ Carbona) has spent his adult life in the gasification field. "The work we did at GTI and the experience we gained from the commercial installation at Skive has proved out our concept and design," Patel says.

The Skive plant in Denmark (see Spectrum No. 20 – "First-of-its-kind") produces fuel gas from wood-based biomass for combined heat-power (CHP) production. "The Skive gasifier is about the same physical size as our scale-up with UPM for the bio-mass-to-liquid plant, except that the UPM gasifier will operate at a higher pressure," Patel says.

New testing of the entire value chain begins

New testing, financed in part by the U.S. Department of Energy, will prove out the technology for producing bio-gasoline from wood. The work will be conducted at GTI. UPM provides the energy wood, ANDRITZ Carbona provides the technology to convert biomass to clean syngas, Haldor Topsøe (a Danish company) provides the technology for processing syngas into gasoline, and ConocoPhillips (the American energy company) will provide the fleet testing of the drop-in bio-gasoline.

According to Kukkonen, the value of Haldor Topsøe's TIGAS process (Topsøe Integrated Gasoline Synthesis) is that it is single-loop, eliminating the requirement for upstream methanol production and intermediate storage.

"It is an exciting project," Kukkonen says. "We have quality partners representing the entire value chain from wood supply to commercial gas station."

The project will demonstrate efficient conversion of 25 t/d of biomass into transportation fuel. About 60% of the energy in the wood ends up in the fuel – a high efficiency for the production of wood-based biofuels.

"Biofuel production totally fits UPM's infrastructure and Biofore vision," Kukkonen says. "We are leading the integration of bio and forest industries, creating value from renewable and sustainable materials."

With ANDRITZ Carbona, UPM has readied the design for a BTL plant. "We are both looking forward to bringing the design to life in the very near future," Kukkonen says. "I think our world needs it."

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"Steel out of the ground"

Dear Readers: Regular readers of Spectrum know that our articles are usually written after a project starts up. However, Montes del Plata of Uruguay is giving us a rare opportunity to publish a series of articles while this greenfield mill is being built. We thank Montes del Plata for allowing us to journey with them as they build, commission, and start up a world-class 1.3 million t/a market pulp mill.

Dispatch #3: Punta Pereira, Uruguay

We see a project moving full-speed ahead. Steel is rising out of the foundations and plans are being put in place for the commissioning phase. Richard Turner, Montes del Plata's Project Director, has added some key people, moved some personnel into different assignments, and implemented some new project controls. Turner and the new ANDRITZ Project Director, Peter Outzen, are bringing a calm discipline and focus to the controlled chaos of 3,000 people on-site at the moment.

▲ ANDRITZ is the main technology supplier for the entire Montes del Plata mill – with a scope covering the woodyard, fiberline, pulp drying/baling plant, chemical recovery block, white liquor plant, and power island. Shown here is the fiberline building taking shape.

ANDRITZ is the main technology supplier for the entire Montes del Plata mill – with a scope covering the woodyard, fiberline, pulp drying/baling plant, chemical recovery block, white liquor plant, and power island (biomass and auxiliary boilers).

"Though Peter Outzen is new to the site," Turner says, "he has already had a positive impact. I have a lot of respect for him and his abilities."

The feeling is mutual. "Richard is straightforward, very experienced, and results-centered," Outzen says. "We may not always agree on the tactic, but we share the same vision and goal."

Support from the owners

The intensity and commitment of Outzen and his team at ANDRITZ has been noticed by the owners (Stora Enso and Arauco). "From Dr. Leitner on down, there is no doubt in our mind about ANDRITZ's commitment to keep the momentum going."

The speakers are Sakari Eloranta and José Vivanco, two members of the original Steering Committee who are now on-site two weeks a month. They share a small office in one of the project buildings. Eloranta is head of Mill Operations and Investment Projects for Stora Enso's Biomaterials business area. Vivanco is Arauco's head of Business Development.

"We started out as colleagues, but have become friends," Eloranta and Vivanco say. "We share similar experiences as mill managers and business managers, and are here to give full support to the Project Director and the Mill Manager."

"Richard Turner has the day-to-day issues in hand," Eloranta explains, "but occasionally will need a quick decision from the owners. There are also times when either he or Héctor Araneda (Mill Manager) needs more resources. José and I are the guys to locate these resources within the owner companies."

Planning is also another key area, specifically personnel and commissioning planning. Eloranta explains that they need an additional 20 experienced engineers and operators for the commissioning and start-up work. “We have already trained a team of 25 engineers from Uruguay in Finland and Chile late last year.”

Soon to arrive on-site will be the IDEAS dynamic simulator from ANDRITZ, which will be used for operator training and also to check out the DCS configuration. “We have used this for all our major start-ups and it is a vital tool for a quick learning curve,” Eloranta and Vivanco agree.

Both gentlemen are pleased with the cooperation during the project. As Vivanco puts it, “One team, one project, one goal.”

With construction in full swing, and with commissioning starting at about 75% completion, there is a lot to plan for. “We plan to the last detail,” Vivanco explains. “First is cold commissioning, then hot commissioning, then the water runs on all the systems. When the systems pass the water runs, they are ready for start-up. This whole process takes about six months.”

“We need to check every piece of equipment to ensure that we will have a successful start-up,” Eloranta says. “If we take shortcuts in commissioning, we will fail in the start-up.”

“The project teams all know their equipment and their specialties. I’m here to bring overall coordination and be the main liaison with Montes del Plata.”
Peter Outzen,
ANDRITZ Project Director

Of critical importance is that the mill team learns to operate the mill. “We want our operators to look at every piece of equipment and fully understand how it works before it starts up,” Vivanco says. “This is impossible once the vessels and pipes are full, so it has to be done during commissioning.

“This mill is a big one, and we need to learn how to run it efficiently,” Vivanco says. “If we lose one day’s production, we easily lose at least 4,000 tonnes. That is why we have to do everything possible to keep the mill running steady. It is very important to keep the wheels turning.”

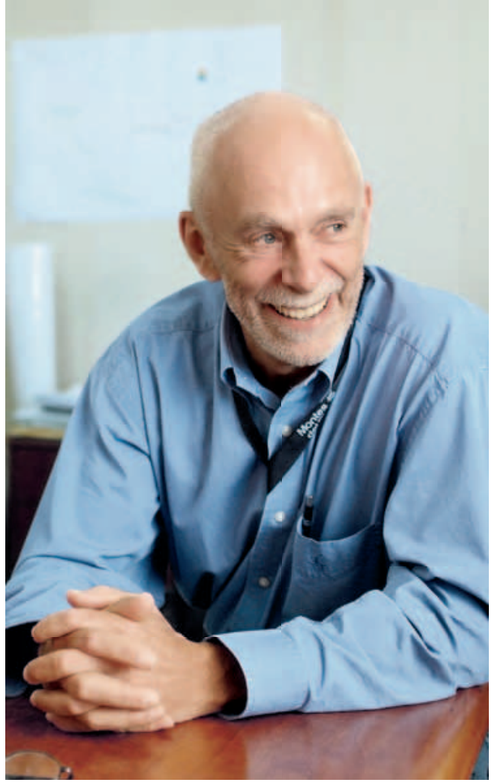
After all these years in the business, how do Eloranta and Vivanco keep their energy up?

“Are you kidding?” Vivanco says. “I am as excited as a newly married man with his bride. This is a great experience!”

“The majority of pulp engineers can go through their entire careers and not have the opportunity to start up a completely new mill,” Eloranta says. “We are really lucky guys.”

What every project director loves to see

Steel out of the ground gets the juices flowing. It is a tangible sign of plans-turned-into-action. This brings a smile to Turner.



“We have our challenges, but I am positive we will work through everything and will hand this mill to the owners in very good shape.”
Richard Turner,
Montes del Plata Project Director

He is a practical man and speaks without hyperbole. A Canadian by birth, he has spent a considerable part of his career doing projects in Asia and faraway places, which has taught him to be resourceful and adaptable. These skills are put to the test dealing with weather, labor, and infrastructure challenges. But now things are on a roll.

“I really appreciate the presence of Sakari and José here,” Turner says. “They are a big help in getting resources out of the owner companies – technologies and people when we need them – and in sharing their experiences.”

Turner has implemented morning meetings, effective cost controls, and other measures too. “Stay on top of the project and speed up our response to problems. This has improved communications a lot,” he says.

Another plus has been the addition of Harald Hauer as Site Manager. “I had a very definite profile for the person I wanted,”

▲ Above: Preparing the foundation for a bleaching tower (fiberline building in background).

Below: A crane removes the lower section of a bleaching tower from the transport truck.

MOVING FULL-SPEED AHEAD

FROM PLANS TO ACTION:
A NEW MILL TAKES FORM

"There is no doubt in our minds about ANDRITZ's commitment to keep the momentum going."
Sakari Eloranta, Stora Enso's head of Mill Operations and Investments (left), with José Vivanco, Arauco's head of Business Development.

▲ With the ANDRITZ recovery boiler taking shape behind them, Eloranta of Stora Enso and Vivanco of Arauco represent the owners on-site. They offer executive support to the project and mill teams. "We started out as colleagues, but have become friends," they say.

Ready for take-off: the foundation for the 4,000 t/d digester vessel. ▶

Turner says, "Harald not only has a vision of what needs to be done, but he understands how to work in an EPC environment. Our role is to make sure that nothing falls between the cracks of the major EPC packages, and I think the suppliers appreciate Harald's skills."

With 38 years in the industry ("33 years in the field" he points out), Peter Outzen has worked with his share of site managers and project people. He came to ANDRITZ in 2007. "Harald is very experienced and quite professional," Outzen confirms.

From China to Uruguay

Outzen arrived as Project Director in February, directly from his most recent assignment building and starting up a greenfield pulp mill in China. "I like it here," he says. "The first week was a little rough, as there was a labor strike. That is something I was not accustomed to."

But the progress now is quite encouraging to Outzen. "I know all the ANDRITZ project managers from previous jobs," he says. "It's a good group of professionals."

As director for such a large project, Outzen has to be a jack-of-all-trades. "I am communicator, advisor, mentor, disciplinarian – a little of everything," Outzen says. "The project teams all know their equipment and their specialties. I'm here to bring overall coordination and be the main liaison with Montes del Plata."

Outzen rates the communications as "very good." "We are working hard to meet our targets and keep this project on schedule," he says. "There is no margin for error in the schedule now, but when we get the utilities (power, water, steam) and the balance of plant, we should be in a position to move fast with commissioning."

And those are the main challenges for Turner and his team: completing the port, the balance of plant, and navigating the labor situation. "In Canada trade unions have always been a part of our projects," Turner says, "but the rules and roles are clearly defined. In Uruguay, the unions don't have established traditions. This makes it difficult to predict and plan. When the UPM Fray Bentos was built here, there were around 25,000 workers in the construction unions.

That number today is 70,000, and many are young."

Practical challenges

For ANDRITZ project people, one practical challenge has been educating these young civil and structural construction workers in real-time about the special requirements of a pulp mill. According to Seppo Sandberg, ANDRITZ's Supervisor of Mechanical Erection for the fiberline area, the education is paying off. We found Sandberg checking the levelness of a large circular concrete pad that will be the base for the digester vessel (a rather large vessel we might add, as it will produce 4,000 t/d!).

"When we started here, the crafts people thought they were just pouring and working concrete," Sandberg explains. "We taught them what was going to go on top of this concrete pad and how important their work is to a critical piece of equipment like a digester. Now that they understand what is needed, they are taking good care with the work." Sandberg peers under his large straightedge looking for even minor gaps – then walks away satisfied.

"We have issues to overcome, as with any project," Turner confirms. "But I am positive we will work through everything and, with ANDRITZ, will hand this mill to the owners in very good shape. ANDRITZ is definitely committed, and that is a big, big thing."

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▲ Work is progressing well on the ANDRITZ recovery boiler.

Outside of ANDRITZ's scope, but on the critical path, is the port at Punta Pereira. The area is being dredged to allow for larger ships to bring in plantation logs and to transport finished bales of pulp. ▼

Highlights of NEW ORDERS

COMPLETE LINES

North Star Pulp Industrial Complex
Amazar, Russia
Complete fiberline and 4.2 m pulp drying line

Lunds Energi
Lund, Sweden
External biofuel handling for power plant

ZeaChem
Boardman, Oregon, USA
Continuous biomass pretreatment demo scale system

Borregaard Industries
Sarpsborg, Norway
Pilot scale continuous system for pretreatment of biofuel and biochemical feedstocks

Tembec
Témiscaming, Québec, Canada
SulfitePower boiler plant

Mondi Group – Mondi Frantschach
St. Gertraud, Austria
New recovery boiler (replacing two older units)

AES Gener/Norgener
Tocopilla and Ventanas, Chile
Two turnkey TurboSorp flue gas desulphurization plants
First ANDRITZ air pollution control systems in Chile

MCC Paper Yinhe
Linqing, Shandong, China
P-RC APMP system (200 admt/d)
Repeat order – 2nd line

JSC Arkhangelsk Pulp and Paper Mill
Novodvinsk, Russia
Pre-engineering and equipment for new 1,000 admt/d semi-chemical pulp line
First complete green liquor pulping and washing line supplied by ANDRITZ

COMPLETE LINES

Vinda Paper
Jiangmen, Guangdong, China
Stock preparation and approach system for tissue machine

Vinda Paper
Xiaogan, Hubei, China
Stock preparation and approach system for tissue machine

Guanhao Hi-Tech
Zhanjiang, Guangdong, China
Stock preparation and approach system for release paper machine

EcoPaper JP
Nagoya, Japan
SelectaFlot deinking system

Precot Meridian
Coimbatore, India
Jetlace 3000 Demak Up Line LM 1500
Complete new nonwovens line for cotton pads production (from spinning mill waste)

Avangard
Tosno, Russia
neXline Spunlace – LM3600
Complete Spunlace nonwovens line

KEY EQUIPMENT, UPGRADES, AND MODERNIZATIONS

Nippon Paper
Kushiro, Japan
Modification of digester (Pre-hydrolysis vessel) for producing dissolving pulp

ITC Paperboards & Specialty Papers Division
Bhadrachalam, India
LimeGreen filter

Ilim Group
Kotlas, Russia
Lime stone kiln and white liquor plant modernization

KEY EQUIPMENT, UPGRADES, AND MODERNIZATIONS

Smurfit Kappa Piteå
Piteå, Sweden
Chipping line upgrade with HHQ-Chipper

Stora Enso
Kemi, Finland
LimeCool and LimeFire (lime kiln modernization)

Sappi Fine Paper North America
Cloquet, Minnesota, USA
Wet end, cutter and baling line modifications

APP
Danzhou, Hainan, China
Headbox Screens

Jeonju Paper
Cheongwon, Korea
FibreFlow drum pulper

Hangzhou Nbond
Hangzhou, Zhejiang, China
JetlaceAvantage and PerfodryAvantage – LM2500 nonwovens lines

Smurfit Kappa Hoya
Hoya, Germany
*Prime*Winder Arcus Evo
Delivery of newly developed two-drum winder

Steinbeis Papier
Glückstadt, Germany
Rebuild of PM4 with a *Prime*Cal ProSoft calender

PT. Indah Kiat Pulp & Paper
Perawang, Indonesia
Calender and winder rebuild

Highlights of NEW START-UPS

COMPLETE LINES

CMPC Celulosa
Santa Fe, Chile
Complete debarking/chipping line; modernization of fiberline and white liquor plant; key equipment for biomass handling; and upgrade of pulp drying line

Sun Paper Industry Joint Stock
Yanzhou, Shandong, China
Conversion of fiberline for production of dissolving pulp (including continuous cooking upgrade)
First dissolving pulp conversion project start-up
Stock preparation and approach flow system

Arauco
Nueva Aldea, Chile
Complete debarking and chipping line with RotaBarker technology

JSC Solombala PPM
Arkhangelsk, Russia
Debarking and chipping line

COMPLETE LINES

PVO Kaukaan Voima
Lappeenranta, Finland
Biomass handling system

Bollnäs Energi
Bollnäs, Sweden
Bubbling Fluidized Bed boiler plant, including auxiliaries for Refuse-Derived Fuels (RDF)
First ANDRITZ RDF boiler in Sweden

Hengan Group
Chongqing, China
*Prime*LineTM W8 tissue machine with complete stock preparation and automation
Seven PrimeLine machines in operation at Hengan with two more starting up in 2012 (will have world's largest Steel Yankees (diameter: 5m) for high-speed machines

Saigon Paper Corporation
My Xuan A Industrial Zone; Tan Thanh District, Vietnam
*Prime*LineCOMPACT tissue machine with *Prime*Dry Steel Yankee; complete stock preparation and automation

KEY EQUIPMENT, UPGRADES, AND MODERNIZATIONS

Arauco
Arauco, Chile
Debarking and chipping line with RotaBarker technology

W. Hamburger
Pitten, Austria
PrimeCoat Film for simultaneously coating on both sides and PrimeAir Glide

Doh-Ei Paper
Hokkaido, Japan
*Prime*Dry Steel Yankee

Confidential customer
Indonesia
*Prime*Dry Steel Yankee and *Prime*Flow SW headbox; key components for approach system and dilution water control equipment
Largest Steel Yankee in the world – 7.4 m shell length

ANDRITZ
Automation

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We accept the challenge!

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