

# FiberSpectrum

*The customer magazine of Andritz Pulp & Paper*

*Issue 2 — 2004*



Durametal® plates make the difference at Powell River — Page 12

**ANDRITZ**

## Contents

- 3** Pulp & Paper  
A message from Andritz P&P Management
- 4** Bark with a bite at Valdivia  
Arauco benefits from innovative wood processing technology
- 8** Biggest and best at Wisaforest  
UPM's modernization at Pietarsaari includes the world's largest chemical recovery
- 12** Plates full of performance at Powell River  
NorskeCanada finds that refiner plates make a big difference
- 16** A world's first at Yueyang  
Hunan Tiger becomes first in world to benefit from new mechanical pulping technology
- 20** Breathing new life into Kingsport  
Weyerhaeuser investment brings technology, stability to community
- 25** The rising Sun in China  
New Andritz stock prep system helps Shandong Sun Paper shine
- 28** News from the world of Andritz

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Pictures on pages 25-27 courtesy  
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## A message from **Andritz P&P** Management

This has been a year of progress within Andritz, followed by excellent market acceptance. Valued customers have trusted us with more comprehensive orders than ever before in our history — as a result of our ability to integrate complementary acquisitions into a "full-line" capability from the woodyard to finished pulp bales. We have delivered complete stock preparation systems and deinking lines as well as tissue production systems. By efficiently integrating our acquisitions, we have been able to capitalize on inherent synergies to better meet customer requirements.

### Single-line dependability

The "single line" mill has firmly taken hold, since redundant or repetitive smaller systems increase capital and operating costs. "Super Size" lines with 3000 t/d digesters (Veracel, Brazil), 4700 tds/d recovery boilers (Wisaforest, Finland), and 3200 adt/d pulp dryers (Hainan, China) are now appearing around the world.

Andritz's full-line strategy and highly reliable equipment are preferred by customers. The most recent examples are the award of a fiberline (including pulp drying/baling) and chemical recovery systems from CMPC's Santa Fe mill in Chile, and a complete pulping line, including recovery, for Andra Pradesh Paper Mills in India. We would not have been able to compete for these projects without the efficient integration of Ahlstrom Machinery, ABB Fläkt, Lamb, and others.

### Reduced capital cost

One consistent requirement from customers is the need to drastically

reduce their capital costs and to improve the start-up curve to quickly reach full production. Our efforts have centered around simplifying system designs, utilizing global sourcing, manufacturing in the most efficient geographies, and standardizing system components while maintaining high product quality standards. We introduced dynamic simulation (IDEAS) tools for DCS check-out and operator training. This has contributed to shorter start-up curves.

Customers, too, have a remarkable impact on capital costs: from their selection of project partners (individual equipment or EPC) to the specification of equipment (standard modules or new designs).

Recent examples of standardization include the 9.3 m wide dewatering and pulp drying lines including cutter/layboy and baling. Another is the PrimeLine™ tissue production systems (5.4 m+ at speeds over 2000 m/min). Modularization still permits customization, but allows us to reduce engineering hours and develop quality sub-suppliers — driving the overall cost down.

### Service partnership

The formation of European Mill Service (EMS), a joint venture between Rheinhold & Mahla of Germany and Andritz, gives mills a service alternative as they consider their outsourcing

options. We can demonstrate savings in maintenance costs of 20% over three years with this approach, combined with our OPE® concept — while improving a mill's overall production efficiency.



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## Overcoming the "bark with a bite" at Valdivia

*In January 2002, Celulosa Arauco y Constitución S.A. chose Andritz to supply a complete woodyard, black liquor evaporation plant, and white liquor plant for its Valdivia mill in Chile. One of the big challenges mastered by Andritz was the handling of eucalyptus and its unique bark.*

The **Arauco Group** is a leading Chilean pulp, wood, sawmill and panelboard company in Chile and Argentina. Its new Valdivia greenfield pulp mill cost US\$1.2 billion and began operating in February 2004.

Andritz worked closely with Arauco during the technical and commercial phases of the project. Valdivia Mill Manager José Vivanco explains, "Because the Andritz technical scope was clear and easy to follow, the whole negotiation process went smoothly."

Following a successful start-up, Vivanco confirms that all Andritz systems are operating as expected and have already exceeded design production levels.

### The Valdivia woodyard

The Valdivia project contains several new features that are designed for a world-class mill producing 600,000 t/a of ECF pulp. There are two debarking lines, chipping, storage, screening, and bark handling. "It looks like a normal set-up for a woodyard," Timo Palo, Andritz Project Manager for wood processing systems, explains, "but the insides are different."

### The eucalyptus challenge

The "insides" are different to accommodate the species mix at Valdivia. Pulp production is 60% pine (*Pinus radiata*) and 40% eucalyptus (a mixture of *Eucalyptus globulus* and *Eucalyptus nitens*). Arauco is now harvesting eucalyptus to produce 1900-2100 adt/d pulp (1700 adt/d for pine).

Arauco chose Andritz to supply the woodyard due to its firm belief that Andritz could supply cost-efficient, competitive quality equipment, according to Vivanco.

"Eucalyptus presents unique challenges," Palo says. "The bark is long and stringy like rope. Instead of coming out of the debarker at designated slots, it comes out with the logs. And *Eucalyptus nitens* is even more difficult than *Eucalyptus globulus*. It bends like rubber and knots like dreadlocks!"



**José Vivanco, Mill Manager at Valdivia.**

The relationship between Andritz and Arauco began in 1991 when Andritz supplied two pine debarking lines. In preparation for the Valdivia project, Arauco allowed Andritz to conduct experiments on their eucalyptus line.

The PowerFeed™ drum infeed conveyor feeds entire 6-7 m<sup>2</sup> unbarked log bundles directly into the debarking drum. Eucalyptus and pine logs, short and long, are treated separately. The variable speed of the PowerFeed™ and



**Timo Palo, Andritz Project Manager for woodyard systems for the Valdivia greenfield project.**

the debarking drum provide the flexibility to handle different logs. If the logs are difficult to debark, the control system can increase the speed of the debarking drum and/or reduce the speed of the PowerFeed™ conveyor.

The two debarking drums use a normal “tumble” de-barking method for 2.44 m logs and a parallel debarking format for 6 m logs, according to Palo. Rotational speed can be adjusted according to wood quality and species from 3-7 rpm.

### EucaRoller™ to the rescue

Between 20-30% of eucalyptus bark is removed in the debarking drum. The remaining bark comes out of the drum with the logs and is extracted by the EucaRoller™.

The EucaRoller™ is an Andritz innovation that removes the remaining bark through engineered gaps between strategically placed rollers. It has reverse and shaking rollers to move the debarked logs sideways. This enables the loose eucalyptus bark to fall through the gaps.

“The EucaRoller™ works extremely well and delivers full debarking capacity to the line,” Palo says.

### HHQ-Chipper™ centerpiece

The Chipper is the centerpiece of the woodyard because it has the most influence on the chip quality – the foundation for good pulping. Andritz’s horizontally fed HHQ-Chipper™ systems are successfully fulfilling this role at Valdivia.

“The chippers produce quality chips for us at the required high capacities,” says Vivanco. Eucalyptus is again a challenge for the chipper, since it is a very hard, rough wood. In addition, eucalyptus has a low pH-value (acidic) which promotes corrosion in open-air conditions. Stainless steel replaces typical mild steel in the construction of the chipper system to prolong the working life. The two Andritz HHQ-Chippers™ at Valdivia can process both long (6 m) and short (2.44 m) logs, but are ideal for the longer logs.



*The EucaRoller™ is an Andritz innovation to remove stringy eucalyptus bark prior to the chipping operation.*



*One of the debarking drums on the new lines at Valdivia. Each drum is 5.5 m in diameter and 35 m long.*

## Andritz Scope at Valdivia

### Wood Preparation Plant (Started up November 2003)

The Andritz woodyard consists of a two-line debarking and chipping plant. PowerFeed™ conveyors, 5.5 x 35 m debarking drums, EucaRoller™ systems, and HHQ-Chippers™ are installed in parallel. The debarking plant also has bark treatment with bark shredding and water treatment. Chip storage is handled with Travelling Screw Reclaimers. Chip screening is performed with two gyratory type screens. Oversized chips are transformed into acceptable chips with an HQ-Sizer™.

### White Liquor Plant (Started up February 2004)

The plant produces 7600 m<sup>3</sup>/d of white liquor. It started up on schedule and exceeded nominal capacity within two weeks of the start-up. The recausticizing plant includes X-Filters™ for green liquor filtration and a CD-Filter™ for white liquor filtration. Both filters represent the first of this filtration technology in operation in Chile. Also included was a modern LMD Lime Kiln equipped with a Sector Cooler. The Lime Kiln has a capacity of 545 t/d of burnt lime.

### Evaporation Plant (876 t/h) (Started up February 2004)

This is the first complete Andritz evaporation plant delivered to Chile. The firing liquor produced in the Andritz crystallizing concentrators is 78% dry solids and the liquor is stored in a pressurized storage tank. The 6-effect lamella-type evaporators have internal segregation technology and an integrated stripper. The methanol gas from the stripper is handled in the liquefaction plant also delivered by Andritz.

### Special equipment for shredding and fiber recovery

Eucalyptus bark requires special knives for shredding its bark. Andritz provided the equipment for bark treatment — including the hammer-type shredder which effectively treats the bark so that it can be burned in the boiler as biofuel.

Another Andritz innovation for fiber recovery — the breakage and log recovery system — helps Arauco minimize wood losses. “Our losses are minimal

According to Vivanco, “The chip storage arrangement and reclaiming gives us the flexibility we need to maintain chip inventories and feed the digester with the right chip quality at the right time.”

At Valdivia, rectangular chips are screened by two CS 1000 screens with a combined capacity of 2000 loose m<sup>3</sup>/h. Each screen has decks for “oversize,” “accepts,” “pins,” and “fines.” The latter are sent to the boiler. The “overs” are sent to the HQ-Sizer™ for processing into the correct size for cooking.



**The Andritz evaporation plant at Valdivia removes 876 t/h of water and delivers 78% dry solids black liquor to the recovery boiler.**

because of the system,” Vivanco says. “It filters out the bark on its way to the shredder and can rescue wood over 0.5 m long for chipping. The recovered wood is then sent to a chipping line to rejoin the process.”

### Chip storage and screening

The chip storage facility at Valdivia has 100% active volume and consists of two longitudinal chip piles storing and reclaiming four different chip species.

The HQ-Sizer™ replaces re-chippers, crackers, slicers, and conditioners with one unit. It splits the larger chips horizontally into the required size. In practice, 80% of the “overs” are converted into accepts with minimal pins and fines.

Another contributor to the system's flexibility are bypass options for reducing downtime and maintaining production. If needed, one or both screens and/or the HQ-Sizer™ can be bypassed and chips sent straight to the digester.



**The Andritz two-line debarking and chipping plant for the greenfield Valdivia mill. Andritz's scope also included chip storage and reclaiming.**



**The Andritz 7600 m<sup>3</sup>/d white liquor plant for Valdivia started up on schedule and exceeded nominal production within two weeks of start-up.**

### Working closely

Arauco and Andritz signed the project contract in January 2002. By November 2003, the first wood processing trials were taking place at the mill. The woodyard was officially handed over to Arauco in January 2004. All of the critical training of operators and maintenance personnel was conducted by Andritz. The debarking plant control system from Andritz also contributed to a smooth start-up. "Operator training is easier when hardware and software come from the same supplier," says Palo.

For Arauco, the team approach was one of the keys to success. "The project was carried out under the full supervision of Andritz technicians working closely together with construction and Valdivia mill personnel," Vivanco says. "We consider it a

very good example of cooperation at work. We are satisfied that problems are solved quickly and we get very good technical assistance when we need it."

Another innovation that Andritz is still putting in place is a system for remote monitoring so that the Andritz Wood Processing experts in Finland can be connected to the Valdivia mill. This is part of Andritz's OPE® (Overall Production Efficiency) service. The online system will gather process data to assist in optimization and problem-solving activities as needed.

Vivanco is very proud that Arauco currently operates the highest capacity debarking plant for eucalyptus in the world. "The Andritz system gives us flexibility in debarking eucalyptus and/or pine in both lines," he says.

Find out more at [www.fiberspectrum.andritz.com](http://www.fiberspectrum.andritz.com)

"The **biggest** *and the* **best environmental**  
*and* **energy equipment** available today"

*Requiring 22.5 months from breaking ground to start-up, UPM-Kymmene took a step into the future with its modernization and expansion at Pietarsaari. This is the world's largest single-line chemical recovery plant — and all Andritz technology. The recovery boiler has 600 MW biofuel firing capacity, with virtually no fossil carbon dioxide emissions.*



*Inside the Andritz recovery boiler — the world's largest at 4450 tds/d. The boiler operates at high pressure (92-102 bar) and high-temperature (492-505°C). Steam generation with internal circulation is 205 kg/s. A higher power-to-steam ratio increases power generation by 10%.*



"Very seldom do any of us have an opportunity to set a world record — especially not with the press of an electronic button. It is a great honor to be able to participate in the setting of a productivity-boosting record!"

Those were the words of Matti Vanhanen, Finnish Prime Minister, as he and top management from UPM-Kymmene celebrated the completion of the world's largest chemical recovery

system. The ceremony took place August 24, 2004 in Pietarsaari. Mill technicians gave Vanhanen an electronic panel with a single button. When he pressed it, the new Andritz recovery boiler was ramped up to recover a world record 4700 tonnes of dry solids per day (tds/d).



**Finnish Prime Minister Matti Vanhanen presses the button on the electronic panel to ramp up black liquor recovery in the new Andritz recovery boiler to a world record 4700 tds/d.**



### Wisa 800

The modernization project, named Wisa 800 by UPM, puts the Pietarsaari pulp, paper, and energy complex in top form. "Through this investment in Wisa 800, we have strengthened our pulp self-sufficiency and have moved into an elite category in terms of energy and environmental performance," says Vesa Vainio, Chairman of the Board of UPM-Kymmene.

UPM mills use about four million tonnes of pulp annually. Before the Wisa 800 project, the company purchased about 10% of its pulp. After the project, purchased pulp requirements are minimal.

On the cost side, the technology of the world's largest recovery boiler and the single-line chemical recovery process will reduce production costs significantly. On the environmental side, in spite of the fact that pulp production increased by 200,000 t/a to a total 800,000 t/a, fossil carbon dioxide emissions are reduced to being almost non-existent. All other environmental targets set for the mill are also clearly achieved.



**Jari Niemelä (left) of Pohjolan Voima Oy, talks with Anja Silvennoinen of UPM (center) and Ari Nieminen. Nieminen was Project Director for Andritz who led the team that won recognition within UPM for "Best Start-up Implementation."**

UPM purchased the black liquor evaporators, recovery boiler, and white liquor production plant in cooperation with Wisapower Oy, a subsidiary of the Pohjolan Voima energy group. Wisapower owns the new evaporation plant and recovery boiler, while UPM operates and maintains them.

## Andritz supplies best available technology

Andritz was responsible for the recovery island equipment — evaporation plant, recovery boiler, recausticizing plant, and lime kiln — in addition to the new sawdust pulp cooking plant. Andritz also modernized one of Wisaforest's pulp drying lines. The delivery was additionally supplemented with simulation equipment for recovery boiler operation developed by Andritz.

The start-up of the chemical recovery line in April 2004 was a great success, and exactly within schedule.

"The best available environmental and energy equipment was sought for this project," says Matti Lievonen, President, Fine and Specialty Papers Division with UPM. "Thanks to this equipment, pulp mill effluents have decreased in spite of the increased pulp and energy production. The fossil carbon dioxide emissions are close to zero, and the energy from black liquor combustion satisfies the requirements of all production plants in the mill area."

## An attitude of openness

"One thing above all is that we played with an open deck," says Heikki Öhman, Technical Director and Project Director. "We put all of our cards on the table and agreed on solving all problems jointly. To identify potential problems early enough, we agreed to quickly inform each other about any conflicts we learned about."

"From our side, we are proud of the trust UPM placed in Andritz," says Markku Hänninen, President and CEO of Andritz Oy. "UPM challenged us to do our best. They are skilled implementers of investment projects. In a project of this size, problems are bound to surface, but we were always able to arrive at joint solutions to the benefit of both companies."

"It was very rewarding to us that UPM was prepared to utilize our newest



**The white liquor plant supplied by Andritz is the world's largest at 10,000 m<sup>3</sup>/d of white liquor production. Lime mud for the kiln is separated, washed, and dewatered in a special disc filter, the Andritz LMD-Filter™ (above), which is new Andritz technology. Markku Lankinen (left) of Andritz and Kaj Nordbäck, Power and Recovery Plant Manager at Pietarsaari stand in front of the new filter.**



**The most advanced evaporator plant in the world is operating at Pietarsaari. Supplied by Andritz, the plant evaporates 1050 t/h of water and produces firing liquor at 85% dry solids using a Liquor Heat Treatment Concentrator.**

and best technology, which is now working well. By managing risks, UPM benefits from the latest technology. Some of the chemical recovery line is 'pioneer' equipment. Yet, with all this technology and scale, the start-up occurred right on time — and the start-up curve has been amazingly steep. This is quite an accomplishment."

After the completion of the chemical recovery project, UPM rewarded key suppliers who delivered the best performance, according to criteria established within the company. Ari Nieminen, Andritz Project Director for Wisa 800, and his project team were selected for the "Best Start-up Implementation" award.

## An acid test for the LMD-Filter™

Nieminen cites one of the more interesting strategic investments for both UPM and Andritz — the decision by UPM to select the LMD-Filter™ in the white liquor plant.

Andritz had developed a new concept for drying lime mud, the LMD-Filter™, in which mud is separated and washed with a special disc filter. Due to the high capacity requirements of the process, Wisaforest would have normally required two large drum filters to separate and dewater the lime mud. However, this would have been costly in terms of invested capital and also the space required.

"It was an example of risk-taking by both Wisaforest and Andritz," says Nieminen. "Wisaforest was willing to try new, conceptual technology and we were able to stand behind it and guarantee its performance."

Pilot tests proved the concept. "We went from pilot runs directly to world record production," Nieminen says.

In fact, perhaps the LMD-Filter™ performed too well. "After start-up, we observed that the lime mud going to the kiln was too dry, which increased the temperature of the flue gases," Öhman says. "This affected the operation of the electrostatic precipitator. We decided to add moisture to the lime mud after the filter. Now we must adjust somewhere else in the process to be able to benefit from this ability to make highly dry lime mud."

***Aerial view of Pietarsaari showing the world's largest single-line chemical recovery island from Andritz. Start-up of the island occurred in April 2004 — on schedule, on budget, and meeting all performance targets.***

## Bioenergy super-efficiently

Pietarsaari is a good example of the synergy between a forest products plant and an energy producer. Ahlholmens Kraft, which now is the world's second largest bio power plant (550 MW/240MWe) after Wisapower, is situated adjacent to the mill. It utilizes all locally generated bio-fuels to generate power. The power also satisfies Pietarsaari's need for heat, electricity, and steam.

## Working while celebrating

The day that Finnish Prime Minister Matti Vanhanen pushed the button to set a world record for black liquor combustion was a day of celebration. It was also "business as usual" as this massive mill produced another 2285 adt of pulp — while the recovery boiler fired a peak load corresponding to 4803 tds/d. The potential electricity production of Wisapower (140MWe) makes Pietarsaari a significant bio power plant — with its 1150 MW of biofuel firing capacity and 380 MW of electricity production.

Find out more at [www.fiberspectrum.andritz.com](http://www.fiberspectrum.andritz.com)

## Tailor-made sawdust cooking for Wisaforest

*Pietarsaari's sawmill produces approx. 100,000 m<sup>3</sup> of sawdust each year. It used to be burned for energy, but with the Wisa 800 project, UPM decided to produce pulp with it.*

*Conventional sawdust cooking is rough on the fiber. UPM asked Andritz to develop the cooking process to gently and slowly cook the fibers — maximizing pulp strength and yield.*

*Andritz has supplied sawdust digesters since 1967, according to Kai Lindroos, Fiberline Sales Director. Test runs and laboratory research at Andritz, UPM, and the Åbo Akademi University in Finland yielded a process very suitable for Wisaforest.*

*The cooking process at Pietarsaari starts with an impregnation stage performed at low temperature in an M&D Digester. Then a separate digester finishes the cook and the pulp is washed in a DD Washer. Design capacity of the line is 200 t/d.*

*"This is tailor-made for UPM's conditions," says Lindroos. "It ensures that there is no degradation when the sawdust pulp is added to the hardwood pulp."*



## NorskeCanada

*NorskeCanada's Powell River Division produces newsprint and hi-brite publication papers. Total output is 459,000 t/a of paper products, made primarily from high quality TMP.*

*NorskeCanada is the largest paper company in Western North America, the world's largest producer of directory papers, one of North America's leading producers of groundwood printing papers, and also operates the largest paper recycling facility in Western Canada.*

*It was formed from the roots of British Columbia Forest Products Limited, which was acquired by Fletcher Challenge and later (2000) by Norske Skog. Norske Skog also acquired Pacifica Papers, which was formed from the paper assets of MacMillan Bloedel. With the acquisition of Pacifica, the company assumed the new identity of NorskeCanada and*



*became a publicly-traded company, with Norske Skog today owning about one-third of the shares.*

*NorskeCanada operates four mills and one paper recycling division in British Columbia. Headquartered in Vancouver, total sales are about C\$ 1.6 billion.*

## Plates full of performance at Powell River

***For cost and efficiency reasons, NorskeCanada shut down the woodroom, groundwood mill, and kraft mill at Powell River. This put the spotlight directly on the TMP mill. Working with Andritz, the TMP mill was able to boost capacity and quality with no capital investments. The results are exceeding expectations.***

**NorskeCanada** operates four mills in British Columbia as well as Western Canada's largest paper recycling facility (see column at left). After acquisitions that formed the company in 2001, the mills (Crofton, Elk Falls, Port Alberni, and Powell River) underwent a program to avoid overlaps and exploit synergies.

efficiency," Jones says. "We had an urgent need to find new ways of doing things to remain competitive."

The focus at Powell River was on pulp supply. The kraft mill (vintage 1960's) was too small for cost-efficient production and was shut down.

Closed, too, were the woodroom and groundwood mill which were too costly to operate. The mill would now rely on purchased chips for its TMP mill, which was started in 1975.

Before the changes, Powell River's TMP mill produced an average of 650 t/d from five lines. When Jones asked what was the maximum that could be produced on a sustained basis, the answer came back, "810 tonnes per day."

"That's a bit short of the 950 tonnes per day our three paper machines consume when in full production," Jones thought. "We have to do more!"

"The TMP mill at Port Alberni (sister mill) was way ahead of

Murray Jones, now Director of Operational Excellence at Powell River, was at that time appointed "synergy champion" for manufacturing. "In 2002, I was part of the group responsible for improving our company's manufacturing

us in adopting new refiner plate designs," Jones says. "Compared to Port Alberni, we had a gap of 300 tonnes per day between our installed horsepower and what we were getting out of the TMP mill. That's the tonnage we needed."

"That was then,  
and this is now!"

"Ed Antolovich has a focused way of doing things that I admire," Jones says. "He is the main person, from my perspective, who took the challenge and made it work with his team."

When NorskeCanada was formed, Antolovich was named TMP Operations Specialist. When presented with the challenge of increasing TMP tonnage and quality, he moved his team into the same building (they called it the "Pod") so they could interact and review progress on a daily basis.

"We didn't have a real need to change before," Antolovich says, "because with the groundwood and kraft mills, TMP was putting out what it needed to. Also, with the closures, we lost our most experienced operators to retirement. This may have been a blessing. Experienced operators get into a comfort zone. They typically don't push the equipment to get the extra tonnage, for fear of plugging something or causing a breakdown.

"But, that was then, and this is now. It's as much about changing cultures as it is about changing equipment. Today, we hold our morning production meetings in the control room so our operators are completely involved."



**Partnership based on trust.** Ed Antolovich, TMP Operations Specialist (left), with Norm Webster, Western Regional Manager for Andritz Services.

### The TMP mill

The TMP mill consists of five lines. Lines #1 and #2 have Bauer\* 52-inch 485/489 Double Disc refiners of 1970's vintage. Lines #3 and #4 have Bauer B-60 counter-rotating Double Disc refiners from 1980. These are the only units of their kind in the world. Line #5, the newest, utilizes Sprout-Bauer\* Twin 60 refiners from 1987. The mill also has three Bauer Double Disc atmospheric reject refiners.

\* Bauer and Sprout-Bauer are tradenames of a company acquired by Andritz in 1990.

With no groundwood, TMP would have to replace and compensate for the 200 t/d of species-specific fiber used in Powell River's speciality papers. Since kraft would now be a purchased item, the replacement TMP had to be stronger and brighter to compensate. For cost reasons, the mill wanted to minimize kraft usage.

"So the task was clear," Antolovich says. "More tonnage, more strength, more brightness from TMP!"



**Gord Scott, Reliability Engineer (center) discusses details of refiner plate changes with Ed Westgate, Millwright (left) and Lyn Combs, Andritz Service Specialist (right).**

## The call to Andritz

"One of the early things we did was to sit down with Andritz," Antolovich explains. "We explained that we wanted it all — more tonnage, higher strength, cleaner pulp, maximum energy efficiency, and no loss in long fiber fraction. And we wanted it fast."

Norm Webster and Luc Gingras from Andritz/Durametal® became involved in January 2002 and quickly absorbed the challenge.

"We knew the mill was using 15-to 20-year-old plate designs with little previous incentive to change," says Webster, Western Regional Manager for Andritz Services. "Now, they were motivated to try new things."

Gingras, Product Development Director for Mechanical Pulping with Andritz agrees. "We became part of Ed's team to look at the overall TMP operation and make recommendations. They put their trust in us."

Andritz recommendations came in two areas: 1) general process and operational changes, and 2) a Durametal® refiner plate upgrade development program.

Powell River operated each of the five refiner lines with different freeness targets, ranging from 95 to 220 ml CSF at the secondary discharge. When a line went down for any reason, the quality of pulp would change dramatically.

Andritz suggested setting the freeness target for all lines at 135-150 ml CSF. This immediately stabilized the screen room and the long fiber fraction on all five lines, rather than having to depend upon Line #5 for most of the long fiber.

Next was to replace the old refiner plates with new Durametal® technology. Webster, Gingras, and others from Andritz met with the mill regularly over an 8-month period to develop a plate development program together, implement the changes, and monitor the results.



**Plates make a difference.** TMP Millwright Ed Westgate puts new Durametal® plates on Line #5.

## A leap of faith — no time for trials

"Typically, when you propose new plate designs to a mill, they order one set and run a trial," Gingras says. "Then, they may order another trial set and analyze the results before deciding to convert. This process can take months."

Not so at Powell River. "Durametal® has a great reputation and holds several patents," Antolovich says. "They gave recommendations for each plate position, we agreed, they manufactured the plates, and we ran them. What they recommended worked, and we didn't waste a lot of time."

## Finding the limits

"Our approach was to maximize refiner loads and total production by reducing the specific energy per tonne of pulp produced," Antolovich says. "We wanted to use all the energy available to us in the most efficient way possible."

Step-by-step, each production line was pushed to its production limit while staying in the pulp quality guidelines. Bottlenecks were eliminated. New attention was given to the online pulp quality monitoring system that had

been in the mill, but had not been relied upon. According to Randy Wagner, Process Control Specialist at Powell River, "We eliminated manual testing so the operators would rely on the online measurements."

Wagner reviewed key data to find the range of normal operating values. From this, he wrote predictive models so operators could adhere to a "90% of maximum" target for each production unit. The "90% of maximum" rule applies everywhere. For example, electric motors (with typical 15% reserve factors) are operated at 103% of capacity (90% of 115%).



**Running to the limits.** Randy Wagner, Process Control Specialist (standing), explains one his predictive software models to Bill Mayenburg, No. 2 TMP Operator.

"The stability of our refiners is probably the best in the company," Wagner says. "We max out the motors on Line #5 at 18 MW (15 MW motors) and yet the standard deviation of load swings is incredibly low. We have a very smooth operation."

"Our goal is to run our assets to the limits without breaking them," Wagner says.

## Production improved substantially

Durametal® engineers coupled new inner plate designs that promote stable chip and pulp feeding with outer plate designs that improve pulp quality.

"Once our operators got used to the new plates and realized they could push the refiners without blowing them up, we really ramped up," Antolovich says.

For Lines #1 and #2, the new Durametal® plate designs achieved an 8% production improvement and 7% improvement in tensile, along with the increase in freeness level. Specific energy was reduced an average of 300 kWh/t. "We push the line harder than we ever have and don't encounter twin screw feeder issues since the installation of the new plates," says Antolovich.

In 20 years of operation, Lines #3 and #4 never achieved full production capacity due to their sensitivity to vibration, which limited the maximum closing pressure that could be tolerated. New Durametal® plate designs stabilized the feeding of chips and the pulp and steam flows. This reduced motor load variations. Long fiber content increased from

20 to 30% leading to greater tensile indices (from 3817 to 4397 m).

"We took production on Line #5 from 300 to 380 tonnes per day, an increase of 26%, and lowered freeness from 220 to 145 ml CSF," Antolovich says. "Before, we couldn't load the refiners past 13-14 MW on the primary and 11-12 MW on the secondary. Now we run 18 MW on both. Our peak production has been 450 tonnes per day out of this line. Since we put in the new plates, we've never had to take the blowline down to clean it. We used to plug it on a regular basis, because of steam handling in the refiners."

## Can plates really make a difference?

According to Antolovich, "Once we proved to the operators that the Andritz refiners and Durametal® plates could take it, they began to push — and they haven't stopped since. The plates were the catalyst, but the culture change with the operators has made a huge difference.

"We had an event where we ran out of plates and had to put the old plates back in," Antolovich says, "and we went right back to where we were before. High freeness, poor fiber strength, poor operation, blowline plugs. So, these plates have made a tremendous difference for us.

"Overall TMP production increased 20% with a tougher species to pulp, requiring higher energy," says Antolovich. "We now use zero kraft on two of our machines. No new capital equipment was needed. That tells the story."

Find out more at [www.fiberspectrum.andritz.com](http://www.fiberspectrum.andritz.com)

**26% increase in production.** After installing new plate designs, Powell River took production on Line #5 from 300 to 380 t/d and lowered freeness from 220 to 145 ml CSF. Peak production has been 450 t/d out of this line.

## Plates for performance

*At Powell River, low energy/high performance refiner plates were employed. Durametal® inner plates that promote stable chip and pulp feeding were coupled with outer plates that improve pulp quality.*



*"Powell River began to see immediate advantages with the new plates," Norm Webster of Andritz says.*

*"Things like variable pitch and feed injectors began to pay off quickly."*

*"These designs are proven in mills," says Luc Gingras. "We add more bar edges to the plate by extending the outer plate diameter (overhung) and by making the bars thinner. This lowers the intensity of the refining. For better steam handling, we give the bars a small net pumping angle which moves pulp more quickly through the refining zone. This lowers energy requirements. The design is optimized to direct steam away from the pulp flow, leading to more stable motor loads."*



## A world's first at Yueyang

**China is the second largest producer of paper in the world. In order to satisfy domestic demand, it imports huge quantities of recycled paper and market pulp each year. Tiger Forest and Paper Group is a company that is developing its own sources of high quality fiber with the help of the world's first P-RC APMP pulping line and an Andritz woodyard.**

The Yueyang Paper Mill in Hunan province is situated on the shores of the Yangtze River, China's largest. The mill is rapidly becoming one of the most important in China, manufacturing a range of paper grades from high-yield fiber furnishes including annual crops.

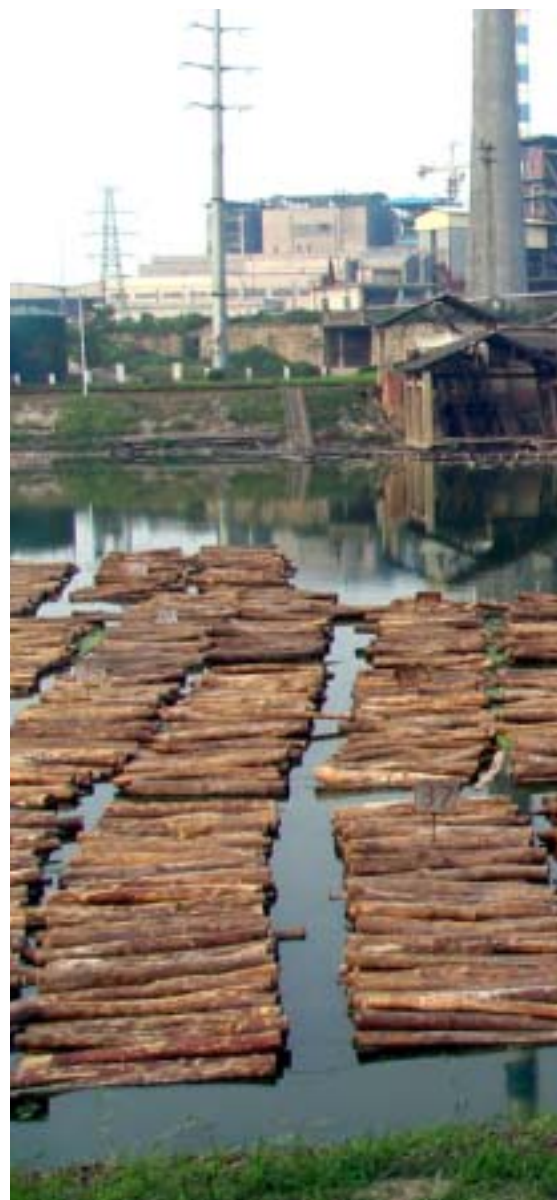
In 2003, the company installed a modern woodyard, the first of its kind in China, in order to supply its Andritz APMP pulping line and a new 100,000 t/a Andritz P-RC APMP pulping line.

### The attributes of a Tiger

The former Yueyang Paper is now operating under the new name of Tiger Forest and Paper Group. According to Group Vice General Manager and Chief Engineer, Mr. Zhang Dong Ji, "We believe our company embodies the attributes of the tiger, being very sensitive to its surroundings (the market and the environment). It is also strong and flexible, delivering the right product for emerging market demands."

Since the late 1980's, the company has been planting 500,000 Mu (33,000 ha) of trees for pulpwood. Species include slash pine, loblolly pine, and poplar. These plantations can be seen on either side of the six-lane highway that runs from Guangdong to Beijing passing through the Hunan capital on its way north. Yueyang is the province's third largest city with excellent connections by road, rail, and river to the rest of China.

**Mr. Zhang Dong Ji, Vice General Manager and Chief Engineer of the Tiger Forest and Paper Group.**



### "Putting something back"

In talking with Mr. Zhang Dong Ji, you very quickly become aware that he is a paper industry enthusiast. He talks freely about his company's pulp and paper-making capabilities and his own personal plans for the future development of paper and board production in Hunan.

"In the past, our industry in China consumed raw materials that we purchased on the open market," Mr. Zhang Dong Ji says. "We recognize that we have to operate sustainably, putting something back and not just taking





*The Yueyang Paper Mill is situated on the shores of China's largest river, the Yangtze, in the province of Hunan. Shown here are incoming logs to be debarked and chipped in the Andritz-supplied woodyard.*

process enables Chinese mills to get the most benefit from precious plantation resources.

At present, locally grown poplar is used for various end products including newsprint, LWC, and printing/writing grades. The poplar originally came from Italy and grows very rapidly. The region around Yueyang has good fertile soil, an annual rainfall of 1200-1400 mm, and strong sunshine. Winter lasts from November to March, but temperatures seldom fall below freezing. This results in a tree diameter of 20 cm at chest height within five years, when the first commercial cut can be carried out.

Yueyang's woodyard includes an Andritz dry debarking-chipping line. Logs are fed through the debarking drum and then to the Andritz HQ-Chipper™. The chipper is gravity-fed and has a capacity of 105 m<sup>3</sup> sub/h. According to the mill, it produces homogeneous chips. The chips are screened with an Andritz CS-type screen and conveyed to the storage silo, which uses a CenterScrew™ slewing screw reclaimer.

"The Andritz woodyard equipment has run perfectly from the very beginning," Mr. Zhang Dong Ji says. "It gives us the necessary chip quality for the pulping process."

away from the environment. Three years ago, we extended our sourcing to include the plantations that we have nurtured in surrounding areas."

The selection of advanced mechanical pulping technology fits also into the sustainability picture, Mr. Zhang Dong Ji notes. The higher yields of mechanical pulping systems compared to chemical pulping systems and the flexibility of the



**The Andritz dry debarking drum at the Yueyang Mill.**

## The P-RC APMP process

*The process consists of mild temperature Preconditioning (P) of alkaline peroxide treated chips and Refiner Chemical treatment (RC) to carry out some of the bleaching reaction. The main difference between P-RC and traditional APMP is that the P-RC process has a High Consistency (HC) retention tower after the primary refiner. This makes it possible to do more Refiner Chemical treatment for better optical qualities of the pulp and to better utilize the residual chemicals for brightness.*

*With its inter-stage HC tower, the P-RC APMP process has more flexibility in controlling pulp property development. It can even be run like conventional APMP by changing the process conditions for the chemical reactions prior to refining. With low chemical applications, the process can develop properties close to SGW pulps; with more chemicals, the process is able to produce pulp similar in tensile to most hardwood BCTMP pulps at a lower specific refining energy input.*



*One of the Andritz refiners utilized in the P-RC APMP pulping process.*

### First there was APMP

The first Andritz mechanical pulping line at Yueyang was installed in 1995. The line is based on Alkaline Peroxide Mechanical Pulping (APMP) technology and produces 200-220 CSF pulp for the mill's offset book paper production at a today's production rate of 120 t/d.

Mechanical pulping of high-density hardwoods requires some degree of chemical pretreatment to develop high-strength properties and reduce energy consumption.

There are several choices in pretreatment processes, but alkaline peroxide is a preferred method for the locally planted poplar by Yueyang.

In addition to the APMP line, there is a batch kraft pulp line with a capacity of 130 t/d and a line that produces 120 t/d

of kraft pulp from reeds. Also, the mill has a traditional groundwood line producing 70 t/d and a new 400 t/d DIP line installed last year to supply the new PM8 paper machine.



*Andritz Disc Filter, MicraSieve screens, and Screw Press in operation on the P-RC APMP pulping line at Yueyang.*

Then a world's first — P-RC APMP

The APMP process completes most, or all, of the chemical treatment before refining. Often, this places some limitations in opacity and light scattering ability. The Yueyang Mill was the first in the world to install the new Andritz P-RC APMP technology, which maximizes chemical and mechanical efficiency in developing the optical properties of the pulp.

"Andritz first introduced APMP into China in 1989 and this new P-RC line is the first installation of its kind in the world," says Mr. Zhang Dong Ji. "Now we see many other mills following our example."

The P-RC APMP line at Yuyang produces pulp with 90-100 CSF freeness for the production of LWC grades. It is designed for 300 t/d production. Andritz provided, among other parts, primary and secondary refiners, two low-consistency post refiners, and one reject refiner. "The new P-RC APMP technology is working very well," says Mr. Zhang Dong Ji. "It has already exceeded its design production of 300 tonnes per day since starting up in September 2003



**Mr. Liu Zhenghong, Director and Engineer of Yueyang's APMP plant (left) with Ms. Li Tiehong, Andritz Service Manager near the Yangtze River.**

and has reached all guarantee values and quality targets."

Mr. Zhang Dong Ji says that, "The P-RC APMP process has resulted in our mak-

ing a product with an average brightness of 80 ISO, sometimes reaching 85, for LWC and printing/writing grades, depending on wood species being used."

Production of APMP short fiber from this line accounts for about 45% of the pulp for Yueyang's LWC grades (58, 60, 64, 70, and 80 g/m<sup>2</sup>). "We are moving towards 54 g/m<sup>2</sup> and our target is 48 g/m<sup>2</sup>," Mr. Zhang Dong Ji says.

Slush pulp from the P-RC APMP is mixed with market pulp from Canada and a proportion of DIP (20-40% depending on grade) to provide the furnish for PM8.

### Long relationship with Andritz

"We have a long relationship with Andritz and we have done a lot of trials

at their R&D facility in Springfield, Ohio (USA)," says Mr. Zhang Dong Ji. Logs were even sent from Yueyang plantations to Springfield for trials.

"Trials proved that the Andritz technology would enable us to reduce chemical consumption by some 20% and still achieve the quality we wanted," Mr. Zhang Dong Ji says. "The Andritz team and our engineers work very closely together. The service we received during start-up and optimization was very good. We are satisfied with the quality of the engineering and if there are any problems Andritz has been quick to come up with solutions. They are very good at problem-solving and we could not ask for more."

Find out more at [www.fiberspectrum.andritz.com](http://www.fiberspectrum.andritz.com)

### *Tiger Forest and Paper*

*(formerly Yueyang Paper) is a state-owned shareholding company that was established in the year 2000. The company was issued ISO 9002 certification in 2000, and has since been awarded a number of National Quality and Environmental accolades. It also won a product quality award for its Yueyang Tower 49 g/m<sup>2</sup> offset newsprint brand.*

*In addition to the Yueyang mill's four machines producing 132,000 t/a, production was increased through the start-up in July 2003 of the new PM8. This machine is capable of producing either 580 t/d of high quality newsprint or 715 t/d of LWC grades.*

*Mr. Zhang Dong Ji said that it was planned to*

*increase the capacity of the mill to about 600,000 t/a by 2007. "We would like to get into the liquid packaging board business, but this is for future development. The Tiger Forest and Paper Group has four mills in the Hunan province of which Yueyang is the largest. We are planning on expanding the Yuan Jiang Paper mill. The project is expected to add some 100,000 tonnes per year in capacity."*



## Breathing new life into **Kingsport**

***Weyerhaeuser rebuilt its Kingsport mill essentially "from the ground up." A gleaming new continuous fiberline from Andritz started up in August 2003. This, and a new paper machine, make Kingsport a world benchmark for low cost free-sheet production. "It's as technologically advanced as any in the world," says the fiberline manager.***

Kingsport is like a lot of small towns in America. Perhaps prettier than most, due to the surrounding Appalachian and Great Smoky Mountains. Also unique in another way — it has a large, yet virtually odor-free, pulp and paper mill near its town center.

The mill, an important part of Kingsport's economy, was once owned by Mead, later Willamette, and, through acquisition, now Weyerhaeuser. Weyerhaeuser, one of the world's largest integrated forest products companies, recently completed a major modernization that, according to all concerned, "rebuilt the mill from the ground up."

A great deal of pride surrounds the "new" mill. The construction project logged 6.2 million work hours without a lost-time accident. It was completed on time, on budget. And, Weyerhaeuser's investment breathed new life — and a stable future — into the mill.

The Kingsport story is one of hard-working employees "managing enormous change," according to Jeff Chamberlin, Fiberline Department Manager. "It is also a story of becoming one of the world's lowest cost free-sheet producers with a fiber-



*"I have a lot of respect for the people who work here." Jeff Chamberlin, Fiberline Department Manager, has seen the Kingsport workforce go through significant change. "They have a great work ethic. They care about what they do. They have experience, maturity, and good sense. We started up this new pulp mill without a single lost-time injury — and that is really amazing."*

line that is as technologically advanced as any in the world."

But, the story might have had a much different ending.





*Weyerhaeuser's Kingsport, TN mill is near the center of town, adjacent to the South Holston River. Local citizens appreciate the virtually odor-free pulping process.*

### The old batch mill

Not so long ago, things at Kingsport were not nearly as positive. The mill, operating since 1916, began to see hard times in the mid-1990's. Employees and the community knew that the mill might be closed any day.

"If you go through the old pulp mill, you'll see six ancient batch digesters with manual capping valves," Chamberlin says. "There were panels where operators had to turn dials to manually adjust the speed of a washer. Before they replaced the recovery unit, Kingsport had one of the oldest operating Tomlinson recovery furnaces (circa 1948) in the world."

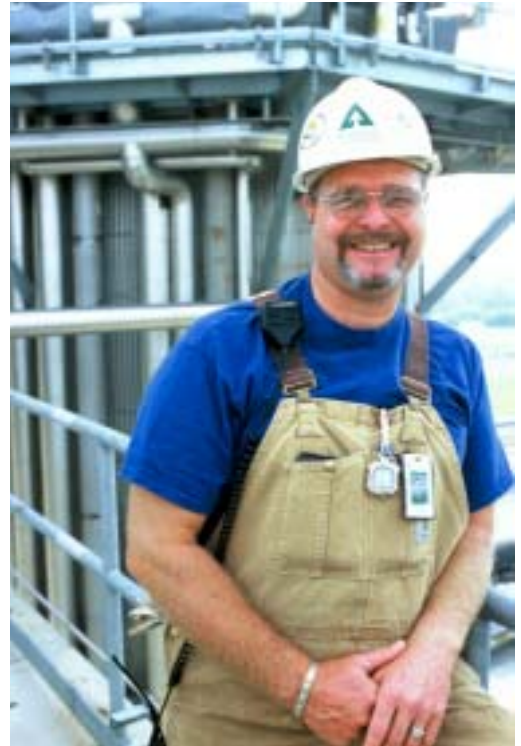
Enter Willamette Industries in 1995 when they purchased the mill from Mead. Chamberlin, a Willamette veteran, explains, "The strategy was to breathe new life into the mill with strategic investments."

Willamette began by making modest improvements. Then, in 2002, it announced its decision to invest nearly \$500 million to bring the mill in line with its other low-cost and environmentally sound mills.

### A pause — and renewed commitment

In November 2000, Weyerhaeuser made a bid to acquire Willamette Industries. There was considerable concern in Kingsport. Where did the mill fit into the new owner's future plans? Would the investment at Kingsport be cancelled? Everyone knew that, without modernization to make the mill competitive again, there was little hope for the future.

Thankfully, Weyerhaeuser strongly



*"We've come a long way." Scott Tipton, Fiberline Shift Supervisor, has worked at the mill for 16 years. "I started here in the labor pool providing help wherever needed. I've done most of the jobs in the old pulp mill — digester, brownstock, bleach plant. It was exhausting work. Then I became a foreman. It was tough to keep the old mill running while they were building the new fiberline, but we did a good job. When the transition came to the new mill, it was very smooth. The continuous digester was completely foreign to me. The DD Washers just run. The equipment and the technology are just great."*

supported the investment decision — maintaining that Kingsport positions the company to capture and hold domestic market share even against imports from low-cost centers such as Brazil and Indonesia.

### Responding to challenges

Chamberlin came to Kingsport from Willamette's "Marlboro" (Bennettsville, South Carolina) mill in December 2002 when the fiberline project was in early stages of construction. "When I got here," he says, "it was tough with limited manpower to keep the old mill running.

"At the same time, we were trying to get everyone trained to run the new mill.

"I really respect the people who work here. They have gone through an awful lot. I've seen how well they respond to challenges and stress. We have one of the oldest average age workforces within the Weyerhaeuser system — about 56 years old. All of a sudden, they had to grasp all this new technology. And, they had to do it while keeping the old mill running up until the final minutes before the switchover."

### A safe project, on budget, ahead of schedule

Over the years, Willamette earned a reputation as a builder of low-cost, efficient mills by managing projects with internal resources rather than outside engineers and construction firms. This capability transferred seamlessly to Weyerhaeuser.

Design and engineering for Kingsport were provided by Weyerhaeuser Engineering Services (WES), with help from its construction management group. According to Howard Irwin, Area Construction Manager at the time, there were 1800 workers on site at the project's peak. The project broke ground in July 2000 and was completed in four phases.

The woodyard was relocated and upgraded first. The new paper machine started up in August 2002. A new recovery boiler started up in October 2002. A lime kiln (relocated from another mill) and recausticizing equipment started in May 2003. And, the new Andritz bleached hardwood fiberline and rebuilt ClO<sub>2</sub> plant, started up August 7, 2003 — two weeks ahead of schedule.

"By the time we got to the fiberline, we had tuned ourselves up very well," Irwin says. "We picked the best subcontractors and labor."

Although the equipment it uses is the same as that in a kraft pulping and



*"An experience I'll value forever." John Sanders, Assistant Fiberline Manager, (right) with Tyson Hunt, Andritz Product Manager.*



*Drum Displacers at work. Danny Webb, Fiberline Operator I, in front of the Andritz interstage DD Washers in the bleach plant.*

bleaching process, Kingsport's adaptation of the cooking technology is one of the industry's first and is thought to be the only one of its kind in North America. "The chemistry enables us to be different and better," says John Sanders, Assistant Fiberline Manager.

"From day one of my career, I always wanted to go through a start-up and see everything from breaking ground to the finished plant," says Sanders. "We all were aware of the time commitment required during a project of this magnitude. Basically, we were all working 80- and 90-hour weeks for a year leading up to start-up. We had heard horror stories from other mills about this continuing for months after start-up. But, that didn't happen here. Things went that smoothly.

"The plan was to keep the old mill running until the new fiberline could consistently make 400 t/d. We tried to prepare ourselves for having half the crew in the old mill and half the crew in the new mill. In the end, we knew we could not staff both mills. So we shut down the old mill and immediately came over and started the new fiberline. And, we never looked back."

Sanders was impressed with the teamwork. "The Andritz guys we worked with on this project were very knowledgeable and focused on our success," Sanders says. "I don't think we would have started up on time if it wasn't for them working as hard as they did. They pushed us and did an excellent job.

"This start-up is an experience that I will value forever."

## The hardwood fiberline

The hardwood fiberline has a design capacity of 925 adst/d. The digester uses single-vessel hydraulic cooking technology. There are control strategies to compensate for the fact that lignin removal is not as aggressive with Kingsport's cooking chemistry.

The chip feeding system is based upon Andritz TurboFeed® technology (see box to right). A Diamondback® chip bin is used for uniformly pre-steaming the chips.

The screen room consists of a primary knotter close-coupled to three stages of screening and one high-density cleaning stage. Knots and rejects are washed of good fiber before removal from the fiberline system. Accepts from the primary screens are sent to a pre-thickener and washed in a two-stage DD Washer before moving to a two-stage oxygen delignification system. Another two-stage DD Washer performs post oxygen washing before the bleach plant. The three-stage bleach plant also uses DD Washers for interstage and final pulp washing.

"The differences between the old mill's pulp and our current pulp is that now it's cleaner and around one point brighter," Sanders says. "The fiberline produces a strong fiber that mixes well with the softwood kraft pulp used in the paper machine's furnish."

## Feedback from the paper mill

"I talk with the paper machine people every day," Chamberlin says. "That's a big part of my job. The new paper machine has not produced a single ton of off-spec paper that could be attributed to pulp mill quality."

The new paper machine, dubbed K-1 by the mill, replaced three older paper machines and started up in August 2002. It produces uncoated free-sheet in a variety of roll sizes, brightness, basis weights, and recycle contents.

"This machine has the potential to be the flagship of Weyerhaeuser," Chamberlin says. "It has tremendous availability and efficiency. Its production is already among the highest in the company. Our pulp is certainly a factor in its success."

## Turbo-ized chip feeding.

*Weyerhaeuser Company's linerboard mill in Albany, Oregon was the first in the world to install the revolutionary new chip feeding system for continuous digesters — the Andritz TurboFeed® system.*



*TurboFeed® transfers chips from the chipmeter directly to the top of the digester using specially designed pumps instead of the traditional High Pressure Feeder (HPF). Based upon the success at Albany, the Kingsport mill installed a TurboFeed® system, with three chip pumps in line.*

*"I was very skeptical when they told me it would pump chips all the way up to top of that digester." says Scott Tipton, who many years ago was the chip filler for the old batch digesters at Kingsport. "I'm a believer now. They pump with no problem."*

*By eliminating the HPF and other equipment, mills obtain significant savings in capital, installation, operating, and maintenance costs. Recently, mills in Brazil and Chile have also ordered TurboFeed® systems — including the world's largest single-line continuous cooking plant (3000 t/d capacity).*



The Andritz fiberline at Kingsport is designed for 925 adst/d of bleached stock. It consists of an Andritz Lo-Solids® continuous digester, screen room with post-screen Drum Displacer™ (DD) Washers, a three-stage bleach plant with interstage DD washing, and a two-reactor oxygen delignification system with post-oxygen DD washing.

## Improving every month

After the start-up, Kingsport is focusing on three areas: workplace safety, continually looking for ways to lower manufacturing costs, and employee training.

"Our product quality is improving every month," Chamberlin says. "We're now in the middle of step-up training (one or two job levels up) so employees can relieve each other for days off and vacations. We're about to embark on the SafeStart™ program, which is a common sense approach to safety using behavior-based techniques.

## "A great pulp mill"

What is Chamberlin's view of the fiberline start-up? "Water in, liquor in, chips in, and we were making on-grade pulp. We have never sent any off-grade pulp to the paper machine."

Weyerhaeuser believes it has technical advantages in the Kingsport fiberline. To do this, they took some calculated risks with regard to the equipment, according to Chamberlin. "For example, we helped work out the nuts and bolts of the TurboFeed® system that had only been installed in one other mill in the world. The risks we took are paying off in terms of dollars for our shareholders.

"This is a great pulp mill," he continues. "It's high quality. Strength, cleanliness, bleachability, brightness, and yield are right where we need them to be. It's environmentally sound. BOD on a per-ton basis is less than half of the previous operation. It's extremely reliable. We just went one month with zero downtime — no shorts, no breaks, no trips, no equipment failures. It's amazingly flexible. We can speed up and slow down as needed to match production of the paper mill."

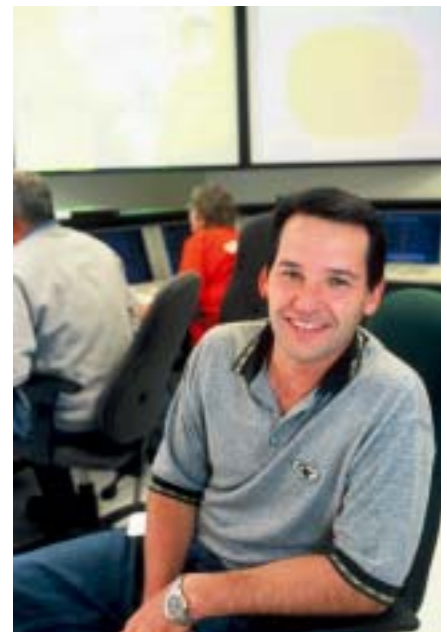
And, it has room to grow. "Within three or four months from start-up we were running for days at a time at 100% of design capacity," Chamberlin says, adding, "we can run 15% above design and I know we can go higher if needed."

## Raising the bar

"This is undoubtedly one of the most automated pulp mills in the world," says Steve Turner, Fiberline Process Control Specialist. "We have lots of instrumentation and the most automated start-up sequences for operators that I have ever seen."

Turner thinks that Kingsport has "raised the bar on the level of automation.

"There is a lot of flexibility built into this digester, so we are able to try different control strategies," he says. "We've really taken the load off the operators when it comes to tasks like sequencing the start of equipment. Most of the operators had never used a DCS before. Now they can concentrate on production and quality, and not on being computer experts. The computer is fast, consistent, and keeps the processes stable. Stability means higher quality at lower costs."



**"This is one of the most automated fiberlines in the world."** Steve Turner, Fiberline Process Control Specialist in the pulp mill control room at Kingsport.

"This whole project with Andritz was excellent. Whenever there was a technical issue, there was always a knowledgeable resource at Andritz willing to help. There was never a point where we raised our voices. We went through this together. The project team and start-up experts from Andritz were the best."

Find out more at [www.fiberspectrum.andritz.com](http://www.fiberspectrum.andritz.com)



## Sun Paper — The rising sun in China

*Shandong Sun Paper is one of the largest privately-owned paper companies in China. It has 17 paper machines at its mill in Yanzhou City, with a total capacity of one million tonnes per year. Its newest machine depends upon an Andritz stock preparation system, the first of its kind in China.*



*Sun Paper's mill near Yanzhou City produces over one million tonnes of paper and board products a year.*

Shandong Sun Paper Industry started manufacturing paper 22 years ago with a single machine producing 1 t/d. It was a second-hand machine and the proprietor, Mr. Li, was not permitted to purchase new machine clothing. So he used off-cuts from the State-run mills.

At the Sun Paper mill in Yanzhou City (two hours drive south of Jinan, the capital of Shandong province), total paper capacity is today over 1,000,000 t/a. According to Deputy General Manager and Chief Engineer, Mr. Ying Guang Dong, five machines (700,000 t/a capacity) make coated board grades. Three machines produce coated duplex board, with a top layer of 100% virgin fiber and the other layers from recycled fiber. The other two machines make folding boxboard.

The rest of the mill produces printing and writing papers. The new PM19, started up in August 2004, has a capacity of 200,000 t/a. A new finishing line will be started up in August 2005.

Andritz supplied the stock preparation system for PM19, the first complete Andritz stock prep line in China. This system features new Andritz Papillon™ cylindrical refiners, a thick stock screening plant, and a complete machine approach system for maximum deaeration and final cleaning of the stock, as well as a CD profiling water system.

"We installed the Andritz Papillon™ refiners in our new line at Yanzhou based upon our successful experience with them at the Guangdong Mill," says Mr. Ying Guang Dong.

## Experience gained at Guangdong Mill

The Guangdong Mill, a private joint venture with a local family, produces board products. Papillon™ refiners are utilized for refining the bleached hardwood (LBKP) and softwood (NBKP) furnish. Andritz also delivered the pulpers, deflakers, broke handling, and board machine approach systems for all four plies.

"It is the experience we gained from this stock preparation equipment that prompted us to go with Andritz on the present project," Mr. Ying Guang Dong explains.

Mr. Ying Guang Dong has been in the industry for 20 years, and was trained as a paper engineer. He has been a Project Engineer on seven new paper machines in the past five years. He has also been involved in a number of rebuilds. He spent 15 years at the Ningbo mill and the last five years with Sun Paper.

## Stock preparation at Yanzhou

Andritz FibreSolve™ pulpers and Papillon™ refiners at Yanzhou are preparing stock for three different furnishes:

- BCTMP — 100 admt/d capacity
- NBKP — 200 admt/d capacity
- LBKP — 300 admt/d capacity

## Shandong Sun Paper

**Sun Paper has its own plantations in the Shandong province planting a species of poplar very similar to the aspen found in Canada. "We are planting some 4000 hectare per year and find that we are able to start some commercial harvesting after only five years," Mr. Ying Guang Dong says.**

**The mill location in Yanzhou City accords it excellent logistics capabilities. A large quantity of goods, including wood, market pulp, and paper reels, is transferred by water.**

**Shandong Sun Paper is considering a project that would necessitate an investment of about US \$123 million to produce coated paper and board grades, including liquid packaging board.**



**Papillon™ cylindrical refiner for the NBKP line (200 admt/d).**



**Thick stock screening system (0.15 mm slotted baskets) at Yanzhou.**



**Andritz TC-133 cleaner plant.**



*Capacity would be 600 t/d or just over 200,000 t/a. The company is looking into the possibility of setting up a joint venture with an overseas partner.*

*Shandong province in Eastern China has a history of more than 5000 years. It is considered to be one of the significant birthplaces of Chinese civilization and, of course, it was Chinese civilization that invent-*

*ed paper close to 2000 years ago. Shandong has also been the home of a large number of historical figures, whose important influences are still evident in contemporary China. Confucius, the great thinker and statesman, was born in Shandong. His teachings are a pillar of Chinese culture and have exerted great influence around the world.*



**Jouko Hepola of Andritz (right) with Sun Paper operators.**

There is also an Andritz thick stock screening system utilizing ModuScreen™ F pressure screens with 0.15 mm slotted baskets, rated at 650 adm/d.

White water fiber recovery is accomplished with an Andritz disc filter.

The machine approach system consists of a five-stage cleaning plant, a Multi-Retention Dual Deculator® for complete deaeration, and ModuScreen™ HB headbox screens. A FibreSolve™ broke pulper is utilized under the machine.

"The screening and thick stock cleaning system supplied by Andritz is working very well," says Mr. Ying Guang Dong. "We are pleased to the extent we have ordered four additional systems."

### Papillon™ cylindrical refining

"The Papillon™ refiners were chosen because of their advanced technology and very largely because of their lower energy consumption," says Mr. Ying Guang Dong. "We find that the tear and burst strength of the pulp is an improvement over conventional refining."

The unique cylindrical refiner, Papillon™, combines gentle and stable fiber treatment and extremely low energy consumption. It efficiently applies power to gently refine and develop the fiber. With its small diameter in the refining area, it is much more energy-efficient than conventional designs.



**The Multi-Retention Dual Deculator® for stock deaeration on PM19.**

Find out more at [www.fiberspectrum.andritz.com](http://www.fiberspectrum.andritz.com)

# New Orders

## Wood Processing

### Complete Lines & Systems

**Celulosa Arauco y Constitución  
Itata, Chile**  
Complete Wood Processing System with two  
Debarking Lines

**Shandong Huatai Paper  
Dongying, Shandong, China**  
Woodyard for BCTMP

**Jiaozuo Ruifeng Forest & Paper  
Henan, China**  
Woodyard Equipment for APMP

**Xinxiang Xinya Group  
Xinxiang, Henan, China**  
Woodyard Equipment for TMP

**Sichuan Guodong Construction  
Sichuan, China**  
Woodyard Equipment for MDF

**Estonian Cell  
Kunda, Estonia**  
Woodyard

**Klabin, Monte Alegre  
Telémaco Borba, Paraná, Brazil**  
Chipping Line

**JSC Arkhangelsk  
Arkhangelsk, Russia**  
Woodroom

**Weyerhaeuser  
Oglethorpe, GA, USA**  
Circular Crane and Drum-Chipping Line

### Key Equipment

**Slocan Forest Products  
Fort St. John, British Columbia, Canada**  
2 Portal Cranes

### Upgrades & Modernizations

**Stora Enso Port Hawkesbury  
Port Hawkesbury, Nova Scotia, Canada**  
De-Icing Deck

**Södra Cell Tofte  
Tofte, Norway**  
New Chipping Line with HHQ-Chipper™

**Langboard  
Quitman, GA, USA**  
Crane Refurbish and Rebuild

**Weyerhaeuser  
New Bern, NC, USA**  
Pre-Steamer Bin Upgrade

**Weyerhaeuser  
Port Wentworth, GA, USA**  
Pre-Steamer Bin Upgrade

## Fiberline

### Complete Lines & Systems

**CMPC Celulosa  
Santa Fe, Chile**  
Complete EPC 2405 t/d Fiberline

**CMPC Celulosa  
Laja, Chile**  
Oxygen Delignification System

### Key Equipment

**LWARCELL  
Lençois Paulista, Brazil**  
Main Equipment for Washing, Screening, and  
Bleaching

## Recovery

### Complete Lines & Systems

**Portucel  
Cacia, Portugal**  
Recovery Boiler

**Weyerhaeuser  
Valliant, OK, USA**  
Recovery Boiler

**Kondopoga Newsprint Mill  
Kondopoga, Russia**  
TMP Heat Recovery

**CMPC Celulosa  
Santa Fe, Chile**  
Recovery Boiler

**SCA Graphic Sundsvall  
Östrand Pulp Mill, Sweden**  
Recovery Boiler  
*High Energy Recovery Boiler (HERB)*

### Key Equipment

**Zellstoff Pöls  
Pöls, Austria**  
Condensate Stripping System

### Upgrades & Modernizations

**Phoenix P&P  
Khoen Kaen, Thailand**  
Evaporator Upgrade

**Canfor  
Prince George, British Columbia, Canada**  
Recovery Boiler Upgrade

**Mondi Kraft  
Richards Bay, South Africa**  
NCG System Upgrade

**Frantschach  
Steti, Czech Republic**  
Evaporator Upgrade

**Kappa Kraft  
Piteå, Sweden**  
Evaporator Upgrade

**Metsä-Botnia  
Kaskinen, Finland**  
Recovery Boiler Upgrade

**VCP  
Luiz Antonio, Brazil**  
Recovery Boiler and Evaporator Upgrade

## Chemical Systems

### Complete Lines & Systems

**CMPC Celulosa  
Santa Fe, Chile**  
Complete White Liquor Plant  
(Recausticizing Plant and Lime Kiln)

**Celulosa Arauco y Constitución  
Itata, Chile**  
Complete White Liquor Plant  
(Recausticizing Plant and Lime Kiln)  
*Repeat order*

**Irving Pulp and Paper  
New Brunswick, Canada**  
Complete White Liquor Plant  
(Recausticizing Plant and Lime Kiln)  
*First LMD lime kiln in Canada*

**Grasim Harihar  
India**  
Lime Kiln

### Key Equipment

**Georgia-Pacific  
Palatka, FL, USA**  
StiroX™ White Liquor Oxidation

**Södra Cell  
Mörum, Sweden**  
X-Filters™

### Upgrades & Modernizations

**Metsä-Botnia  
Kaskinen, Finland**  
Sector Cooler

**Stora Billerud  
Skärblacka, Sweden**  
Lime Kiln Modernization

## Pulp Drying & Finishing

### Complete Lines & Systems

**CMPC Celulosa  
Santa Fe, Chile**  
Pulp Drying Plant  
*EPC single-line drying machine*

**Estonian Cell  
Kunda, Estonia**  
Baling Line and Flash Dryer

**Pavatex  
Cham, Switzerland**  
Fiberboard Plant, Twin Wire Technology

**M-real  
Kaskinen, Finland**  
Flash Dryer  
*Most efficient flash dryer system*

### Key Equipment

**Hainan Changxiang Trading  
Hainan, China**  
Steam Box  
*Production increase for world's largest  
single-line drying machine (Andritz)*

**Aracruz Celulose  
Aracruz, Brazil**  
Bale Tying Machine

### Upgrades & Modernizations

**Veracel Celulose  
Vitoria, Brazil**  
Dryer Production Upgrade

## Mechanical Pulping

### Complete Lines & Systems

**Shandong Zhongmao Pulp**  
Shandong, China  
P-RC APMP System

**Jiaozuo Ruifeng Forest & Paper**  
Henan, China  
P-RC APMP System

**M-real**  
Kaskinen, Finland  
BCTMP Plant

**Estonian Cell**  
Kunda, Estonia  
P-RC APMP System

**Ningxia Meili Paper Industry**  
Ningxia, China  
P-RC APMP System

**Xinxiang Xinya Group**  
Xinxiang, Henan, China  
P-RC APMP System

**Kondopoga Newsprint Mill**  
Kondopoga, Russia  
RTS-TMP System

**Norske Skog Walsum**  
Duisburg, Germany  
RTS-TMP Line

**Bowater**  
Calhoun, TN, USA  
Reject Refining

### Key Equipment

**Södra Cell Folla**  
Follafoss, Norway  
Chip Washing

**Dunaujvarosi Cellulozgyar**  
Dunaujvaros, Hungary  
Cantilevered Pressurized Single Disc Refiner

**M-real**  
Metsä, Finland  
Mixer, HC-Discharge System, and Bottom for HC-Tower

**Holmen Paper**  
Vargön, Sweden  
Reject Thickening and Bleach Plant Equipment

**Norske Skog Paper Mills Albury**  
Lavington, Australia  
Screw Press

**Weyerhaeuser**  
Springfield, OR, USA  
Blowline Refining

**Georgia-Pacific**  
Clatskanie, OR, USA  
MSD Impressafiner

### Upgrades & Modernizations

**Holmen Paper Braviken**  
Norrköping, Sweden  
Extension of TMP System

**UPM-Kymmene Papier**  
Schongau, Germany  
TMP Upgrade Screening

**Norske Skog Golbey**  
Golbey, France  
Rebuild of TMP System to RTS

**Norske Skog Pisa**  
Jaguariaiva, Parana, Brazil  
3<sup>rd</sup> Stage TMP Refining

## Panelboard

### Complete Lines & Systems

**Heze Chenming Panels**  
Shandong, China  
Pressurized Refining System

**Jiu Ke Song WBP**  
Hubei, China  
Pressurized Refining System  
*2<sup>nd</sup> line*

**Qihe Chenming Panels**  
Shandong, China  
Pressurized Refining System  
*2<sup>nd</sup> line*

**Feicheng Zhonglu Industry**  
Shandong, China  
Pressurized Refining System

**Hubei Baoyuan Group**  
Hubei, China  
Pressurized Refining System

**Shandong Qixing Panel Board**  
Shandong, China  
Pressurized Refining System

**M. Kaindl**  
Wals, Austria  
Pressurized Refining System  
*2<sup>nd</sup> line*

### Upgrades & Modernizations

**Kronospan PL**  
Szczecinek, Poland  
Refiner Rebuild

## Fiber Preparation

### Complete Lines & Systems

**World Waste Technologies**  
Anaheim, CA, USA  
Complete Cellulose Recovery System  
*Unique and patented system to recover aluminum, plastics, and cellulose (fiber) from municipal solid waste to dramatically reduce amount going to landfill*

**Shandong Huatai Paper**  
Dongying, Shandong, China  
Pulping and Sludge Dewatering System

**Shandong Huatai Paper**  
Dongying, Shandong, China  
Complete PM Approach, Saveall Disc Filter, Thick Stock Screening  
*World's largest disc filter with a diameter of 5.7 m and with 38 discs, and world's largest thick stock screening plant for 1400 t/d*

**Thüringer Hygienepapier**  
Wernshausen, Germany  
Complete Stock Preparation for Tissue Machine

**Shandong Hengan Paper**  
Weifang, Shandong, China  
Complete Stock Preparation / PMA for Tissue Machine

**ICT Iberica**  
Pozuelo de Alarcón, Spain  
Stock Preparation for Tissue Machine

**Al Sindian Paper Mill (Nuqul Group)**  
Giza, Egypt  
Complete Stock Preparation for Tissue Machine

### Key Equipment

**Smurfit-Stone Container**  
Bathurst, Quebec, Canada  
Coarse Screening System  
*World's largest recycler selects unique technology to simplify mill flows and reduce energy costs*

**Norampac**  
Cabano, Quebec, Canada  
TwinFlo™ Refiner

**Georgia-Pacific Hellas**  
St. Stefanos, Greece  
TwinFlo™ Refiner

**Nordland Papier**  
Dörpen, Germany  
Papillon™ Refiner  
*Largest Papillon™ refiner installed*

**Pfleiderer Teisnach**  
Teisnach, Germany  
Papillon™ Refiner

**Norske Skog Bruck**  
Bruck/Mur, Austria  
Papillon™ Refiner



*World's largest disperser and screw press at UPM-Kymmene (UK) Shotton Paper*

**M-real Stockstadt**  
Stockstadt, Germany  
FibreSolve™ Pulper

**Thai Paper**  
Ratchaburi, Thailand  
FibreSolve™ Pulper, TwinFlo™ Refiner

**Mondi Fine Paper, Merebank Mill**  
Merebank, Durban, South Africa  
FibreSolve™ Pulper

**De Eendracht Karton**  
Appingedam, Netherlands  
PM Approach for Board Machine and Key Components for 5 Stock Preparation Lines

**Holmen Paper, Papelera Peninsular**  
Fuenlabrada (Madrid), Spain  
FibreFlow™ Drum Pulper, Pulp Screw Presses, Sludge Screw Presses, PM Approach

**UPM-Kymmene**  
Kaipola Mill, Finland  
DIP Line, Coarse and Fine Screening, Dewatering  
*Andritz is a major supplier for UPM Kaipola DIP 100 project.*

**Norske Skog Industry**  
Albury, Australia  
PM Approach

**Daehan Paper**  
Chungbuk, South Korea  
Conveyors and FibreFlow® Drum Pulper

**Cartiera del Polesine**  
Favaro Veneto, Italy  
OCC Screening System

## Tissue Machines

### Complete Lines & Systems

**Thüringer Hygienepapier**  
Wernshausen, Germany  
PrimeLine™ Tissue Machine with TissueFlex™

**Shandong Hengan Paper**  
Weifang, Shandong, China  
CrescentFormer Tissue Machine  
*3<sup>rd</sup> tissue machine for Hengan*

**ICT Iberica**  
Pozuelo de Alarcon, Spain  
CrescentFormer Tissue Machine  
*2<sup>nd</sup> tissue machine for ICT*

## Ventilation & Drying For Tissue and Paper Machines

### Key Equipment

**Voith Paper for CMPC**  
Talagente, Santiago, Chile  
Yankee Hood, Process Air System, Tissue Machine Dust Extraction System, and Wet End Mist Removal System

**Holmen Paper Papelera Peninsular**  
Fuenlabrada, Madrid, Spain  
PM Hood and Air Systems

**Adolf Jass**  
Schwarza, Germany  
PM Hood and Air Systems

**Familia Sancela**  
Santa Fe de Bogota, Colombia  
Yankee Hood, Process Air System, Tissue Machine Dust Extraction System, and Wet End Mist Removal System



*Wet-crepe tissue process line for SCA North America, Florence, Alabama USA.*

# Start-ups

## Wood Processing

### Complete Lines & Systems

**Confidential Customer**  
Hainan, China  
Woodyard with 4 Chipping Lines

**Asia Dekor (Heyuan) Woods**  
Shenzhen, Guangdong, China  
Woodroom Equipment for MDF

**Guangdong Weihua**  
Qingyuan, Guangdong, China  
Woodroom Equipment for MDF

**Dare Wood Industry**  
Fuzhou, Jiangxi, China  
Woodroom Equipment for MDF

**Weyerhaeuser**  
Valliant, OK, USA  
Tree Length Debarking System

**J.M. Huber**  
Broken Bow, OK, USA  
2 Portal Cranes, 2 Debarking Systems

**Sappi**  
Cloquet, MN, USA  
Feed Line and HHQ-Chipper™  
*1<sup>st</sup> HHQ-Chipper™ in North America including HQ-Plus™ knife system*

### Key Equipment

**Grant Forest Products**  
Englehart, Ontario, Canada  
Rotary Debarking System

**Interstate Paper**  
Riceboro, GA, USA  
Chip Stacker/Reclaimer System

**Brabant Van Opstal**  
Breda, Netherlands  
PowerScrew™ Reclaimers

**Oji Paper**  
Tomiooka, Japan  
PowerScrew™ Reclaimers

**Weyerhaeuser**  
Kamloops, British Columbia, Canada  
Travelling Screw Reclaimer for Bark

## Fiberline

### Key Equipment

**Riau Andalan Pulp and Paper**  
Kerichi, Indonesia  
Sawdust Digester and DD Washer

**UPM-Kymmene, Wisaforest**  
Pietarsaari, Finland  
Sawdust Digester and DD Washer

**Sappi**  
Tugela, South Africa  
DD Washer, Atmospheric Diffuser

### Upgrades & Modernizations

**LWARCELL**  
Lencau Paulista, Brazil  
Continuous Digester Upgrade

**Metsä-Botnia**  
Kemi, Finland  
White Liquor Oxidation Upgrade

**JSC Segezha**  
Segezha, Russia  
Continuous Digester, DD Washer and Screening Modernization  
*1<sup>st</sup> Lo-Solids® Digester and 2<sup>nd</sup> DD Washer in Russia*

**Portucel**  
Rodao, Portugal  
Modernization of Complete Fiberline  
*1<sup>st</sup> Diamondback® bin and Lo-Level® system in Portugal*

**Stora Enso**  
Varkaus, Finland  
Screening Room Upgrade  
*1<sup>st</sup> chemical pulp screen combining two operations in one machine*

**Stora Enso**  
Norrundet, Sweden  
Washing Upgrade

## Recovery

### Complete Lines & Systems

**Celulosa Arauco y Constitución**  
Valdivia, Chile  
Evaporation Plant

**Boise Cascade**  
De Ridder, LA, USA  
TMP Heat Recovery

**CMPC**  
Maule, Chile  
TMP Heat Recovery

**UPM-Kymmene, Wisaforest**  
Pietarsaari, Finland  
Recovery Boiler, Evaporation Plant  
*World's largest chemical recovery plant*

**Zellstoff Stendal**  
Stendal, Germany  
Recovery Boiler, Evaporation Plant

**Neusiedler**  
Ruzomberok, Slovakia  
Recovery Boiler

**Mondi Kraft**  
Richards Bay, South Africa  
Evaporation Plant

### Upgrades & Modernizations

**M-real**  
Husum, Sweden  
Evaporator Upgrade

**UPM-Kymmene, Kaukas**  
Lappeenranta, Finland  
Evaporator Upgrade

**Neusiedler**  
Ruzomberok, Slovakia  
Evaporator and NCG System Upgrades

**Portucel**  
Rodao, Portugal  
Recovery Boiler and Evaporator Upgrade

## Chemical Systems

### Complete Lines & Systems

**UPM-Kymmene, Wisaforest**  
Pietarsaari, Finland  
White Liquor Plant incl. Recausticizing and Lime Kiln

**Zellstoff Stendal**  
Stendal, Germany  
Recausticizing Plant

**Celulosa Arauco y Constitución**  
Valdivia, Chile  
White Liquor Plant incl. Recausticizing Plant and Lime Kiln

### Key Equipment

**Oji Paper**  
Tomioka, Japan  
X-Filter™  
*1st X-Filter™ delivery to Japan*

## Pulp Drying & Finishing

### Complete Lines & Systems

**Hainan Changxiang Trading**  
Hainan, China  
Sheet Drying Line  
*World's largest single pulp drying line (9.3 m)*

**Stora Enso North America**  
Wisconsin Rapids, WI, USA  
Wet-Lap Plant

**CMPC Papeles**  
Yerba Buenas, Chile  
Wet-Lap Plant

### Upgrades & Modernizations

**Mondi Kraft Richards Bay**  
Natal, South Africa  
Sheet Drying Rebuild and Capacity Increase to 1600 t/d

**UPM-Kymmene**  
Rauma, Finland  
Rebuild of Wire Section

## Mechanical Pulping

### Complete Lines & Systems

**Stora Enso Publication Paper**  
Summa, Finland  
HC-Bleach Plant

**Stora Enso**  
Veitsiluoto, Finland  
HC-Bleach Plant

**Södra Cell Folla**  
Follafoss, Norway  
Chip Washing

**MD Papier**  
Plattling, Germany  
HC-Bleach Plant

**Solikamskumprom Public**  
Solikamsk, Russia  
RTS-TMP System

**Shandong Chenming Paper**  
Shouguang, Shandong, China  
P-RC APMP System

**CMPC Papeles**  
Yerba Buenas, Chile  
RTS-TMP System, HC-Bleaching

**Hunan Yueyang**  
Yueyang, Hunan, China  
P-RC APMP System

**SCA Graphic Sundsvall**  
Ortviken Mill, Sweden  
HC-Bleach Plant

**Abitibi Consolidated Papeterie Alma**  
Alma, Quebec, Canada  
HC-Bleach Plant

## Panelboard

### Complete Lines & Systems

**Camsan Wood Industry**  
Ordu, Turkey  
Pressurized Refining System

**Guangdong Weihua**  
Qingyuan, Guangdong, China  
Front-End System

**Asia Dekor (Heyuan) Woods**  
Shenzhen, Guangdong, China  
Front-End System

**Dare Wood Industry**  
Fuzhou, Jiangxi, China  
Front-End System  
*2nd line*

**Shanghai Wanxiang Wood**  
Shanghai, China  
Pressurized Refining incl. Chip Washing System

**Zhejiang Luyuan Wood**  
Zhejiang, China  
Front-End System

## Fiber Preparation

### Complete Lines & Systems

**Cartiera del Polesine**  
Favaro Veneto, Italy  
OCC Line

**Yanzhou Tian Yuan Paper Industry**  
Shandong, China  
Stock Preparation for Fine Paper Machine

### Key Equipment

**SCA Hygiene Products**  
Pernitz, Ortmann Mill, Austria  
FibreFlow® Drum  
*Erection time — 10 days!*

**Pan Asia Paper Chongwon**  
Choongbuk, South Korea  
Sludge Dewatering Equipment

**SCA Hygiene Products**  
Mannheim, Germany  
TwinFlo™ Refiner

**Cartiere del Chiese**  
Montichiari, Italy  
Papillon™ Refiners

**Krempel Pressspanwerk**  
Thalheim, Germany  
Papillon™ Refiners

**Severoslovenske Celulozky a Papierne**  
Ruzomberok, Slovakia  
Broke Handling

**LEIPA Georg Leinfelder**  
Schwedt, Germany  
Sludge Dewatering Equipment

**P.T. Indo-Bharat Rayon**  
Purwakarta, Indonesia  
Sludge Dewatering Equipment

**Dongguan Jianhui Paper**  
Dongguan City, Guangdong, China  
Broke Handling, NBKP/LBKP Pulping and Refining Lines for Coated White Board Machine  
*First Papillon™ refiners in China*

## Tissue Machines

### Complete Lines & Systems

**SCA Tissue North America**  
Florence, AL, USA  
Wet-Crepe Tissue Process Line

### Upgrades & Modernizations

**Procter & Gamble**  
Neuss, Germany  
Major Tissue Machine Modernization

**Thanatarn Paper**  
Samuthprakarn, Thailand  
Major Tissue Machine Modernization

## Ventilation & Drying

For Tissue and Paper Machines

### Key Equipment

**W. Hamburger**  
Pitten, Austria  
Canopy Hood and Heat Recovery

**Kappa**  
Sturovo, Slovakia  
Heat Recovery System

**Procter & Gamble**  
Green Bay, WI, USA  
Yankee Hood, Process Air System

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