“The Fray Bentos mill is an important investment for us. We knew there would be many challenges. That’s why we want a proven partner, with the best available technology and maintenance practices, there with us.”

Timo Pihlomäki, Senior Vice President of Metsä-Botnia
Dear Readers,

The articles in this issue of FiberSpectrum reflect the trends in our industry. The articles show Andritz’s contribution to each of these trends and the partnerships we have established to successfully navigate the future as a leading technology and maintenance supplier to our valued customers.

Large single lines. The start-up of Botnia’s Fray Bentos mill is a great success for Botnia, and a showcase for the scope of supply that Andritz can offer pulp producers. All the major production technology comes from Andritz – as well as the long-term maintenance. It is also a showcase for a tremendously constructive cooperation between owner and supplier. You can read more about the project starting on page 4.

Fast project start-ups. Botnia is on a world-record pace in terms of start-ups. Prime quality pulp came off the line virtually from the moment chips were first fed to the digester. In the article about Kvarnsveden (starting on page 16), we see another example of a fast start-up, this time for mechanical pulps. Burgo’s Kvarnsveden (starting on page 24) also realized the benefits of a fast start-up on its newsmachine upgrade with a soft calendaring system.

New concepts for maintenance. A multi-year contract to perform complete maintenance in all areas of the Botnia mill highlights a different area of Andritz’s commitment to enhance the life cycle performance of its equipment. In this case, the maintenance extends beyond the traditional areas for Andritz – including Kemira’s chemical plant and virtually everything “inside the fence” at the mill. Next, we hope to integrate some of the new capabilities for automation/instrumentation/service maintenance acquired with Sindus Andritz of Brazil into our global maintenance capabilities.

Energy and biomass. The importance of energy-efficiency is highlighted in the article written by McKinsey and Co. (starting on page 20). The exciting development work that UPM is doing to convert biomass into second-genera- tion biofuel – and our partnership in developing the technology – is also highlighted in the article starting on page 12.

Our global coverage and range is expanding. In emerging markets, such as Russia, we secured a large order from Mend Silvnykker Pulp and Paper Mill to supply a new woodyard, evaporation plant, and recovery boiler to the mill and to rebuild the mill’s two existing fiberlines. This is the largest project underway in Russia at this time. In Brazil, we are currently shipping major production systems to Posy Empleabantimentos Industriais S.A., the contractor for VCP’s mill in Brazil’s Mato Grosso do Sul state, which will be the world’s largest single fiberline.

In addition, we formed a new Automation Solutions Division within the Pulp and Paper Business Area. The new Division combines all the company’s control capabilities under one roof and offers clear benefits to customers from design, through implementation, to on-going support.

We hope you enjoy this issue of FiberSpectrum. As always, we thank you for your continued trust in us.

Wolfgang Leitner
President & CEO
Proven partners take on a new challenge together.

The relationship between Metsä-Botnia and Andritz has strengthened over the years, with the most recent collaboration being Andritz’s supply of all the major production systems for the greenfield pulp mill in Fray Bentos, Uruguay – plus maintenance for all areas of the mill. This scope has never been accomplished by a single supplier before.

“The Finnish way of doing things is based upon trust,” says Timo Piilonen, Senior Vice President of Metsä-Botnia and the leader of the Fray Bentos greenfield project. “From the beginning, we had a mixed organization of Andritz and Botnia – there was no buyer and no supplier.”

Of course, this kind of relationship was not built overnight. Andritz supplied technology for Metsä-Botnia’s first greenfield mill (Kaskinen) in the 1970’s, and has supplied systems to all five mills in Finland. In addition, Andritz has provided maintenance development services to Botnia for many years.

The Fray Bentos facility is modern in every way – from the production technology in the mill to the gleaming office building which provides ample room for people to collaborate.

Two species of eucalyptus are mixed for Botnia’s pulp. Botnia’s subsidiary, Forestal Oriental, supplies about 70% of the mill’s requirements from its FSC certified plantations.

Looking for opportunities

A few years ago, Piilonen was chosen to lead a team to investigate Metsä-Botnia’s production opportunities outside Finland. In 2003, Botnia purchased a 60% share of Compania Forestal Oriental S.A. (FOSA) from Shell, with the remaining shares owned by UPM. Also in 2003, Piilonen and his team performed a pre-feasibility study for citing a new pulp mill near Fray Bentos. In 2004, the first environmental impact study was presented to government officials.

The project gained momentum when environmental permits were granted in March 2005. The Botnia board of directors approved the investment for the Fray Bentos mill. At a cost of about $1.2 billion, this became the company’s largest investment outside Finland.

The Fray Bentos project

When a signed letter of intent was received from Botnia in May 2005, Andritz immediately set its project team in motion. Working with Project Director Jukka Sainiemi was a global team of project managers for each key process area, supported by technical experts, a global procurement team, site managers, and commissioning specialists.

“A fast start for the engineering was crucial for a successful project,” Sainiemi says. “Botnia involved about 20 people from their team, supported by their engineering consultant and, of course, by Andritz. We were responsible for the basic engineering for each of our process islands. The engineering work was performed in Finland.”

During the time that Andritz’s project team was preparing quotations for the technology, its service team was putting together a 10-year maintenance plan and rough cost estimates, according to Risto Häimäinen, Senior Vice President, Pulp and Paper Mill Maintenance.

“In September 2005, Botnia signed an agreement with us to supply all mill maintenance services for a five-year period,” Häimäinen says. “This gave the opportunity for Andritz Capital and Service specialists to work side-by-side to ensure that long-term maintenance aspects of the equipment were considered from the very beginning.”

The project teams from Botnia and Andritz moved from Finland to Fray Bentos in the summer of 2006. Construction of the mill involved nearly 5000 construction workers who lived...
in Fray Bentos during the two-year build-up. Hans Unger, an Andritz site manager from Graz, likened the scene to a “miniature United Nations” with people from 25 countries working together to build this massive mill. Even with this, the majority of workers came from Uruguay – between 70-80% during the construction peak period were Uruguayans. Local companies from Uruguay participated in the general assembly work in all technical areas for which Andritz had responsibility.

Political opposition

The Fray Bentos mill is sited next to a river which forms the border between Uruguay and Argentina. The original announcement of plans to build a pulp mill in Uruguay (by the Spanish company ENCE in 2003) was met with strong opposition by Asamblea Ciudadana de Gualeguaychu, a citizen’s movement in Argentina. Asamblea was concerned about how Uruguay would be able to monitor the environmental performance of such a large mill. The government of Argentina took the offensive at the International Court of Justice in The Hague, claiming that Uruguay had violated a border treaty between the two countries.

“We cover the environmental aspects every day in our morning meeting as they have the highest priority.”
Gervasio González, Environmental Manager at Fray Bentos mill

First chips to the digester

The mill was thoroughly commissioned before its actual start-up. Operators were fully trained and ready, in part thanks to the Andritz group’s IDEAS Dynamic Process Simulator. When Botnia received the final permit to start-up the mill in November, the start-up crews were eager to spring into action. Thursday night (8 November), the oil burners in the massive Andritz recovery boiler were fired up and the digester was filled with liquor for the first time. Twenty-four hours later, chips began feeding to the digester. On Monday afternoon, the first sheets of dried prime quality pulp were coming from the Andritz baling line.

From that moment, according to Mill Manager Sami Saarela, progress has been rapid and stable. “We really worked to simplify the design of this mill, and it has paid off with a rapid start-up,” Saarela says. “Early in the engineering phase, we worked with

* The Andritz woodyard features a two-line chipping plant, chip storage, and chip screening system. Chip quality is maintained in two circular chip storage systems utilizing the latest blending technology for the FRB Eucalyptus grandis and eucalyptus dunnii.

* The 3200 admt/d bleached fiberline at Fray Bentos features a two-vessel Downflow Lo-Solid® digester with TurboFeed® chip feeding (shown to the right of the fiberline and in the photo below). Nine large Drum Displacer® (DD) washers perform brownstock washing, screening/post-oxygen washing, and bleaching. The bleach plant features the patented A-Stage™ for the first stage of the ECF bleaching process. The DD washers recycle bleaching filtrates to reduce the volume of effluent that must be processed in the water treatment facility.

“We cover the environmental aspects every day in our morning meeting as they have the highest priority.”
Gervasio González, Environmental Manager at Fray Bentos mill
Andritz to simplify our process. For example, we have simplified chip feeding, the four-stage bleach plant makes it easy to correct for any variations, and the two drying lines help us balance the mill’s whitewater and steam flows much easier.”

Saaarela explains that the production goal is to produce as stable a quality as possible. “Unplanned production stops are the biggest enemy to pulp quality and the biggest potential for negative environmental impacts, so our target is to keep the mill running.” Saaarela says, “We are seeing very stable and uniform production from the Andritz technology.”

Environmental monitoring

The Fray Bentos mill is based in all aspects on the best available technologies, e.g. for forestry, wood harvesting and transport, pulp production, pollution control, and environmental management. The Best Available Techniques (BAT) from Andritz are impressive in terms of scale and efficiency.

According to Gervasio González, Environmental Manager, the Fray Bentos mill has “some of the most strict permit levels in the world.”

“This mill functioned continuously without disturbances even during start-up,” González says, “We have the best technology available and we have trained the people the best we can. Anyone in the mill is empowered to stop the production process if they see an environmental situation. We cover the environmental aspects every day in our morning meeting as they have the highest priority.”

Compared to the amount of pulp produced, the emissions from the Fray Bentos mill are among the least intrusive in the world. Air emissions of TRS (odorous compounds) and sulfur dioxide have been virtually eliminated with the advanced chemical recovery technologies.

Modified cooking and efficient pulp washing lower the effluent load from the fiberline. Oxygen delignification and A-Stage bleaching decrease the amount of chemicals required.

As a result of using raw materials efficiently, there is very little solid residue left to discard to the landfill. In fact, less than 1% of the initial raw material is discarded.

Since the collection and treatment of odorous gases are a major factor in forming the local community’s opinion about having a pulp mill as a neighbor, designed into the plant are alternative ways to burn these gases. Electricity is also generated in an environmentally friendly way at the Fray Bentos mill. Botnia’s electricity generation adheres to the Clean Development Mechanism (CDM) which is determined in the Kyoto Protocol to the United Nations Framework Convention on Climate Change.

Long-term support

“A lot of work is involved in planning the maintenance of a new pulp mill, such as Fray Bentos,” says Lars Klang, Vice President of Mill Services and Logistics for Botnia. “The reason we chose to outsource our maintenance is that it is easier to focus people’s attention when it is a well-defined organization.”

“We can see the results already from choosing Andritz to perform our maintenance activities,” Klang says. “We are well prepared.”

Aulis Katajamäki is the Andritz manager on-site responsible for maintenance. In explaining Andritz’s interest in providing total maintenance services, Katajamäki says, “Customers used to call us when they had problems. Now we want them to call us before problems occur.”

“We are here to prevent problems,” Katajamäki continues. “Even though we act as part of the Botnia team, we are also Botnia’s portal into Andritz’s

Andritz supplied the entire chemical recovery island. The evaporation capacity is 1110 t/h. The recovery boiler is among the world’s largest – burning up to 4450 tds/d.

The Andritz white liquor plant produces 10,000 m³ of white liquor per day for the fiberline. The kiln – at 135 m long – can produce 830 t/d of lime. The primary fuel is heavy oil, although odorous gases collected from the pulping process are also utilized.
Andritz Technologies at Fray Bentos

Woodyard
Two-line chipping system, chip storage, chip screening, and conveying system to provide high-quality eucalyptus chips to the fiberline. Chipping capacity is 330 m³/hr.

Pulp Production
Two-vessel Downflow Lo-Solids® continuous digester (design capacity 3200 admt/d unbleached) with patented TurboFeed® chip feeding system produces high-yield, high-quality pulp. DD washers clean the pulp before and after two-stage oxygen delignification. Combined knot separation and screening system cleans the pulp prior to bleaching.

Pulp Bleaching
Four-stage light ECF bleaching with patented A-Stage™ to reduce the amount of bleaching chemicals required. No elemental chlorine is used in the bleaching process. Four efficient DD washers wash the pulp to segregate condensate streams. The recovery boiler is among the world’s largest at 4450 tbsd. The white liquor plant (10,000 m³/d) consists of advanced technology for the filtration of green and white liquors, and a lime reburning kiln (830 t/d). A complete system for the collection of odorous gases and incineration in the recovery boiler (with backup alternatives in the auxiliary boilers) ensures low odor emissions from the mill. The steam from the recovery boiler is sufficient for the turbo generator to generate enough electricity to power the entire mill.

Dynamic simulation
Dynamic Process Simulator from IDEAS to model all the mill’s processes for training operators prior to startup. Andritz dryer, followed by a Cutter/Layboy. There are four automated baling lines to weigh, press, wrap, stencil, and tie the dried pulp bales. No other pulp company has a product range that includes eucalyptus pulp.

Dewatering / Drying / Baling
The drying plant consists of two parallel lines. Each line has a five-stage screening system to ensure pulp cleanliness, followed by a twin wire former pulp machine (5.3 m width) to dewater the pulp, followed by an Andritz dryer, followed by a Cutter/Layboy. There are four automated baling lines to weigh, press, wrap, stencil, and tie the dried pulp bales.

Chemical Recovery and Energy Production
The evaporation plant (1100 t/h) consists of seven effects of lamella-type evaporators, with internal stripping of volatile gases and the ability to segregate condensate streams. The recovery boiler is the world’s largest at 4450 tbsd. The white liquor plant (10,000 m³/d) consists of advanced technology for the filtration of green and white liquors, and a lime reburning kiln (830 t/d). A complete system for the collection of odorous gases and incineration in the recovery boiler (with backup alternatives in the auxiliary boilers) ensures low odor emissions from the mill. The steam from the recovery boiler is sufficient for the turbo generator to generate enough electricity to power the entire mill.

The maintenance target for Fray Bentos is to have better productivity (in terms of maintenance cost per tonne of pulp produced) than it has today in Finland.

Today, 95% of the maintenance staff is from Uruguay, and Andritz’s goal is to make it 100% Uruguayan. Since Uruguay does not have a tradition of pulp production as Nordic countries do, this required Andritz to recruit locally and train extensively. ‘The key people for our maintenance group were hired here in Uruguay two years ago and trained extensively in Finland,’ Katajamaki says. Local companies have been hired as subcontractors for auxiliary maintenance services (HVAC, cleaning, etc.).

By adding the ability to produce pulp and paper to the established ability to export solid wood materials, Andritz’s technology and maintenance expertise enables Botnia to help Uruguay develop a new industry and provide significant positive socioeconomic impact in the entire region.

For added flexibility, Botnia selected two identical Andritz 3000 admt/d dewatering and drying lines. Dewatering is performed using Andritz’s Twin Wire Former pulp machines, with him widths of 5.3 meters. Technical support. We also give feedback about equipment performance to the product designers, based on our day-to-day experience. We are not just a corrective service organization.

Pasi Sahalm, a member of the maintenance team’s Reliability Group, explains the depth of pre-engineering and planning for Fray Bentos that occurred even before the mill started up. ‘We have over 400 categories of equipment defined in our preventive maintenance (PM) system,’ Sahalm says. ‘We determined how important each piece of equipment was to the process, the time required to repair, cost to repair, etc. From this, we developed a preventive and predictive maintenance plan and entered it into Botnia’s SAP PM computer system.’

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UPM – Carbona / Andritz

From biomass to biobusiness

Many experts say that first-generation biofuels are doing our planet more harm than good. So, UPM of Finland is investing in second-generation technologies to turn biomass into liquid fuels. The creation of synthetic diesel and other biochemicals from forest residues represents a ground floor (or actually forest floor) opportunity. UPM’s chosen partners in key technology development? Andritz and Carbona.

Editor’s note: Since the biofuel business may be new to many readers, we have included a glossary of terms, “Talking the Biolingo” on page 15 which you may find helpful.

“Developed nations are looking for alternatives to fossil fuels,” says Petri Kukkonen, Director of Business Development for UPM-Kymmene Corporation. “Second-generation biofuels have the potential to be a big part of the solution. And, UPM has the potential to provide these biofuels while developing a profitable business in a fast-moving market.”

The pace of development is exciting. UPM is leading a fast-track program to investigate the production of biofuels on a commercial scale, along with Carbona/Andritz and GTI. More about these partners in a minute.

It starts on the forest floor

According to Kukkonen, there are significant differences between first- and second-generation biofuels. Until now, the EU has mainly focused on first-generation bioenergy. However, concerns are being raised that first-generation biofuels actually produce more greenhouse gases than conventional fuels if you include the emissions from agriculture, transport, and processing. In addition, diverting foodstuffs to biofuel production is triggering a record rise in the price of edible oils and other foods. Lastly, imports of ethanol vegetable oils or biodiesel from countries where rainforests are being cleared is causing some groups to label first-generation biofuels “deforestation diesels.”

“Second-generation biofuels will be based largely on wood residues,” Kukkonen explains. “UPM knows how to cultivate, harvest, and process wood. We have the infrastructure in place to deliver the highest possible energy yield for society.”

Log wood, pulp wood, energy wood

Typically, a tree is divided into three sections, Kukkonen explains. “One section is the log wood for the sawmill, one section is pulp wood, and the third section is energy wood.” UPM’s energy wood harvest equals about 3.5 TWh per year. It includes small diameters, branches, and stumps.

Stumps? “Stumps will be an important portion of the biomass feedstock,” Kukkonen says. “UPM is the only company that collects and processes spruce stumps on a large scale. There is as much energy in the stumps as in the other forest residue combined. About 13-15% of the volume of roundwood entering the mill consists of bark.”

The Carbona connection

The main path for second-generation bioenergy production is through gasification. This is where Carbona comes in.

Carbona was formed in 1996, when partners Kari Salo and Jim Patel bought the technology from a Finnish company and ventured out on their own.

Both Salo and Patel have spent virtually their entire adult lives around gasification technology. Their paths converged in the late 1980’s when specifically, Andritz now offers Bubbling Fluidized Bed boilers for different biomass fuels to the pulp, paper, and power industries. Currently, four such boilers have been sold or are in the order process. Two units are destined for Spain (subsidiaries of the ENCE Group), one rated at 120 t/h of steam and the other at 190 t/h. Two units have been sold to Portugal in Portugal (58 t/h each).

From biomass to biobusiness

Andritz and biomass

Andritz has become increasingly active in the promising liquid biofuel industry as the battle against climate change and high oil prices is initiating global developments.

The product portfolio includes systems for gasification, drying systems for biomass, pelleting machinery, centrifugals for bioethanol production, gasifiers, and biomass power boilers.
the Gas Technology Institute (where Patel was working) sold the license for its U-GAS® process to the company where Salo was Director of Technology. Working cooperatively, they built a coal gasification pilot plant in Tampere, Finland. The system was then converted for biomass gasification.

“We went to different vendors looking for gasification solutions,” Kukkonen of UPM says. “We knew that we wanted fluidized bed technology, and were interested in Carbona’s solutions. Carbona has the knowledge and Andritz has the muscle.”

Patel explains, “Despite our experience, Carbona was too small to be a strong financial partner for the large pulp and paper companies.” In August 2006, Andritz acquired a minority share position in Carbona, with an option for full ownership in the future.

In May 2007, UPM announced its co-operation with Carbona/Andritz on the development of technology for biomass gasification and synthetic gas purification. The cooperation also covers the design and supply of a commercial-scale biomass gasification plant.

“The goal of our project is to develop a technology platform that we can duplicate for multiple sites,” Kukkonen says. “First, we have to prove the gasifier concept and run it in a reliable manner. Of course there are challenges, but we have some experience feeding wood into pressurized vessels.”

UPM has prepared the biomass feedstock in pellet form and is in the process of shipping 1000 tonnes to the Flex-Fuel Test Facility near Chicago, Illinois USA. Shaving two years off the schedule?

Carbona’s close relationship with the Gas Technology Institute (GTI) has helped UPM keep on its fast-track schedule. “If we didn’t have access to GTI’s plant, we would have to build a pilot plant from scratch, which would take 18 to 30 months, and then begin a 6-month testing program,” Kukkonen says.

According to Bruce Bryan, Director of Gasification at GTI, the test facility is unique in its capabilities for evaluating different systems and processes. “The facility is configurable to test a variety of gasification, gas clean-up, and processing schemes,” Bryan says. “The instrumentation and control systems in the facility are unparalleled, offering online analyses of gas composition for instant feedback about the performance of gasification and gas conditioning systems. We don’t have to wait for lab tests as we can see what’s happening online.”

Modifications to the GTI test facility, which center around Carbona’s technology for gas reforming/cleaning, are being completed. Salo explains, “A common problem with the F-T process is the sensitivity of the catalyst to contamination. Most likely, the catalyst will be cobalt. This requires a very pure syngas, so gas cleaning becomes extremely critical.”

“The pilot tests will verify the technologies for the feed system, gas cleaning, scrubbing, the syngas recycling compressor system, and the cooler,” Kukkonen says. “We expect to have results by the end of the year. Based on these results, we’ll move forward with the next step.”

The next step: commercial-scale

“First-generation biofuel suppliers can be more entrepreneurial,” Kukkonen says. “But, second-generation companies have to be well funded because of the capital investments required for the multi-stage process.”

“Pulp and paper companies have a distinct advantage,” Kukkonen says. “Biofuel production totally fits our infrastructure. We have access to biomass and much of the equipment, utilities, transportation, water treatment, and effluent treatment in place.”

The commercial-scale plant that UPM has in mind will produce about 100,000 to 150,000 t/a of finished product – a synthetic diesel fuel much cleaner than conventional diesel. The feedstock required for this will be about 1,000,000 t/a of biomass, so the ratio is about 10:1.

“But with Andritz and Carbona, we have completed the conceptual engineering for the plant,” Kukkonen says. “Andritz has the technology, starting from wood handling equipment and dryers. We hope they will provide technical solutions for our integrated processes from wood processing to the balance of plant.”

UPM has yet to select the site for its plant. “We have many good sites, 17 in Europe in fact,” Kukkonen says. “Our decision criteria will be based on the mill having space available and the cost of the biomass feedstock.”

• Bruce Bryan (left), Director of Gasification at GTI, and Jim Patel of Carbona show the pelletized biomass feedstock shipped from UPM to the GTI test facility. The blue vessel behind Patel is part of the biomass gasifier at GTI.
Where there’s a will, there’s a way

Coordination, cooperation, communication – the successful elements for any capital project – require a commitment from both supplier and customer. A textbook example of this commitment is the new bleach plant at Stora Enso’s Kvarnsveden Mill. The plant had to be brought online quickly for a new SC grade being produced at the mill.

Stora Enso’s Kvarnsveden Mill is a modern facility in Borlänge, originally built in 1900 on the banks of the Dalälven River in the heart of Sweden. Many generations of Borlänge people have earned their living working at the mill, which employs more than 900 people.

The mill’s product range focuses on three paper grades: newsprint, improved newsprint, and uncoated magazine paper. The current production capacity of the mill is 970,000 tons per year on four paper machines.

Mechanical pulp (groundwood and TMP) is produced in the mill. Most of the raw materials is spruce. “Over 80% of our final products and about 45% of our wood are conveyed by rail, making the transport as environmentally friendly as possible,” says Kjell Nygren, Manager of Projects & Strategic Planning, Stora Enso Kvarnsveden.

A shift in production

Stora Enso’s decision to close down its Reisholz Mill in Germany by the end of 2007 and move production of its high-quality InnoPress brand to PM 8 at Kvarnsveden prompted the need for a new bleach plant – and drove the fast-track schedule.

InnoPress is one of Stora Enso’s top brands, says Stenberg. “Both InnoPress and MagniPress represent some of our highest standards.”

InnoPress is also well in demand by major European customers. So, Stora Enso needed a smooth transition in production from Reisholz to Kvarnsveden. After a quick decision by the Board in November 2006, a contract was signed with Andritz on December 7 for delivery of the PHC bleach plant. In November 2007, operations were up and running, according to Stenberg.

“We chose Andritz because we knew that they could deliver the equipment in time and they have an excellent reputation,” Stenberg says. “References were extremely important. Andritz has a long history of success with Stora Enso, having delivered bleach plants for example to the Summa Mill in Finland, the Maxau and Reisholz Mills in Germany … so yes, there is a long and solid cooperation.”

Expanded Andritz scope

The equipment Andritz supplied for the Kvarnsveden Mill consisted of two twin-wire presses, an HC-mixer, and HC-tower – as well as a screw conveyor system and four MC-pumps. Andritz was also responsible for engineering as well as for DCS (Distributed Control System) programming, complete mechanical installation, training, commissioning, and start-up.

Though it was rather uncommon for Andritz to perform the detailed engineering for the bleach plant project. “We usually do this on our own with local support,” Stenberg says, “but in this case it made our life much easier in the planning phase and helped us meet the tight schedule.”

The first phase of the project was to decide upon the precise bleaching concept. This was followed by detailed engineering diagrams, flowsheets, and equipment layouts. “What is very important in this kind of operation is quality process engineering,” Stenberg notes.

Cooperation, coordination, communication

Technically speaking, the Kvarnsveden Mill’s bleach plant is similar to the other 130 that Andritz has installed. “But what made this project challenging for all of us – and exciting when you see the outcome – was the tight schedule of the delivery and installation,” says Josef Liendl, Sales Manager for Mechanical Pulping Systems at Andritz.

Due to worldwide shortages, some components such as gearboxes and the stainless steel for the twin-wire press rips were extremely hard to procure. “Our sub-suppliers’ order books are quite full with orders from Chinese customers for the next few years,” Liendl says. “It took quite a lot of effort and some additional money, but we were able to get the materials for Kvarnsveden in time.”

Stefan Pettersson, Assistant Superintendent of Wood-handling and Groundwood, and MagniPress represent some of our highest standards. It took quite a lot of effort and some additional money, but we were able to get the materials for Kvarnsveden in time.
For all those involved in the project, one of the key success factors was the easy flow of communications. There was very good cooperation within and between the project teams which contributed to the precise planning, delivery, and execution of the project.

“All our discussions were very open,” Stenberg says. “Together we came up with a very straight equipment layout, instead of the original idea of a side-by-side arrangement.” The twin-wire presses are now located where Kvamsveden’s PM 9 once stood which allows perfect access for the overhead crane. “With this solution, we could even install a third twin-wire press in the future in line with the existing ones,” Liendl agrees.

An interesting aspect of the new Andritz line is that it was placed in the center of the existing building through the roof opening. This required the use of the largest and most out-reaching mobile cranes available in the region. According to Günther Glück, Andritz Project Manager, “The lifting boom was 42.5 m long. It was quite challenging to move the components for the bleach tower bottom and discharge system with two cranes (one 250-ton and one 200-ton) working in coordination...especially since the crane operators could not see inside the building to the installation area. The lifting and placement opera- tion was very challenging, sensitive, and intense throughout equipment erection.”

The Kvamsveden-Andritz project team was able to complete the task safely, on time, and without any major setbacks. “I must say that it was a masterpiece of coordination and communication,” Glück says.

Energy recovery, environmental efficiency

The state-of-the-art bleaching equipment helps Kvamsveden reduce its impact on the environment by being efficient in terms of energy and chemicals consumed.

“This mill’s carbon dioxide footprint is continually being reduced,” says Nygren. “Very early in the 1980’s, we installed equipment for efficient heat recovery and for utilizing biofuel in our boilers. With our efficient TMP steam recovery system and two big boilers designed for burning high shares of wood waste, we are in a good situation today. Our internal bark, wood waste, and water treatment sludge is fully utilized as high-value fuel – and has been for over 20 years. Every year we increase the quantity of biofuel that we buy from sawmills and forest operations and convert it to energy.”

“The new Andritz sludge press plays an important role in giving us the processing capacity for wastewater treatment,” Nygren continues. “The material from all three presses goes directly to the boiler plant.”

Performance guaranteed

“Of course, I’m a bit prejudiced,” Liendl says, “but I would venture to say that nothing compares with our PHC bleach plants. The world’s high-quality SC and LWC paper producers have our technology. With more than 130 PHC bleach plants installed, this indicates that our equipment is well proven.”

After intimate mixing of pulp and chemicals in a unique fluffer-type mixer from Andritz, the pulp enters the bleaching tower. Retention time in the HC-Per-oxide bleaching tower is two to three hours. Then, the pulp is re-diluted with wash water and fed to the twin-wire press to remove anionic trash. The clean bleached pulp then goes to the stock prep system for PM 8, primarily for the production of the SC magazine paper InnoPress.

“I must compliment the Andritz team on doing a fine job. The new bleach plant has run very well since its start-up in November, and now we are discussing together how to make future improvements.” Stenberg says. “We always seek improvements in our pulp quality, energy efficiency, and environmental performance. Currently, we are discussing with Andritz ways to improve some other systems in the mill, over and above what has already been delivered.”

“Andritz’s bleach plant helps us achieve the pulp quality needed to produce InnoPress which has been very well received in our markets and we are positive about the future of this grade,” Nygren says. “The print performance is excellent.”

> find out more at www.fiberspectrum.andritz.com

Stora Enso

► The Kvamsveden Mill in Borlänge, Sweden was built in 1900 on the banks of the Dalälven River. While some of the typical Swedish buildings around reflect earlier times, the production machinery inside Kvamsveden Mill is modern and efficient.

► One of the twin-wire press units is shown in the photo above. In the photo below, Stefan Pettersson (left), Josef Liendl (center), Andritz Sales Manager for Mechanical Pulping Systems and Per Stenberg are standing in the basement of the bleach plant. Andritz also provided basic and detailed engineering, control system programming, mechanical installation, training, commissioning, and start-up services.

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“Andritz’s bleach plant helps us to achieve the pulp quality needed to produce InnoPress which has been very well received in our markets.”

Andritz’s Josef Liendl (right) joins Per Stenberg (left) and Stefan Pettersson in displaying a sample of the InnoPress product.
Revisiting energy efficiency*

As with many energy intensive industries these days, the forest products industry is facing increasing pressure from rising energy costs. This is particularly acute in key developed regions, such as Europe and the U.S., where the industry is already struggling to remain competitive against global players with significant factor cost advantages in other key cost elements. Though the industry had made major strides in increasing energy efficiency, the challenge is as great as ever. However, we have seen that companies can reap significant additional savings from increasing energy efficiency in their operations. To capture these opportunities, companies must reassess energy efficiency programs in light of the new energy reality.

A new energy reality

Energy has become more and more important over the past several years, something the forest products industry has felt in a rising energy share in overall costs. Expenditures on energy are rising more than 25% of operating costs. The key drivers are the combination of rising oil and gas prices, an increasing focus on regional security of energy supply, and increasing concerns about the potential for energy prices to rise significantly over the last few years, and with currently trading over $100 per barrel and natural gas prices more than double since 2001 to over $6 per thousand cubic feet. World energy markets are more interlinked than ever, with supply shortages in one region – such as retinyl downstream from hurricane Katrina – quickly having ripple effects on global energy markets. This has made regional security of energy supply a focus for many governments, and led to increasing efforts to diversify energy supply. Compounding this challenge is growing concern over CO2 emissions and the need to combat global warming. One result is the current call for a greater share of renewable energy in the final energy consumption mix. This could further increase energy costs. For example, many countries in Europe are granting large subsidies to energy producers to make renewable energy economically viable. Eventually, these higher production costs could be passed on to the “utilities” customers. The days of low-cost energy clearly seem numbered, if not gone entirely.

An energy-intensive industry

The forest products industry is one of the major energy-intensive industries in the world, and energy is a key element in driving competitiveness of individual companies. Today, the industry’s global consumption accounts for roughly 4%, 1.1% of total industrial use and energy demand. Energy intensity does vary by product, with the energy intensity of a range of examples in illustration. These differences highlight that the levers and absolute potential for improved energy efficiency within each region and product, as shown in the graph below. Examples include:

- Investments in more energy efficient systems;
- New operating procedures;
- Recovery and reuse of waste process energy;
- Improved drying technologies, enhanced steam systems, efficiently designed motor systems, and combined heat and power generation.

New operating procedures can also pay great dividends. One pulp and paper mill that exemplifies this was operating multiple boilers including an electric boiler to meet steam demand. However, overall boiler utilization was well below 50%, with peak steam demand representing just over 50% of overall boiler capacity. Furthermore, there was more than 160% variance from the average production cost to the high-cost electric boiler capacity. By shutting down the electric boiler and using the excess capacity as true peaking capacity, the mill saved nearly 4% of its total annual energy spend across the entire mill. These savings were largely from reduced electricity and maintenance costs, partly offset by increased gas costs and carbon dioxide fees.

Finally, no matter how efficient the processes and procedures, residual process energy always remains. This “waste heat” can often be reclaimed and reused within the process, or its quality and/or quantity may make it valuable to external “heat sinks.” Internally, waste heat can often directly replace fuel needs, such as using low pressure steam to heat air at furnace vents.

Path forward

To capture these opportunities, companies must look both within their operations and beyond. Historically, the major energy productivity programs are the first step. We have found that a combination approach – combining capital-driven and people-driven projects, overlayed by new financial evaluation economics – is the key to success. Examples include:

- Improved energy management. For example, newsprint companies will be wise to revisit all options to capture the economic and environmental benefits of energy savings.

Clearly, there are still opportunities to improve energy efficiency. Given the new energy reality and the fact that energy continues to be an important driver of competitiveness, forest products companies will be wise to revisit all options to capture the economic and environmental benefits of energy savings.

*This article appears by courtesy of McKinsey & Company, a management consulting firm. It has previously been published in “McKinsey On Paper.” The authors are Shishir Thakur, Engagement Manager, and Malasse Ringpook, Principal, from McKinsey’s Stockholm office. More information can be found at www.mckinsey.com.
FiberSpectrum talked with Karl Hornhofer and Humbert Köfler, heads of Andritz’s Pulp & Paper Business, to get their response to the McKinsey article – particularly with regards to the role that technology and service suppliers play in improving energy efficiency.

Authors Makris and Ringvist from McKinsey say that the days of low-cost energy are numbered, if not gone completely. Are there regional differences that you see?

Köfler: Rising energy costs are crippling some of our customers’ operations. In mechanical pulping, the high costs in Eastern Canada and Northern Europe are stifling. We are now seeing the impact in emerging markets such as China. The one region that seems to be in a better position is Russia, with its abundant wood resources and a surplus of energy. That said, it’s important to stress that energy has always been a major cost factor. As a supplier to the industry, we have focused on energy efficiency for years, since it is a major component of cost.

Hornhofer: The price of oil is now approaching US$ 120 a barrel and dynamic growth in developing economies such as China and India, we don’t anticipate that the cost of energy will become much lower. Security of supply and the need to reduce greenhouse gas emissions are placing a big emphasis on biofuels – which puts pressure on wood supplies. We can’t un-bundle the energy discussion from the other major components of cost – where fiber supply, labor costs, other raw material costs, water consumption, and environmental costs enter the picture. These can be seen partially as threats, and partially as opportunities.

The threats are real. How real are the opportunities? The McKinsey authors talk about lower energy-intensity papermaking using recycled fiber as an example.

Hornhofer: The opportunities are very real and vary in their overall impact by the furnish being produced. For example, the electric power consumption of dried chemical pulp is 600-700 kWh/adt (incl. pumping, process equipment, bleaching chemicals, etc.) and the consumption of heat is 11-13 GJ/adt for heating fluids, acceleration of reactions, and evaporation of water. At the same time, a modern kraft mill generates 900-1100 kWh/adt of electricity from its own turbinas. So the excess electricity, 200-500 kWh/adt, can be sold on the grid or be utilized in integrated paper production. That said, there is still a lot of unutilized low-value heat in flue gases and water/filtrate streams. The wider use of vari- able speed motors, operating process-es as they were originally dimensioned, pre-heating incoming raw materials and air, keeping heat surfaces clean (sootblowing in the boiler, cleaning of evaporator elements, etc.), operating at lower temperature levels, and using steam and heat in finalisate all contribute to energy savings.

Köfler: TMP consumes 1500-3300 kWh/adt electric power (refining, pumping, process equipment, and bleaching chemicals). If the line has a heat recovery system, about 3-4 GJ/adt of low-pressure steam is recovered.

From an energy standpoint, recycled fiber processing is the most efficient. Typically, deinked pulp consumes 400 kWh/adt of electric power (pump-ing, process equipment, and bleaching chemicals) and some 1.5 GJ/adt of heat for heating of fluids. More than half of the world’s papermaking fibers are based on wastewater recycling. But we can’t base everything on waste-paper. Gradually, we’re reaching the maximum 55-60% recovery rate. A certain portion of fresh virgin fibers is required to keep RCF quality satisfactory enough for papermaking.

Also, papermakers must balance wood utilization well. The wood yield from mechanical pulping is about twice that of chemical pulping.

What is Andritz doing to help pulp and paper producers capitalize on their opportunities?

Köfler: Our customers are looking for faster paybacks than they can achieve with conventional investments – typically one year or less. Andritz has technology solutions and services that reduce power consumption, increase energy recovery, and increase the generation of electric power.

One of the simplest solutions for mechanical pulping is to install a heat recovery system. There are still production lines running without this most basic heat recovery. We can recover condensation of steam for every one mega-joule of applied energy. Energy savings are in the area of 30%. Another simple solution is the application of the right refiner plate design. By simply making this change, we have seen mills reduce their TMP energy costs by 10% in some cases. The basic refining process RT-RTS saves up to 20% in energy costs (or allows for 20% increased production). Significant savings for hardwoods using the PR-C APMP are also achieved. The pulp quality from these hardwood lines is such that for certain paper grades, it can be substituted for softwood. Energy savings for this conversion is 900-1300 kWh/adt.

We are working now on solutions to extract another 10-20% energy savings using low consistency refining and the addition of special chemicals in the stock preparation process.

In the service area, when our experts go into a mill to perform an audit, we typically see opportunities to reduce energy by 20% increased productivity. We have developed special bearings and new lubricants that reduce energy. We identify idle power consumers and can optimize the pumps to reduce energy consumption. This is all done in coop- eration and partnership with the mill.

Hornhofer: One very important way to reduce energy consumption is in the process design and layout stage. A simple process flowsheet with fewer stages will have much lower energy demand. For example, an important step was taken when fine screening was installed after the oxygen stage and coarse screening was also moved to the same position. We innovated a combined fine/coarse screen with multi-stage DD washers. One pump moves the pulp from the oxygen stage blow tank through the screenroom to the post-oxygen washer without any booster pumps. The reject content is lower and screening can be done with three stages and a reject washer – instead of four screening stages.

In the recovery area, our HERB (high energy recovery boiler) considerably improves power generation per tonne of pulp produced and improves the profitability of pulp production with the potential sale of green electricity. We also recover/reuse heat energy by flashing the green liquor from the re-covery boiler to generate steam for our ARC chloride removal process.

The transfer of materials (pumping) typically represents 50% of the electric power consumption of a mill. We have introduced a new generation of MC pumps which substantially lower energy consumption.

McKinsey cites industry partner- ships as a way forward. They also talk of external partnerships as a way to encourage breakthrough ad- vances in technology. Does Andritz participate in any of these?

Hornhofer: On many occasions we hold seminars with specific custom- ers at a group level to discuss energy efficiency improvements for their mills. In Finland, we are part of national energy programs and work closely with research institutions dedicated to energy issues (such as VTT). Another example is the joint development work we are doing with UPM to gasify forest residues and create second generation biofuels.

Köfler: We also have our periodic user seminars where we provide the forum for customers to share their experience and best practices. With regards to McKinsey’s comments about the mon- etization of our R&D investments, there are situations where we do partner the development of a technology directly with a customer. Both parties have to bring something to the development ta- ble and then we grant exclusivity to the customer for a defined period of time – often this helps them gain a competitive advantage.

“Energy is always a major cost factor.”

“One very important way to reduce energy consumption is in the process design and layout stage. A simple process flowsheet with fewer stages will have much lower energy demand.”

Karl Hornhofer, Member of the Executive Board, Pulp & Paper – Capital Equipment.

“In any discussion on energy, papermakers must balance the discussion about fiber supply and utilization as well. These are important considerations and trade-offs.”

Humbert Köfler, Member of the Executive Board, Pulp & Paper – Service and Units.
A “systems” approach to efficiency and energy

The Italian Burgo Group’s desire to compete in complex markets for its graphics papers has led it to evolve into what they refer to as a “paper industry system” – with activities ranging from paper production, distribution, and recycling, to the production and sale of energy. This systematic approach to business led Burgo to work with Andritz on diverse projects to improve machine efficiency and energy utilization in its mills.

For the modernization, new systems for fiber preparation, a new forming section, and a new Andritz Küsters soft calendar, including a web feeding system, were installed. The calender is 7320 mm wide and runs at a speed of 1200 m/min. It consists of a heated roll (surface temperature 120° C) and a PrimeRoll MHV to achieve the best possible control over the paper profile. The calender and feeding system experienced a smooth start-up in May 2007.

Burgo Mantova’s Project Manager for PM 1, Matteo Nicoli, says, “and they ran printing tests for us to verify the paper qualities.”

Nicoli praises the support from Andritz Küsters during the start-up of the new soft calender. “They had all of our machine performance data available to them through a web-based monitoring system,” Nicoli says. “So their best experts in Krefeld (Germany) were available to us. That was some kind of experience!”

The modernization has resulted in smoother and more uniform paper profiles. “It seems like we are working with a new machine today,” Nicoli says. “Many customers expressed their appreciation for the positive changes in paper quality.”

For the modernization of PM 1 at Mantova.

Nicoli finds the new PrimeFeeder from Andritz Küsters particularly noteworthy. “We were a little skeptical at first, because Andritz had not installed a web feeding system before,” Nicoli says. But, after a visit to the pilot plant in Krefeld, the skepticism was removed. “They impressively demonstrated how uncomplicated web feeding can be with our paper.”

The PrimeFeeder is equipped in such a way that usually three “shots” are sufficient to securely feed the paper web. Regarding more or less typical figures throughout the industry, the average time to restart the machine after a sheet break can be reduced by two to three minutes every time. Multiplied by the average number of production days in a year, that equals nearly 24 hours of increased production time each year.

When asked whether the modernization of PM 1 also had an effect on machine efficiency and energy consumption, the engineer nods a careful yes. However, the question of energy consumption can actually only be answered indirectly.

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Burgo Group

Energy savings for the finishing section is estimated to be about 25% with the soft calender in place. “Although the finishing section is not a major energy consumer on a paper machine, any reduction in our total energy consumption is welcome,” Nicoli says. Perhaps the biggest surprise for Burgo lay in the machine efficiency. Usually, the use of online calenders leads to a slight loss in machine efficiency. But, at Mantova this did not happen. “We did not experience a loss in machine efficiency through the installation of the Andritz Küsters soft calender,” Nicoli says. “There were marked gains in the ability to control paper profiles.”

E = Energy
Refiner plates at Avezzano

Energy – its generation, utilization, and sale – plays a unique role in Burgo’s development. If you ask Gianfranco Gaiano, Research Manager for the Burgo Group, how the company addresses energy issues, he will reply, “Because of our history, we have a special relationship to the energy aspect.”

Guiseppe Tagliaferri, R&D Manager for the Burgo Group (left) with Gianfranco Gaiano, Research Manager.

Energy production within Burgo (including its hydroelectric and cogeneration facilities) is sufficient to meet the energy requirements of its mills. In this context, the Group operated an “Energy System” in Italy of around 4.8 billion KWh. The energy business unit, Burgo Energia, handled approximately 1.8 billion KWh, buying and selling on the Italian electricity exchange and the bilateral trading market.

Gaiano and a colleague, Guiseppe Tagliaferri, are studying a move to include more short-fiber eucalyptus in the furnish. They ran a trial recently using Andritz’s LemaxX Spiral™ refiner plates. The trials were carried out at the Avezzano Mill, around 100 km east of Rome. The mill specializes in double- and triple-coated woodfree papers and has several refining lines. “With multiple lines, we were able to run our tests without interrupting paper production,” Gaiano says.

The two factors – raw material and energy consumption – constitute a huge component of production costs, according to Gaiano. “If we can positively change both factors at the same time, of course this is of great interest to us.”

Conventional plates have grooved bars in concentric, parallel patterns around the plate. The crossing angle (angle between plate and fiber) fluctuates depending upon where the fiber is positioned on the plate. The bars in the LemaxX Spiral™ plate are arranged in a spiral shape. This maintains a consistent crossing angle regardless of the fiber position on the plate. The design of the LemaxX Spiral™ produces very good refining results with significantly lower energy consumption.

“When it comes to using short-fiber raw materials, we still have a thing or two to learn,” Gaiano says. “We want to deepen our understanding of the behavior of short-fibered pulp under different conditions and see what that means for our production and the energy balance.”

The specific characteristics of eucalyptus fiber after refining were studied. Fiber length, specific volume, Gurley porosity, tensile strength (tensile index), tear propagation, strength (tear index), and firmness according to Scott Bond tests were meticulously measured, as well as opacity and the light scattering coefficient. All tests were run at different speeds to study how the fiber characteristics would change as production speed was accelerated. Gaiano is positive that the results from the LemaxX Spiral™ trials will be very interesting for those Burgo mills that process short fiber furnish.

E = Expectations
Customers and Andritz

In terms of customer expectations, Stefani explains that one of Burgo’s strengths is the complete range of graphic papers it produces. “We offer coated and uncoated papers with finishes and characteristics that meet the various specific needs of the graphics and publishing sectors.”

With this in mind, the Group has been expanding its range of uncoated and coated papers with FSC mixed sources certification, and introduced coated woodfree papers with PEFC (Program for Endorsement of Forest Certification). These certifications indicate that the paper is being produced with fibers originating in forests managed in an environmentally responsible manner and with an eye to protecting biodiversity.

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Experience with Andritz in the finishing section of the paper machine was gained before the Mantua project. In 2006, Andritz Küsters installed a hard-rip calendar in Cartiere Toscolano, and has installed several swimming rolls over the years for calenders that did not originate from Andritz Küsters.

And, concerning expectations working with Andritz? “The LemaxX Spiral™ trials and the calender and PrimeFeeder for Mantua were not our first projects with Andritz,” Gaiano says.

Not too long ago, when he had temporarily changed from research to project management for modernization and construction projects, Gaiano was responsible for a PHC bleaching project delivered by Andritz to the Duino mill. “I remember the installation of the bleach plant very well,” Gaiano says. “It went really smoothly and was a good project.”

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find out more at www.fiberspectrum.andritz.com

“Because of our history, we have a special relationship to the energy aspect.”

Guiseppe Tagliaferri, R&D Manager for the Burgo Group (left) with Gianfranco Gaiano, Research Manager.

From left to right: Gianfranco Gaiano, Michael Jarolim, Andritz Project Manager, and Guiseppe Tagliaferri.
## Wood Processing

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  - Vray Pulp & Paper
  - Tumut, Australia
  - Liquid methanation plant

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- **Complete Lines & Systems**
  - Ripasa Celulose e Papel
  - Limeira, Brazil
  - LMD® for lime kiln
  - New technology for lime mud drying boosts lime kiln production over 20%
- **Portucel Empresa Produtora de Pasta e Papel**
  - Sáturso, Portugal
  - Biomass power boiler

## Chemical Systems

- **Upgrade & Modernization**
  - Weyerhaeuser
  - Columbus, Missouri, USA
  - Recovery boiler retrofit

## Fiber Preparation

- **Complete Lines & Systems**
  - SCA Tissue
  - Piner, Oregon
  - Rebuild of the former section
  - San Pietro, Italy
  - Cartiere Modesto Cardella
  - Rebuild of the former section

## Paper Machines

- **Complete Lines & Systems**
  - Saigon Dixi Dix Paper
  - Ba Ria Vung Tau Province, Vietnam
  - PrimoRefill S with hydraulic unit
  - KR Pulp & Paper
  - Delhi, India
  - PrimeRefill S

## Paper Finishing

- **Complete Lines & Systems**
  - Burrows Paper Corporation
  - Little Falls, New York, USA
  - PrimeCal Hard calender for specialty MG papers
  - Stora Enso
  - Fors, Sweden
  - PrimeCal Hard calender and PrimeFeeder for board
  - Hardayal
  - Delhi, India
  - PrimeRefill S

## Key Equipment

- **PrimeFlow headbox**
- **PrimeRoll S with hydraulic unit**
- **Andritz disc filter ADT55**
- **Andritz disc filter ADT56**
- **FlyEnkri decalculator**
  - for board
  - Hardayal
  - Delhi, India
  - PrimeRefill S
Recent Start-ups

**Wood Processing**
- Complete Lines & Systems
  - Ningxia Meili Paper
    - LMD lime kiln
  - Three CenterScrew™ slitting screw reclaimer for chip handling

**Recovery**
- Complete Lines & Systems
  - Yanzhou Heli Paper Industry
    - Three CenterScrew™ slitting screw reclaimer for chip handling
  - Xianjiayi, Sichuan, China

**Mechanical Pulping**
- Complete Lines & Systems
  - Ningxia Meili Paper
    - P-RC™ APMP refining system for 360 admt/d
      - First APMP line in Ningxia province

**Fiber Preparation**
- Complete Lines & Systems
  - Sichuan Shengda Forestry Industry
    - Chengdu, Sichuan, China
      - Pressurized refining system for MDF with 384 t/d capacity
  - Yuncheng Xinyuan Junda Wood Industry
    - Yuncheng, Shanxi, China
      - Pressurized refining system for MDF with 312 t/d capacity

**Paper Machines**
- Complete Lines & Systems
  - Shangqiu Dingsheng Wood Industry
    - Shangqiu, Henan, China
      - Pressurized refining system for MDF with 312 t/d capacity
  - Bajaj Eco-tech Projects
    - Shangqiu, Henan, China
      - Pressurized refining system for MDF with 228 t/d capacity

**Mechanical Pulping**
- Complete Lines & Systems
  - Zhongwei, Ningxia, China
    - P-RC™ APMP refining system for 260 bdst/d
      - Fast ramp-up after 4 weeks system is operating at design throughput and reaching guarantee values
  - Haitang Liubao Paper Industry
    - Haitang, Guangdong, China
      - Mechanical pulp HC bleaching system for 360 admt/d
        - Fast-track project – less than one year from contract to full production

**Panelboard**
- Complete Lines & Systems
  - Bajaj EcoTech Projects
    - Kundarki & Paliakanal, India
      - Two pressurized refining systems for MDF with 228 t/d capacity each
        - First order for Andritz in India for processing bagasse as raw material
  - Shangguo Dingsheng Wood Industry
    - Shangguo, Henan, China
      - Pressurized refining system for MDF with 312 t/d capacity

**Pulp Preparation**
- Complete Lines & Systems
  - Shandong Shandong Paper Industry
    - Shandong, China
      - Complete deinking line for newspaper including sludge dewatering, and stock and water system
  - Huatai Paper Industry
    - Shangqiu, Henan, China
      - Stock preparation system for tissue machine
  - Kaizheng, Shandong, China
      - Stock preparation system for tissue machine
    - Key Equipment
      - PrimePress XT
  - Yanzhou Heli Paper Industry
    - Yanzhou, Shandong, China
      - Stock preparation system for tissue machine

**Nonwoven**
- Sefar
  - Heiden, Switzerland
    - Nonwoven XT calender for compacting and glazing of technical textiles and filter material
    - Successful start-up of multi-functional and precise compacting and calibrating calendar
  - Aschaslierei, Germany
    - NeKoal calender with 2 Hot S-rolls, 7300 mm roll width, 800 m/min production speed for spunbond nonwovens
    - Successful start-up of world’s widest nonwoven calender

**ICP Poland**
- Kostrzyn, Poland
  - PrimeLine CrescentFormer tissue machine
    - With 5.55 m working width
    - 3rd repeat order from ICP

**Upgrades and Modernizations**
- Complete Lines & Systems
  - Confederated customer
    - Sweden
      - PrimeLine CrescentFormer tissue machine
        - First installation with PrimePress XT

**Key Equipment**
- Andritz Local Service Centers
  - Andritz is focusing on the expansion of its network of service centers in order to strengthen the resources available to customers locally. The goal is to have the right combination of trained people, tools, and capabilities in place to provide quality service at an affordable price.
  - Additional knowledge and experience based on the Group’s joint venture with Sindus Andritz, a leading supplier of maintenance services for instrumentation and automation in South America, is now being incorporated to Andritz’s local service capabilities.
  - Examples of expanded capabilities in Europe include the Service Center South (in Graz, Austria) and Service Center West (in Düsseldorf, Germany and pictured here), which were established in 2005 and 2006. Additional Service Centers in France and the U.K. were established in 2007. Plans for further geographic expansion are underway.

**Recent PrimeLineCOMPACT**
- Including stock drying technology
  - PrimeLineCOMPACT tissue machine
    - Complete turnkey installation of a PrimeLineCOMPACT tissue line
  - Miltenberg, Germany
    - 1360 t/d deinking line
    - Capacity and sludge dewatering system for Wastepaper pulping system with 1750 t/d capacity
  - Shouguang, Shandong, China
    - Complete deinking line for newsprint
  - Dongying, Shandong, China
    - Complete deinking line for newsprint
  - Guangzhou, Guangdong, China
    - Complete deinking line for newsprint
  - Stora Enso Huatai Paper Industry
    - Shangqiu, Henan, China
      - Stock preparation system for tissue machine
  - Yanzhou Yongyue Paper Industry
    - Shangqiu, Henan, China
      - Stock preparation system for tissue machine
  - Borlänge, Sweden
    - Stock preparation system for tissue machine
  - Hyltebruk, Sweden
    - Stock preparation system for tissue machine
  - Yanzhou, Shandong, China
    - Stock preparation system for tissue machine
  - Kostrzyn, Poland
    - Stock preparation system for tissue machine
  - ICT Poland
    - Stock preparation system for tissue machine
  - ICT Poland
    - Stock preparation system for tissue machine
  - Osaka, Japan
    - 11 shafts with elements for PrimeRoll MHV
  - Stora Enso Hytte
    - Hyltebruk, Sweden
      - PrimeRoll HV
      - Successful start-up of energy saving roll: up to 40% less energy consumption
Getting ahead
...with Andritz drying technology

Optimized drying of all paper grades and efficient use of energy through innovative air technologies.

PrimeDry Systems for paper and board drying increase the water evaporation of the entire drying section. For tissue, high-temperature hoods and high-precision Yankees (cast or steel) allow excellent drying rates. The TAD hood and air system provide uniform drying of premium quality tissue and towels. Each component of the PrimeDry Systems has its unique strengths to move your products ahead.

We accept the challenge!