SPECTRUM

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ANDRITZ
Pulp & Paper

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Scaling up. **Speeding** up.

Larger production units lower the capital and operating costs per tonne of product. But, “bigger is better” only when the machine starts up quickly, ramps up quickly, and works reliably from shutdown to shutdown.

Think back 20 years ago. If a colleague told you that he/she was going to design a 4,800 t/d digester, or a 11,600 tds/d recovery boiler, or a 900 t/d mechanical pulping line, or a 2,500 t/d wastepaper processing line, you would (after you finished laughing) suggest that your colleague take a long vacation, or take a reality-pill.

Today, such large-capacity production equipment is a reality. That digester is operating at the world’s largest single-line pulp mill (Eldorado). That recovery boiler is now being built for delivery to Indonesia (OKI Pulp & Paper). Three such mechanical pulping lines are operating for APP in China – and a 2,450 t/d OCC line started up at Shouguang Chenming Meilun.

◀ Karl Hornhofer (standing) and Humbert Köfler.

What happened?

“Economies of scale” are being pushed to new limits. Not that long ago, a mill had TWO of everything (they call it “redundancy” in the IT world). Redundancy comes with a high price tag. As margins got squeezed, mills could no longer afford redundant systems. So, the demand was for ONE highly reliable machine to lower capital and operating costs.

But in most cases, throughput was lowered, too. The ONE machine was not big enough. Our response was to design ONE BIG RELIABLE machine. This was not a simple scale-up – doubling the amount of steel to get double the capacity was too costly. Our solutions required re-thinking, re-inventing. Newer and stronger materials, new materials handling technologies, and new manufacturing methods helped us in this pursuit.

Okay, not every mill wants the world’s biggest or the world’s fastest. But, every mill wants the most reliable. The discipline required to deliver ONE BIG RELIABLE machine is an asset in designing smaller, slower machines as well.

Need for speed

BIG and RELIABLE are of little use if they are not joined by FAST. By FAST, we mean “project speed” as well as “machine speed.”

Fast project start-ups – from the large new machine at Zellstoff Pöls (page 8), or the tissue machines at Hengan in China, to the digester outlet device at Mondi Frantschach (page 22) – are all important. When our customer says, “It was only a matter of hours from start-up to making saleable product,” that puts money in their pockets – and is music to our ears.

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

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

“Renewable gasoline” from wood

A project to demonstrate an economically viable method for thermochemical conversion of woody biomass into gasoline is underway and gaining momentum. The first product has been produced and the results are promising. ANDRITZ and its partners are now ramping up to fine-tune the design for a commercial plant and to verify the economics.

Editor’s note:
We have been reporting on the progress of biomass-to-liquid development since UPM (the giant forest products company) announced its cooperation with ANDRITZ for the design and supply of a commercial-scale biomass gasification plant. The first story detailed the conceptual testing at the Gas Technology Institute (GTI) in the USA. The second story looked at UPM’s work in Finland with renewable diesel and talked of the testing at GTI with Haldor Topsøe’s syngas-to-gasoline process. This third report brings you up-to-speed on the exciting developments.

Note: *The material in this story is based upon work supported by the U.S. Department of Energy, Golden Field Office, under Award Number DE-EE0002874.*

“Developed nations are looking for alternatives to fossil fuels,” says Petri Kukkonen, Vice President, Biofuels at UPM. “Second-generation biofuels have the potential to be a big part of the solution. And, UPM can provide these biofuels while developing a profitable business in a fast-moving market.”

According to Kukkonen, the initial goal of the UPM-ANDRITZ work was to develop a technology platform that could be duplicated for multiple sites. “This development work was successful,” he says.

The initial testing at the Gas Technology Institute (GTI) in the USA was conducted on several different types of woody biomass. According to Kari Salo, Managing Director of Carbona, “We completed 10 test campaigns at GTI 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.”

◀ From tree to pump. Jim Patel of Carbona (left) holds a sample of the woody biomass while Samy Ramzy Diab of Haldor Topsøe holds a sample of the renewable gasoline produced at GTI.

“The use of renewable gasoline would represent about a 92% reduction in life cycle greenhouse gas emissions when compared to conventional gasoline.”

Jim Patel
President
Carbona

New tests produce new results

New testing is proving out the integrated technology for producing a renewable gasoline from wood. Financing from the US Department of Energy (DOE) covers about 70% of the costs, with the partners sharing the rest.

The overall goal of the DOE’s Integrated Biorefinery Program is to enable the production of biofuels and reduce the dependence on oil. A longer term (2022) goal set forth in the USA’s Energy Independence and Security Act is the production of 36 billion gallons per year of renewable transportation fuels.

“This is a dream project,” says Niels Udengaard, Syngas Technology Manager at Haldor Topsøe and the overall Project Manager for the tree-to-tank project. “All the individual technology steps – from wood supply to fuel station – have been demonstrated individually in the past. But, for the first time, they are now integrated into one plant to produce transportation fuel.”

Udengaard explains that the demonstration project is focused on achieving a production rate of about 20 barrels per day of renewable gasoline from wood biomass for 20 to 30 days. “This will give us enough experience to establish a design for a commercial plant which can produce 85 million gallons per year of ‘drop-in’ renewable gasoline. Drop-in means that no modifications are required to the infrastructure or the vehicles.”

According to Udengaard, about 95% of American automobiles are fuelled by gasoline. The scenario is different in Europe, where UPM is also involved in research for wood-to-diesel transportation fuels (using the Fischer-Tropsch synthesis process).

For the demonstration, UPM provides the wood biomass, Carbona provides the technology to convert biomass to clean syngas, Haldor Topsøe provides the technology for processing syngas into gasoline, and Phillips 66 provides the emissions testing and fleet testing of the drop-in renewable gasoline (See box on page 7 for a brief profile of each company).

Unique technologies

The project was kicked off in June 2010 when the process design was detailed and reviewed. The project makes use of proprietary technologies from Carbona (gasification), GTI/Uhde (acid gas removal), and Haldor Topsøe (gas purification and synthesis).

The biomass is converted into renewable gasoline through the following steps at the Flex Fuel testing facility at GTI: gasification, gas cleaning/filtration, tar reforming, acid gas removal, and gasoline synthesis. One test bay at the facility accommodates the Carbona gasification, gas processing (reformer), gas conditioning (cooler), and cleaning (filtration and scrubbing) equipment. Another houses the Haldor Topsøe TIGAS unit.

Gasification and tar reforming. In the gasification process, biomass is partially oxidized or partially combusted. The product of gasification is a combustible synthesis gas (or syngas). The Carbona bubbling fluidized bed gasifier is a high-pressure, oxygen-blown design capable of, in commercial size, up to 200 MW_{th} biomass fuel input. Oxygen-blown syngas typically has two to three times the calorific value of air-blown.

The gasifier is operated with a catalytic tar reforming system developed by Carbona and Haldor Topsøe to destroy and reform tars in the gas. “Compared to a boiler, the mixture in our gasifier is very fuel-rich, be-

cause the oxygen is controlled to avoid complete combustion," says Jim Patel, President of Carbona. "Instead of producing CO_2 and H_2O, a gasifier produces mostly CO and H_2. Our technology removes the heavy tars, cracks the lighter tars, reforms the methane, and reduces the ammonia content to produce a clean syngas."

Acid gas removal. "Gas cleaning is very critical," explains Richard Knight, GTI's Project Manager. "The catalysts in the gasoline synthesis process are sensitive to contamination, so we are using our Morphysorb acid gas removal process prior to the Haldor Topsøe technology. Morphysorb was developed jointly between GTI and Uhde GmbH of Germany. It uses a nontoxic solvent created primarily from members of the morpholine chemical family to remove CO_2 and H_2S from the syngas."

Gasoline synthesis. The TIGAS process (Topsøe Integrated GAsoline Synthesis) is an improved version of the methanol-to-gasoline process. Other technologies convert syngas into methanol, methanol into dimethyl ether (DME), and then DME into gasoline in a two-loop process. TIGAS streamlines that process by producing DME directly from the syngas in a single-loop process, eliminating the need for methanol production and storage. "TIGAS was developed in the 1980's to convert natural gas to fuel," Udengaard says. "Today, we can use non-fossil resources as our raw material. We should be able to use any biomass in the future, perhaps even household waste."

"Using these integrated processes, nearly 50% of the energy in the wood ends up in the gasoline," Patel says. "That is a very high efficiency for the production of biofuels."

Two down, one to go

The work is being conducted at GTI in three test campaigns over a 29-month time frame. The first campaign, completed during March 2013, proved that the plant could be operated at steady-state to produce gasoline from woody biomass.

The pilot plant's capacity for feeding biomass is about 20 t/d. The biomass feed pellets are softer than standard fuel pellets and have about 10% moisture or less. The wood source is primarily aspen from UPM's forests, but the bark has been left on to simulate forest residue and mill wastes.

During the first test, the front-end equipment responsible for producing the clean syngas operated very well and was on stand-by several days in readiness to provide syngas for the downstream processes, according to Knight of GTI. "The carbon conversion exceeded targets, gas cleanup was within limits, and the acid gas removal process was also within limits. The TIGAS unit produced 96 octane gasoline, and the trace methanol in the wastewater was much lower than expected. After some initial mechanical issues, the TIGAS synthesis operated very well at steady reactor temperature profiles."

▲ Richard Knight, GTI Project Manager, shown with a portion of the TIGAS equipment at the Flex Fuel facility.

"The results of the initial testing were significant," Patel says. "We were able to establish stable operating conditions for steam-oxygen gasification and achieve high carbon conversion rates. Heavy tars were reduced in the reformer by up to 100%. The things we had to work on for the second test were to improve the reliability of the hot gas filter, to reduce the amount of nitrogen in the syngas, to integrate more tail gases to the gasifier, and to increase the yield," explains Patel.

The second campaign was recently completed with excellent results. The integrated plant operated for over 10 days and produced about 4,000 gallons (15,100 l) of good quality gasoline. The gasoline will be used to perform engine tests.

The third campaign, to be completed by mid-2014, will apply the lessons learned to run steady-state for up to one month and produce sufficient gasoline for fleet testing. Based on success with this testing, a plant design capable of running steady-state at commercially attractive volumes and costs will be finalized.

"By the end of the third test, we should have arrived at a commercial plant design that solves the current challenges, with all of the processes integrated and tested thoroughly," Udengaard says. "Our project goals are energy efficiency above 45% and carbon efficiency above 32% (meaning the percentage of input energy and carbon content of the biomass converted into usable gasoline and LPG).

"Using these integrated processes, conversion of wood biomass to gasoline is energy efficient and one of the more attractive methods of producing renewable biofuels," says Patel. "The use of renewable gasoline would represent about a 92% reduction in life cycle greenhouse gas emissions when compared to conventional gasoline."

◀ Partial view of the gasification system at GTI where testing is underway.

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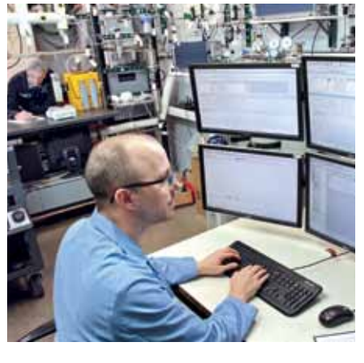
Analytical lab at GTI where test data is analyzed. ▶



Main partners in the Wood-to-Green-Gasoline project:

Carbona is an ANDRITZ subsidiary dedicated to gasification technology. It is supplying gasifier and gas cleanup technologies, including tar reforming.

Phillips 66 is an energy manufacturing and logistics company with midstream, chemicals, refining, marketing, and specialties businesses. The company has 13,500 employees and about US 51 billion in assets. It is providing the liquid fuel handling, transportation, single-engine emissions testing, and moderate fleet testing in preparation for registration with the US Environmental Protection Agency (EPA).

The Gas Technology Institute (GTI) is a leading research, development, and training institute that has been addressing energy and environmental challenges for more than 70 years. It has extensive experience with all types of gasification systems. It is providing the design, construction, and operation of the pilot plant as well as data analysis and data modeling.

Haldor Topsøe is a family-owned business founded in Denmark with about 2,200 employees worldwide. Its main activities are the manufacturing and sale of state-of-the-art catalyst and the licensing/engineering of catalytic processes. It is providing the TIGAS process, the technology for ultra-cleanup and conversion of the syngas, and overall project management.

UPM has 24,000 employees and is known as the Biofore Company. Its activities involve energy and pulp, papermaking, and the production of engineered materials. Its subsidiary in the USA is providing the biomass raw material (wood pellets).

A bright new **Star** in **kraft** paper production

ANDRITZ and Zellstoff Pöls recently commissioned Europe's newest and largest specialty paper machine (PM2). The work was completed one month ahead of schedule. The new machine produces high quality kraft paper (the Starkraft brand). It also features the largest Steel Yankee in the world – along with some other technical highlights. This major investment opens up new possibilities for Pöls and is an excellent reference for ANDRITZ.

It is not often that a supplier gets the opportunity to offer a complete line – from stock preparation to machine to automation, and even the pumps. A request for such a line from a specialty paper producer is even more rare. So, you can imagine the intense competition from suppliers when the request for bid from Zellstoff Pöls of Austria for a complete line to produce machine-glazed kraft paper was received.

For ANDRITZ, this was an extremely important order to win, according to Michael Pichler, head of ANDRITZ's Pulp Drying and Paper Division. "We knew that we would have to deliver the best package, technically and commercially, in order to win the competition," Pichler says. "Even though we are located in Austria, which gives us some logistical advantages, Zellstoff Pöls is a global producer and a very sophisticated customer."

A good starting point

The starting point for the new machine was that Zellstoff Pöls, part of the Heinzel Group, needed to make a strategic decision about how to further develop the Pöls mill location. "The big question for us was what, in addition to pulp, could we produce that would create or add value?" says Dr. Kurt Maier, CEO of Zellstoff Pöls.

Pulp has been manufactured in Pöls for over 300 years. The company has made investments consistently over the years to stay current with technology and maximize efficiencies. For example, in recent years, the company invested EUR 150 million in capacity expansion and power generation projects.

Today, the Pöls pulp mill produces 410,000 t/a. It is the largest manufacturer of elemental chlorine free (ECF) bleached softwood pulp in Central and Southeast Europe. The pulp

◀ In the long-fiber line, a gravity table is used for pulp thickening, in order to reduce the volume of the subsequent storage tower. This is a new application of the ANDRITZ gravity table which is typically used for sludge dewatering.

mill processes two million cubic meters of wood each year, basically with CO_2-neutral production. So, one important capability, according to Maier, was that the employees in Pöls had an extremely good understanding of pulp production and wood fiber processing.

Another factor was that a small amount (15,000 t/a) of specialty paper production was already occurring at the mill. PM1 was shut down after the start-up of the new PM2, but as Maier points out, operating PM1 gave his employees good familiarity with speciality paper production and the specific requirements of that market.

This provided the basis for the new PM2 to take flight. Now, the question was, who should be the co-pilot for this new and major investment?

▲ The *Prime*Line MG paper machine has a working width of 5.4 m and features a number of technical highlights.

▲ The gigantic heart of the machine – the *Prime*Dry Steel Yankee – is the largest in the world.

▲ TwinFlo refiners for optimum fiber development in the stock preparation process.

▲ The *Prime*Form HB hybrid former provides excellent formation.

▲ View of the pre-dryer section with vacuum rolls and web stabilizers.

A trusted partner

"The timing of this project was perfect for us," says Pichler. "We were looking to supply a state-of-the-art paper production line in Europe, with a customer who would be willing to incorporate some of our newer, more innovative design ideas into a proven machine platform. Most of our new machine references are in Asia, so it was strategically important to have a showcase machine in Europe again."

The good cooperation between Zellstoff Pöls and ANDRITZ over the years, through a series of modernizations in the pulp mill, was an important consideration. Also, according to Stefan Wilms, ANDRITZ Project Manager, the proximity of the ANDRITZ workshop in Graz was a big advantage. "We were able to propose a workflow where many of the components for PM2 could be pre-assembled and tested in Graz," Wilms says. "This speeded up the erection on-site and minimized the disruption inside an operating mill."

All of these advantages aligned at the right time and formed the basis for the new ANDRITZ-designed machine to take flight.

"Holding paper in my hands was physical proof that our hard work and excellent cooperation over many months paid off."

Siegfried Gruber
Head of Project Engineering
Zellstoff Pöls

Key design consideration: grade variety

Initial discussions about the new machine began nearly three years ago, according to Tomas Nölle, ANDRITZ Vice President of Paper and Board Systems. "Pöls wanted to produce a variety of grades on the same machine," he says. "Their wish was for a machine similar to PM1, but with a capacity over five times higher and with the ability to produce grades for a broader customer base. The number and type of grades was one of the biggest design challenges from the very start."

During an early meeting, Nölle began sketching out concepts for what he calls a "jack-of-all-trades" machine. After discussion and the creative input of ANDRITZ's engineers, a design was finalized that would produce machine-glazed (MG) white kraft paper for food packaging, carrier bags, gift wrapping paper, as well as industrial, medical, and clinical applications.

"Our grammage range is extremely broad (28 to 120 g/m²)," says Werner Hartmann, Managing Director of Zellstoff Pöls' Starkraft brand. "We are producing paper for basically six product categories, with between two and four sub-categories each. That means about 180 different specifications."

"Zellstoff Pöls also required an extremely agile machine," Nölle says. "It had to be able to switch grades in an instant to minimize waste and keep machine efficiency high. Keep in mind, this customer has a very precise knowledge of its markets and customers. A great value is placed on being able to meet customer demand without building excess inventory."

And, of course, energy consumption was another important design consideration. This is especially challenging for a speciality paper machine with multiple grade changes.

Ready, set, go

With the design and details in hand, Zellstoff Pöls signed the contract with ANDRITZ in May 2012. This set in motion an ambitious plan on the part of ANDRITZ and the mill to deliver, install, and start-up a complete paper production line by December 2013.

When the contract was announced, Hartmann was a bit surprised by the skepticism he encountered from outsiders who he met at industry events. "I suppose if you just look at top-line data about the European paper industry," he says, "the investment in a new specialty machine might seem difficult to justify. But, we looked at the kraft paper segment for food packaging and special purposes and arrived at a different conclusion. The growth in these segments is estimated to be 2-4% a year. And, unlike publication grades, this segment is not susceptible to competition from the internet, iPad, etc."

Zellstoff Pöls intended to fully capitalize on this and their other key advantages: an extremely modern pulp mill, high-quality fiber, an excellent and sustainable eco-balance, the availability of energy at a good price thanks to investments in power generation, a very flexible machine design, and the infrastructure to provide short-turn, flexible deliveries with fast grade changes.

Now that they have done so, the initial skepticism from the industry observers has turned to pure respect.

Full speed ahead

"From starting the civil works, it took just 13 months and 10 days until we had paper on the pope reel," says Siegfried Gruber, Zellstoff Pöls' head of Project Engineering, who was Project Manager for PM2.

"It should be pointed out that this was not only a Graz project," says Wilms. "While it was nice that our main workshop was only 100 km away, we involved several locations and divisions, as well as a diverse group of specialist sub-contractors, in this project."

For example, the stock preparation equipment and automation systems came from other ANDRITZ divisions. There are actually two stock prep lines for PM2 – one for the long-fiber pulp produced at the Pöls mill,

and one for the purchased bales of short-fiber pulp.

In the long-fiber line, ANDRITZ installed a gravity table for pulp thickening. The gravity table increases consistency from four to eight percent, allowing Pöls to save money by building a smaller storage tower. Separate refining lines for the long and short fibers are employed, though both use ANDRITZ TwinFlo double-disc refiners. Stock blending is performed in the ANDRITZ paper machine approach system, just prior to the high-efficiency 92% ANDRITZ headbox pump. ANDRITZ also delivered the paper machine approach and reject systems.

ANDRITZ supplied all centrifugal pumps of the PM2. The new series of MC pump feature patented SMARTSEP technology. With SMARTSEP, air is separated, fibers are fed back to the pump, and no vacuum pump is needed. The efficiency of these pumps at their duty point is well above average (70%+).

The heart of the machine

The *Prime*Line MG paper machine has a working width of 5.4 m and features a number of technical highlights. The *Prime*Flow headbox has a lamella design and dilution water control to ensure uniform fiber distribution on the wire. The hybrid former, a *Prime*Form HB, provides excellent formation for the kraft paper sheet. The press section utilizes a compact two-nip *Prime*Press with a shoe press module for very gentle dewatering. Moisture is reduced further in the *Prime*Dry pre-dryer section, which includes vacuum rollers and web stabilizers.

▲ The ANDRITZ headbox pump for PM2 operates at an impressive 92% efficiency.

The gigantic heart of the machine – the *Prime*Dry Steel Yankee – follows the pre-dryers. The Steel Yankee at Pöls is the largest in the world. The Steel Yankee and the steam-heated hood (160° C) utilize heat from the mill's biomass boiler, improving the cost-efficiency of the drying process.

One of the more interesting aspects of the erection work was the assembly and installation of the Yankee. "The assembly and erection work for the Yankee was masterfully executed," says Gruber. "It has a 6.7 m diameter and is 6.25 m long, and was delivered to our site in two halves due to truck transport limitations. It was assembled at the site and was lifted by a massive crane (it weighs 150 tons), then lowered through the roof of the hall and into the right position on the machine. It was really very interesting to watch, as everything was coordinated perfectly."

Wilms recalls the crane lift well. "When the scheduled day arrived, there was too much wind to do the lift," he says. "The clearances were so tight, literally centimeters to spare. However, after a few hours, the wind died down and we could complete the lift and placement."

▲ The jumbo reel is rewound and converted to rolls on a two-drum *Prime*Winder Arcus Evo.

▲ The symbol created for the Starkraft paper brand coming from PM2 is the "Flying Rhino." It symbolizes both strength and agility. Here an operator is shown in the new control room for PM2, equipped with automation systems from ANDRITZ.

▲ (Left to right): Siegfried Gruber, Head of Project Engineering, Zellstoff Pöls; Dr. Kurt Maier, CEO, Zellstoff Pöls; Werner Hartmann, Managing Director of Zellstoff Pöls Starkraft brand; Stefan Wilms, ANDRITZ Project Manager; Tomas Nölle, ANDRITZ Vice President of Paper & Board; and Michael Pichler, ANDRITZ Head of the Pulp Drying and Paper Division.

After the paper sheet is dried to final moisture in the after-dryer section, it passes through a *Prime*Cal Soft calendering system. The compression zone in the calender consists of an oil-heated thermo-roll and soft-covered Multi HV backing roll. This ensures excellent sheet smoothness and density with an even cross-direction profile. In the *Prime*Reel section the paper is then wound onto reels.

Jumbo rolls are moved to a two-drum *Prime*Winder Arcus Evo. This equipment rewinds the paper and converts it into roll sizes required by Zellstoff Pöls' customers – with diameters from 450 to 1,500 mm. Jürgen Rieger, Zellstoff Pöls' Chief Operating Manager for PM2, praises the winding results that they have been able to achieve due to the winder's ability to suppress vibration.

An early Christmas present

All of these complex high-tech components, including a complete automation system from ANDRITZ, were installed by the end of September 2013. After commissioning, all involved remember the night of November 10, 2013 when fiber was put to the headbox. Early the next morning – and one month early in the schedule – the first paper was wound on the reel.

> *"At Pöls, we have a long tradition in papermaking, dating back to 1900. With the PM2 we have the latest available technology installed - a real start in a new dimension."*
>
> Jürgen Rieger
> Chief Operating Manager Pöls PM2
> Zellstoff Pöls

"Holding that paper in my hands at last brought out an emotion difficult to express," says Gruber. "It was physical proof that our hard work and excellent cooperation over many months paid off."

From the ANDRITZ side, Wilms and his team were sharing the emotion. "It was, of course, wonderful to see high-quality paper coming off the machine so early in the start-up. This was a cause for celebration. By this time, we had all become friends, and sharing this success with friends was a great feeling."

Hartmann adds: "We achieved the greatest production so far on the 23rd and 24th of December, which was a great Christmas present for us. Production has steadily continued into the New Year." In view of the fact that the PM2 has so far exceeded all targets, Hartmann is convinced that the production budget of 55,000 tons will be achieved this year.

CEO Maier emphasizes that not only the machine and his staff have fully met his high expectations, but also the team from ANDRITZ. "It was an advantage to us that they kept the same team in place for negotiations, engineering, and project direction," Maier says. "Key project team members were with us right from the start. That was very important to us."

Flying into the future

With a great start-up behind them, the team at Zellstoff Pöls has great expectations. "First, we need to earn this investment," Maier says, "and then we will continue to grow. This project definitely gives us wings for the future."

It is fitting that the symbol created for the new paper coming from PM2 is the "Flying Rhino." The Rhino symbolizes strength (company and product strength) and the ability to fly shows an agility to respond to the grade, delivery, and quality requirements of its customers. "Our message to customers is that we are a strong partner, ready to add value whenever white kraft paper can provide a good solution," Hartmann says.

Strong, adaptable, and agile: characteristics that can also be applied to the technology partner for PM2 – ANDRITZ.

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DIP plant provides much-needed **fiber** and **flexibility**

With a new printing/writing machine on the way, Tamil Nadu Newsprint & Papers Ltd. better known as TNPL, predicted a shortfall of pulp. This led to the decision to purchase a deinked pulp processing line. With the new plant from ANDRITZ, the mill now has ample high-quality pulp to feed its paper machines, and will soon be sending part of the DIP plant's output to a new cartonboard machine being erected 90 km away.

"The investment in a new DIP plant removes a major bottleneck in production, and gives us fiber flexibility that we never had before," says S. Udayasankar, Chief General Manager, Projects Department. With a post-graduate degree in chemical engineering, Udayasankar heads the in-house projects department of TNPL, which is responsible for implementing major capital projects including capacity expansions, environmental improvements, projects etc.

TNPL is a government-owned enterprise established in the 1980's to produce newsprint, printing, and writing papers. The mill uses bagasse (a sugarcane residue) as the primary raw material. Paper production started at 90,000 t/a and, over the years, increased to 245,000 t/a. A mill expansion plan which TNPL undertook raised capacity to 400,000 t/a. TNPL is now the largest bagasse-based paper mill in the world.

TNPL caters to the requirements of multi-functional printing processes like sheetfed, web offset, and digital printers. Printing and writing paper grades are manufactured with a grammage range from 50-110 g/m^2 on three machines. The newest, PM3, was installed in 2011. It was, in fact, the installation of PM3 (wire width 6.1 m and a design speed of 1,200 m/min) which was the primary driver for the addition of a deinked pulp (DIP) plant.

"With the new machine, we expected there would be a shortfall of about 250 t/d of pulp," Udayasankar explains. "This is on top of our bagasse pulping line (500 t/d) and our hardwood line (300 t/d). To give us more flexibility in handling our raw material mix at the lowest investment cost, we elected to add deinked recycled fiber to our furnish."

More than enough

In discussions with various suppliers, a DIP capacity of 300 t/d was arrived at. This should be more than enough to meet the mill's pulp requirements.

In the early discussions, ANDRITZ was one of the potential suppliers for Udayasankar and his deputy, S.J. Varadarajan, who became Project Manager for the DIP plant. "Of course, we knew of the company and had installed some ANDRITZ equipment in our pulp mill," Varadarajan explains, "but other suppliers have strong references in

"The new DIP plant removes a major bottleneck in production and gives us fiber flexibility that we never had before."

S. Udayasankar
Chief General Manager of Projects
TNPL

(Left to right): Michael Rošker, ANDRITZ VP of Recycled Fiber Systems; S. Udayasankar, TNPL's Chief General Manager of Projects; Chen Zuqing, ANDRITZ Project Manager; and TNPL's S.J. Varadarajan, Deputy General Manager of Projects and Project Manager for the DIP installation. ▶

India. We have had a long association with Vikas Kothari (ANDRITZ's Country Manager in India) and he encouraged us to inspect their workshop in China and visit some references before making up our minds."

As Udayasankar explains, "We visited the ANDRITZ workshop in Foshan to see the quality of engineering and manufacturing. We were really impressed with the ANDRITZ installation at Yueyang Paper in Hunan Province. They have a three-loop DIP plant with 550 t/d capacity, including a FibreFlow drum pulper, producing pulp for a new LWC machine. One of the key factors for us was the performance of the drum pulper and the SelectaFlot flotation, as we were not that familiar with ANDRITZ's technology." *(See story about this mill in Spectrum No. 21)*

"Based on our analysis, we knew the drum pulper would be a good fit here," Varadarajan says. "It is a continuous process with very low fiber losses and less disintegration of impurities. We knew that it would be key to our success here and is a core technology for DIP processing."

The contract with ANDRITZ was signed in July 2010. Key to the final decision, according to Varadarajan, was ANDRITZ's willingness to guarantee performance. "Of all the pulp characteristics, the two that were most important to us were brightness gain and fiber yield. ANDRITZ was willing to guarantee these."

"We started up the line in the morning and were making quality pulp by evening. It was a very smooth start-up, a remarkable thing."

R. Venkateswaran
Pulp Production Manager
TNPL

No DIP experience

With no DIP operating experience in the mill, TNPL brought in R. Venkateswaran, a man with 20+ years' experience in recycled fiber processing, to be the Pulp Production Manager. Venkateswaran had previous experience with ANDRITZ equipment and worked side-by-side with Chen Zuqing, ANDRITZ Project Manager, during the build-up, commissioning, and start-up of the plant.

"ANDRITZ was very responsive to any questions or concerns that we had during the project," Venkateswaran says. "The relationship was very good. We are, of course, buying much more than just equipment with an investment like this. We are interested in the process knowledge and technical support as well, since we did not have experienced deinking operators at this mill."

"Our equipment began arriving on-site as planned," Zuqing says, "and TNPL, through its engineering company out of Chennai, began the civil and structural work. Then there was a delay in getting all the environmental permits from the authorities, so we were not able to keep to the original schedule."

The line started up in July 2013. "You can really tell the quality of the project work during start-up," Venkateswaran says. "We started up the line in the morning and were making quality high-bright and clean pulp by evening. Pulp that was used on the machine without problems. It was a very smooth start-up, which is remarkable."

First of its kind

The ANDRITZ DIP system with three loops – including drum pulping, three flotation stages, two dispersing stages, and a sludge dewatering system – is state-of-the-art and the first of its kind in India.

According to M. Subramanian, Chief General Manager of Production, "We are producing very high quality pulp. This deinking technology produces a furnish that is excellent for the production of high-quality printing and writing grades."

The raw material – 80% sorted office papers and 20% old magazines – enters the line with an initial brightness of 60-65% ISO. The deinking and bleaching processes increase the final brightness up to 87% ISO. The Effective Residual Ink Concentration (ERIC) of the final pulp is as low as 50 ppm. In addition to the high final brightness and cleanliness of the pulp, another highlight is the 75%+ yield, which is outstanding for a three-loop system.

"ANDRITZ deinking technology produces a furnish that is excellent for the production of high-quality printing and writing grades."

M. Subramanian
Chief General Manager of Production
TNPL

▲ The FibreFlow drum pulper is considered a core technology in the DIP line by TNPL management. It disintegrates the secondary fibers without harming them, while large contaminants are removed intact.

▲ After pulping, the next task is the removal of heavy particles in a two-stage cleaning system, preserving the life of downstream equipment.

"A critical parameter for us in the system design is the type of ink and the printing process used in the raw material mix," says Michael Rošker, Vice President of Recycled Fiber Systems for ANDRITZ. "Office papers have what we call a 'hard' ink, with the laser print virtually fused onto the paper surface. Magazine papers have a 'soft' ink that is smoothly printed onto the coated surface via an offset or gravure press. The right balance of equipment and process knowledge is required to remove both of these ink types."

Three-loop system design

Due to impurities coming with the secondary fiber furnish, deinked pulp systems require a series of process stages in order to remove and/or reduce the impurities without harming the fiber material. Disintegration without affecting of the secondary fibers is the main task of the FibreFlow drum pulper, according to Erwin Hertl, ANDRITZ's Chief Technology Manager for fiber preparation systems. After pulping, the next concern is the removal of heavy particles in a two-stage cleaning system to reduce the wear on downstream equipment.

The first loop in the TNPL system is focused on screening and cleaning technology. Although ink detachment is not fully completed at this point, flotation equipment to remove the "soft" inks and dirt particles is also included in the first loop. "With the exception of ink and small dirt particles, the removal of contaminants is completed in the first loop and clean pulp

Bagasse fiber

Bagasse is the residue that remains after sugar is removed from sugarcane. Manufacturing paper from a sugar cane waste product is another example of the paper industry producing quality products from what used to be considered "waste" material. Bagasse has its limitations, but also its useful characteristics: it is plantation-raised with a short growth cycle, is easily harvested, and requires less bleaching chemicals. As the largest bagasse-based paper mill in the world, TNPL has the experience to extract the most value from this renewable, sustainable fiber source.

It also now has the flexibility to blend the bagasse furnish with deinked pulp and hardwood sources.

◀ The high-bright and clean DIP is utilized for TNPL's high-quality printing and writing grades which are preferred for sheetfed, web offset, and digital printing. Here, a machine operator at PM3 takes a sample that will be fed into the automated paper lab for analysis.

is sent forward in the system," Hertl says. A heated and pressurized disperser at the end of the first loop detaches ink particles and reduces the size of other impurities to achieve a homogeneous particle size distribution.

The second flotation stage is used mainly for removing detached "hard" inks. "Office waste also contains fragments of varnished and special coated papers which can be eliminated at least partially by cleaners which provide high centrifugal separation forces," Hertl says. A second disperser handles the most resistant ink particles as well as some very small stickies and dirt particles. Oxidative bleaching chemicals are also mixed into the pulp at this dispersing stage to enable high-consistency bleaching.

The final flotation stage removes the remaining dirt and ink particles. The third thickening is followed by a reductive bleaching stage, important not only for bleaching colored fibers, but also for achieving high final brightness.

"An effective water management system reduces overall fresh water consumption at this mill," Rošker says. "Filtrate from sludge dewatering is clarified partly reused as dilution water for the drum pulper. This reduces the effluent volume and make-up fresh water required."

According to Udayasankar, fresh water consumption is a critical factor at the Kagithapuram mill. "We draw water from the nearby river, but do not return our treated effluent there. Processing recycled fiber can be done basically effluent-free, so this is a big plus for us."

Shortfall becomes a surplus

When PM3 started up, the ash content of the sheet was about 8-9%. "We changed our chemistry to alkaline sizing, which allowed us to increase the ash content by another 7-8%," says Subramanian. "With the ash content going up, our pulp requirement is reduced accordingly."

"We operate the DIP plant at a steady rate, though not at full capacity," Venkateswaran says. "It will be utilized to the maximum when we complete the installation of a double-coated multi-layer cartonboard machine in a greenfield location just 90 km away. The new machine is designed to produce 200,000 t/a. The target for commissioning the new machine is 2015."

The DIP plant gives TNPL a lot of flexibility. "We handle one million tonnes of bagasse each year – which is a huge quantity," Udayasankar says. "But if the monsoons are particularly bad, which occurs some years, the sugarcane crop is impacted and we have a shortage of bagasse. Similarly, we sometimes face a shortage of chips for our hardwood line. In these cases, DIP gives us enormous flexibility in shifting our raw materials. It is very important to our mill."

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▲ The raw material mix consists of 80% sorted office paper and 20% old magazines. The ANDRITZ deinking and bleaching technology achieves a final brightness up to 87% ISO.

Growth in India

Anyone who visits India is impressed by the size of the country and the population density – 1.24 billion people, with 20 million being added each year. This population growth is the equivalent of two and one-half times the total population of Austria being added every year.

As a growing nation, India is experiencing a dramatic increase in paper consumption. Yet, the quantity of domestically produced quality virgin fiber for the manufacture of high-quality paper grades remains scarce, so there is an intense focus on recycled fibers.

In the south of India, the state of Tamil Nadu (where TNPL is located) has over 65 million residents (equivalent to the population of the United Kingdom or France). Where there are people, paper is needed. Tamil Nadu is a good location for a mill the size of TNPL. With an ample supply of fiber, and easy access to domestic and export markets, TNPL is well positioned for growth.

The W-O-W factor

The success of its recycling initiative in India, known as the WOW program, was the driving force for ITC to install a FibreFlow drum pulper from ANDRITZ. The drum, which processes a wide variety of waste paper types, has been called “a game changer” by mill management.

This is a story of how success breeds success.

The first success is a program called Wealth Out of Waste (WOW). ITC’s Paperboards and Specialty Papers Division created WOW to improve the collection and recycling of post-consumer waste.

The success of WOW was the foundation for ITC’s next success – an efficient waste paper processing system with the flexibility to handle the volume and diversity of the waste paper collected from the local communities.

ITC is one of India’s foremost private companies (USD 7 billion turnover). It has a multi-business portfolio, and is the market leader in the Indian paperboard and packaging sector. ITC is the only enterprise in the world of similar size that is carbon-positive, water-positive, and solid waste recycling positive.

This focus on sustainability brought the WOW factor into existence.

WOW – cash from trash!

India in general has a rather low recycling rate, estimated to be 12-15% of total paper consumed. “On average, an Indian city generates around 2,500 tonnes of waste every day,” says Makarand Barhanpurkar, Head of ITC’s Kovai Unit. “We decided to take the issues of waste management, source segregation of waste, and recycling directly to the people to see if we could have a positive influence.”

In the cities where it has been rolled out, WOW has resulted in a 30% reduction in solid waste going to landfills. Says Barhanpurkar, “Our monthly collection of waste paper at this mill is now about 3,500 tonnes. We have the potential to expand this to 5,000 tonnes within a year.”

The success of WOW was a good thing for the Kovai mill, which uses virtually 100% recycled fiber in the production of duplex board. “We have reached a point where 100% of the furnish for the filler layer in our board is produced from domestic waste paper,” remarks S. Masilamani, Production Manager at Kovai.

However, WOW also created a problem. The incoming waste stream includes plastic laminated papers, foiled and colored papers, and some other very hard-to-process post-consumer products. “Our old batch pulpers could not handle the volume and the quality of the waste paper coming into our mill,” says P. Ravindran, Manager of the Stock Preparation department. “They were constantly plugging, which impacted our downstream equipment as well.”

> *“Since we installed the drum, we have been able to process highly contaminated waste, something that we could not do before.”*
>
> S. Masilamani
> Production Manager
> ITC Kovai

◀ P. Ravindran, Manager of Stock Preparation Operations with some of the difficult-to-process waste paper.

(Left to right in front of the FibreFlow drum): Wu Xiaoyan of ANDRITZ China with ITC Kovai’s P. Ravindran, Stock Preparation Manager; R. Nandha Kumar, Engineering Manager; G. Suvegan, Project Manager; S. Rajendran, Asst. Stock Preparation Manager; and R. Jose Pray Bell, Asst. Instrumentation Manager. ▶

Drumming up a solution

The mill produces 100,000 t/a of duplex board. About 80% of the machine’s production is Grey Back. White Back and other specialty grades, such as cup stock, make up the remainder. “The cup stock was not recyclable in our old batch pulpers,” Masilamani says. “We started to look into drum pulping solutions.”

ANDRITZ’s Gary Beckingham, Vice President for Pulping and Fiber Preparation Systems in Asia, visited ITC’s head office to discuss possible solutions.“ITC was very interested in our FibreFlow drum pulping technology,” Beckingham says. “They wanted to visit references to see how effective the drum pulper was in handling difficult waste paper materials.”

“When you look at our raw material, you see everything from high-quality pressroom cuttings to the most colored and laminated papers imaginable,” says R. Nandha Kumar, Manager of Engineering at Kovai. “We needed to be convinced that the FibreFlow drum could handle this range of furnish without plugging and without fiber losses.”

How it works ... and works

The FibreFlow drum pulper at the Kovai mill is rated for 300 t/d production. “Our batch pulpers cut plastics into very small bits that were difficult to remove downstream,” says G. Suvegan, Deputy Manager for the Mechanical Department and Project Manager for the FibreFlow drum installation. “With the drum, plastics and other contaminants come out whole. We get continuous production without much variability.”

“Since we installed the drum, we have been able to process highly contaminated waste, something that we could not do before,” Masilamani says. “We no longer have to deal with plugging and jamming of our downstream equipment. The fiber loss with this drum is extremely low. We can see only plastics coming out of the drum pulper.”

“Now that we have educated ourselves about the full capabilities of the drum, we are in the process of upgrading our downstream equipment to handle the rated capacity of the drum,” says Barhanpurkar.

Another tribute to the drum’s flexibility and efficiency is the fact that the waste paper pre-sorting operation is no longer needed. “We used to have about 50 people pre-sorting our imported waste paper, to remove things that our batch pulpers could not handle,” Masilamani says. “Today, there is no need to pre-sort as the drum pulper can handle just about everything.”

Kovai also added a hot dispersing system from ANDRITZ for the filler layer at the same time the drum pulper was installed. “This helps remove stickies and other contaminants from our filler layer,” says Ravindran. “The level of contaminants has gone down, even with the increased use of lower cost raw materials. The quality of the filler layer has improved.”

“The drum pulper can handle our steadily increasing volume, remove major contaminants intact, and process even the most difficult waste paper streams,” Barhanpurkar summarizes. “Combined with our WOW program, this is a story of success breeding success.”

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▲ The discharge end of the 300 t/d FibreFlow drum pulper from ANDRITZ.

▲ S. Masilamani, Production Manager (left), with Makarand Barhanpurkar, Head of ITC‘s Kovai unit.

▲ High-quality packaging made from Kovai’s duplex board.

New and renew

This mill in Austria recently revived its "green" status with a new ANDRITZ recovery boiler. In addition, ANDRITZ also helps renew the existing mill with small upgrades to improve efficiency.

◀ Frantschach's Recovery Boiler 4 (RB4) replaced two older units which were approaching end-of-life. The boiler allows the mill to produce steam and electricity that is carbon-neutral, increasing electricity production from the same amount of black liquor.

▲ (Left to right): Günter Leitner, Mondi's Technical Manager and Project Manager for RB4; Marja Heinola, Director of Recovery Boiler Sales for ANDRITZ; and Manfred Hacker, Pulp Mill Manager inside the new recovery boiler.

Mondi's Frantschach mill in the south of Austria is recognized as one of the leading manufacturers of sack kraft and specialty kraft papers, as well as specialty pulps. The location is home to a pulp mill and three paper machines (two for sack paper and one for machine-glazed kraft papers). "Continuous improvement and development is a hallmark of this location," says Managing Director Gottfried Joham. "This is the most modern sack kraft paper production facility in the world."

Keeping the mill modern is a step-by-step process. Some steps, like new recovery boilers, are large. Others, like upgrades to the fiberline, are smaller. But, all require a team effort. "As soon as we sign a contract, we are a team," Joham says. "We don't sit back. Our people are very experienced, and very involved."

New and green: RB4

The teamwork was evident with the new recovery boiler project (RB4). Mondi's needs were clearly defined from the start. Perhaps some of this is due to the background of Manfred Hacker, Pulp Mill Manager. Hacker has 20+ years' experience in the boiler business. "We wanted a highly efficient boiler that would fit within our capital budget and that would help us further close our chemical cycle without increasing emissions," he says. "We wanted it to burn all the gases from our pulp mill. And, it was important to conserve the sulfidity to improve our pulp quality."

RB4 was going to replace two older units (1958 and 1972). The pressure parts in the oldest unit were at end-of-life, and costly repairs were on the horizon for the other unit. Together, the boilers represented a bottleneck to production.

"We burn wood to generate power, but before we burn it, we convert it into fiber, then into pulp, and then into paper. Each step adds value."

Gottfried Joham
Managing Director
Mondi Frantschach

"We got the green light from management in February 2011 to prepare a detailed plan for a new boiler," Hacker says. "In parallel, we obtained all the approvals from the authorities. Within months, the investment was approved."

A Portuguese "twin"

Hacker's experience in the boiler business gave him insight how to proceed. "My vision was to build a copy of an existing boiler that was working quite well," he says. "This would allow us to see the boiler ahead of time, and to save money on engineering costs. So, we asked each supplier to show us a boiler similar to the one we were planning at Frantschach."

Marja Heinola, Director of Recovery Boiler Sales for ANDRITZ, showed the data for an ANDRITZ recovery boiler installed at Portucel Soporcel's Cacia mill in Portugal. Following the start-up of that boiler in 2006, Cacia's Mill Manager, José Manuel Nordeste, had this to say: "This recovery boiler works perfectly – like a Swiss watch!" *(See Spectrum No. 21 for related story about Portucel Soporcel)*

The team from Frantschach visited Cacia. "The information shared by Portucel Soporcel was very helpful," says Günter Leitner, Mondi Frantschach's Technical Manager and the Project Manager for RB4.

"RB4 is about a 90% copy of Cacia," Heinola says. "The basic geometry was an excellent starting point. The black liquor at Frantschach is different, so we optimized the design within that geometry. There is more heat transfer surface in the Frantschach boiler, particularly in the superheaters. The material selection and other design features inside RB4 were tailor-made."

The contract with ANDRITZ was signed early 2012 for EPC delivery of the recovery boiler (excluding foundation work). Antti Räisänen was the ANDRITZ Project Manager. "We had detailed discussions during the sales phase, which helped us streamline project execution," Räisänen says. "Mondi has very high quality standards, which set everyone's expectations, and we focused on the critical issues."

"We had everything clarified and planned ahead of time," Leitner says. "That way, there were no contract surprises once the work began. There are enough challenges building a boiler inside an existing mill, without worrying about contract issues."

"Erection was challenging because of the limited storage area near the boiler," Räisänen recalls. "We created an area outside the mill gates and transported the large parts by truck."

"This could have been a problem, but the logistics were well-managed and done in a very professional way," Leitner says.

The first liquor firing of RB4 occurred in July 2013, and operational tests were completed by the end of August. "We took over the boiler in September 2013," Leitner says. "All this was according to our plan; we were right on time."

"Collaboration and cooperation were excellent," Hacker says. "We got a well-designed boiler, meeting our requirements, and fitting exactly into our environment here in Frantschach."

Key to success was that Mondi and ANDRITZ worked together on the commissioning of the boiler. "Our people operated the boiler under the direction of ANDRITZ."

◀ Manfred Hacker, Pulp Mill Manager (left), with Günter Leitner, Mondi's Technical Manager and the Project Manager for RB4.

Hacker says. "They got hands-on experience learning how the boiler behaved. So, the actual start-up and handover were very smooth."

Another key point was that operators and maintenance people spent one week "training" with the mill people in Cacia. "They could observe and ask questions of the experienced operators at Cacia," Leitner says. "This was really well organized by ANDRITZ and very beneficial to us."

> *"To my knowledge, this is the first mill burning SOG and CNCG in one burner without a supporting flame."*
>
> Manfred Hacker
> Pulp Mill Manager
> Mondi Frantschach

Sustainable "liquid wood"

"This is a highly efficient boiler with steam parameters of 87 bar and 480° C to fit the existing turbines," says Hacker. "It improves the efficiency of our steam turbines to the point where we now produce sufficient energy to sell electricity to the grid. We have increased electricity production by 30%. By removing the bottleneck, we can increase pulp production by 15,000 t/a."

An additional benefit is that the output of the new RB4 also allows the mill to increase the amount of district heating steam for the nearby city of Wolfsberg.

Unlike other European nations where this "green energy" creates economic-incentives by the state, Austria does not grant subsidies for burning black liquor, even though it is a renewable, sustainable fuel source. "If you burn solid wood, you get a subsidy," Joham explains. "If you burn liquid wood, which is what black liquor is, you don't get the subsidy here in Austria. You can imagine what this has done to the wood price in our country."

The Frantschach mill produces steam and electricity that is carbon-neutral. "We burn wood to generate power," Joham says. "But, before we burn it, we convert over one million solid cubic meters of wood each year into fiber, then into pulp, and then into paper. Each step adds value. And, each step requires significant investments in technology and people."

A new approach to gas handling

According to Hacker, Frantschach is the first mill to regularly burn stripper off gases (SOG) and concentrated non-condensable gases (CNCG) in one burner without a supporting flame. "We have discussed this with recovery boiler authorities and have submitted a revision to the best practices guidelines within Mondi," he says. "This is proven safe and will reduce our fossil fuel usage to save us money."

Renew: fiberline

Digester Double-Wash upgrade. The continuous digester at Frantschach produces well above the original design of 450 t/d. This degree of loading limited the effectiveness of the in-digester washing. In 2008, Frantschach's digester was the first to receive a Double-Wash modification from ANDRITZ.

"This upgrade is ideal for overloaded, Hi-Heat digesters," says Paavo Tolonen, ANDRITZ Service Product Manager for Cooking. "We converted the digester to Double-Wash mode by modifying the center pipe and replacing the vertical screens in the extraction zone with SureFlow diagonal screens. This resulted in an improved cook and more efficient washing."

SureFlow screens have considerably more open area than vertical slotted or vertical bar screens, increasing throughput. The contour of the slots and the radius edges reduce plugging.

"The SureFlow screens are working very well," says Stefan Raffalt, Head of Woodyard and Fiberline. "They have much more capacity and the cleaning is much easier. The old screens plugged and we would have to cut out all 28, clean them, and weld them back in again during each shutdown. This consumed a lot of time and effort."

▲ Another interesting upgrade at the Mondi mill is the installation of an emergency drive unit for the lime kiln. This provides a low-cost additional drive to keep the kiln rotating, avoiding burnout of the refractory, if the main drive for the kiln is stopped suddenly. In the photograph above are Hannes Perchtold, Mondi's Mechanical Maintenance Manager (left) and Walter Scholz-Sommerbauer of ANDRITZ.

Top Separator rebuild. In 2009, ANDRITZ upgraded the top separator device by replacing the screen basket with a more rigid design and adding a bottom bearing with a labyrinth sealing system. This was the first digester in the world to utilize the new bottom bearing system.

"We used to have a problem with the wearing of the screen basket," says Hannes Perchtold, Mechanical Maintenance Manager. "The top separator had a long screw with a small diameter, suitable for the original capacity. But, as increased capacity, we essentially doubled the amount of chips pressing on the screw. This caused it to move off-center and score the screen basket. We could not run more than a year without replacing the basket."

"We developed a solution jointly with Frantschach," says Walter Scholz-Sommerbauer, ANDRITZ Customer Service Manager. "The bottom bearing with sealing system keeps the screw in place and avoids abnormal wear of the basket. It can easily run for the full 18 months between shutdowns, and longer."

Outlet Device for impregnation vessel. In 2013, ANDRITZ replaced the 37-year-old outlet device on the impregnation vessel. "The old device had two mechanical gearboxes driven by DC motors," says Stefan Sattler, Head of the Mechanical Engineering Project Department at Frantschach. "When a gearbox failed, it was impossible to move the scraper to evacuate the chips. You can imagine the time and effort required to empty a very large vessel in order to repair the device."

"The new Outlet Device is direct-hydraulic driven without gearboxes," explains Scholz-Sommerbauer of ANDRITZ. "The reliability is extremely high."

"Our challenge was that there were only four days allotted for dismantling the old device and installing the new one," says Sattler, who was Project Manager for the upgrade. "This included removing the concrete foundation for the old gearbox."

"The challenge for our engineers was to design all the flanges to fit without any piping or other modifications to the vessel," says Tolonen of ANDRITZ. "Since we had such a tight deadline and were working in a very confined space under the vessel, we prefabricated the drive system in our workshop."

"I have to say that I was very impressed with the execution," Sattler says. "The start-up went perfectly and it worked well from the very beginning. It has helped stabilize the levels in the digester."

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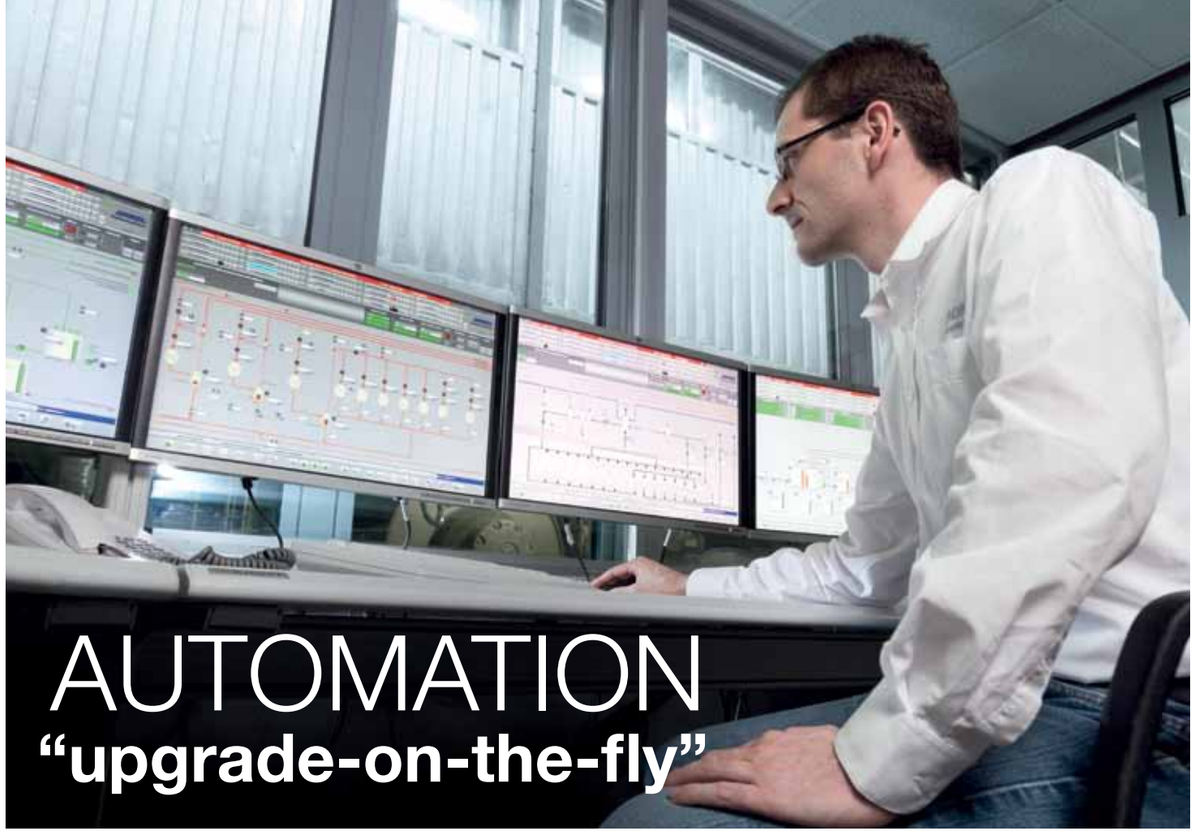
Walter Scholz-Sommerbauer, ANDRITZ Customer Service Manager; Hannes Perchtold, Mechanical Maintenance Manager; Paavo Tolonen, ANDRITZ Service Product Manager for Cooking; Stefan Raffalt, Head of Woodyard and Fiberline; and Stefan Sattler, Head of the Mechanical Engineering Project Department with the Outlet Device for the impregnation vessel. ▼



AUTOMATION “upgrade-on-the-fly”

ANDRITZ AUTOMATION helped Hamburger Containerboard in Austria move to a modern control network under tight time constraints – in a series of well-executed steps.

Hamburger Containerboard’s Pitten mill in Austria has the capacity to produce 445,000 t/a of packaging papers from 100% recovered paper. PM3, a 2.5 m width machine with a capacity of 130,000 t/a, is one of two machines at Pitten. It has been modernized over the years and is highly efficient.

Modernizing a paper machine usually involves rebuilding certain parts, and perhaps upgrading some other components to bring the machine closer to state-of-the-art. However, modernizing a process control system usually involves replacing the hardware and software – with a long learning curve as operators try to adjust to a totally new way of working.

That does not have to be the case, according to Jürgen Kern, Head of the Service Business for ANDRITZ AUTOMATION. “The traditional approach – ripping out the equipment, replacing it with modern control, testing the loops, testing the logic, training operators, and then starting up the machine again – might be okay when an extended shutdown is planned and the machine is out of production anyway.”

But what about a situation where only a short shutdown is planned and continued production is vital?

“That is when we recommend our ‘upgrade-on-the-fly’ approach to installing and commissioning the automation systems,” Kern says. “We work in carefully executed steps to dramatically shorten the shutdown time, and to keep production flowing.”

End-of-life

It was part of Hamburger Pitten’s longer term plan to upgrade its entire control system network, but certain areas needed attention first. The automation hardware for PM3 and three pulping lines at Hamburger Pitten was approaching end-of-life. The instruments, controllers, and software had been built up over years – creating an “interesting” mix of components. There were some Siemens S5 programmable logic controllers; some obsolete TELEPERM M systems, and some SIPART panel-based controllers in the mix.

As Franz Zodtl, Electrical Maintenance Manager at Pitten, explains it, “For all of these components, there was a high risk of production downtime and decreased performance due to failures. It was impossible to even find spare parts for certain systems. Because of the vintage of the equipment, finding people to work on it was costly. We had to rely on outside specialists, as most of our people who really knew the equipment have retired.”

From a production side, there were also concerns. According to Gerald Steiner, Production Manager for the Pitten mill, “The old system did not have the capability to give us insight into our processes, or to analyze complex trends and faults.”

Adds Alfred Quantschnigg, PM3 Production Manager, “It was difficult for operators, especially new ones. The displays did not give any visualization of the process or flowsheets. The information presented was very limited.”

It starts with a precise plan

Even though the project execution is called “upgrade-on-the-fly”, that does not mean that the planning is done quickly or by the seat-of-the-pants. “Exactly the opposite,” says Kern. “The fact that we can do it quickly is the result of a very thorough analysis of the process and the control strategy.”

Since this was the first of a series of potential projects for ANDRITZ AUTOMATION, it was important to work with the team at Hamburger Pitten to develop a plan of attack so that everything could be accomplished during a short annual shutdown.

“We were also counting on ANDRITZ AUTOMATION to help us create automation standards for our mill,” says Quantschnigg. “This has proven to be the case, as we are applying the standards in current projects.”

Stepwise to avoid long downtime

The Hamburger Pitten team set the requirements for the informational displays needed to operate the processes. ANDRITZ provided input on how the displays could be laid out and arranged for ease of use. The project team jointly defined how the programming levels would be set up.

Key to the success of the start-up, according to Steiner, was the thoroughness of the Factory Acceptance Testing (FAT) at ANDRITZ’s facility. During the FAT, all of the inputs-outputs were simulated so that different control scenarios could be tried out before the systems were installed in the mill. “This level of preparation is very important,” he says. “This is where everything was checked out, and problems corrected, so that start-up at the mill was easier.”

The on-site work (including dismantling the existing I-O cabinets and cabling and connecting these 4,500 I-O to the new hardware) was completed in 10 days.

The goals were simple enough. “The main target,” says Steiner, “was a one-to-one copy of the existing system, only with newer and more reliable hardware. We were also open to ANDRITZ’s suggestions for software optimization to improve our processes.”

As the new hardware was being programmed, it became obvious to the ANDRITZ programmers where certain control modules could be improved. “It was easy to discuss with the customer, and share our knowledge about certain modules such as refiner power control and sheet break analysis that we knew they could benefit from,” Kern says.

The old refiner control had many elements which were set manually by the operators. The new control, which combines refiner throughput and power control, is integrated directly into the distributed control system (DCS). The old sheet break logic was relay-based, outside the DCS. The new control logic is integrated into the DCS, with the ability to bypass a web break sensor in case it is not functioning, to avoid losing production.

The first step was to upgrade PM3’s control to Siemens PCS7 V8 hardware and software. The second step was to change the automation system for the three pulping lines.

According to Steiner, “This was something new and different for us. It was our first project with a complete hardware exchange like this. We were running in full automatic mode on the second day after start-up.”

Steiner appreciates ANDRITZ AUTOMATION’s way of operating. “It was a good partnership,” he says. “What I valued most is that we had a lot of wishes and ideas about how we wanted things. ANDRITZ responded well to this, without being defensive or explaining how what we wanted was not possible. They did a fine job helping us get what we wanted.”

It seems that “upgrade-on-the-fly” suits Hamburger Pitten’s way of operating. After completion of this project for PM3 and the pulping lines, ANDRITZ AUTOMATION received contracts for automation upgrades for the boiler and clarification plant.

◀ (Left to right): Gerald Steiner, Production Manager; Jürgen Kern, ANDRITZ AUTOMATION’s Head of Service; Alfred Quantschnigg, PM3 Production Manager; and Franz Zodtl, Electrical Maintenance Manager.

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▲ Greg Hallas, ANDRITZ Product Manager for Twin Roll Press Services (left), with Kelly Parfitt, Canfor Project Engineer, standing on post-oxygen press #1 that received the Mult-E-Nip upgrade.

A pressing problem … SOLVED.

The team at Canfor had a problem with a twin roll press. What do you do when there is no ready-made solution? You innovate. Or, better yet, find a technology and service supplier who has the skills to be your innovation partner.

When Greg Hallas walks into Kelly Parfitt's office, there is the usual friendly banter, inquiries about family, and the standard question, "How's POW #1 running?" You would think they have been long-time colleagues.

Colleagues they are, even though they are on different sides of the supplier-customer relationship. But, they have not known each other all that long – just the length of one upgrade project. Hallas is Product Manager for Twin Roll Press Services for ANDRITZ in North America. Parfitt is a Project Engineer for two adjacent Canfor mills in Prince George, British Columbia, Canada.

"Suppliers throw around the word 'partnership' all the time," Parfitt says. "For me, a true partnership requires both parties to have something at risk and something to gain. Both have to be committed to staying – even when things get tough. The upgrade of our post-oxygen wash press (POW #1) here was a true partnership."

The risk for Canfor was that the upgrade that Hallas recommended had never been tried before. The potential reward was greatly increased washing efficiency, reduced COD to the bleach plant, and a very stable operation. All at a fraction of the cost of a new press.

Loaded (with COD)

Canfor's digester is heavily loaded, running continuously at nearly twice its original 600 t/d rated capacity. Because of this, very little washing is done in the digester itself. That is why the fiberline includes a pressure diffuser, two brownstock washers, a pre-oxygen washer, and two wash presses. "Even with this, we run a high COD load into our bleach plant," Parfitt says.

High COD carryover requires significant chlorine dioxide just to neutralize it before the bleaching can take place. "We looked at different options across the fiberline to reduce bleaching costs," Parfitt explains. "We also knew we could reduce our effluent load. So, there are many benefits to running cleaner pulp into the bleach plant."

Investing in what we have

A company of Canfor's size certainly has the money to replace a press or two. "We don't just throw out equipment to buy something new," Parfitt says. "We push our equipment reasonably hard and we are always looking for ways to make our existing equipment operate better and at a lower cost. That is our job."

Canfor's focus honed in on the wash presses since they were the last stage before bleaching. "Improving the wash presses should also help our oxygen delignification process, since we have been holding back on caustic to reduce soda carryover to the bleach plant."

With the goal of improving the existing presses, Parfitt and a colleague started speaking to vendors. "Their options were limited," Parfitt says, "either in the benefit or very high in capital cost. For example, one option was to go to a medium-consistency screw feed with a medium-consistency downpipe and pump. That is a huge capital cost."

Faced with the currently available options – and not being happy with any of them – Canfor gave the challenge to ANDRITZ.

A new design

Greg Hallas has worked around wash presses for about 20 years. He knows the designs, the strengths, and the limitations well. "There are twin roll displacement press designs that can result in poor washing efficiency and limited throughput," he says.

▲ Canfor Pulp is the largest North American producer of market NBSK pulp and is the leading producer of bleached, high performance kraft paper. It owns and operates three mills in Prince George, British Columbia. The Intercontinental Mill shown here is the site of the first installation of the Mult-E-Nip press upgrade.

"Plugging in the tapered headboxes, plugging in the vat, low feed consistencies, poor wash distribution, and low discharge consistencies are all potential problems."

When he joined ANDRITZ, Hallas worked with an international team to design products which would improve the performance of existing presses. Following a months-long development program, including collaboration with ANDRITZ's Todd Grace (Vice President, Product Management) in the USA and Pekka Tervola (R&D Engineer) in Finland, they were ready to present their innovative upgrade solution to mills looking for better washing efficiency and/or capacity increases.

The timing was excellent because Canfor was ready. "ANDRITZ came to us with their idea – keeping the low consistency, but really make a big improvement," Parfitt says. "Every time we presented the concept internally, people got excited about it. They could see how it would fit our operation, giving us all the benefits for a reasonable cost."

In the case of Canfor, Hallas had an advantage. He was at the mill for the original start-up of the two Sunds DPA-1255 units. "Some of the people that I worked with then are still here," he says. "I have earned some credibility with them."

The Mult-E-Nip upgrade is born

When Hallas first presented his ideas, the upgrade product did not have a name. In fact, there were only conceptual sketches to explain the concept. "The actual design changed some since the original sketches," Hallas says, "improving during each discussion between customers and our global design team."

The original proposal called for a feed distribution screw. Concerns about adding more moving equipment to an existing press during the upgrade, which would also increase energy consumption and might cause plugging issues were raised by Canfor. "Listening to those concerns, we simplified the design so there was no moving equipment," Hallas says. "We would not have to

upgrade the auxiliaries and could bolt to the existing vat."

With the design solidified, the product was given a name: Mult-E-Nip upgrade. The "Mult-E" stands for multiple wash zones and multiple nips. The "E" also stands for E10 improvement and washing efficiency. It is a unique solution for low-consistency (2.5 to 6%) applications and the technology can be applied to medium-consistency (6-11%) as well.

The center feed design distributes the pulp more uniformly than the corner feed design of the original press. It also allows for higher feed consistencies. The pulp enters the press higher on the press roll, utilizing more of the screen area for dewatering. There are two locations for introducing wash water, and there are multiple nips. These features all contribute to higher washing efficiency.

How much higher? About 18-24% improvement. If additional capacity is needed, an improvement in the neighborhood of 28% is possible.

From sketch to reality in 18 months

Since this was the first ever Mult-E-Nip upgrade, and their first look at it was through Hallas' hand-drawn sketches, Canfor chose to upgrade the #1 press first so they could bypass it if there was a problem. The contract with ANDRITZ was signed in January 2013.

> *"We now run at higher feed consistencies and have no plugging. The press just runs and we don't have to babysit it."*
>
> Kelly Parfitt
> Project Engineer
> Canfor Corporation

With field measurements in hand, the team at the Delta Service Centre (see story on next page) began producing working drawings and fabricating the unit.

When the equipment arrived at the mill in July, the transformation of the wash press began. The feed system was converted from corner feed to center feed. The wash zones were added and the low consistency feed assembly was installed. The installation took six days. "Based on what we know now, and with our planned fabrication improvements, we think we can do the next one in four days," Hallas says.

Greg Hallas, ANDRITZ (left) with Kelly Parfitt, Canfor. ▶

"We explored an innovative new option with ANDRITZ and then watched it materialize into exactly what we needed," Parfitt says. "We were on the edge of our seats when it started up. It was exciting to be a part of it."

From ANDRITZ's side, the evolution of the product – from a conceptual sketch to actual installation to excellent results all within 18 months – was also exciting.

A partnership as promised

"We entered into this partnership with ANDRITZ cautiously based on our experiences with other suppliers," Parfitt says. "But coming out of it, I have to say I am very pleased. ANDRITZ stayed with us until the press ran beautifully."

The mill has evaluated the E10, displacement ratio, and all the criteria that are part of the performance guarantee. "We are seeing improved displacement ratio, improved E10, and improved operability of the press," Parfitt says. "Before the upgrade, we had trouble with plugging headboxes and things like that. We now run at higher feed consistencies and have no plugging. The press just runs. We don't have to babysit it."

A big part of optimization is sharing data with operators so they can know just how far to push the press. The upgrade offers considerable flexibility, so the mill is running bump tests to understand the impact of feed consistency, the split of wash water between the two zones, and torque settings to get good discharge consistency.

"This year, we have big projects in the green energy area that are consuming capital, but I'm very sure we will upgrade POW #2 next year," Parfitt says. "Our sister mill (Northwood) is also evaluating a Mult-E-Nip upgrade. Looks like we will see our friends from ANDRITZ around here for awhile."

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The Delta connection

ANDRITZ PULP & PAPER acquired the assets of Tristar Industries Ltd., and restarted the high-quality rebuild and manufacturing facility in Delta, BC (just outside Vancouver) in the fall of 2011. The facility is now known as the Delta Service Centre (DSC).

DSC manufactures and rebuilds equipment such as digester feedline equipment, vacuum washers, twin roll presses, thick stock pumps, and other equipment. The experienced employees, reputation, and location made it ideal to manufacture the first Mult-E-Nip – the upgrade destined for Canfor.

◀ Jacob Townsen (left) and Wayne Leary of Delta Service Centre.

Wayne Leary, Operations Manager, says that the first Mult-E-Nip project was an interesting challenge. "When Greg Hallas brought in his design concepts, the first thing we did was have him work with Zeljko Sirovljevic in Engineering, who turned the concepts into working drawings," Leary says. "Then we sat with our most experienced machinists, welders, and fabricators to arrive at a tactical plan for building the equipment."

The Mult-E-Nip unit, which is constructed of stainless steel, had long welding passes. "The welding process tends to distort the stainless, so we had to carefully plan the welds and the points for stress relief. The use of vibratory stress relief equipment made this easier. We were able to maintain the final tolerances, but it was demanding work."

▲ Rainer Kojo was project manager for the Mult-E-Nip work at DSC.

According to Rainer Kojo, Project Manager for the Mult-E-Nip work at DSC, there were some other important learnings. "For the next unit, we will use some formed pieces that will put the ridges in a different direction to reduce distortion," he says. "I'm sure the fabrication will be more efficient."

Leary, Kojo, and their team are anxious to build the next Mult-E-Nip. "Hearing that Canfor is pleased with our first one is the best news," Kojo says. "That is what it is all about."

Good chemistry … good service

ANDRITZ installed a new chemical recovery island as part of Zellstoff Rosenthal's major mill conversion back in 1999. Recent improvements made together show that the partnership remains strong to this day. A critical shutdown to do further improvements to the boiler was recently completed.

◀ Recovery boiler, installed by ANDRITZ in 1999 and modernized during a critical shutdown in 2012.

A "continuing dialogue"

ANDRITZ began its collaboration with Zellstoff Rosenthal (ZPR) at a critical moment in the mill's history.

The pulp mill at Blankenstein, Germany was first built in 1883. After WW II, the Thuringia region was taken over by the German Democratic Republic. "The technology connections this mill had with the West were broken," explains Hansjörg Krieg, Head of Technical Department. Krieg has a unique perspective on the mill, since he has worked at ZPR for 50 years.

When the Berlin Wall fell in 1989 ZPR re-entered the competitive world of market economies. It was privatized when Mercer International came into the picture in 1994. Mercer decided to convert the mill from sulphite to sulphate, and called upon ANDRITZ to help.

ANDRITZ performed digester modifications and delivered the entire chemical recovery island. Production rose to 310,000 from about 200,000 t/a. "We were extremely satisfied with the work ANDRITZ did," says Krieg, who was Project Director for the conversion in 1999.

It is a continuing dialogue today. "ANDRITZ often reviews our processes and makes suggestions which we evaluate in the context of our Rosenthal 400 plan," says Mill Manager Christian Sörgel.

"Rather than do one large investment project, we set about doing it in steps."

Adolf Koppensteiner
Managing Director, Zellstoff Stendal
(former Mill Manager at Zellstoff Rosenthal)

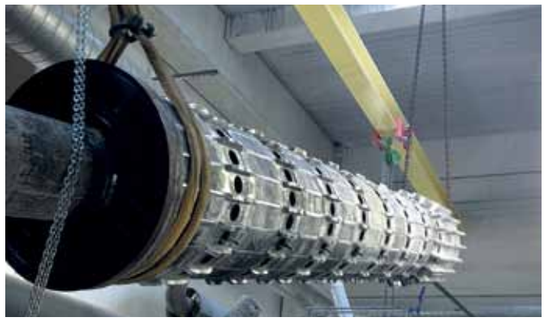
"This shutdown was key to de-bottlenecking the mill."

Christian Sörgel
Mill Manager
Zellstoff Rosenthal

History and chemistry

Rosenthal 400 is the plan to bring production up to 400,000. It started in 2007. By 2012, production increased to 350,000 t/a. "Economics did not allow us to do this as one large investment project," Koppensteiner, former Mill Manager explains. "So we are doing it in steps. While we can't change wood prices or pulp prices – we can focus on improving what we do here."

ZPR has a long history of sharing ideas with key suppliers and of learning from them.



◀ As part of the recent de-bottlenecking project, ANDRITZ expanded capacity of the white liquor filter. This involved removing the 7 m long center shaft through a skylight in the building with only centimeters to spare in the window, modifying it to add two more discs, and then re-installing it through the same skylight.

"We have some exceptional people at this mill," Koppensteiner says. "People chemistry has always been important to us, and we have been very satisfied with the long partnership between our experts and the experts at ANDRITZ."

Chemical recovery bottleneck

Increasing pulp production through Rosenthal 400 required ZPR to add chemical recovery capacity. As Sörgel explains, "This is key to de-bottlenecking the mill.

"ZPR is always eager to get the latest technology with high technical standards," says Walter Scholz-Sommerbauer, ANDRITZ's Regional Manager for pulp mill services. "In 2012, we mapped out a plan with a very ambitious time schedule."

The plan was to modernize and expand capacity in a 21-day shutdown: 1) increasing recovery boiler capacity from 1,650 to 2,300 tds/d while reducing corrosive chlorine in the ash, and improving emissions; 2) increasing both green and white liquor filtration capacity in the white liquor plant;

▲ (Left to right) Hans-Joachim Milz, White Liquor Plant Production Manager; Ralf Tolksdorf, Maintenance Manager; Walter Scholz-Sommerbauer, ANDRITZ; Christian Sörgel, Mill Manager; and Visa Kuutti, ANDRITZ, on the newly modernized CD-Filter.

▲ Hans-Joachim Milz, White Liquor Plant Production Manager (left) and Visa Kuutti of ANDRITZ in front of the ANDRITZ evaporators. ZPR recently ordered a new laser-welded lamella package for the evaporator.

▲ ZPR now gets about 100 t/d more production out of its digester as a result of several small improvement projects. The most recent upgrade to the fiberline was the replacement of the lower extraction screens with new ANDRITZ SureFlow diagonal screens.

and 3) improving stability while increasing capacity in the fiberline.

The centerpiece of the modernization was the recovery boiler, which ANDRITZ supplied new in 1999. This modernization was not an easy one, according to Janne Kolehmainen, ANDRITZ Project Manager. “It was a very short time to do such an extensive rebuild,” he says. “We replaced the primary air ports, added a new secondary air system, and enlarged the tertiary air ports. We also modified the nose arch, installed additional water screens, added 18 sootblowers, modified the vent scrubber, and modified the water/steam circulation to increase capacity. We also relined the dissolving tank with stainless steel, something we had not tried before, but it turned out to be very successful.”

The shutdown took one more day than planned, but this was only because of severe space limitations inside the boiler, according to Sörgel. “ANDRITZ had the manpower and the plan, but the space was so tight on the second floor of the boiler that it could only accommodate a limited number of welders at one time.”

Working with such a time crunch required great cooperation from both partners, says Sörgel. “Even in the most stressful times we found a fair way to move forward,” he says. “You can only do this if you trust each other. We were prepared for some problems after start up, but they did not happen. We can now increase production without a bottleneck in recovery.”

Careful planning in the WLP

“Our mission was to add a LimeGreen filter to increase filtration capacity of raw green liquor and to modify the CD-Filter to also increase its capacity,” says Hannu Sankala, Project Manager. “The modifications to the CD-Filter were challenging due to its location.”

▲ Andreas Dietzsch, Assistant Fiberline Manager in front of Diamondback bin, which ANDRITZ added to the fiberline.

Sörgel was impressed with the CD-Filter work. “The shaft was removed so that two additional discs could be added,” he says. “By moving the suction head and filtrate valve outside the unit, there was now room for 10 discs in the same filter body. The main challenge was that the shaft had to be lifted through a skylight in our roof. There were only centimeters to spare, but ANDRITZ made it.”

The CD-Filter modifications required new civil works to be supplied by ZPR. “The normal curing time for the concrete is 14 days, and we did not have 14 days,” Sörgel says. “So, together with ANDRITZ, we arrived at the solution of using pre-fabricated concrete slabs to reduce the volume of concrete poured on-site. Hannu and his crew from ANDRITZ Savonlinna (Finland) did excellent work.”

High-performance cooking

Andreas Dietzsch, Assistant Fiberline Manager, oversaw the upgrades to the cooking plant. In 1999 when the mill converted to sulphate cooking, ANDRITZ upgraded the digester and feed line with a Lo-Level feed systems and Diamondback chip bin. A new pressure diffuser washer was also installed. “In the last 10 years, we have done many small improvement projects with ANDRITZ,” Dietzsch says. “We have had a rather unique situation in that Juha Welling (ANDRITZ Project Manager) has been our key contact for the fiberline, and was also part of the big conversion project in 1999. He knows this mill very well, and has been a big help in each improvement.”

The most recent upgrade was the replacement of the lower extraction screens with new ANDRITZ SureFlow diagonal screens. “The old digester screens were plugging, which caused stability problems,” Dietzsch explains. “Each shutdown, it was a three-day process to cut, clean, and re-assemble the screens.”

ANDRITZ also modified the digester to remove the washing zone at the bottom of the digester and re-route some extraction liquor to increase cooking capacity. ZPR now gets about 100 t/d increased throughput. “Not all of this can be claimed by the SureFlow screens of course, but I can say that there are no longer pressure differences and the digester is running very stably.”

“We were extremely satisfied with the work ANDRITZ did during our major conversion project.”

Hansjörg Krieg, Head of Technical Department at ZPR. Krieg was Project Manager for mill’s conversion from sulphite to sulphate in 1999.

Dietzsch has this to say about the partnership: “This has been a long-term commitment to partnership. We have worked with the same ANDRITZ people for many years, so we have continuity. From my experience, this is not normal with other suppliers.”

Further improvements

Service improvements continue almost daily. Most recently, ZPR ordered an upgrade to the cooking plant and a new lamella heating surface package for one of its ANDRITZ evaporators. “ANDRITZ’s lamella design provides a very cost-effective solution,” says Visa Kuutti, ANDRITZ service engineer for evaporation. “With our new laser-welding capabilities, instead of resistance welding used in the past, the construction and durability of the lamellas have improved.”

Each improvement is a step closer to completion of Rosenthal 400. Sörgel concludes: “We are always working on the next improvement, and we are regularly discussing with ANDRITZ. You know, the two partners have bonded pretty well, and our bond is enabling us both to fulfill our goals.”

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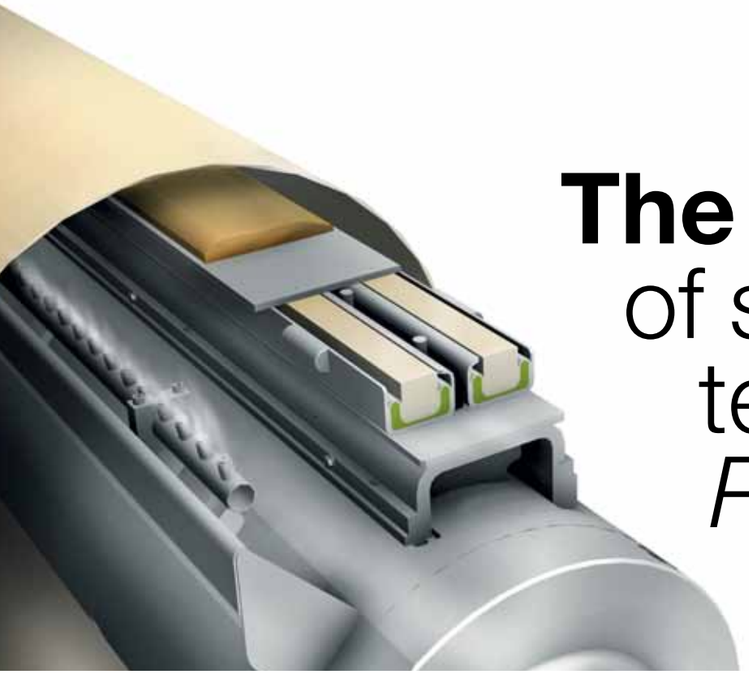


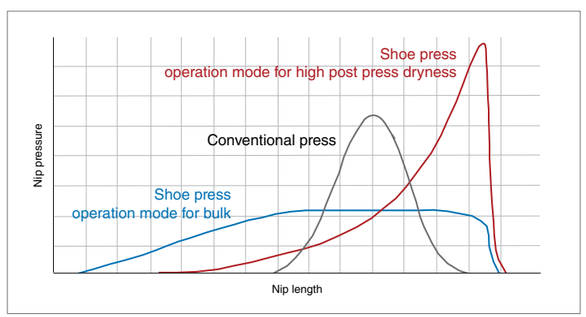
The evolution of shoe press technology: *Prime*Press XT Evo

Evolution not revolution: ANDRITZ continues the development of its shoe press to achieve a higher level of performance while enhancing tissue quality. While shoe presses have been around for decades in conventional papermaking, their use in tissue production started in the late 1990s. Since then, ANDRITZ has been one of the pioneers in creating products for the demands of the tissue segment, collecting considerable knowledge and operational experience.

The *Prime*Press XT Evo is the latest development in shoe press technology, boosting tissue production and drying efficiency. The new ANDRITZ shoe press gently dewaters the web, but still achieves a far higher post-press dryness than conventional presses. Due to the new energy-efficient press design, improved dewatering and reduced need for thermal drying, the *Prime*Press XT Evo achieves significant savings in energy. Alternatively, a noticeable increase in capacity can be achieved.

Nip pressure profiles

Comparing the operation of a conventional press roll with that of a shoe press reveals some of the advantages of the shoe press. The figure below shows a typical nip pressure curve of a conventional press roll along with a typical shoe press. The conventional press roll gives medium nip pressure and notable rewetting due to its symmetrical pressure curve (grey line). When the focus is on obtaining maximum bulk, the maximum nip pressure of a shoe press is kept low (blue line). When the emphasis is on obtaining maximum dryness, the maximum nip pressure of the shoe press is pushed to the top (red line). Typical for both shoe press operational modes (maximum bulk or maximum dryness) is the abrupt pressure relief at the end of the nip, minimizing rewetting effects.



◀ Typical nip pressure profiles

▲ *Prime*Press XT Evo installed in a tissue machine
Pressing against the Yankee

Therefore, shoe presses for tissue offer two main benefits:

First, higher after-press dryness

This can be achieved by operating the shoe press in “dryness” mode, obtaining high after-press dryness due to the right nip pressure curve and only minor rewetting. A papermaker can choose to either lower the thermal energy consumption or to increase the machine speed, raising production for a given level of thermal energy consumption.

Second, a bulkier sheet

A shoe press operated in “bulk” mode produces a bulkier sheet. Low maximum nip pressures are permitted, still giving good after-press sheet dryness. This advantage of the shoe press can be used to produce a bulky sheet, compared to that produced with “standard suction press rolls,” but requiring less virgin fiber, or allowing the substitution of less costly furnish for high-quality furnish. This reduces the raw material cost.

In summary, shoe presses offer a tissue producer rich versatility and flexibility – the ability to lower energy consumption, improve sheet quality, and obtain optimum productivity.

The environment for shoe presses on a tissue machine is demanding. The sheet is formed on a water-saturated felt – following the CrescentFormer concept – which requires appropriate vacuum conditioning of the felt upstream of the press nip. And, since the Yankee is not a perfect counter-roll press member, the shoe press must be able to compensate for the less-than-ideal Yankee surface. This requires mechanical flexibility and the ability to control the sheet edges.

In order to operate a shoe press optimally, the whole system surrounding the shoe press must be set up soundly – including the vacuum system, the felt belt interaction, and the shoe press design itself. Based on its 14 years’ experience, ANDRITZ has the expertise to be an ideal partner for offering an optimized system.

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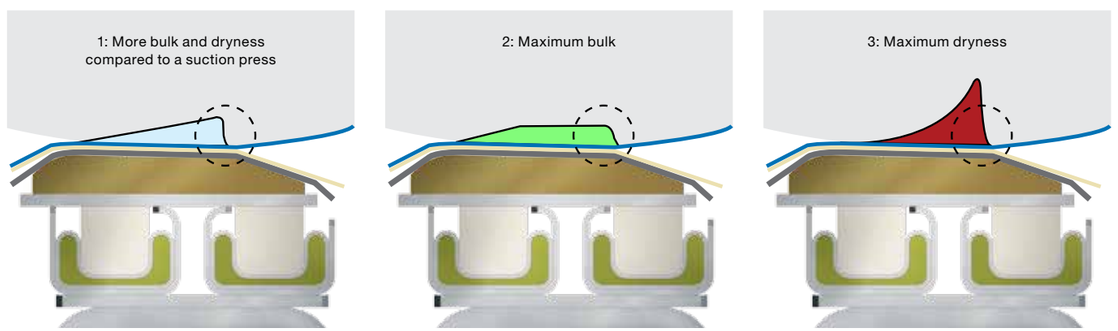
Targets of the new shoe press

- New patent-pending loading system for low energy consumption
- Flexible shoe design and edge control system
- High post-press dryness for superior dewatering
- Low-flow, low-pressure, low operating costs

▼ Working principle



NEWS

You bet! ANDRITZ wetlace technology reduces environmental impact

Most of us flush it and forget it. We don't think about the environmental impact of the toilet tissue we use for convenience and cleanliness.

But nonwovens associations such as EDANA (European Disposables and Nonwovens Association) and INDA (International Nonwovens and Disposables Association) are thinking about this issue of flushability – and have developed clear guidelines.

A "flushable" product needs to meet certain standards: it has to be made from natural fibers that are fully biodegradable, it has to have adequate strength while in use, and then it has to have adequate dispersibility at drainage. EDANA developed seven test methods to ensure that a nonwovens material is flushable and disintegrates correctly in residential and municipal settings.

Products produced using ANDRITZ wetlace technology passed all seven EDANA tests. Wetlace is a technology developed by ANDRITZ that combines wet forming and hydroentanglement. It has proven ideal for producing flushable wipes from 100% natural and/or renewable raw materials without chemical binders.

ANDRITZ invites wipes producers to use the Nonwovens Technical Center in Krefeld, Germany to conduct their own test and develop products with the full assistance of ANDRITZ wetlaid and wetlace experts.

ANDRITZ MeWa: shredding, crushing, recycling

ANDRITZ acquired the assets of MeWa Recycling Systems of Germany, a company involved in the development, engineering, and servicing of shredding and crushing machines, as well as complete recycling plants for more than 30 years. Backed by the strength and global scope of ANDRITZ, MeWa will continue to expand its products/services and geographic scope.

ANDRITZ MeWa provides products and services for various applications: tire recycling, recycling of electrical and electronic waste, metal recycling, disposal of refrigeration units, production of alternative fuels, and disposal of household or industrial waste. Among its customers are small- and medium-sized waste treatment companies and some large multinationals.

In the paper sector, ANDRITZ MeWa offers solutions for the disintegration of pulper rags – and the separation of valuable materials (ferrous and non-ferrous metals; substitute fuels) during recycled fiber processing.

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Highlights of **new orders**

COMPLETE LINES AND SYSTEMS

Klabin
Ortigueira, Paraná, Brazil
Woodyard; complete fiberline (softwood and hardwood); and white liquor plant

Mondi
Ruzomberok, Slovakia
LimeKiln

OKI Pulp & Paper Mills
Indonesia
9 horizontally fed HHQ-Chippers
Largest woodyard in the world

High Energy Recovery Boiler (HERB)
Largest recovery boiler in the world – capacity 11,600 tds/d

Mondi Świecie
Świecie, Poland
High Energy Recovery Boiler (HERB)

Confidential Customer
USA
High Energy Recovery Boiler (HERB) and 7-effect high solids evaporation plant

Energoinstal S.A
Zofiowka, Poland
CFB boiler

COMPLETE LINES AND SYSTEMS

United Paper Public Company
Prachinburi, Thailand
Complete 500 t/d OCC line

Siam Kraft Industry
Bangkok, Thailand
Rebuild of 2 OCC lines, 1 DIP line, and paper machine approach system

Tralin Paper
Shangdong, China
*Prime*Cal Soft calender

Confidential Customer
USA
*Prime*LineCOMPACT VI tissue machine

Confidential Customer
USA
Two *Prime*Line TM W8 tissue machines

KEY EQUIPMENT, UPGRADES, AND MODERNIZATIONS

International Paper
Riegelwood, NC, USA
Woodyard modernization

Howe Sound Pulp & Paper, Paper Excellence
Howe Sound, BC, Canada
Oxygen delignification system

KEY EQUIPMENT, UPGRADES, AND MODERNIZATIONS

International Paper
Saillat, France
Oxygen delignification system and DD washer

Estonian Cell
Kunda, Estonia
Upgrade of mechanical pulping screening system

Confidential customer
Middle East
*Prime*Dry Steel Yankee (12 ft. diameter)

Middle East Paper
Jeddah, Kingdom of Saudi Arabia
Upgrades in OCC line; rebuild of three paper machines

Suzano Papel e Celulose
Suzano, São Paulo, Brazil
OPP contract for process optimization in the mill

Companhia Siderúrgica Nacional - CSN
Volta Redonda, Rio de Janeiro, Brazil
Maintenance services contract

Highlights of **new start-ups**

COMPLETE LINES AND SYSTEMS

Mondi Dynäs
Väja, Sweden
LimeKiln with LimeFlash technology

Confidential customer
Virginia, USA
BFB biomass boiler

POSCO E&C
Busan, South Korea
CFB boiler for refuse-derived fuels

Dong Tien Packaging & Paper Company
Ho Chi Minh City, Vietnam
150 t/d OCC line

Jiangsu Fuxing Paper
Jiangsu, China
DIP, stock preparation, and paper machine approach systems

COMPLETE LINES AND SYSTEMS

Jiangsu Longheng Paper
Jiangsu, China
Deinked pulp plant (MOW, MW, OCC, ONP) and paper machine approach system

Zellstoff Pöls
Pöls, Austria
Complete *Prime*Line MG paper plant
Europe's newest and largest line for kraft papers. ANDRITZ scope includes stock preparation, MG paper machine, two-drum winder, pumps, and automation. Largest Steel Yankee (22 ft. diameter) in the world. (Read story on page 8 of this issue).

Yuanjiang Tiger
Yuanjiang, China
P-RC APMP System, 600 admt/d
Record start-up within 16 h (from chips to fiber)

KEY EQUIPMENT, UPGRADES, AND MODERNIZATIONS

Lunds Energi
Lund, Sweden
Biomass handling and crushing line

Oji Paper
Yonago, Japan
Conversion of digester and pulp dryer (2.4 m width) for dissolving pulp

Mondi Frantschach
Frantschach, Austria
TwinFlo TF34 refiner with dual outlet

Confidential customer
Indonesia
*Prime*Dry Steel Yankee (18 ft. diameter)

ANDRITZ
Pulp & Paper

Good news for Mother Nature.

She can breathe a sigh of relief.

The industry is ready for some good news. At a time when many industrial processes leave a large footprint on the planet, our industry is leading the way in minimal impact. ANDRITZ has been at the forefront with solutions on every front: air, water, fiber, chemicals, and energy. And the good news is that every ANDRITZ innovation that reduces fiber losses, recovers and reuses chemicals, uses less fresh water, lowers energy consumption, eliminates air emissions, and sustains higher production at lower costs is not only good for your bottom line, but also good for Mother Nature. Yes, the industry is ready for some good news – and ANDRITZ delivers.

www.andritz.com

We accept the challenge!