Metso's customer magazine for the pulp and paper industry No. 2/2013

# results pulp & paper

## Biorefining

– the next step in the evolution of the pulp and paper industry

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# Good old things in a new package

Striving for customer success, serving customers both locally and globally, listening even more carefully to customer needs - these continue to be top priorities on the agenda of the new Valmet which will start its operation at the beginning of 2014*). We will be happy to offer our customers the familiar, skilled and well-equipped resources and business support in a slightly different "package": as an independent company concentrating on serving the pulp, paper and energy industries.

With a focused business scope , we will be able to accelerate strategy implementation and develop our operations faster and more efficiently towards an even greater customer and investor value. Our ambition will continue to be the leading technology and services provider in all of the fields we work in. Our services business especially, with its extensive global network and support from our strong process and technology know-how, has a lot to offer. The work for the benefit of our customers will continue.

The choice of the name Valmet, still familiar to many of us from the earlier days, offers an excellent opportunity to incorporate its strong heritage and brand in building a new corporate identity. While the name is time-honored, the quest for continuous renewal will characterize everything we do and will be the essence of our corporate identity. The new Valmet will be a modern, energetic and responsible company that has confidence in its future in all its business areas.

The new Valmet is getting ready to serve you!

**PASI LAINE**
President, Metso's Pulp, Paper and Power businesses
President & CEO, Valmet Corporation as of Jan. 1, 2014

*) The Extraordinary General Meeting of Metso will convene at the beginning of October 2013 to adopt final decisions on the demerging of the companies.

# Metso to manage mill maintenance at Australian Paper's Maryvale Mill

Metso and Australian Paper have signed a multi-year agreement according to which Metso will manage the mill maintenance operations at the Maryvale Mill in Victoria, Australia. Metso will manage all maintenance systems and procedures at the mill and will be responsible for optimizing maintenance costs and developing maintenance quality. The agreement became effective on June 1, 2013.

The Maryvale Mill has three pulp lines, five papermaking machines, an elemental chlorine-free bleach plant, a pulp lapping machine, a finishing facility and a waste paper processing plant. The objective of the agreement with Metso is to achieve world-class maintenance standards at the Maryvale Mill. Metso will assist Australian Paper in developing the skills of maintenance staff and employees, and in improving planning and productivity.

"We are pleased to announce that Metso is our alliance partner and will work with Australian Paper to achieve world-class maintenance," says **Jim Henneberry,** CEO, Australian Paper. "Metso is a supplier of world-class maintenance and manufacturer of original equipment for the global pulp and paper industry. The company's significant worldwide expertise and professionalism will greatly benefit our operations at Maryvale." ▢

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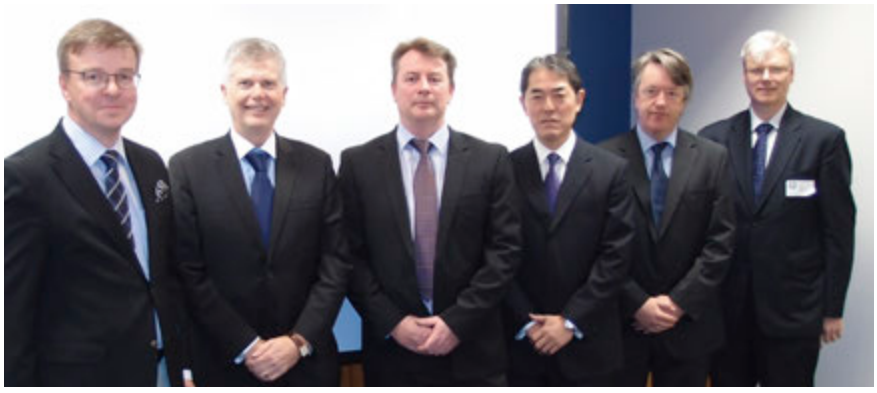

Australian Paper and Metso signing the mill maintenance management contract at Maryvale Mill. From left to right: **Jukka Koiranen,** Director, Mill Maintenance, Metso; **Jim Henneberry,** CEO, Australian Paper; **Pierre de Villiers,** Vice President, Sales, Australia and New Zealand, Metso; **Hirofumi Fujimori,** Representative Director, Australian Paper; **Peter Williams,** CFO, Australian Paper, and **Markku Salo,** Manager, Sales and Global Operation Development, Mill Maintenance, Metso.

## Metso and UPM to continue mill maintenance agreement at Plattling mill

Metso and UPM have agreed to continue their mill maintenance outsourcing agreement at the UPM Plattling mill in Bavaria, Germany. Metso will provide maintenance systems and procedures and be responsible for optimizing maintenance costs and developing technical availability at the mill. The agreement, covering three paper production lines, became effective on July 1, 2013.

Metso has been responsible for the maintenance of the Plattling mill's PM 1 since 2007 and of PM 10 and 11 since 2011. The new multi-year agreement will cover mill maintenance operations for these three paper production lines. ▢

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# Yunnan Yun-Jing Forestry and Pulp Mill orders tissue line

Metso will supply a complete tissue production line for Yunnan Yun-Jing Forestry and Pulp Mill Co. Ltd in China. The new tissue machine will be installed at the company's mill in Jinggu County, Yunnan Province. The start-up of the machine is scheduled for mid 2014.

"This will be the most advanced tissue machine with highest capacity and product quality and lowest energy consumption in the Yunnan Province. The new tissue line will integrate tissue making into Yunnan Yun-Jing's current business and will supply high-quality tissue to the Yunnan market. We are convinced that the new line will improve our competitiveness and support our market expansion," says **Chen Xueping,** Deputy Manager, Project Management, Yunnan Yun-Jing Forestry and Pulp Mill Co. Ltd.

Metso's delivery will comprise a complete high-speed tissue production line featuring an Advantage DCT 100+ tissue machine. The new line will have a width of 2.85 m and an operating speed of 1,870 m/min. It will have a yearly production of 30,000 tonnes of bathroom tissue for the Chinese market. Raw material for the new production line will be virgin fiber from the company's own pulp mill. ▢

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# Tissue production line for PT Suparma Tbk


**The contract signing ceremony** for the supply of an Advantage DCT 100 tissue machine at PT. Suparma, Tbk, Indonesia.

Metso will supply a complete tissue production line for PT. Suparma, Tbk., in Indonesia. The new tissue machine will be installed at the company's mill in Surabaya. The start-up of the machine is scheduled for 2014.

The new tissue line will fulfill PT. Suparma, Tbk's ambition to produce environmentally friendly products of the highest quality in a cost-efficient way.

"As a tissue producer since 2007, we have utilized 96% of our existing tissue machine capacity, which means that we must install a new machine in order to develop our market. We decided to place an order with Metso because quality is essential for us and we believe that Metso's advanced technology is certain to produce a high-quality tissue product," says **Lanny Bernadette,** Director, PT. Suparma, Tbk.

Metso's delivery will comprise a complete high-speed tissue production line featuring an Advantage DCT 100 tissue machine. The new line will have a width of 2.75 m and an operating speed of 1,600 m/min. It will add another 25,000 tonnes per year of bathroom tissue, towel grades and diaper tissue to the company's existing production for the Indonesian market. The raw material for the new production line will be virgin fiber and recycled fiber. ▢

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## Containerboard line for Zhejiang Jingxing Paper

Metso will supply Zhejiang Jingxing Paper Joint Stock Co., Ltd. with an OptiConcept M containerboard production line for their Pinghu site in Zhejiang Province in China. The new production line is targeted to produce high-quality containerboard grades out of 100% recycled raw materials. The start-up of the machine is scheduled for 2014.

"The line ordered by Zhejiang Jingxing Paper will be the fourth OptiConcept M-type production line to be supplied to Asia. The first line delivered was started up in China in December 2012. This latest project concerns the newest member in the OptiConcept M family, and widens Metso's offering to include the narrower trim width of 5,650 mm. This represents a strategic move by Metso to enter this narrow segment, especially in China and Asia-Pacific," says **Petri Paukkunen,** Vice President, Paper Mills Sales and Marketing, Metso.

Metso's delivery will comprise a complete OptiConcept M boardmaking line from headbox to reel. The new 5.65-m-wide (trim) machine, PM 16, will produce fluting grades out of recycled raw materials in the basis weight range of 70-120 g/m$^2$. The production capacity of the machine will be approximately 880 tonnes per day with a design speed of 1,100 m/min. ▢

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# Containerboard line for Lee & Man

Metso will supply Lee & Man Paper Manufacturing Ltd. with an OptiConcept M containerboard production line for their Chongqing site in Sichuan Province in China. The new production line is targeted to produce a high-quality end product with excellent strength properties. The start-up of the production line is scheduled for 2014.

Metso's novel OptiConcept M production line stands for economy of total investment, personnel safety and machine usability as well as reduction of environmental load.

"This production line optimizes the machine investment in line with the mill's capacity needs and ensures optimized productivity at minimal operational cost," summarizes **Sami Anttilainen,** R&D Director, Paper business line, Metso.

Metso's delivery will comprise a complete OptiConcept M boardmaking line from headbox to reel with related air systems. The 7.25-m-wide (wire) PM 20 will produce testliner grades out of recycled raw material in the basis weight range of 70-160 g/m$^2$. The production capacity of PM 20 will be approximately 1,160 tonnes per day and the design speed 1,100 m/min. ▢

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# Metso opens a service center next to Suzano's new mega pulp mill

Metso will expand its global service network by opening a new service center to serve Suzano Papel e Celulose S.A.'s 1.5-million-tonne greenfield pulp mill in Maranhão, northeastern Brazil. The service center will supply roll grinding and other maintenance services, and selected spare parts and consumables will also be stored on site. The center will be located in Imperatriz, close to the Maranhão mill, and will be operational in late 2013.

"This investment is in line with Metso's strategy for services growth. Local support to customers and long-term partnerships provide value to our customers and to Metso," says **Jukka Tiitinen,** President, Services business line, Pulp, Paper and Power, Metso.

Metso and Suzano Papel e Celulose S.A. have also agreed that Metso will establish mill maintenance activities for the entire Maranhão mill. According to the agreement Metso will take responsibility for the establishment of the mill's maintenance management system and support Suzano in establishing materials management operations.

"We have decided to contract Metso to use its process knowledge and maintenance expertise to establish maintenance activities for the Maranhão mill. We anticipate efficient maintenance plans and organization which will ensure a reliable start-up and quick learning curve, from the first days of operation," says **José Alexandre,** Industrial Director, Suzano Papel e Celulose.

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The groundbreaking ceremony of the new service center to be built in Imperatriz was held on April 25, 2013. Pictured are (left to right) **Adriano Canela,** Project Manager, Suzano Papel e Celulose, **Sebastião Madeira,** Mayor of City of Imperatriz, **Elio Krummenauer,** Director, Services, South America, Metso, **Volnei Remor Hilbert,** Industrial Manager of Suzano Maranhão mill, **Celso Tacla,** Area President, South America, Pulp, Paper and Power, Metso, and **Jukka Tiitinen,** President, Services business line, Pulp, Paper and Power, Metso.

# Metso and CMPC finalize order agreement

Metso and CMPC Celulose Riograndense S.A. (CMPC) have finalized an agreement, according to which Metso will supply the key technology for CMPC's Guaíba II pulp line in Brazil.

The new pulp line, which is an expansion of the existing Guaíba pulp mill, will have a capacity of 1.3 million tonnes per year, and will be able to reach 1.5 million tonnes per year with minor investments. The new pulp line will be built in the state of Rio Grande do Sul in southern Brazil and is scheduled to be commissioned in the first half of 2015.

Metso's delivery will include the main parts of the pulp line: the cooking plant and fiber line, pulp drying and baling, evaporation, a recovery boiler, causticizing and lime kiln, an integrated automation solution and an operator training simulator for all mill process areas.

The order will be supplied by Metso's units in Europe and Brazil. The total impact on employment at the Metso Group will be approximately 300 man-years, and during the peak of the construction phase approximately 4,000 people will be working for Metso at the construction site.

"The confirmation of the agreement marks the conclusion of an important stage in the construction of this new pulp mill in Brazil. This is a significant step towards the consolidation of a project involving lots of people and resources. Guaíba II is a project involving many people who have been working professionally and tirelessly. Metso's professionalism and commitment to health and safety was a key element for CMPC in the decision process," says **Gonzalo García,** General Secretary, Empresas CMPC.

"This major order from CMPC is a recognition of Metso's strong capabilities as a full-scope supplier for the pulp industry," says **Pasi Laine,** President of Metso's Pulp, Paper and Power business. "It is proof that our customers trust our know-how concerning the construction of complete pulp mills that we have developed locally."

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# The four waves of biorefining

Fortunately, *biorefining* has not yet become a content-free buzzword. For *sustainability,* vague and foggy speech with a sprinkling of "green" and "sustainability" often passes for insight. This is an insult to a very significant topic.

However, trends reign. In a recent analysis quoted in the journal Nature online in July, it was shown, based on 320 000 articles, that scientists—in this case physicists—are flocking to the topic others are already pursuing. This isn't exactly news, but it is nice to have one's prejudices confirmed. Biorefining is also in danger of becoming fashionable and simply a word bandied about to make something sound more current and interesting.

As it so happens, biorefining is neither new nor revolutionary. At Pöyry, we divide its life cycle into four waves. The first wave—**"Very Decentralized Biomass"**—lasted from ancient times to the Second World War. It was simply a question of using the available biomass for the greatest need with the Best Available Technology. Covering a pile of wood with dirt and igniting the wood (the earth kiln) was for a long time the BAT. The way in which biomass was refined into pulp and paper also had its BAT. The bioenergy supply chain was people collecting firewood.

With the Second World War resource scarcity became an issue. The second wave—**"Wartime Innovation"**—came about with, for example, biogas-driven cars and ethanol from wood, such as at Domsjö. As the war came to an end so did the extraordinary efforts; there came an end to the "Project Manhattans".

In the 1970s, a severe, political/oil crisis took place. The third wave—**"Oil Substitution"**—emerged, and much of current biorefining knowledge was created at that time or at least has its roots there. Of course, the crisis passed and many important studies were later destroyed due to the lack of archive space. These studies now have to be tracked down by calling on retirees and asking them if they just happen to have copies somewhere in their basements.

We are now in the fourth wave—**"Reinventing Biorefining"**. Partly due to the issue of climate change, and partly due to resource scarcity and political security of supply, the world has spent the last few years somewhat reinventing the second and third waves, often blithely ignoring the work that has already been done. At the same time, a bewildering array of different value-from-biomass projects have been created to compete for attention. Subsidies have boosted some branches of products, and some have subsided, leaving uncertainty in their wake.

What remains as a solid foundation is that in a resource-scarce world, renewable, sustainably produced biomass is a golden asset. The whole spectrum of products and processes is also arranging itself. The full spectrum in biorefining from basic bioenergy to pulp, solid and liquid biofuels, biobased chemicals and biobased materials (including paper) is advancing on every front and integrating into a whole.

"The King of the Hill" is the one who understands biomass from waste to agro and wood, masters the technologies and processes, and is able to decide on the optimal use to add value. Such a "king" has every possibility to breach previous cluster limits and expand from the current paper chain to a basis for many key industry sectors. The throne awaits... ▢

**Dr. Petri Vasara**
Global Practice Head,
Pöyry Management Consulting Oy

# New Valmet getting ready to serve!

**TEXT** Elisa Lomperi

Starting from the beginning of 2014, the customers of Metso's Pulp, Paper and Power businesses will be dealing with a new, independent company, bearing the renowned, time-honored name of Valmet.*

## Metso plans to demerge into two independent companies

The Board of Directors of Metso Corporation has approved a demerger plan to separate the company's Pulp, Paper and Power businesses into a new, independent listed company that will be named Valmet Corporation. The Mining and Construction and Automation businesses will remain in the current company, which would continue to operate under the Metso name.

All the assets, debts, and liabilities of Metso's Pulp, Paper and Power businesses will be transferred to the new company. Valmet would initially have the same ownership structure as Metso and would be totally independent without any cross-ownership between Metso and Valmet.

Pasi Laine, the present head of Metso's Pulp, Paper and Power businesses, has been appointed President and CEO of the new Valmet Corporation.

The demerger will require the approval of an Extraordinary General Meeting, planned to be held in early October 2013. If approved, the planned registration date of the completion of the demerger is December 31, 2013 and public trading in new Valmet shares on NASDAQ OMX Helsinki is expected to commence as soon as possible thereafter.

* Pending Metso Extraordinary General Meeting approval.

"The name will be Valmet, but the company itself will be quite different from the former Valmet days," explains **Pasi Laine,** the future President and CEO of Valmet Corporation. Metso has during the last decade acquired know-how and heritage from a number of companies and businesses through mergers and acquisitions, making it a strong player in all of its present operating areas.

"The things that have remained and have been developed further are the quality and reliability of our technology and operations as well as commitment to our customers. We are glad to be able to incorporate in the new company all the good connotations the Valmet name still has in the minds of many persons within the industry, " Laine continues.

**Why the demerger?**

Metso is today a strong global player with well-established positions in its customer industries. The next steps in the strategic development will be taken most efficiently as two separate companies, enabling more focused and crystallized strategies and operations.

"With a focused business scope, we will be able to develop our operations more briskly and efficiently towards even greater customer and investor value. The pulp, paper and power industry will be our main employers, challenging us to offer ever more competitive products, more successful projects and more high-class customer service", Laine says.


**Good market position ensures a good start**

The new Valmet will start its operation in a good market position. The company is the number one or number two supplier for the pulp, board and paper industries as well as for the bio-energy industry.

"Our main advantages are a large installed base and excellent customer relations. We have an extensive and most capable service network around the world, employing thousands of committed service experts who are in daily contact helping the customers. On top of this, we have a large technology portfolio to offer, enabling our customers to draw long-term value out of their rebuilds and new investments."

"In spite of all this, we like to regard ourselves as a challenger. To be able to stay at the frontline of technology, we need a humble attitude, and we need to listen to our customers and to their needs more carefully than ever. Today's business is based on cooperation and mutual understanding," Pasi Laine points out.

**Traditional and new ways of business**

The basic elements of the current strategy will continue to be important also in the new Valmet. "The market area-based operating model will remain vital for our business. We want to work close to our customers in all our main markets and be easily accessible. We will rely even more than before on our services business. The services, supported by our strong process know-how, have a lot to offer for the benefit of our customers."

Extensive services, strong board and paper machine know-how, full-scope pulp mill deliveries, modern energy generation solutions - these are, according to Pasi Laine, some of the core items on Valmet's agenda.

In the demerger process, Metso's Automation business will remain with Metso. The close cooperation will continue and the synergies utilized between Automation and the future Valmet businesses to create the best possible customer value.

Furthermore, Laine wants to draw attention to the new, innovative, bio-based solutions that Metso has been actively developing. Gasification of waste and biomass, pyrolysis, lignin separation from black liquor, prehydrolysis, to name just a few of these technologies, will create new business opportunities to extract an even bigger value out of biomass. They will open up new revenue streams both for the pulp and paper industry and for Valmet.

New end products and innovative technologies also enable increased flexibility to cope with today's rapidly changing business environment.

**Committed to customers' success**

Where does the future President and CEO personally see the new Valmet Corporation in five years' time?

"We are a modern, and agile service and technology provider, working as partners, close to our customers, with an extensive, own technology offering. Even more know-how and capabilities, maybe fewer own production assets. Our bio-energy solutions will create added value for customers," says Pasi Laine, explaining his vision of the future.

"All of this can only be realized with the help of a dedicated, knowledgeable, committed personnel, taking care of service operations close to customers or working on our technology as centralized resources. We all have our contribution to make to the success of our customers and to the success of the new Valmet", Pasi Laine concludes.

A COAL-FIRED PLANT GOES GREEN

# The world's largest biomass gasification plant supplied by Metso

**TEXT** Satu Lamminen

World's largest biomass gasification plant came on stream in March 2013 at Vaskiluodon Voima Oy in Vaasa, Finland. With Metso's technology in place, close to half of the coal used by the plant can be replaced with gasified biomass, contributing to a massive reduction of $CO_2$ emissions.

**Mauri Blomberg,** Managing Director of Vaskiluodon Voima, is pleased that the company now has an alternative to coal-firing in its processes.

The new 140-MW bio-gasification plant features Metso's innovative concept for gasifying and utilizing biomass. The delivery included fuel handling, a large-scale dryer, and a circulating fluidized bed gasifier, modification work on the existing coal boiler, and a Metso DNA automation system. The bio-gasification plant was constructed as part of the existing coal-fired power plant, and the produced gas will be combusted along with coal in the existing coal boiler.

The plant is ground-breaking in many ways, particularly as this is the first time anywhere in the world that biomass gasification is being adopted on such a large scale for the replacement of fossil fuels.

"Vaskiluodon Voima made a coal-fired plant go green, and for this reason will set an example for others to follow in the future," explained **Jyrki Holmala,** President of Metso's Power business line.

The ribbon cutting ceremony at the inauguration of the plant was performed by **Rami Vuola,** Chairman of the Board of Vaskiluodon Voima and CEO of EPV Energia Oy, a joint owner of Vaskiluodon Voima (left); **Lauri Ihalainen,** Minister of Labor; **Lauri Virkkunen,** President and CEO of Pohjolan Voima Oy, the other joint owner of Vaskiluodon Voima; and **Jyrki Holmala,** President of Metso's Power business line.

## Metso's work safety is highly valued

Close to half of the coal used by the plant can be replaced with gasified biomass. This means the solution is highly environmentally friendly, it also enables the flexible use of different fuels and significantly extends the life of the current power plant.

"We now use three to six kilos less coal per second in our production than earlier. This means having one coal shipment less per month," explains **Matti Loukonen,** Power Plant Manager of Vaskiluodon Voima.

Loukonen is happy that the project is now finally completed and everything went according to plan. Special thanks must go to Metso's work safety culture. "Although at some point there were about 200 people working on the site, there was only one incident reported—and that was a strain injury!"

**Mauri Blomberg,** Managing Director of Vaskiluodon Voima, is happy that the company now has an alternative to coal-firing in its processes.

"I'm sure that gasification is the right choice for us, and I believe that other power plants will also start to use it," he commented. "Metso is our long-time partner and was thus a natural choice to supply the technology." ▢

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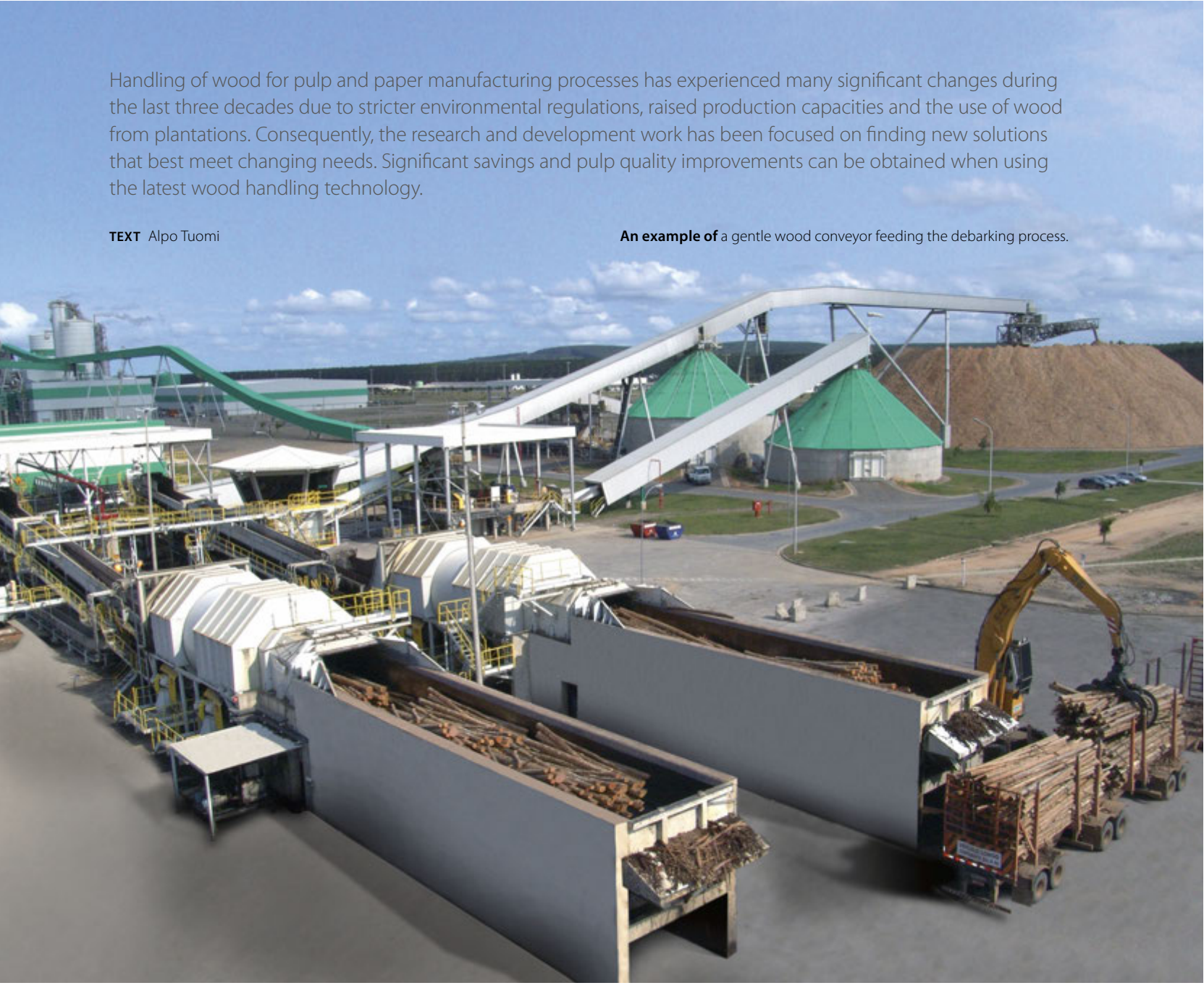
Handling of wood for pulp and paper manufacturing processes has experienced many significant changes during the last three decades due to stricter environmental regulations, raised production capacities and the use of wood from plantations. Consequently, the research and development work has been focused on finding new solutions that best meet changing needs. Significant savings and pulp quality improvements can be obtained when using the latest wood handling technology.

**TEXT** Alpo Tuomi



**An example of** a gentle wood conveyor feeding the debarking process.

# Modern wood handling for high-quality pulp

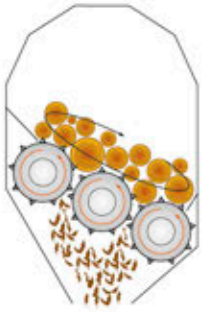
**The main objectives in current wood handling technology are**

- Removal of bark as efficiently as possible
- Production of uniform chips for pulp digesting
- Minimizing wood losses
- Minimizing environmental impact.

Ideally, these objectives can all be met when debarking and chipping are carried out immediately after harvesting. Furthermore, optimum results, both in debarking and chipping, can be best obtained when there is less variability in log length and diameter. Wood with a high oven dry weight, chips from the surface layer of wood, and chips with a high length-to-thickness ratio offer the best pulp quality in the digesting process.

**Optimizing wood handling for a high-quality end-product**

The main areas of optimizing are log receiving and debarking, chipping and chip storage. Minimizing wood losses starts at the point of feeding the logs into the debarking process. Dropping the logs into the drum damages the log ends and increases wood losses and the volume of pin chips. Therefore, in a modern wood handling system, the logs are gently fed horizontally into the debarking process. Many wood species coming from forest plantations are difficult to debark, compared to easy-to-bark softwood which was the primary raw material only a couple of decades ago. For example, eucalyptus bark emerges in long strips and mainly follows the logs out of the debarking drum. For this reason, a



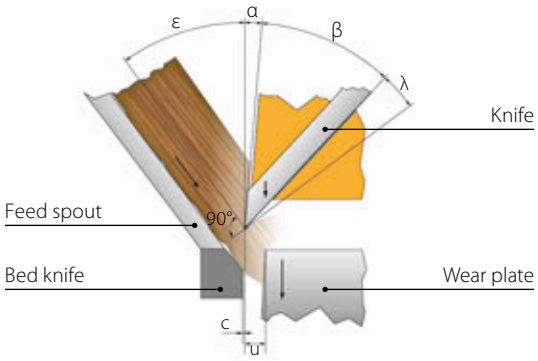
**Operational principle of** a large-capacity mechanical debarker. The teeth of rotating spiral rolls help loosen the bark, which is finally removed by the force of logs rubbing against each other.

special bark separation system after the drum is necessary.

Debarking drums are still commonly used for bark removal at the mill site and they come in a range of structures, with the rubber-tire-supported drum being the most popular. However, in many cases, plantation trees are debarked immediately after felling in the forest using debarking heads mounted on the forest harvester. New mechanical debarking equipment for large capacities can offer an option for debarking of difficult-to-debark species also in frozen conditions.

## Chipping minimizes wood losses

The chipper is the heart of the wood handling process and plays a major role in maximizing the amount of high-quality chips for digesting.




Chipping geometry variables.

| | |
|---|---|
| ε | Spout angle |
| α | Clearange angle |
| β | Knife angle |
| λ | Complementary angle |
| c | Knife clearance |
| u sin ε | Chip length |

**Chipping geometry and** knife design are essential in producing high-quality chips.

## A modern chipper is designed to operate with the following criteria

- low amount of pins and fines
- minimum amount of oversize
- low amount of overthick
- high length-to-thickness ratio.

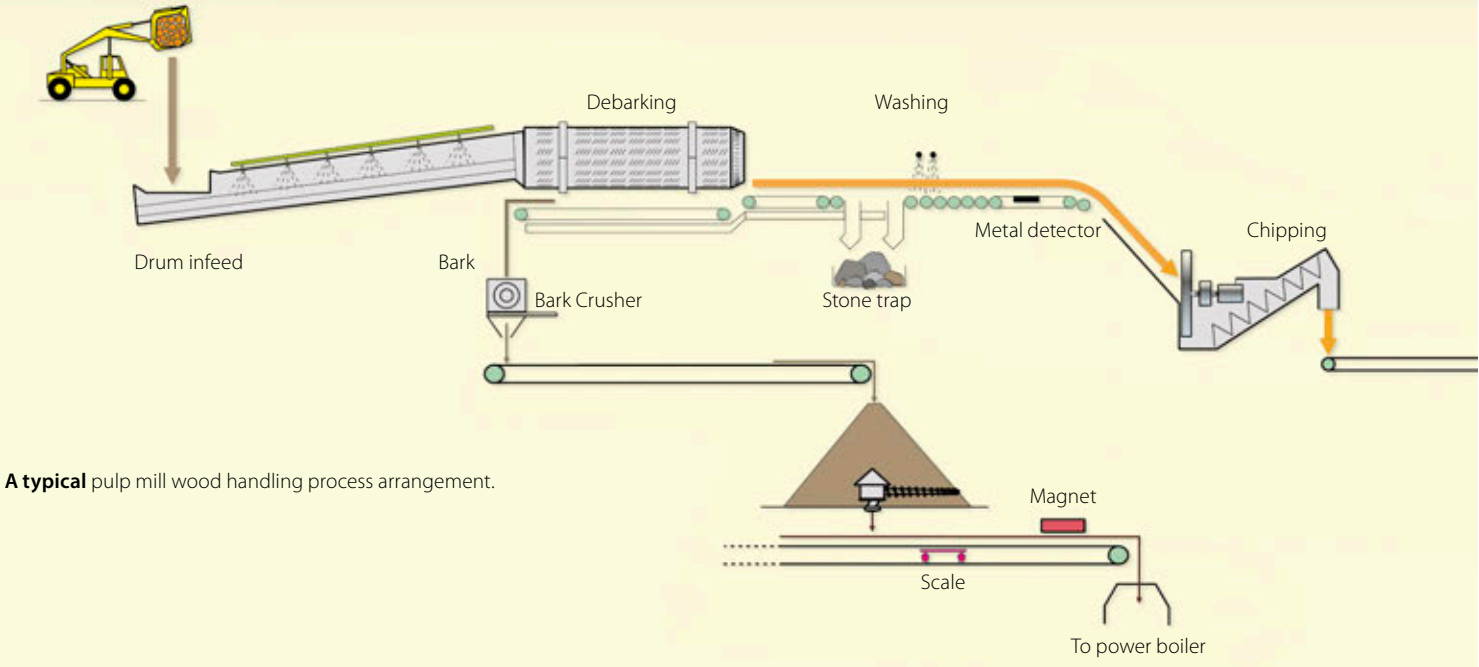
Correct chipping geometry and knife design are essential in minimizing wood losses and maximizing the amount of accepts. Today's mega mills are designed for an annual pulp production of up to two million tones, requiring several wood processing and chipping lines.

For example, the Suzano Maranhao mill, which is currently under construction in Brazil and due for completion before the end of 2013, is designed for an annual pulp production of 1.5 million tonnes and will have three wood processing lines, together providing 2,700 cubic meters an hour of chips for cooking.

The biggest chippers currently on the market can produce about half that amount of chips an hour. Drop feed and horizontal feed type chippers are commonly used, and the horizontal feed type is especially suitable for longer log lengths, which is typical in North American tree length chipping.

## Subsequent wood handling stages

It is important to preserve high chip quality in the subsequent wood processing steps,




**A typical** pulp mill wood handling process arrangement.

| Benefits in cooking | |
|---|---|
| Higher yield | 0.5 - 2.0% -units |
| Lower kappa | 1 - 3 units |
| Less rejects | 50 - 85% |
| ► Less bleaching chemicals | |
| Alkali | 5 - 15% |
| Oxygen | 5% |
| Active chlorine | 5% |
| Higher tear/tensile index | 1 - 2 units |

**Obtainable benefits** and savings potential in subsequent process stages when utilizing latest wood handling technology.

**The GentleStore** automatic chip storage and reclaiming system at the April Rizhao mill.

i.e. chip conveying, storage, and screening. Earlier pneumatic conveying systems are no longer favored due to their high energy consumption and characteristic chip breaking, while the belt conveyor offers an economical and gentle transportation alternative.

Many mills still use front loaders for reclaiming open chip storage piles. However, these rough methods easily destroy some of the benefits gained in preceding process stages and increase the loss of total yield.

A modern chip storage system features an automatic first-in-first-out principle, where all chip particles have the same retention time in the pile and where reclaiming takes place automatically and in a gentle operation. The largest individual piles are capable of storing and handling more than 250,000 cubic meters of chips. One of the world's largest chip storage systems in a single mill is at the April Rizhao mill in China, encompassing five storage piles with one million cubic meters of storage capacity.

## Significant savings in further process steps

Comparison tests with the performance of conventional chippers have shown that significant savings can be achieved in the whole pulping line when using the latest chipping and chip handling technology. In mega-size pulping lines the annual financial savings can be millions of euros. ◻

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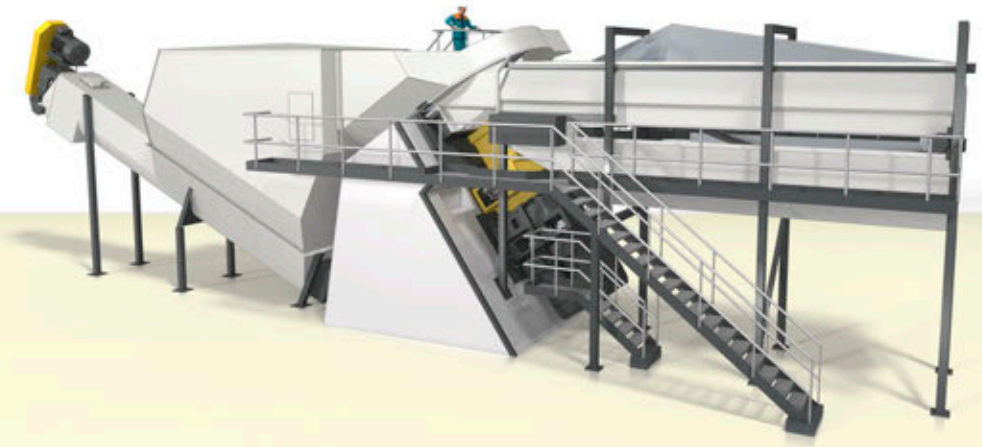
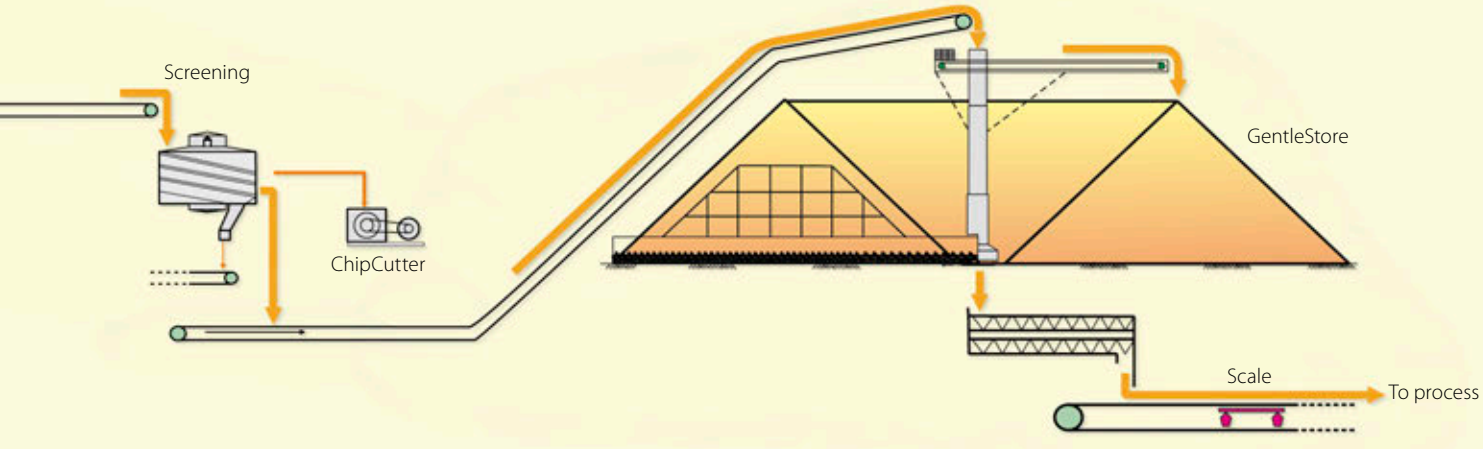
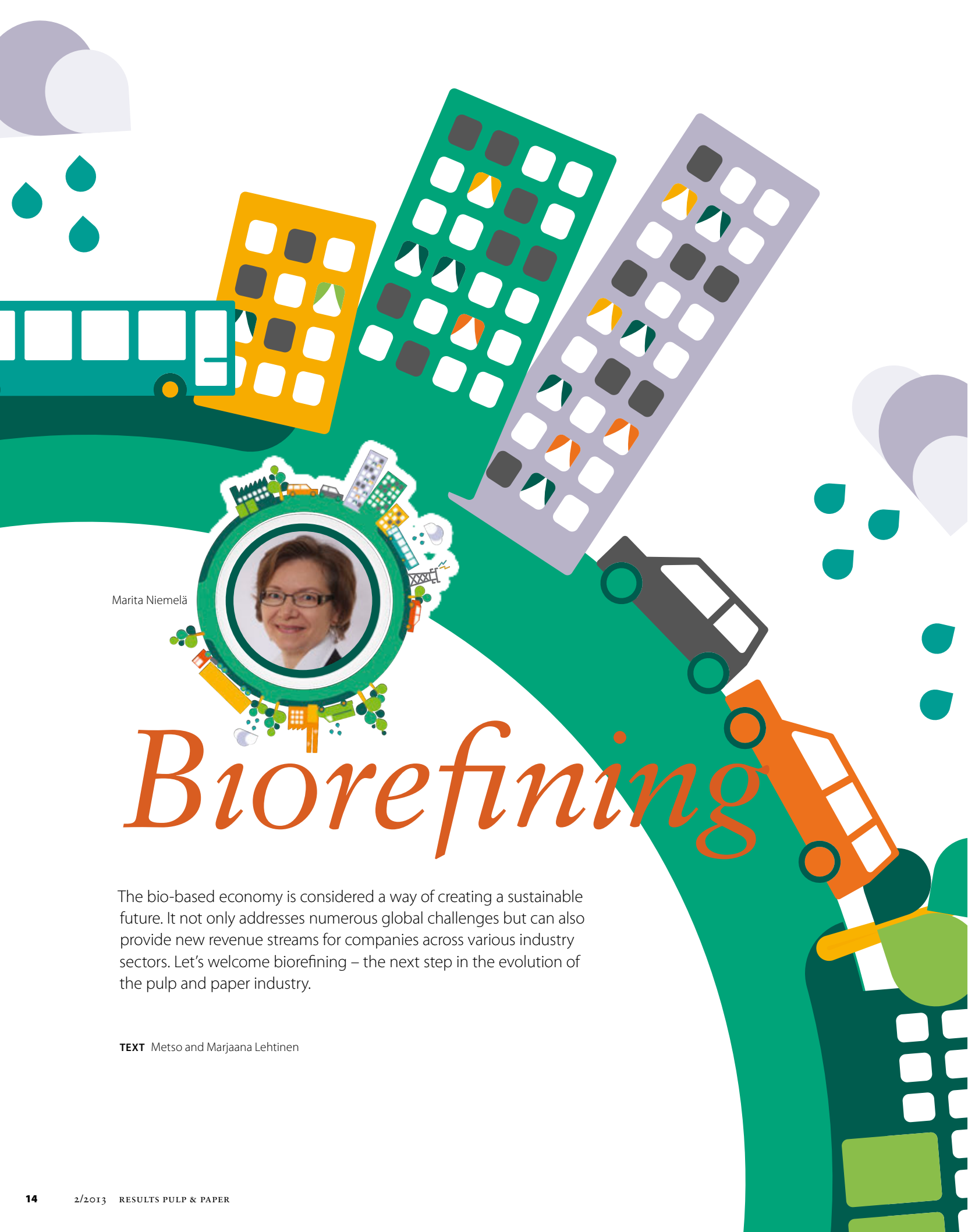


**A horizontal** feed chipper (Metso).





Marita Niemelä

# Biorefining

The bio-based economy is considered a way of creating a sustainable future. It not only addresses numerous global challenges but can also provide new revenue streams for companies across various industry sectors. Let's welcome biorefining – the next step in the evolution of the pulp and paper industry.

**TEXT** Metso and Marjaana Lehtinen

"We are looking into biorefining not only because of our love of technology but also because the world really needs new solutions. This area of business is driven by challenging global issues: climate change, increasing need for energy, energy security, and rural welfare. Therefore, biorefining is urgently needed but it can only be part of the solution," says **Marita Niemelä,** D.Sc. (Tech.), the first Vice President of Bio-Technologies of Pulp, Paper and Power segment, Metso.

Niemelä, who started in her position in November 2012, has an impressive career in biomass and related processing technologies, business consultation, strategy development, marketing and sales. She came to Metso from Pöyry and has published dozens of articles on biotechnology. She is also a Docent at the Aalto University School of Chemical Technology in Finland.

**A fresh perspective on existing technology**

In its operations, Metso has defined biorefining as the sustainable processing of non-food biomass into marketable products such as pulp, paper, heat, power, fuels, chemicals and bio-based materials like composites. The company uses the term biomass to mean woody biomass, recycled paper, agricultural residues, purposely grown energy crops and combustible sorted waste.

"Biorefining with our processes and technologies provides our customers with increased value from biomass. Good examples of our present biorefining technologies are pulp mills and power plants," Niemelä adds. "Biotechnology is largely about further developing what we are already familiar with and taking a fresh perspective on the future potential of our technologies."

Biomass opens up new opportunities for companies especially in the pulp and paper, sugar and biofuels, oil and gas, chemicals and power generation industries.

**Intensified use of wood**

Biorefining is definitely nothing new for pulp and paper mills, since making pulp and paper out of forest resources is biorefining at its purest. So what's in it for them? In the short-term, new opportunities and revenues.

It is no secret that the pulp and paper industry is facing challenges in the modern electronic age. Mills are thus actively seeking new revenue streams and ways to maximize the value created from each processed tonne of biomass.

"Metso offers technologies for intensifying the use of wood and for using various waste flows. Our target is to convert biomass into renewable energy like producer gas and biofuels, lignin-based new products and nanocellulose, composites and bioplastics, as well as new paper and board grades," Niemelä points out. "We are continuously introducing new tools and processes for our customers and thereby contributing to the development of new business opportunities."

Practical examples of new approaches include the structuring of tissue paper in Metso's novel NTT process, or making containerboards and cartonboards with less raw materials, or using multilayer curtain coating to produce specialty grades.

**Innovations improve efficiency**

Other key elements in biorefining are cost efficiency and energy efficiency. Due to rising energy prices, all mills need to pay more attention to their energy consumption and operating costs. New innovations developed by Metso are already making pulp and paper makers' production processes more efficient. They include, for instance, a press to improve press dryness and save energy as well as a new process for low-consistency refining.

"We truly are committed to biorefining and will develop new concepts and make them into winning solutions," Niemelä continues. "And our total offering is just the same as it is now in our traditional areas of business, ranging from new installations to rebuilds and services. For example, the importance of start-up services is likely to increase in this challenging area of new technologies."

In order to ensure that their targets are achieved, Metso works in close partnership with customers who are looking for ways to improve the productivity and availability of their processes throughout the entire life cycle.

# means creating more value from biomass

**New revenue streams through lignin separation**

Metso's LignoBoost process separates and collects lignin from pulping liquor. The world's first commercial installation of this technology was supplied to Domtar, Plymouth, North Carolina, USA. The separation of a portion of the mill's total lignin production allows an increase in pulp production capacity. It also provides the mill with a new and more profitable value stream from a product that was traditionally burned in a recovery boiler. Lignin can be utilized as renewable fuel instead of fossil fuels and as a starting material for new bio-based products in many industries.

**Low water, energy and chemicals consumption at the world's biggest softwood pulp mill**

Ilim Group's new softwood pulp mill for fully bleached pulp in Bratsk, Russia, started up in April 2013. Metso supplied the mill with a complete fiber line including the world's biggest CompactCooking G2 digester with a capacity of 800,000 tonnes per year. When in full operation, the Bratsk mill will be one of the world's largest and most modern softwood pulp production facilities. However, its water, energy and chemicals consumption is expected to be lower than that of a conventional mill.

**Producing tissue with less fibers**

Papel San Francisco in Mexico is currently installing a new Advantage NTT textured tissue production line that was supplied by Metso. It features a novel method of producing premium-quality tissue paper with high bulk and softness in an energy- and cost-efficient way. Innovative textured tissue technology produces a saving in fiber of up to 30%.

FROM JSC SOLIKAMSKBUMPROM

# High-quality newsprint rolls

Printing machine manufacturers released a new generation of printing machines in 2006-2007. These high capacity ink machines were designed for bigger customer rolls, with a web width of up to 2.1 meters and a roll diameter of up to 1.5 meters. By investing in a new wrapping line, JSC Solikamskbumprom was able to meet the needs of the changing markets.

**TEXT** Jari Kuokka and Pauliina Purola

JSC Solikamskbumprom already had the ability to fulfill customer needs in principle, since they had already purchased two Metso (earlier Valmet) WinBelt winders for both PM 1 and PM 2 lines. The winders were already able to produce 1.5-m-diameter newsprint rolls. However, the existing roll handling and wrapping lines limited the size of the produced rolls.

According to **Aleksey B. Tessman,** Process Chief Engineer, Doctor of Chemistry, JSC Solikamskbumprom had two alternatives: to invest in a new roll handling and wrapping line or to lose their share in the changing European newsprint market. JSC Solikamskbumprom chose the first alternative. In the spring of 2010, Metso won the bidding competition for the new line as a result of its viable layout plan and Solikamskbumprom's earlier experiences of good cooperation with the company in several modernizations and rebuild projects that were carried out by Metso over the years. The layout included the possibility of using the existing wrapping line as a reserve line.

## Well-planned project

Just two months after the start-up in January 2012, JSC Solikamskbumprom started to produce XXL-sized newsprint rolls (2.1 m in width and 1.5 m in diameter). XXL production currently makes up 5% of PM 2's production and the trend is upward.

**Juriy Vezner,** Head of Development Department explains the reasons why JSC Solikamskbumprom chose Metso as the supplier: "Metso's quotation was suitable, both technically and layout-wise. Metso's equipment does not have any hydraulics, only pneumatics and electromechanics, which are practically maintenance-free and reliable for paper storage in arctic circumstances."

"Metso's layout enabled the installation of a new line while existing lines on both sides were in operation. The flexibility of the equipment supplier is a great benefit when carrying out new installations in existing premises," Juriy Vezner explains and says that all the set targets of the project were achieved. Roll wrapping quality is

PHOTO: ISTOCKPHOTO/VERNONWILEY

**There have** been no complaints about wrapping quality from customers since the installation of the new wrapping line.

"The main benefits of Metso as a supplier and cooperation partner include the high level of technology, customer tailoring, flexibility of layouts, and rapid response to urgent requests."
**Juriy Vezner,** JSC Solikamskbumprom.

good and the amount of big roll production is growing as planned.

### Easy and safe quality wrapping

The new wrapping line is safer and easier for operators to work with compared with the old ones. Slat conveyors are gentle on the rolls. Equipment maintenance is simpler without hydraulics that can easily leak.

**Makuna Hasiya,** Operator Foreman, says that operators are very pleased with the new wrapping line because rolls are controlled from station to station along the conveyor line, and are highly visible throughout the entire wrapping and labeling process. Additionally, the new wrapping line is very safe to use because it has photocell lines which prevent access to the machine area while automatic wrapping sequences are ongoing.

The wrapping quality is much better compared with that produced by the old wrapper for a number of reasons: the roll heads are better glued to the roll ends, the folding of the roll edges is better and there is less wrinkling compared with the old wrapping line when using the same wrapping materials.

### Well-proven technology

Metso is a well-known international supplier of fully automatic, high capacity wrapping lines. **Mikhail Kuchin,** Project Manager, Metso Paper ZAO, says the project proved that Metso can deliver lines to meet customer's specific needs. Well-proofed core units of an automated wrapping line were put together in a simplified way in order to create a reliable and easy-to-use manual wrapping line. The wrapping machine is operated by three operators. The inner and outer heads are inserted manually, and application of shipping labels to wrapped rolls also takes place manually. All the other functions are automated, including roll identification before they go to the wrapping station.

Basic elements of the conveyor system and the short pitch slat conveyors look like simple devices. However, the technology which enables the gentle crossover of the paper rolls directly from one conveyor to another – as is the case on rubber belt conveyors – combined with maintenance-friendly construction, is a result of development work spanning two decades.

### Smaller investment, less spares and maintenance work

Nowadays, all roll wrapping and handling equipment functions electromechanically or pneumatically as default. Rapidly developed electrical drive controls have made it possible to replace hydraulic equipment with electromechanical drives that require less maintenance. This means lower investment costs for equipment, a smaller stock of spares and less maintenance work. Hydraulic equipment is also available, but only at the customer's request.

One great advantage of the new roll wrapping and handling equipment is its comprehensive user interface. Besides normal run and parameter setting displays and production and error logs, the all-inclusive troubleshooting displays show the expected and actual status of each sensor in the system. This feature dramatically reduces the troubleshooting time of maintenance personnel and keeps the availability of the wrapping line high at all times.

**Roll dimensions**

| | |
|---|---|
| Roll diameter | 900 – 1,500 mm |
| Roll width | 500 – 2,400 mm |
| Roll weight, max. | 3,000 kg |
| Roll capacity/h | 90 |
| Paper grade | Newsprint |

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OAO Solikamskbumprom is located in the Northern Urals, Russia. There are four paper machines that produce standard newsprint, at a basis weight range of 38-56 g/m$^2$. Fifty percent of production is exported to more than fifty countries.

**Mikhail Kuchin** (Sales Manager, Metso), **Yuriy Vezner** (Head of Development Department, Solikamskbumprom) and **Jari Kuokka** (Project Manager, Metso) are happy with the outcome of the project.

General Manager **Xiandong Ji:** "In China, box makers will soon be buying board in square meters instead of tonnes."

# How about saving millions?

**TEXT AND PHOTO** Pauliina Purola

Until now, paper and board makers in China have been focusing all their attention on increasing their output in tonnes. Based on this approach, a paper machine is not considered to be functioning well if its output in tonnes drops, even if this is due to improved bulk and reduced use of fibers. The box makers are not willing to pay premium rates for lighter products, neither – even though they are able to produce more boxes with the same amount of tonnes. According to **Xiandong Ji,** General Manager of Zhuhai S.E.Z. Hongta Reheng Paper Co., Ltd., this era is gradually coming to an end. Environmental considerations and fiercer cost competition are forcing box makers to rethink their processes. Whichever way you look at it, boxes are not made of tonnes but board sheets.

Extremely high-quality board with high bulk is a reality with Zhuhai S.E.Z. Hongta Reheng Paper's PM 2 board making line and Metso's ValZone metal belt calender. The Hongta PM 2 achieves high surface smoothness, and they are aiming for lower and lower basis weights. "The low-weight trend is really growing in China. Today, we are producing boards with basis weights of 210 g/m$^2$ but we plan to further lighten the basis weight to as low as 200 g/m$^2$," confirms Xiandong Ji. According to him, the reasons for reducing board weight are "building image, getting environmentally sounder products and a lower price, and using less fiber". For paper makers, "it's just about saving cost".

"The day will soon be here when paper and board users realize that they need to buy in square meters instead of tonnes," says **Xiandong Ji,** General Manager of Zhuhai S.E.Z. Hongta Reheng Paper Co., Ltd.

## Boxes made of board sheets, not tonnes

When one is producing e.g. cigarette boxes, the actual board tonnes do not matter. What matters is the surface area per tonne. "Most of the box makers still buy in tonnes rather than square meters. We have a fixed arrangement with some box makers, which eases the situation a little. But buying in tonnes will also see a gradual change. The day will soon be here when paper and board users realize that they need to buy in square meters instead of tonnes," says Xiandong Ji.

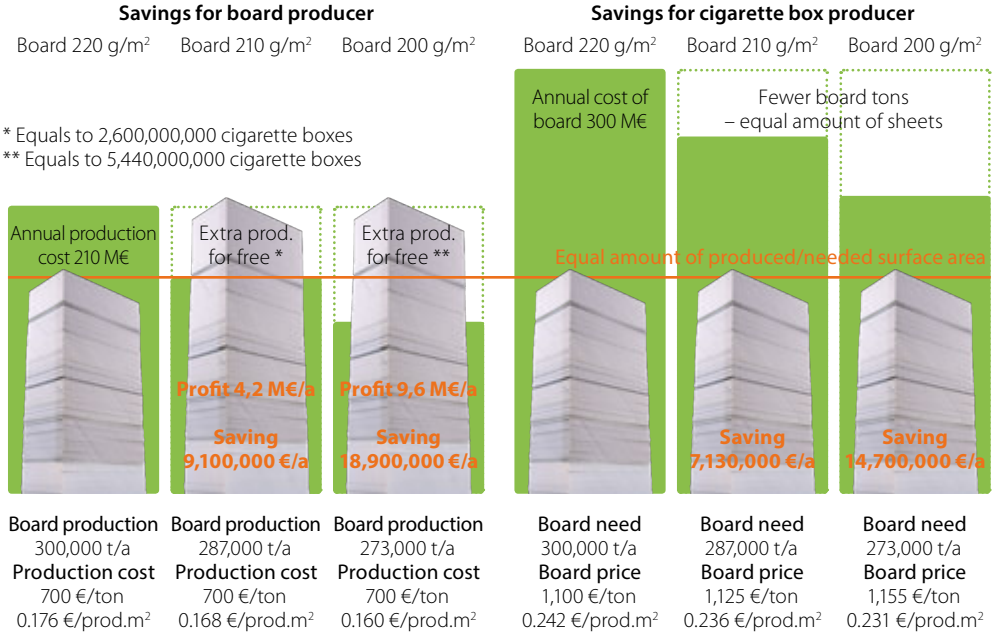
## How about saving millions?

When focusing on lowering basis weights of paper or board, it is important to be open-minded. If you just focus on making and buying in tonnes with predefined basis weight, you will never be able to achieve the benefits of lowering weight. What if cigarette board of 200 g/m$^2$ would easily equal a heavier grade of 210 or 220 g/m$^2$? In these cases, the raw material savings alone are substantial and amount to millions of euros (see calculation below).

To be among the first to change one's viewpoint will require a certain amount of courage, but such a change will result in a greener image with substantially lower cost. It is certainly worth paying a little more per tonne of board.

The ValZone metal belt calender is only one of Metso's numerous solutions for improving bulk and lowering basis weight without a deterioration in the strength or surface quality.

Sounds hard to believe? Let's calculate this together using your numbers. It all ends up in cost savings.




**Cost savings** are enormous when bulk is increased, i.e. basis weight decreased. The calculations consider only direct savings.

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OptiDry Vertical improves production capacity at Wolsan Haman PM 1, South Korea

# Solving production obstacles together

**TEXT** Heli Anttila

At the Wolsan Haman mill, part of Dong Il Paper, South Korea, the testliner and fluting machine PM 1 was experiencing production capacity limitations, especially during the cold season due to irregular steam supply capacity. The mill was seeking greater flexibility for drying and the OptiDry Vertical with gas heating gave them just that.

The 4.7-meter web width machine had a speed limitation due lack of drying capacity. In general, there are three ways to solve drying capacity limitation problems (see the figure). One solution is more drying cylinders with a 3-level drying section, another is more drying cylinders with a longer drying section, or, finally, a short drying section with Metso's OptiDry Vertical air dryers with several heating options. The two cylinder drying capacity solutions are expensive and require a lot of construction work and long shutdown times; they also require more steam capacity, which was not available at the Wolsan mill.

Metso's revolutionary OptiDry impingement drying technology has been developed to replace and improve traditional cylinder drying. In impingement drying, hot air is impinged at high speed against the web to create high drying capacity. The returning air is used to carry out the evaporated water. Metso has three impingement drying solutions offering different benefits for papermakers. OptiDry Twin for drying capacity and bulk savings, OptiDry Vertical for drying capacity increase, especially in rebuilds, and OptiDry Horizontal for curl control.

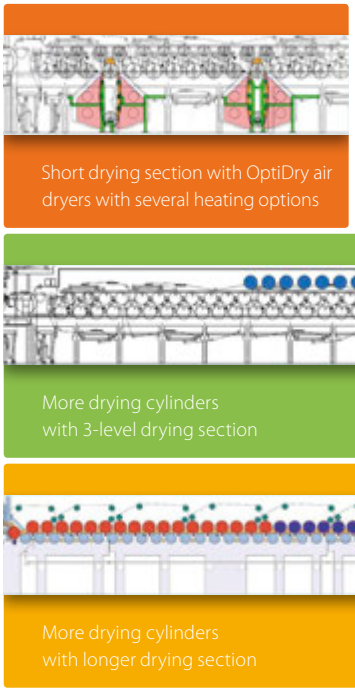
Installation of an OptiDry Vertical impingement dryer at the beginning of the dryer section not only enhances drying, but can also allow the steam pressures of the cylinders to be increased without sticking while the dry content is raised, thus improving the drying effect of the current equipment as well. In many cases OptiDry Vertical is the only possible way of increasing production if the machine is drying-limited and there is no extra space in the machine room. The dryer will be located in the basement so there is no need to find space for extra drying cylinders and to relocate the dry end equipment. This means less construction work and a shorter shutdown time.

OptiDry Vertical offers increased drying capacity without adding machine length. The average production capacity increase with one dryer is around 15%, giving the potential for a speed increase. With OptiDry Vertical technology it is possible to dry all paper and board grades without changing the end product quality and it suits different drying layouts.

## Results at the Wolsan mill

The target of the rebuild was to increase the drying capacity by 14%, to improve the runnability, to even out process conditions during the cold season, and to get more flexibility for drying.

After the short seven-day shutdown, the rebuilt machine was started up in May 2012. The machine speed was increased from 1,050 m/min to 1,200 m/min with 180 g/m$^2$ end product.




**Three ways to** solve drying capacity limitation problems.

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"We were very happy with Metso's expertise during the project. The drying capacity targets were achieved quickly after start-up and this OptiDry Vertical dryer provides a lot of flexibility for our drying energy concept and improves our environmental performance." says **Jin Doo Kim,** Vice president of Dong Il Paper.

METSO PARTNERSHIP AWARD

# Dong Il and Jin Doo Kim pioneers of the papermaking industry

**Jin Doo Kim,** Vice President of Dong Il Paper Manufacturing Co., Ltd. received the Metso Partnership Award from Metso's **Hannu Pietilä** (left), Area President, Pulp, Paper and Power, Asia Pacific, and **Timo Saresvuo** (right), Senior Sales Manager.

Dong Il Paper Group and Jin Doo Kim, Vice President, Dong Il Paper, were presented with a Metso Partnership Award at the end of 2012. The award was given to the company as it has been an outstanding partner and forerunner in adopting new technologies. Dong Il has been actively involved in developing many new solutions for the paper industry.

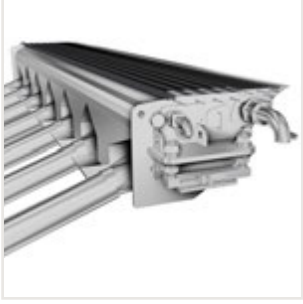
**TEXT** Pauliina Purola

The cooperation between Dong Il and Metso has lasted more than a decade. Dong Il has invested in Metso's new technology and innovative processes and participated in the final fine-tuning of the solutions. As a result, Dong Il has established a competitive edge in the Korean market, which increases its market share and profitability. The products presented in this article are just a few examples of the novelties Dong Il has invested in.

**Here are the latest examples** of the exciting products that Dong Il has invested in.

**OptiFiner Pro refiner** features a revolutionary new low-consistency refining concept, in which one OptiFiner Pro can replace two traditional refiners and deliver electrical energy savings of over 20% with results that are the same or better than before.

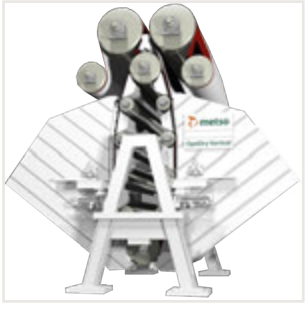
**OptiFlo headbox** with innovative layering technology makes it possible to produce a perfect, layered end-product with very good layer coverage using only one headbox and forming unit. Multilayering provides further possibilities to adjust the quality and strength properties in containerboard grades. Read more about the OptiFlo Layering Fourdrinier on page 28.



**VacuBalance forming board** for the forming section provides controlled dewatering at the very start of the dewatering section. It is a vacuum-assisted forming board for stabilizing the jet impingement. VacuBalance ensures good fine distribution and good dewatering capacity in the forming section.

**FormMaster high-frequency breast roll shaker** is an effective solution for an improved sheet forming process. It improves formation by creating shear forces in the web. It also improves strength properties and makes the sheet more symmetric in the MD and CD direction.

**Jin Doo Kim** is Vice President of Dong Il Paper Manufacturing Co., Ltd., which is a privately-owned paper company established in South Korea in 1986. The company has four paper mill sites (Ansan, Wolsan, Uiryeong and Dongwon) producing various containerboard grades such as liner, testliner and corrugated medium.



**OptiDry impingement air drying** is a new, very efficient way of drying the paper web. The efficiency is achieved by blowing hot, high-velocity air onto the sheet and circulating the air back to the dryer. This method yields considerably higher specific evaporation rates than conventional cylinder drying. Read more about Dong Il and OptiDry on page 19.

**OptiSizer Spray surface sizing** with spray application is a unique size application method. The size is sprayed directly onto the web through a row of spraying nozzles. A higher amount of starch can be applied to achieve better strength properties, and there are no parts in the operation that are subject to wear. Read more about OptiSizer Spray on page 26.

**The OptiLayer multilayer curtain coater** applies one to three extremely thin and uniform layers simultaneously all within one coating station. The concept makes it possible to produce a white-top product without the use of bleached fiber. It also enables precise adjusting of functional coating additives for cost-effective results.

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**Supplied by Metso** and started up in November 2010, the PM 1 line features the very latest in boardmaking technology.

CHANGLE NUMAT PM 1

# Goal reached!

**TEXT** Marjaana Lehtinen

A few years ago, Chinese Shandong Century Sunshine Paper Group set itself the goal of producing high-quality white top liner. With the help of Metso's boardmaking technology and expertise, the company has succeeded; today, its new product is regarded as the benchmark within the Chinese containerboard industry.

**Ci Xiaolei,**
Vice President and General Manager.

**Liu Ting,**
Quality Manager.

**Chang Yongsheng,**
Production Manager.

Changle Numat PM 1 is a true trailblazer in the coated board market in China. It was the first high-capacity production line to introduce a new type of coated white top liner. Although the liner has only a minimal amount of expensive virgin fiber on the top layer, the product has excellent printing properties.

Supplied by Metso and started up in November 2010, the PM 1 line features the very latest in boardmaking technology, from headbox to winder, together with related stock preparation and air systems. The machine control, process control, and quality management systems were also supplied by Metso.

"The competitiveness of a company comes from innovation, in respect of the business model, production technology and management. At the same time, you need to simplify the whole production and supply chain and increase value chain efficiency, from raw material to production and from sales to service," says **Ci Xiaolei,** Vice President and General Manager of Changle Numat Paper Company. "The products with lower basis weight and high performance produced by PM 1 have exceeded customer requirements."

Before the investment, the mill had a production line that produced lightweight coated board, but according to **Liu Ting,** Quality Manager at Changle Numat, product quality was poor.

"In order to improve quality and replace coated board with a gray backside from other paper mills, we invested in the new production line. And we have now achieved both of these objectives."

**Production targets exceeded**

In addition to the quality targets, PM 1 has also reached—or exceeded—the set production target. Current production is about 60–70 tonnes per hour, amounting to 1,400–1,500 tonnes per day. The machine's designed production is over 1,300 tonnes per day and annual production is 500,000 tonnes.

**Chang Yongsheng,** Production Manager at the mill, has every reason to be satisfied with a line that includes headboxes and a three-ply multi-Fourdrinier forming section equipped with top forming unit with shoe and blade technology.

"The headboxes perform very well, and the automatic control system is superior to a manual system. The slice flow controls system perform well, and their accuracy is high," he comments. "This is the first time that we use a top forming unit with shoe and blade technology. The dewatering, formation, and two-sidedness properties of the board are very good. Quality has improved. The dewatering of the top wire is better, which increases PM 1's running speed."

Gas drying has definitely brought savings in electricity costs.

**High-level automation, high efficiency**

The PM 1 line is fully controlled by a Metso DNA automation system. In the past two years, it has proven its capabilities.

"Automation enables us to improve quality, reduce costs as well as enhance efficiency. Better quality eventually improves our customers' competitiveness," explains **Wang Lixin,** Automation Manager at Changle Numat.

Running a production line as massive as PM 1 would not be possible without advanced automation. Wang continues: "Wide, high-speed machines have many parts that operators cannot control unless they use a high-level automation system. High efficiency definitely follows from a high degree of automation."

Metso DNA is a platform for process, machine, drive, and quality controls. "The same platform is good for maintenance. It is easy to update and maintain different systems from the same supplier and with the same hardware. There is very much information in the system. We can find the fault information and alarm information easily. If there is a problem, the system can analyze the problem by finding out the information and trend." There is also a remote connection link to Metso's automation experts in Finland.

**Support from the Zibo service center**

In 2010, Metso opened a service center—the third in China—in Zibo, Shandong Province, serving the pulp and paper industry in the northern part of China. One of the customers is Changle Numat. All of PM 1's roll grindings are carried out at the Zibo center.

"We believe that with the high-speed paper machines gradually started up, the requirements for the staff are becoming higher and higher. For our part, we plan to strengthen the cooperation with Metso in the future," says **Wang Jianhai,** Maintenance Manager at Changle Numat. □

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| | **Changle Numat PM 1** |
|---|---|
| Grades | 120-220 g/m$^2$ coated white top liner and 94-200 g/m$^2$ uncoated white top liner |
| Width | 7.25 m |
| Production capacity | 500,000 tonnes |
| Design speed | 1,100 m/min |

**Wang Lixin,**
Automation Manager.

**Wang Jianhai,**
Maintenance Manager.

**Air drying saves energy**

Like every modern and environmentally conscious mill today, Changle Numat also wants to boost sustainability by improving energy efficiency in its operations. It means cost savings, too.

Energy efficiency on PM 1 is visible, for example, in coating drying, where Metso's PowerDry Plus gas drying is used instead of conventional infrared drying. According to the mill, energy consumption per board tonne has decreased, and water consumption is now about 3–4 m$^3$.


**The coating drying uses PowerDry Plus** gas drying instead of the conventional infrared drying.

The quality of customer rolls is greatly influenced by the winder. Unstable performance can result in major losses and headaches, whereas reliable performance can reduce costs and offers peace of mind. One mill that has benefited considerably from Metso's regular on-time preventive maintenance solutions and professional mill site services is Stora Enso Huatai in China.

"We have improved our winder performance a lot by working with Metso," says **Bin Li,** Winder Supervisor at Stora Enso Huatai.

# Customized winder service ensures efficient operations at Stora Enso Huatai PM 6

**TEXT** Martin Yang and Ahti Peiponen

PHOTO: ISTOCKPHOTO/MALERAPASO

The work of the team is summed up nicely by the Chinese saying: **"When the medicine comes,** the symptoms are alleviated".

Established in April 2006 and located in Dongying, Shandong Province, China, Stora Enso Huatai (Shandong) Paper Co. Ltd. is a joint venture of Stora Enso Group and Shandong Huatai Paper Co., Ltd. Previously located in Germany and then migrated to China, PM 6 produces recycled fiber-based super calendered paper (SC). The grade is widely used, for example, in advertising materials, mass circulation magazines, catalogs, newspaper inserts, mail orders, and supplements.

The production line features a new belt-supported WinBelt winder supplied by Metso. The winder became operational at the end of 2007. The winder is able to turn nip load sensitive paper into large, high-quality shipping rolls by controlling the nip load and making tight paper rolls through the application of high winding force from the driven belts.

Since the start-up of the winder, local Metso service people have been providing the mill with customized winder process know-how, improvements, and maintenance services.

"My cooperation with Metso goes back ten years to the time when I worked at PM 9 and PM 11 in Shandong Huatai Paper," says **Bin Li,** Winder Supervisor at Stora Enso Huatai. "The technology that Metso's mill site service uses is advanced and their service quality is very good. These are the reasons why we trust Metso and why we have chosen the company as our preferred supplier for the winder. In fact, we have improved our winder performance a lot by working with Metso."

Metso's mill site service team in China was established in 2005 to provide fast and effective service for pulp and paper mills. The work of the team is summed up nicely by the Chinese saying: "When the medicine comes, the symptoms are alleviated".

## Increased speed and capacity

In April 2011, when Stora Enso Huatai was adding a new paper grade to its production range, it was necessary to upgrade and optimize the winder. Not only was its speed too low, but there was also major vibration in the winding area.

The mill contacted Metso's mill site service and an expert was immediately assigned to the job. To begin with, the winder's mechanical components were checked for wearing. Then, to keep the vibration at a good level and all rolls in tolerance, mechanical alignments were checked and corrected. Also, new winding parameters were created to produce high-quality shipping rolls out of the new paper grade.

Metso also arranged on-site training for the mill operators. The training better acquainted them with the winder so they could locate possible problems, analyze the paper by using the proper tools, and use the Metso winder automation system more efficiently.

As the result of all these winder performance improvements, the winder speed was increased from 1,600 m/min to 2,000 m/min, which meant an increase in winder capacity.

## Dishing problem eliminated

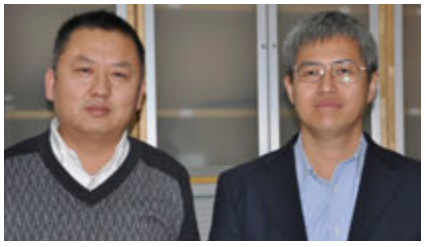
In September 2012, a dishing problem with the winder caused uneven roll edges, resulting in poor roll quality. Despite their best efforts, the Stora Enso Huatai staff could not find the reason for the problem. Metso was contacted to provide deeper insight into the winding process.

After a careful winder inspection and the elimination of some possible causes of the problem, the real reason was discovered. The winder rear drum surface roughness had reduced, making the winding force uneven. Metso fixed the problem by re-coating and re-aligning the rear drum. In addition, the winding recipe was optimized, and the tension transmitter was replaced.

With these measures, it was possible to improve roll quality and eliminate the mystery dishing problem. □

**Regular visits** and inspections are vital in keeping the winder in good shape at Stora Enso Huatai. Leo Zhang of Metso (left) and Bin Li, Winder Supervisor.

**Customer roll** end after service.



**Tao Gang,** General Manager of Stora Enso Huatai (on the left) and Metso's Xie Daorong are glad about the good cooperation between the companies.

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Opti™
for papermakers

**TEXT** Pauliina Purola

A revolutionary technology of spraying surface size directly to the paper web provides a number of benefits for liner and fluting producers: better board strength, lower life-cycle cost, higher production capacity and ease of use and maintenance. The novel method is suitable for both rebuilds and new board machine lines.

# OptiSizer Spray revolutionizes size application

## BETTER STRENGTH PROPERTIES WITH LOWER OPERATING COSTS

In the spray application of surface size, a thin layer of size is sprayed directly to the web from a row of spray nozzles. The spray nozzles are close together and the sprayed fans overlap up to six times for even starch profiles. There is no return circulation, thus no contamination from the web, which means that the surface size in the supply system is always clean. There is no need for a big and complicated supply system, either. The beam construction and mist recovery are carefully designed to keep the spray mist and edge splashes inside the spray beams and the surroundings clean. Therefore, little starch is wasted and there are fewer production disturbances.

### Better strength properties

Applying surface size on the paper web allows papermakers to achieve better strength properties. The strength is crucial especially for liner and fluting producers. OptiSizer Spray responds to this need by enabling an increase in the amount of starch applied – compared with both film and pond size presses. Better strength properties are direct results of this.

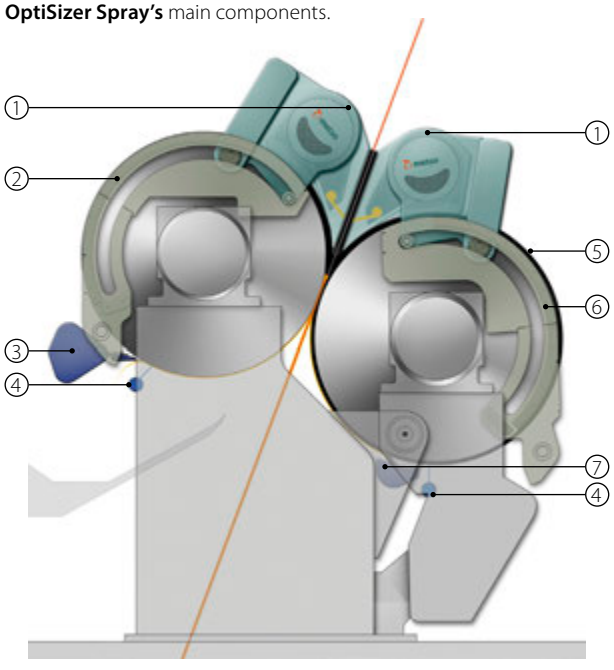
The method also allows easy adjustment of the strength properties depending on the properties of the base paper by adjusting feeding pressure. Therefore, if the base paper properties or customer-specific strength targets vary, the amount of starch can be quickly and accurately controlled accordingly and the desired end-product properties will be achieved. The method also responds quickly to changes in solid content due to the low volume system.

### Lower life cycle cost

It is unlikely that any paper or boardmaker can ignore the overall life cycle cost of production. "Making as many good-quality products as possible with as little as possible" is not an easy equation to solve.

In the case of OptiSizer Spray, the saving potential in life cycle cost is big – especially

**OptiSizer Spray's** main components.




1. Spray beams
2. Hard nip roll
3. Optional hard roll doctor
4. Moisturizing shower pipes
5. Soft nip roll
6. Movements by servo drives, along gear ring
7. Edge doctor

**Auxiliary systems**
Mist removal system
Machine circulation

in pond size press rebuilds. The amount of starch solids can be twice as high compared with pond application. Thus, the savings in drying energy and steam consumption alone are substantial. Compared with film size application, there is a noticeable difference in maintenance cost: there are no consumables (no rods or rod beds) in spray application and no wearing caused by sand or debris in starch circulation. Because it is possible to use a soft-hard nip roll pair compared with the soft-soft roll pair in conventional film application, the roll covers need less maintenance, i.e. grinding.

**Higher production capacity**

As mentioned above, the need for drying is significantly reduced compared with pond sizing. By removing these types of production bottlenecks, there is great potential for improving production capacity by e.g. increasing operating speed. Furthermore, better runnability results in higher efficiency: a dryer web reduces the amount of web breaks.

**Easy to use and maintain**

Spray sizer is easy to operate. The start of spraying is easier compared with pond sizing because spraying can be started gradually. Tail threading is a straightforward and easy task. Precise starch control accuracy is achieved with three independently controlled parameters: the size of the spraying nozzles, application pressure and modification of the starch solid content. Functional additives can also be applied very effectively and precisely. When production parameters require different nozzle sizes, the change-over is fast and easy thanks to exchangeable application modules.

Roll cover and rod wear do not impact the starch pick-up since the spray nozzles stay intact. There is no need to modify the amount of starch solids with worn out roll covers or rods. The nozzle area is typically cleaned during each web break. The cleaning operation is fast: the cleaning takes only 10 minutes with one operator. There is virtually no contamination in the size press environment and a little contamination of the beams.

**Development of spray sizing technology**

The spray application method provides many advantages. Therefore Metso R&D is continuously aiming to widen the paper and board grade application area. OptiSizer Spray is still on the learning curve. The aim is to get even more benefits with fewer compromises. With such a great potential - especially for rebuilds of pond size presses - the chosen path will be worthwhile. ◻

## **OptiSizer sizer family** - high functionality and quality with a low total cost of ownership

Metso has combined its paper and boardmaking offering to introduce the new Opti range of products. The product range has been simplified and solutions are provided that offer the best economic advantage and environmental security for paper and boardmakers.

OptiSizer Spray is a part of the OptiSizer product family, which offers all available application methods and solutions for all paper machine sizes. The application methods are spray application, film application and pond application. All the sizer product family members have a robust and modular construction combined with high functionality and quality with a low total cost of ownership.


Surface sizer with film application.


Surface sizer with spray application.


Surface sizer with pond application.

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Opti™
for papermakers

**TEXT** Marika Mattila

The OptiFlo headbox family combines Metso's expertise and new technology, enabling improved quality and increased productivity in all forming applications. The cost-effective OptiFlo two-layer headbox, which is an innovative member of the family, makes it possible to produce lightweight containerboard with only one hybrid forming unit or with a Fourdrinier-type former. The latest two-layer hybrid forming headbox supplied by Metso came on stream at Liansheng Paper PM 5 in Fujian province, China in October 2012 with excellent performance.

# OptiFlo – Two-layer headbox for lightweight containerboards

## New horizons for boardmaking

"The PM 5 start-up was successful and resulted in a stable operating process. The desired targets were achieved," says **Xue Rong Jun,** Project Manager of Liansheng Paper.

**Cost-efficient two-layer concept**

The OptiFlo two-layer headbox tackles the challenges faced by boardmakers by combining lower basis weights, faster speeds and higher ash contents resulting from increased use of recycled fiber. This novel solution provides excellent layer coverage, considerably lower residual variation in basis weight and excellent formation with no streaks or tiger stripes.

This novel concept offers Liansheng Paper's PM 5 the opportunity to optimize more economical and separately treated raw material components in the most efficient way. The machine's wet end operating costs (headbox pumping cost, forming section drive power and vacuum power costs) are also lower with the 2-layer headbox concept. "The biggest advantage of PM 5 is the OptiFlo two-layer headbox, which enables the production of three-layer board by two forming units. Power consumption is also lower than expected," says **Xue Rong Jun,** Project Manager at Liansheng Paper.

The 7.25-m-wide PM 5 produces recycled lightweight liner using local OCC as furnish on a basis weight range of

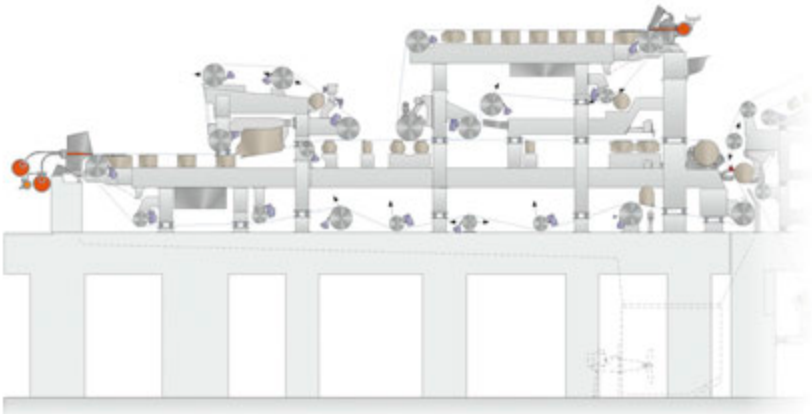
**Lower life cycle cost** through headbox layering technology.

Raw material cost saving potential through light-weighting.

Energy savings - multilayer products can be produced with only one headbox.

Lower investment cost compared to conventional technology.
Simple layout, one forming unit needed to produce multilayer products.

OptiFlo Layering Fourdrinier - right solution for cost-efficient containerboard making.



**New two-layer headbox** as a part of the three-ply wet end concept at Fujian Liansheng PM 5.

100-140 g/m$^2$. The design speed of the production line is 1,200 m/min and the annual production capacity yields 350,000 tonnes.

**Improved paper quality together with increased productivity**

Economical and ecological board production can be achieved by using lower grade recycled furnish as raw material. The latest headbox developments for Fourdrinier and hybrid forming applications offer solutions to improve paper quality, increase machine productivity and reduce energy costs. As a result, a two-layer web can be produced with excellent profiles due to an advanced dilution system and good formation due to a new type of hydraulics.

In two-layer headbox applications it is very important to guarantee layer coverage. All the hydraulic components of the headbox have been designed to minimize slice jet and board sheet disturbances. The design of the OptiFlo Layering headbox hydraulics produces smooth forming board activity, without any mixing of individual layers.

The liner quality has been very good at Liansheng. According to Xue Rong Jun, the internal bond between the layers of the lightweight linerboard produced by PM 5 is excellent.

Hybrid forming with layering technology is a viable alternative technology for the production of lightweight containerboard grades, bringing the speed range up to 1,400 m/min. The new OptiFlo two-layer headbox technology is an excellent and compact high-speed alternative to separate-ply multi-Fourdriniers. It offers lower investment costs than gap forming, and is also a perfect solution for rebuilds. ◻

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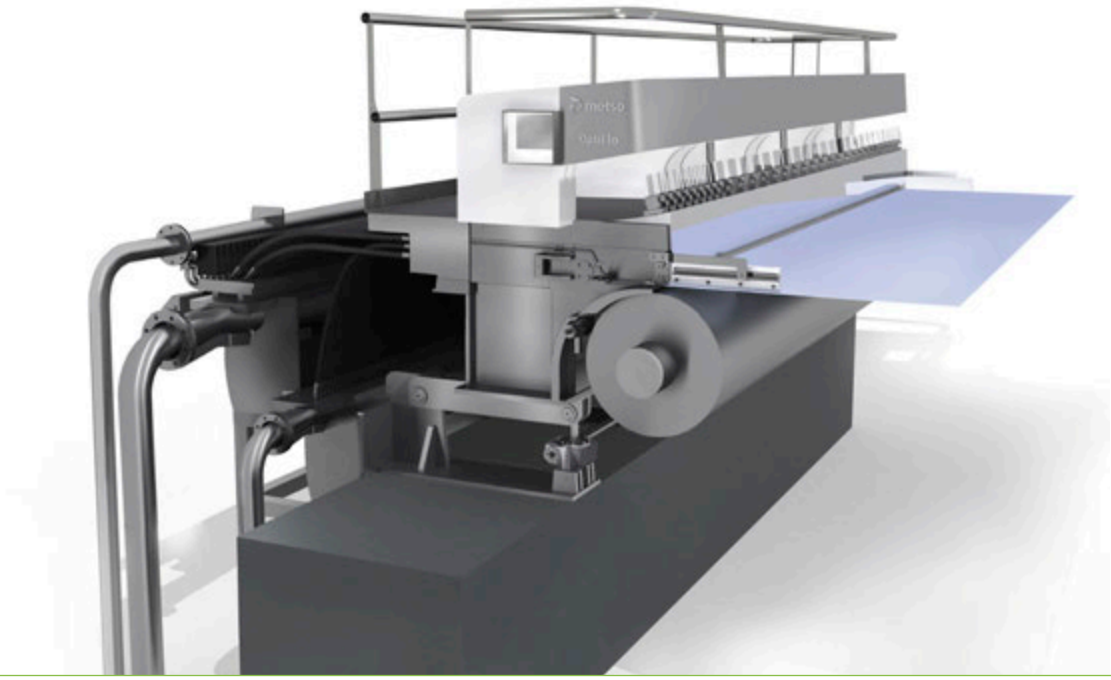


**OptiFlo layering headbox** introduces an entirely new spectrum of product quality and production possibilities for lightweight containerboard making.

**TEXT** Mauri Lattunen

With the cost of energy and raw materials continuously on the increase, Metso has made concentrated efforts to improve the efficiency of stock preparation equipment. Machine screening is no exception and the latest Nimax LD screening baskets with patented Laminar Design wedge wires are reducing energy consumption and improving screening effectiveness.

# Nimax LD
# Reduce energy consumption by machine screening

**Skilled** and experienced screening professionals at your service.

Introduced more than 20 years ago, the wedge wire screening basket uses vertical 'wires' held in place with metal rings to form the shape of a cylinder and doubled the open area of a conventional milled screen basket. A cross section of the wire resembles the shape of a wedge with the slot between the wires performing the screening action. Depending on the amount of impurities and flocs in the paper machine approach flow, ultra-narrow slots are needed to guarantee the accept pulp quality, but screening with narrow slots is a challenge. With conventional wedge wire designs, the very narrow slot size has a strong thickening tendency leading to fiber losses and an increased pressure drop over the screen basket, which requires a corresponding increase in pumping energy to counteract the restriction in screening capacity.

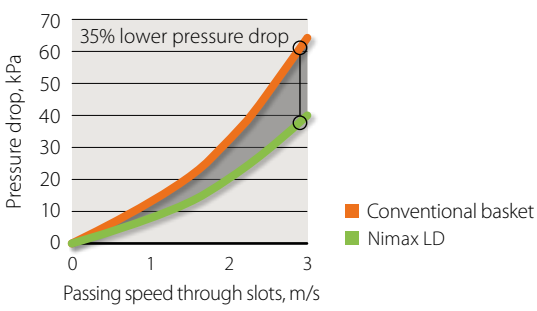
## Proven solutions

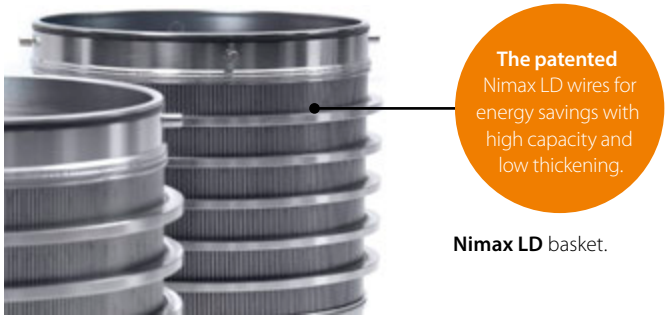
The Laminar Design wedge wire used in Nimax LD screens, and patented by Metso, has been developed to reduce the pressure drop over the screen, providing high screening efficiency and excellent runnability. The main idea of the new wire shape is to remarkably reduce the unfavorable backflow vorticity at the accept channel side right after the narrow slot. The smooth, backward-opening shape of the accept channel with gradually changing opening angle is proven with Computational Fluid Dynamics (CFD) simulations to be free of any backflow vorticies even at higher slot velocities. The result is a laminar, non-turbulent, and streamlined flow through the accept channel between adjacent wires. By optimizing flow at the screen boundary layer and reducing flow resistance through the slots and following accept channel, thickening is reduced and the pressure drop over the screen plate and the screen is reduced. The reduction in pressure drop over the screen offers considerable savings from the reduced energy needed for the headbox feed pump to achieve the same headbox pressure compared to conventional screening technology.

## Excellent results

Nimax LD baskets fit a wide range of screens from many different suppliers. In a recent replacement of a conventional machine screen basket on a 300,000 tpy board machine, the old basket with a 0.40 mm slot and open area of 11.8% was replaced with an exactly dimensioned Nimax LD basket. The pressure drop across the new basket reduced by 7 kPa, to 32 kPa, resulting in 20 kW savings in headbox feed pump energy. This may sound small but then comparing this result to the price of the basket, the saving will become significant. It is also worth remembering that

**Nimax LD** offers 35% lower pressure drop over screen than conventional baskets.




**Nimax LD** basket.

**Results from a Finnish board machine**

In a recent replacement of a conventional machine screen basket on a 300,000 tpy board machine in Finland, the old basket with a 0.40 mm slot and open area of 11.8% was replaced with an exactly dimensioned Laminar Design basket. The pressure drop across the new basket reduced by 7 kPa, to 32 kPa, resulting in 20 kW savings in headbox feed pump energy. This equates to annual energy savings of 168 MWh.

The results were very good even though the flow is very low, only 1 m/s through the machine screen basket whereas the designed maximum flow is 3 m/s. Less pulsation to the headbox was also observed, providing an added bonus of improved sheet quality.

it creates savings in electricity through the whole lifetime of the basket, which may even be as many as ten years with very clean pulp.

Less pulsation to the headbox was also observed, providing an added bonus of improved sheet quality. Other customers have reported significant improvements in machine runnability, i.e. fewer web breaks, provided by Nimax LD's increased screening performance compared to conventional baskets. This is due to the lower level of turbulence, which means that no fiber strings are developed on the accept side of the basket. The Nimax LD wire selection ensures a wide operating window for various raw materials and end-products and it can also be equipped to the screen regardless of its original manufacturer.

Metso intends to stay at the forefront of basket and wire development with new designs that not only improve screening performance but also provide more sustainable solutions for pulp and papermakers.

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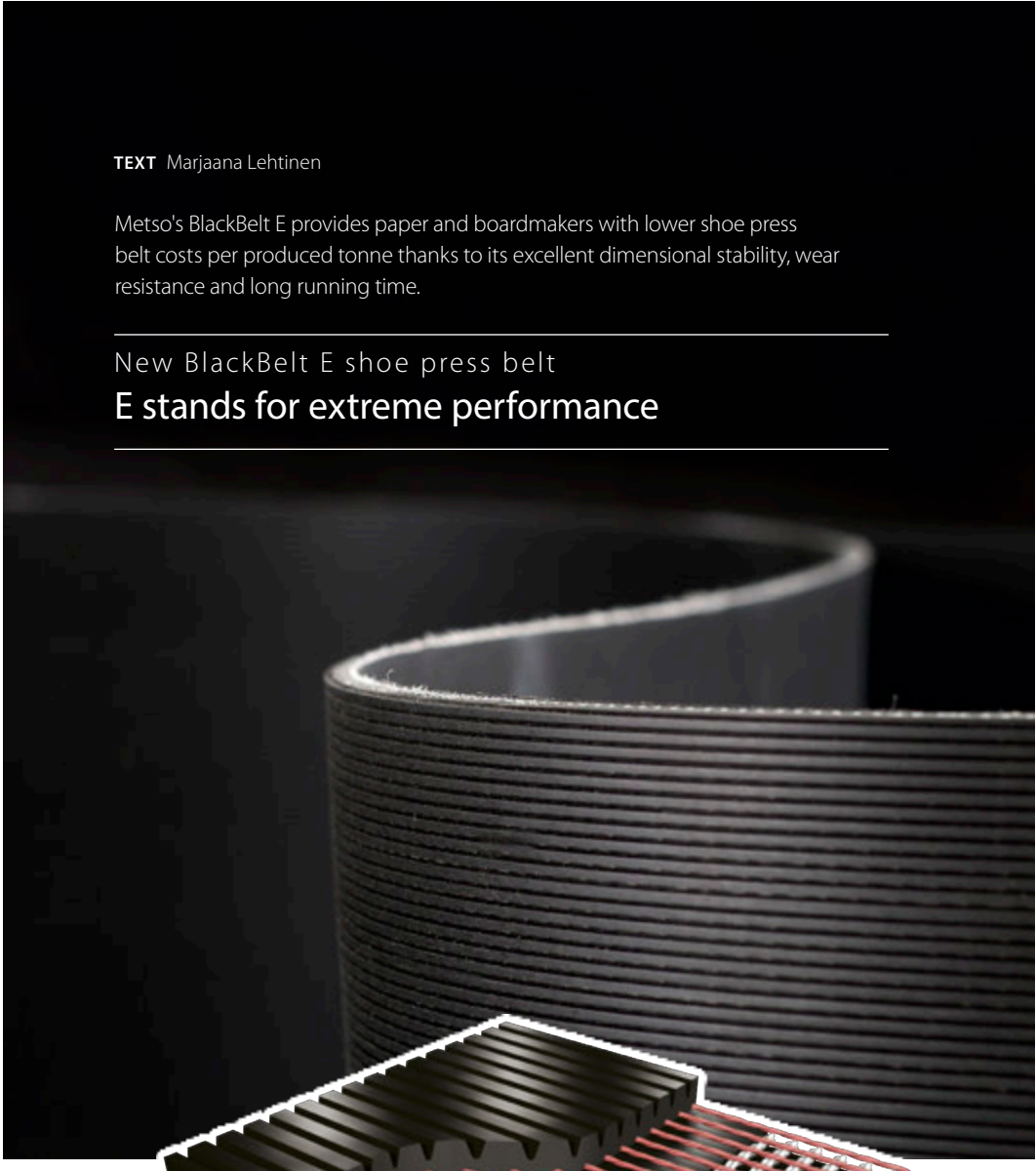
**TEXT** Marjaana Lehtinen

Metso's BlackBelt E provides paper and boardmakers with lower shoe press belt costs per produced tonne thanks to its excellent dimensional stability, wear resistance and long running time.

## New BlackBelt E shoe press belt

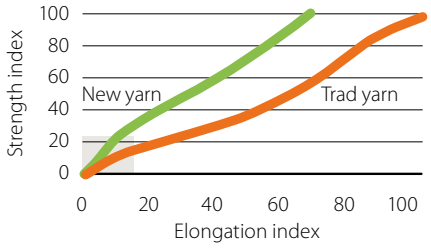
# E stands for extreme performance



The BlackBelt E is an improved version of the BlackBelt shoe press belt that has been very successful at paper mills around the world ever since its introduction in 2008. The benefits of the BlackBelt E include longer life, less wear, even doctoring and better profiles. These factors all reduce the overall belt cost, which is a very important issue for mills in these economically tight times.

Machine-direction (MD) dimensional stability has been taken one step further in the BlackBelt E in order to better address the problems related to stretching and wear on demanding machines.

Uneven plastic MD stretching causes doctoring problems due to diameter variation, which prevents the doctor blade from moving across the belt surface evenly,




**In paper machine conditions,** the new yarn needs twice as much force to stretch over the yield point. Stretching over the yield point leads to irreversible deformation.

**Excellent experiences at Holmen Paper Madrid**

Holmen Paper Madrid PM 62 in Spain is one of Metso's long-standing belt customers. In summer 2012, the mill installed a BlackBelt E shoe press belt on the first press of this newsprint machine. Consequently, PM 62 ran a new world newsprint speed record of 2,030 m/min. The machine was also using Metso's press felts at the time.

And what's more, the BlackBelt E ran for 98.2 million nip cycles, which makes it the longest ever running shoe press belt on PM 62. Congratulations to everyone at Holmen Paper Madrid!

**Positive feedback from customers**

Just like its older brother, the BlackBelt E is available in smooth, grooved, semi-grooved, discontinuously grooved and high-density grooved designs, to fulfill the demands of each individual shoe press.

The new belt has been designed for all kinds of paper and board machines, but especially for the most demanding ones, such as wide printing paper and container board machines. According to Lahdensuo, the belt is also suitable for tissue machines. Tissue machines do not have high press loads but they do have other issues with belts. "We have received only positive feedback from the mills where these new belts are being used and each customer has been able to improve shoe press performance."

**New production line inaugurated**

The demand for all products in the BlackBelt family has been growing steadily over the past years. To increase shoe press belt production capacity, Metso recently built a new belt casting line in Tampere, Finland, which was inaugurated during the Clothing Days seminar in February 2013.

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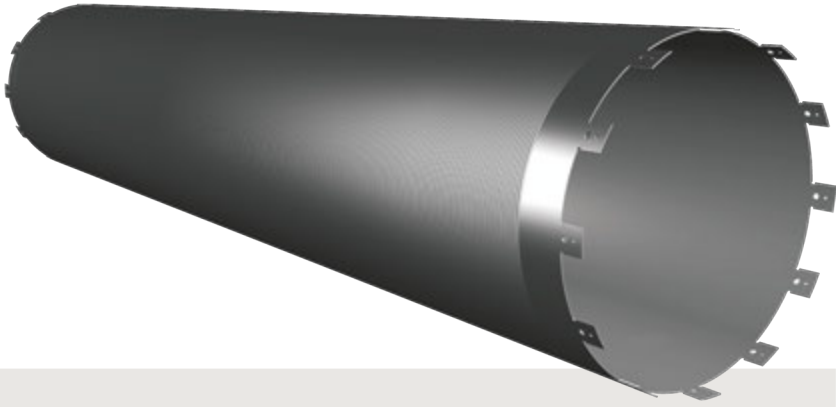
resulting in poor profiles. The speed difference in the nip also causes mechanical belt wear. Elastic MD stretching also causes wear.

"The BlackBelt E features higher MD dimensional stability, which reduces the risk of permanent changes in the belt. It also has a very positive impact on wear resistance," says **Ville Lahdensuo,** Product Technology Manager, Belts, Paper Machine Clothing, Metso. "Since the modulus of the reinforcement has been doubled, stretching in the BlackBelt E is only half of that of a standard BlackBelt. This means that the belt remains within the operating window more efficiently, and its dimensions do not change permanently."

**Also applicable to calendering**

Another major improvement in the new belt is related to its ability to withstand heat. Its polyurethane material endures high temperatures of up to 130°C in continuous use without degradation. The synthetic yarns that reinforce the belt structure do not soften until the temperature reaches 120°C. Belts cannot usually be used in temperatures over 80°C.

"Since the BlackBelt E withstands high temperatures, it can also be used in calendering and other high-temperature applications," Lahdensuo points out.



**Non-marking BlackBelt HD family grows**

In conjunction with the development work on the BlackBelt E shoe press belt, Metso has expanded its range of high-density (HD) grooved surfaces that are available for the standard BlackBelt and the BlackBelt E. They all prevent marking efficiently and improve water removal from the web.

There is now a high-density option for machines that require a larger void volume, such as marking-prone board machines. And some very good results have also been gained with HD on tissue machines.

**Meet the members of the BlackBelt HD family**

**BlackBelt HD 380**

- 0.80 mm grooves, 1.3 mm lands, void volume 380 g/m$^2$
- For fine paper and tissue machines, also other machines making light and sensitive (=marking-prone) paper

**NEW: BlackBelt HD 420**

- 0.90 mm grooves, 1.3 mm lands, void volume 420 g/m$^2$
- For lightweight mechanical paper grades in the 2$^{nd}$ press of OptiPress or similar presses

**NEW: BlackBelt HD 460**

- 1.0 mm grooves, 1.3 mm lands, void volume 460 g/m$^2$
- For newsprint and packaging board machines in the 1$^{st}$ and 2$^{nd}$ press of OptiPress or similar presses

Opti™
for papermakers

**TEXT** Petri Norri and Heli Anttila

It is a well-known fact that the biggest energy flows of the papermaking line are present in the dryer section. The new OptiAir Hood decreases and controls this energy consumption in an efficient way and in a way that reduces installation and investment costs. Liansheng Paper Industry PM 5 and PM 6 are one of the first machines with this new hood.

# New hood creates savings


**Liansheng Paper Industry PM 6,** first OptiConcept M production line.

The OptiAir Hood is a novelty and offers several new features that are not provided by traditional hood constructions. For example, excellent insulation is achieved by avoiding any thermal bridges through the panel, saving energy and isolating the air volume of the hot machine from working environment of machine hall.

A hood must meet the requirements of the process and it must also meet maintenance requirements. A high dew point is a must for energy efficiency. With the OptiAir Hood, fabric changing takes place through hatches on the walls, which allows easy maintenance. The roll change is also a necessary part of the serviceability of the hood. Fabric changing that takes place through a roof that opens is even quicker than fabric changing with traditional constructions.

Life cycle savings come from a lighter and simplified structure, together with energy efficient operation. New solutions have decreased the installation time of the OptiAir Hood by approximately 30%, which reduces costs and saves time during installation of the paper machine.

The hood is the biggest single piece of equipment that you see in a machine room, so it should look attractive and suit the design of the paper machine. Chinese 'Feng Shui' is the art of creating a comfortable atmosphere around you and emphasizing the activity in question, with certain colors, for example. This important target has been achieved with the attractive appearance, color and design of the OptiAir Hood. □

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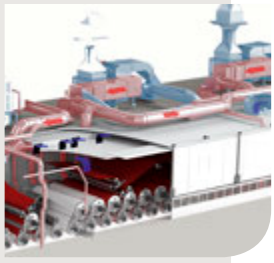
## OptiAir process ventilation family

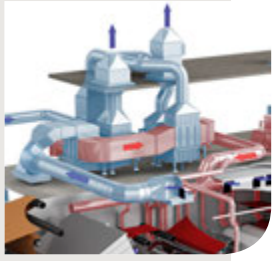
Metso has combined its paper and boardmaking offering, introducing the new Opti range of products. The product range has been simplified. Solutions that are provided offer the best economic advantage and environmental security for paper and boardmakers.

The OptiAir process and product family combines paper machine ventilation under one name – OptiAir. OptiAir is a complete energy-efficient set-up for paper and board machine ventilation. The family consists of the OptiAir Hood, OptiAir Recovery and OptiAir Environment processes and products. OptiAir Recovery presents wide know-how of energy-efficient heat recovery systems and OptiAir Environment consists of products and processes that control noise and dust emissions and machine hall air quality.

**OptiAir Hood**



**OptiAir Recovery**



**OptiAir Environment**

**Cartiere del Garda** paper mill is located in the small town of Riva del Garda in the beautiful area around Lake Garda.

CARTIERE DEL GARDA EXCEEDED 50% ENERGY SAVINGS AFTER REPLACING IR DRYING WITH AIR DRYING

# Powerful results in a beautiful location

**TEXT** Heli Anttila

"We got it all—50% gas savings, better paper quality, better working conditions, better availability, and smaller maintenance costs. Metso impressed us with its technical knowledge and with this exceptional dryer," says Mill Production Manager, **Antonio Di Blas.**

Cartiere del Garda paper mill is part of Lecta Group and is located in the small town of Riva del Garda, a beautiful area near Lake Garda in northern Italy. One might be moved to say it is the most beautiful paper mill location in the world. As an integral part of this breathtaking scenery, the mill's targets are to continuously improve its environmental performance and lower production costs. One step towards achieving these targets was replacing its gas heated infra red dryer with a PowerDry air dryer after the gate roll coating station. Metso guaranteed 48% energy savings compared with the existing infra red dryers, and other benefits such as lower maintenance costs for the dryer and the equipment around the dryer; the payback time for the rebuild is around one year.

After having learned about the energy efficiency of the Metso PowerDry air dryer and being convinced they would achieve at least the same end product quality as with infra red dryers, they were quick to put the new dryer into action. Coating Technical Manager Vittorio D'Olif says: "Every goal of this rebuild was achieved. Gas consumption decreased by 50%, even though we increased our production speed by more than 10%, paper quality is better due to no picking and no stripes, and the working environment around the dryer is much cooler. This dryer is also very operator-friendly and easy to use and adjust."

Cartiere del Garda produces high-quality coated woodfree paper for publishing and advertising work. The top coated grade weight of the paper varies from 90 to 400 g/m$^2$. The mill has two paper machines and two coating machines. The new PowerDry air dryer was installed in PM 2, which has an on-line coating machine with a web width at the reel of 3,350 mm and the production speed varies between 300 and 800 m/min. High end product quality and the environmental performance of the production process are top priorities for the mill.

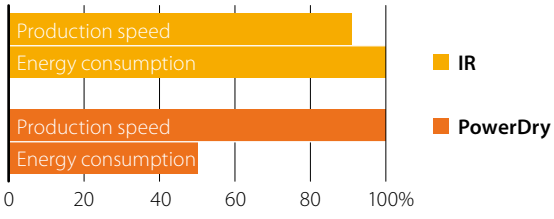
The PowerDry air dryer is an efficient dryer suitable for all coating drying with gas or steam heating. The new PowerDry air dryer at the Riva del Garda mill has a high evaporation capacity of over 200 kg$H_2O$/m$^2$/h and it replaces 22 rows of gas infra drying, giving the paper machine extra drying capacity but still using only half of the gas.

Technical Manager, **Tristano Rossi** says: "Overall, Metso handled this project very well and, for the start-up, we would rate it as trouble-free top performance, we cannot find any flaws. The technical expertise of Metso's people at every step of the project, from sales to the start-up, was convincing, so the excellent end result is not a coincidence."

Antonio Di Blas sums up: "All of our projects must be oriented towards lowering production costs and these dryers have definitely done that. We are just waiting to go forward with the second step of this project and also have new air dryers for our coating machine."

Coating Technical Manager, **Vittorio D'Olif:** "It is important that the paper quality improved after the rebuild."

**At the Garda mill** drying energy consumption with the PowerDry air dryer decreased by 50% even though production speed increased.

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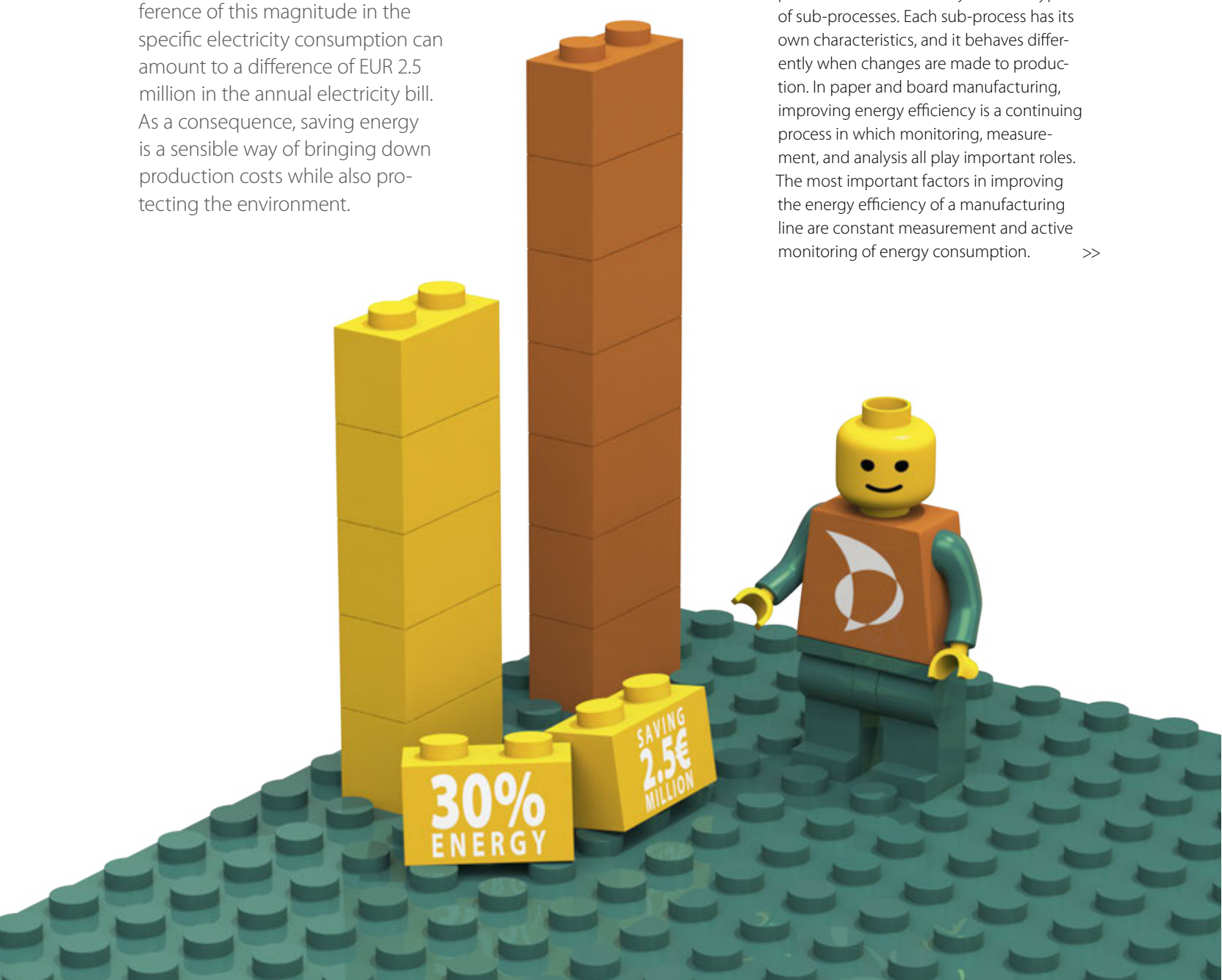
**TEXT** Elli Ikonen and Teemu Immonen

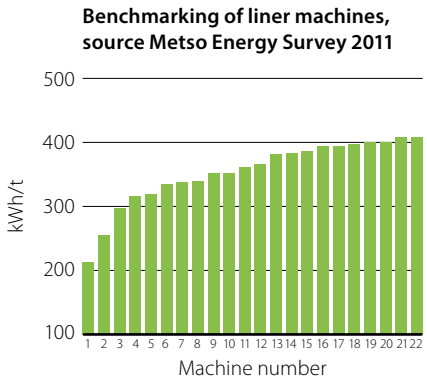
## MEASUREMENT FORMS THE BASIS FOR

# energy efficiency

The amount of energy used to manufacture the same paper or board grade may vary between different mills by as much as 30%. With a modern machine, a difference of this magnitude in the specific electricity consumption can amount to a difference of EUR 2.5 million in the annual electricity bill. As a consequence, saving energy is a sensible way of bringing down production costs while also protecting the environment.

Saving energy is, fundamentally, quite simple: you reduce unnecessary consumption of energy and invest in more efficient technology. However, the manufacturing processes for paper and board are complicated and contain many different types of sub-processes. Each sub-process has its own characteristics, and it behaves differently when changes are made to production. In paper and board manufacturing, improving energy efficiency is a continuing process in which monitoring, measurement, and analysis all play important roles. The most important factors in improving the energy efficiency of a manufacturing line are constant measurement and active monitoring of energy consumption. >>






A comparison of liner lines by specific electricity consumption.

## Benchmarking data is the basis for making savings

Today, new paper and board mills should be capable of providing fairly detailed information on energy consumption. In the best case, the process control system includes separate pages for energy consumption indicators together with a reporting function. However, there are many mills where energy consumption data is utilized poorly in process control, or the data is processed as averages, forgetting to emphasize the factors behind those figures.

The most important factor in measuring energy consumption is the relevance of the data collected and transforming it into clear indicators. The persons responsible for monitoring energy consumption must know the origin of the data and the boundaries of the processes under review. Energy consumption data is best utilized when used in everyday work in just the same way as other process parameters.

The review of energy consumption should be started at the annual level. Metso conducts an annual energy survey in connection with production surveys. The benchmarking shows the energy consumption compared to other production lines producing the same grade. The relation of energy consumption and machine efficiency of different machine concepts has also been analyzed. If consumption exceeds the average for the reference group, it is strongly recommended that the possibilities for making energy savings are investigated; however, it should be noted that possibilities for improving energy efficiency can often also be found on production lines that are placed below the average.

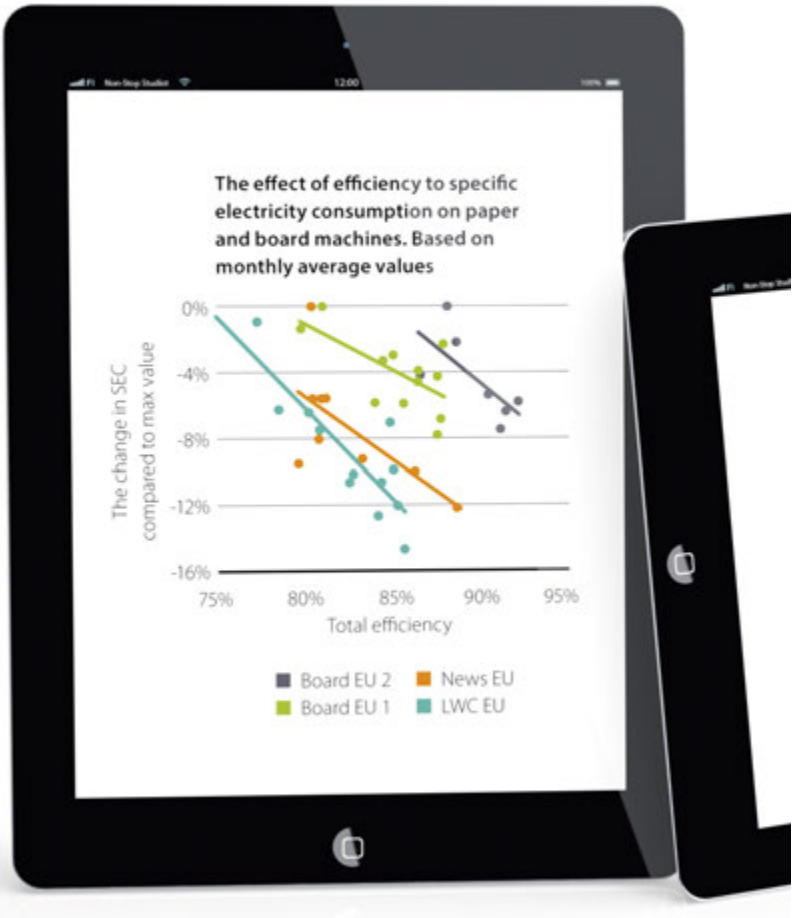
The comparison is further refined when examining lines or machines that are technically of similar age and include similar subprocesses. It should be noted, however, that the comparison of energy consumption does not give any direct indication of how much or by what means the energy consumption of a particular line can be decreased. Even a new production line with state-of-the-art energy-efficient features can be operated inefficiently. On the other hand, an old papermaking line can be surprisingly energy-efficient if its condition has been carefully maintained and the processes are run correctly.

## Monthly averages an indicator of performance

Monthly averages of energy consumption provide a better and more detailed picture of energy use on a papermaking line than annual averages. It is not unusual for specific energy consumption and production efficiency to vary by month. Therefore, the monthly averages for one year offer enough data points to create correlations between energy consumption and production indicators. The examination is very simple to perform and, based on the monthly averages, the potential for improving a machine's performance can be assessed. In one sample case, a 5% improvement in overall efficiency was found to reduce specific electricity consumption by approximately 6%. On a relatively new fine paper line, this means an annual saving of EUR 360,000 in energy costs.

The correlation between efficiency values and energy consumption is particularly visible in electricity consumption. The papermaking process includes many devices that run at constant power regardless of the production speed. Near the design point of the machine, their share of electricity consumption is lowest, and also generally, as production increases, specific electricity consumption decreases. As a result, for the sake of energy efficiency, it is best to run the machine at maximum speed.

The number of breaks and unplanned shutdowns should be minimized. During breaks, electricity consumption often increases as the broke systems and tail threading equipment are on with the machine running at production speed. During shutdowns, only the most essential equipment should be kept running.




The correlation between specific electricity consumption and overall efficiency on selected paper and board machines.

**The most significant savings can be achieved through detailed measurement**

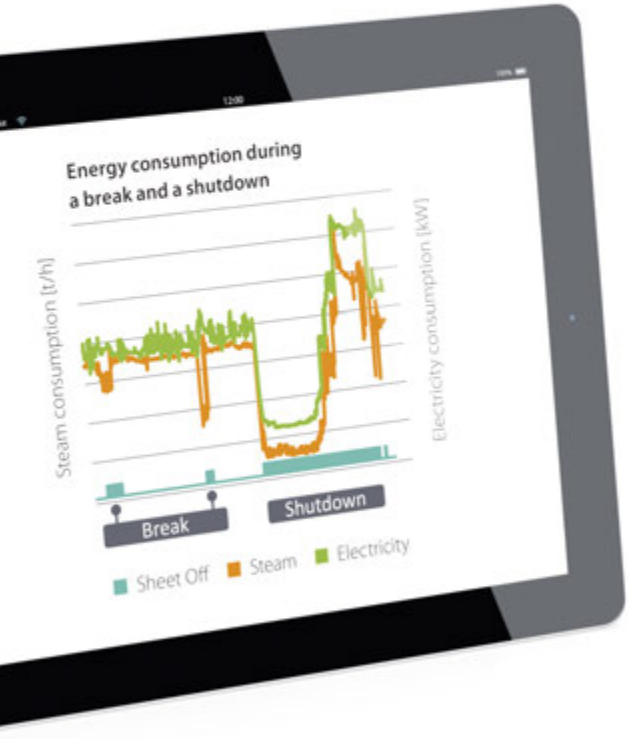
In order to avoid a distorted interpretation of energy use in a process, the annual or monthly averages for energy consumption used for verifying energy savings should not be overly relied upon. If there is monthly variation in the efficiency of a machine, this is also reflected in its specific energy consumption. These changes can hide the impact of a single piece of equipment or a process change on energy consumption; in other words, indications of potential savings are lost in the fluctuation of poorly selected indicators. When energy savings need to be examined or verified in a reliable manner, more detailed process data is required.

The best information on the operation of equipment and the possibilities for energy savings can be obtained from precise process data. In this case, the data for a short interval, such as a few weeks, is usually selected for examination. If constant monitoring is not performed, there is no way of knowing whether the selected sample is representative of a good or poor situation. Erroneous interpretations are minimized by including a sufficient number of production cycles in the examination and supplementing the analysis with measurements performed on site.

Obtaining precise process data and investigating the correlations between variables are the only means of studying what actually happens during the process and what impact changes in process parameters have on energy consumption. Further, only by utilizing precise data can energy savings be verified reliably.

In practice, electric power is directly dependent on a machine's speed, while the basis weight affects steam consumption. Therefore, in terms of energy consumption, only those points where the speed and basis weight are the same can be compared. The creation of proper analyses requires powerful analysis tools and the use of statistical methods. The energy analyses performed by Metso are based on such methods and tools.

One example of utilizing process data is seen in decreasing the base load. During shutdown, the consumption of electricity and steam on the production line decreases. Process data can be used for finding out which equipment is active during the shutdown and calculating the potential savings. In one particular case, during an unplanned shutdown, a base load of up to 50% of the consumption during operation was measured. Typically, the base load is less than 20% of the normal electricity consumption. This means, for instance, if the share of unplanned shutdowns is 3%, simply decreasing the base load would yield annual savings of EUR 150,000.




An example of electricity and steam consumption in different operating situations.

**Metso's specialist services – a key to improved energy efficiency**

Metso offers versatile services for improving and managing energy efficiency in paper and board manufacturing. In addition to energy-saving equipment solutions, Metso provides various types of energy analyses from those covering the entire production line to those targeting specific sub-processes. Every year, a production and energy consumption survey is carried out, which is a very popular tool for comparing energy consumption.

Energy saving projects should be started by performing an energy analysis covering the entire production line. Metso's analyses always produce detailed reports and lists of recommended actions for improving energy efficiency. In addition, the energy analyses provide essential information on the operation of the line and the processes. Energy efficiency can be improved over the long-term through a Metso cooperation agreement. Specific targets can be set for the agreement term to increase production and decrease energy consumption. Additionally, Metso has process control tools for monitoring and reporting energy consumption.

In summary, information on energy consumption and process data provide excellent opportunities for verifying and monitoring energy savings. Measurements and monitoring are the keys to improved energy efficiency. Metso's specialist services and efficient analysis tools, combined with our extensive process expertise, offer the best possibilities for utilizing energy data and saving energy in an effective manner. ▢

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# Bio-oil production offers an extra revenue source for CHP plant

**TEXT** Marjaana Lehtinen and Hanna Sahlstén

With integrated pyrolysis technology, a fluidized bed boiler at a power plant can be turned into a biorefinery that offers new business potential. To this end, Fortum is building the world's first industrial-scale integrated bio-oil plant in Joensuu, Finland.

The brown liquid in a little bottle on the table smells like the tar that was produced hundreds of years ago from the wood and roots of pine by destructive distillation under pyrolysis. It was mainly used for preserving wooden vessels against rot. However, the liquid in this bottle is actually bio-oil, which was only recently produced under integrated fast pyrolysis.

Pyrolysis means decomposition of fuel in an oxygen-free environment by heat. In our modern context, fast pyrolysis produces bio-oil that can be used as such to substitute, for example, heavy fuel oil. Wood-based biomasses are well suited as raw material for bio-oil.

"An integrated pyrolysis process is linked with a commercial-scale fluidized bed boiler, either a circulating or a bubbling fluidized boiler. The hot boiler bed material is used as the heat source," points out **Joakim Autio,** Product Manager, Pyrolysis, at Metso's Power business line.

## Excellent energy efficiency

The pyrolysis process sets strict requirements for wood-based biomass. It needs to be very dry, and its particle size must be under the 5 mm size limit. This solid biomass is heated up in a reactor (pyrolyzer) to approximately 500°C in just a few seconds. At this temperature, the biomass is vaporized into gases, which are then condensed into a liquid form, i.e. bio-oil, when cooled. The uncondensed gases and coke generated during pyrolysis are combusted in the boiler as fuel.

One of the many benefits of an integrated bio-oil plant is its excellent energy efficiency. The bio-oil production process can utilize heat that the power plant would not otherwise utilize—for example, in the energy-intensive drying process.

"Power plants will be able to optimize their production with regard to electricity, heat, and bio-oil. As the same staff can operate all the processes, there are also synergy benefits in this sense," Autio adds.

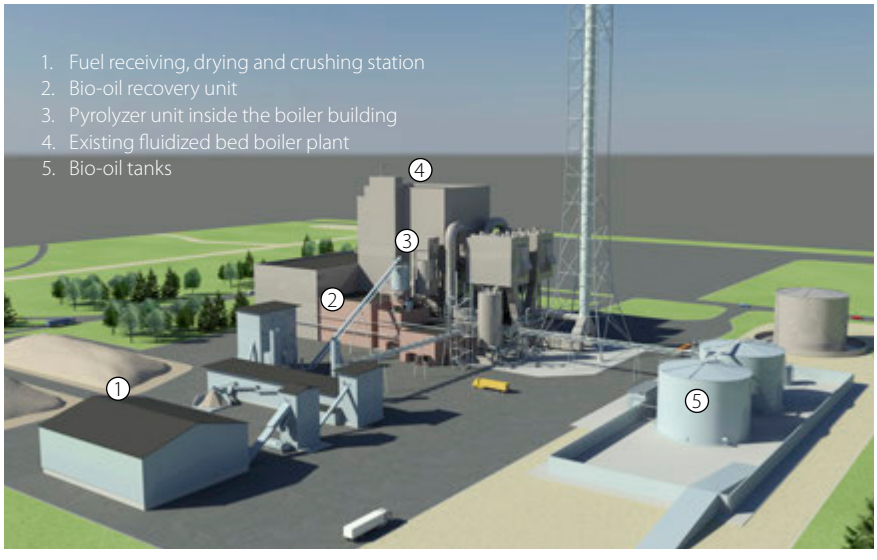
## Four strong partners sharing expertise

The concept took years to develop, but the project actually proceeded rapidly considering all the new aspects and challenges involved. In 2007, Metso, UPM, and VTT Technical Research Centre of Finland started to work on a biomass-based bio-oil production concept based on integrated fast pyrolysis. The target was to provide an alternative to fossil fuels and thus reduce the burden on the atmosphere. The fourth partner in the consortium, Fortum, joined the development project in 2009.

"Metso has delivered hundreds of fluidized bed boilers worldwide, so we see potential in expanding towards bio-oil production with integrated pyrolysis technology," Autio explains. "In the project, we have been in charge of the technological development of the pyrolysis process integrated into the fluidized bed boiler."

The forest products company UPM has added to the project's expertise in the use of biomass as a raw material. The compa-

**Conceptual** drawing of the Joensuu plant.



"A plant such as this one, integrated with the existing electricity and heating plant, is unique in the world. Soon we will have the world's first combi-plant, generating electricity, heat and bio-oil," said **Timo Partanen,** Fortum's Regional Director for eastern Finland, speaking at the foundation stone ceremony.

ny's target is to utilize all parts of a tree in the process in order to produce liquid fuels in a cost-effective way. Fortum has brought the perspective of an energy producer and end-product user to the project. The company's long-term goal is to avoid all carbon dioxide emissions in its production.

The bio-oil production process is based on VTT's earlier research and patents, and VTT's researchers and specialists have contributed strongly to the success through their in-depth know-how and expertise.

**The world's first integrated plant is progressing in Joensuu**

The development work reached a high point with the first commercial-scale deal—signed with Fortum in March 2012. The integrated bio-oil plant, the first of its kind in the world on an industrial scale and based on fast pyrolysis technology, is currently being built at Fortum's CHP plant in Joensuu, with the foundation stone having been laid in November 2012.

"A plant such as this one, integrated with the existing electricity and heating plant, is unique in the world. Soon we will have the world's first combi-plant, generating electricity, heat and bio-oil," said **Timo Partanen,** Fortum's Regional Director for eastern Finland, speaking at the foundation stone ceremony.

The opportunities provided by the integrated pyrolysis process lie not only in replacing heavy fuel oil at power plants. There are scenarios that bio-oil could also be used as raw material for bio-chemical and biodiesel production in the future.

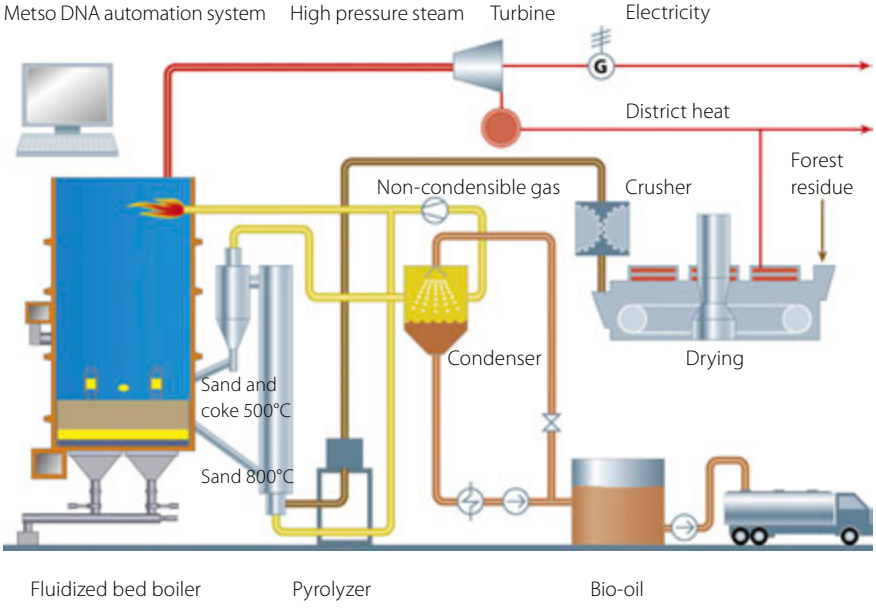
"The demonstration of pyrolysis technology is also an indication of our company's strategy of offering energy solutions in which technologies related to fuel refining have been brought about alongside traditional combustion. Naturally, we are commercializing our pyrolysis technology globally, and reference plants such as the one in Joensuu will be extremely valuable in our future success," said **Jyrki Holmala,** President, Metso Power business line, in his speech at the ceremony.

The nominal output of the Joensuu bio-oil plant will be 30 MW of oil production, and the planned annual production will be 50,000 tonnes, which corresponds to the yearly heating consumption of more than 10,000 private houses. The new bio-oil production plant is scheduled for start-up in the fall of 2013.

**Emissions to be reduced by 70%**

The integrated fast pyrolysis process has been identified in several studies as an economically viable liquid biofuel concept to reduce $CO_2$ emissions. According to such studies, the use of bio-oil has a significant positive environmental impact because energy produced with bio-oil reduces greenhouse emissions by more than 70% compared with fossil fuels.

The integration of bio-oil production into the power plant process enables the utilization of the by-product from the production process in the generation of electricity and district heating. The utilization of bio-oil produced at the Joensuu plant helps reduce carbon dioxide emissions by 59,000 tonnes and sulphur dioxide emissions by 320 tonnes per year.




**Bio-oil production concept -** Metso's integrated pyrolysis.

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SUCCESS IN THE TISSUE BUSINESS

# A matter of mutual trust

A tissue line delivery project can be compared with a working partnership. Before you say **"take my hand"** you have to make sure you have full trust in that partner: one who you feel is willing to help you through every day challenges, time after time.

However, what finally convinces you that you've made the right choice?

"We consider Metso not only to be a supplier of first-class equipment, over the years friendly relations have been established and we are happy that our cooperation is continuing," **Syktyvkar Tissue Group,** Russia.

"Metso has been a reliable and trustworthy partner for our previous installations and we are pleased to continue our good cooperation also in this new project," **Hayat Kimya AS,** Turkey.

"Collaborating with top level companies who can supply equipment which ensures quality and support of great expertise has always been important to us," **Forestal y Papelera Concepción,** Chile.

Three statements from three tissue producers explaining what they consider most important when choosing a business partner for years to come: first-class equipment that ensures high-quality products, expertise, and friendly and trustworthy relations. This explains why so many tissue producers decide to place repeat orders with Metso.

**TEXT** Katarina Åhsberg

**Understanding the challenges**

During the past 12 years Metso has sold close to 100 tissue machines worldwide. Almost three quarters of these machines are operated by tissue producers who own from two and up to as many as eight Metso tissue machines. Among Metso's customers you can find the entire range of tissue producers, from the "big four" global tissue companies with wide technology skills who want to develop technical solutions in partnership with Metso, to newcomers with no previous experience of tissue making.

**Orhan Ogücü,** Chairman, Marmara Group, who owns two Metso machines in Turkey, put it like this: "To supply a tissue machine isn't just about the scope of supply. It is the idea that the supplier needs to know what to do before and after the project period, what to do in order for the mill to operate efficiently, at least for the next 10 years. It is only possible if the supplier thinks and acts as the customer. In this respect, Metso has met our expectations."

PHOTO: ISTOCKPHOTO/AURIS


**The Hayat Kimya team** set the word speed record of 2,210 m/min for tissue machines in June 2012.

**Lütfi Aydin,** Group Paper Director.

### Spending time building relations

Mutual trust and long-term relations have been of the utmost importance for Hayat Kimya AS, Turkey, when selecting a tissue machine supplier. Trust in technology and trust in people. Only seven years ago they were a newcomer in the tissue industry. Today, Hayat is a global player in the tissue market and is also the current holder of the world speed record which was set on their Metso machine in 2012. They have just decided to order their third and fourth tissue machines from Metso. "It is all about trust. You can have the best technology in the world but without good cooperation based on trust you will not succeed." The words come from **Lütfi Aydin,** Group Paper Director. "Spending time building relations between the supplier's team and the mill team is of the utmost importance. Good cooperation brings success in the end."

### Sharing information and developing together

Lütfi Aydin talks about their previous installation in Turkey and how the two teams worked together in a friendly atmosphere. "We are confident that Metso always gives high priority to our concerns and shares their expertise with us. Together we can discuss and our team gets involved to find the best solution for us. We feel that Metso believes in us, which is inspiring and gives confidence."

For Hayat's coming installation in Alabuga, Russia, human relations, training and Best Available Technology will all be success factors. Lütfi Aydin explains: "In Turkey, we are familiar with the technology and have very skilled machine operators. But at our new mill in Russia the team will be inexperienced and needs training. Still, it is important not to lose time and motivation." However, he is convinced that Metso will repeat the previous quick installation, commissioning, and start-up in Izmit, Turkey. "We had a very steep start-up curve and the machine was producing saleable paper from the first hour. The technology is easy to operate and has good accessibility. Even when running at world record speed we reached an efficiency of 93%. Not all can perform at that level even at low speed. The technical advantages of the Advantage DCT technology are significant."


**Lütfi Aydin** from Hayat Kimya (on the right) was handed the placard for their world speed record by Jan Erikson of Metso.

### Believing in each other

Mutual trust must of course be mutual. It is as essential for a supplier to have fruitful relations and cooperation with their customers as vice versa. "The great number of repeat orders is proof that our way of working as partners is rewarding for both sides," says **Jan Erikson,** VP Sales, Metso Tissue. "We are often impressed by our customers' dedication and determination to build first-class tissue manufacturing facilities. Our fast installations and start-ups result from excellent team work between Metso and our customers. It is also evidence of the fact that our technology is optimized for customer needs, efficient installation, and cost-efficient production."

"The great number of repeat orders is a proof that our way of working as partners is rewarding for both sides," says **Jan Erikson**

Spending a long time together in a delivery project does foster individual relations between people. "It is more a rule than an exception that our customers request the same Metso people for their next project. Luckily, we have many skilled and experienced employees so we are usually able to fulfill the wish," concludes Jan Erikson.

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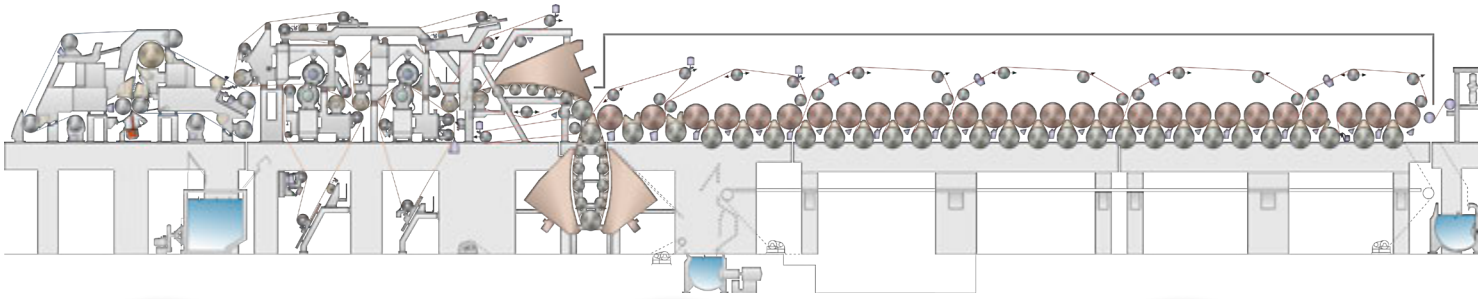
# Zhanjiang Chenming PM 1 -

## The world's best paper machine: UWF speed record of 1,808 m/min

The **OptiFormer Gap shoe and blade gap former** provides high dewatering capacity and filler distribution adjustability.

The **OptiPress press section** has two shoe presses that give high dryness and closed draws for good runnability and high speed.

**HiRun runnability systems** guarantee a stable and trouble-free run as well as drying through the drying section.



The **OptiFlo Gap headbox** is a unique headbox with optimal conditions for jet landing and stable jet, giving excellent runnability and enabling accurate jet adjustment. This headbox ensures perfect formation even at high speed.

The **OptiDry Twin impingement dryer** represents high technology drying that enables 29% fewer drying cylinders and thus a shorter paper machine, higher steam pressure at the beginning of the dryer section, superb end product quality, and uniform moisture and tension profiles.

The **OptiDry Horizontal impingement dryer** for curl control is an effective and energy-efficient way to control curl in the single-felted dryer section.

# – Super Paper Machine

On September 1, 2011, the world's largest and fastest woodfree-producing paper machine was started-up at the Zhanjiang Chenming mill in China. During its first operational year, it achieved on several occasions a new world speed record. In November 2012, the recorded speed was 1,808 m/min. During a 24-hour run, the 11.15-meter-wide PM 1 produced high quality printing paper at a basis weight of 70 g/m$^2$.

Metso's full-scope supply Zhanjiang Chenming PM 1 is wide and large and comes equipped with the very latest technology. In addition, in terms of energy and raw material consumption/produced tonne of paper, it is also an economical and ecological paper machine.

This world record-holding paper machine features the latest in technological innovations for improving machine efficiency, runnability, paper quality, and raw material efficiency. For example, the new OptiFormer Gap with shoe and blade technology has all the tools required for managing excellent formation at high machine speeds in a wide basis weight range.

Revolutionary OptiDry Twin impingement drying technology offers the possibility to radically reduce machine length, leading to savings in construction work; however, it can also be used to increase bulk, save raw materials, and reduce paper grammage.

With all its featured high technology, environmental care, and exceptional production capacity, it is safe to say that Zhanjiang Chenming PM 1 is the best paper machine in the world. ▢

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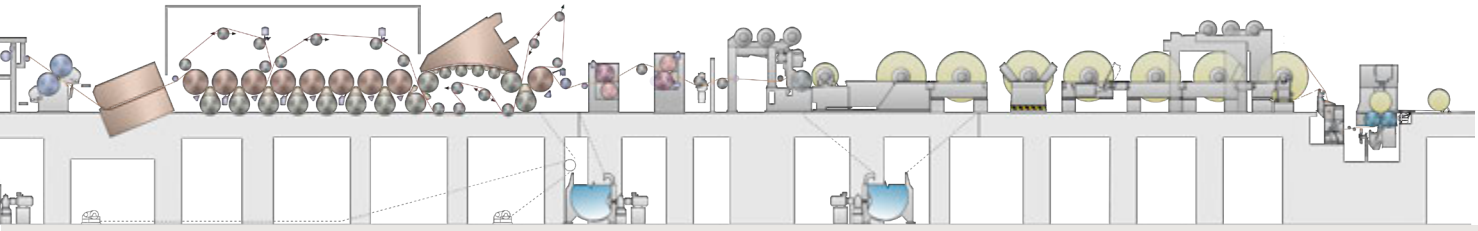

## OptiDry Twin is the pearl of the machine

**Jia Huadong,** PM Deputy General Manager of Zhanjiang Chenming says: "We are very proud to have this world-class paper machine—the fastest in the world. We have a lot of Metso's new technology adapted in this new paper machine and with new technology we get more and better profit from the machine.

The OptiDry impingement dryer is the pearl of the machine. Without OptiDry the new world record speed would not have been possible."

Mechanical Mill Manager **Wang Zongzhou** also comments on the new technology: "Implementation of new technologies is challenging for both parties and requires good cooperation. With the key Metso persons, the communication was good and now we have this superior paper machine as proof of that cooperation."

In front of the record-breaking machine: **Jerome Liu,** Metso; Mechanical Mill Manager **Wang Zongzhou; Risto Penttinen,** Metso; PM Deputy General Manager **Jia Huadong; Hannu Korhonen,** Metso; and Automation Mill Manager **Sang Jiandong.**

"Within a year, we have managed to eliminate about five roll changes and grindings," says **Janne Harjuniemi,** Veitsiluoto mill. Metso's **Marko Nykänen** on the right.

# Stora Enso Veitsiluoto extended their roll change intervals on coating stations using the CoteCondor cover

**TEXT** Tero Kovanen

## AS THE FIRST SUPPLIER, METSO INTRODUCES A POLYURETHANE COVER THAT LASTS A LONG TIME IN BLADE COATING

Blade coating requires a lot of the backing roll cover. It needs to be very homogeneous to achieve a flawless coated paper surface. The cover has to be evenly hard and rough across the entire roll width. It also needs to be easy to clean and wear-resistant in order to maintain good coating profiles during long operating cycles. Usually, backing rolls must be changed when the coating profiles of the blade coating station no longer meet the set paper quality requirements.

Today, hard-coated coater blades are mostly used on blade coating stations, with the advantages of better runnability, better paper profiles, and a longer useful life. The downside is wear of the backing roll cover. Problems usually appear at the edges where the roll cover and the blade meet.

This happened at Stora Enso Veitsiluoto PM 1 in Finland, a paper machine producing 180,000 tonnes of coated printing paper per year. The line includes an offline coater with four blade coating stations.

"The backing roll change interval was quite short, no more than 4–6 weeks, on the blade coating stations due to wear at the cover edges," says **Markku Åman,** Production Manager.

The hard-coated coater blades wore the cover edge very quickly. The situation varied between stations and was worst on the first and fourth stations.

A solution was sought using Metso's new CoteCondor polyurethane cover, designed for all blade coating stations. It is particularly well suited for coaters that use hard-coated coater blades. Metso is the first cover manufacturer to supply a polyurethane cover for this application.

### Wear- and marking-resistant

With the new polyurethane material and mixture, the CoteCondor cover resists wear and marking much better than conventional roll covers. As a result, it can be used on the machine much longer, considerably reducing the need for roll changes. With online coating in particular, the difference is significant as roll changes can be scheduled according to other shutdown needs on the line.

During web breaks, covers are often locally subjected to strong forces that may cause dents in them. The CoteCondor polyurethane material has excellent strength properties, enabling it to resist even heavy local impacts without any marking. The amount of material removed during grinding is also reduced, extending the overall useful life of the cover.

**Excellent results led to a second order by Stora Enso Veitsiluoto mill**

At Stora Enso Veitsiluoto PM 1, the first experiences of the new CoteCondor cover have been excellent. For the first operating cycle, continuous operation for 15 weeks was set as the objective for the fourth station. During this time, the cover was hardly worn at all, so the cycle was extended to 24 weeks. Runnability and coating profiles remained good for the whole period.

During grinding, only 0.4 millimeters of material was removed from the diameter, which is considerably less than normal. During the second operating cycle, the cover has been in use on the first station for 20 weeks already. The Veitsiluoto mill has been very satisfied with the results.

"The roll change interval on the most problematic stations has been extended from the initial situation without any detrimental impact on runnability or profiles," says **Janne Harjuniemi,** Operations Manager. "Within a year, we have managed to eliminate about five roll changes and grindings, which has led us to acquire a second CoteCondor cover for the line."

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## Great experiences from CoteCondor cover also at Metsä Board Husum mill


"It is now much easier to plan roll changes in a controlled manner," note **Andreas Zakrisson** and **Thomas Bolén** of the Husum mill.

The Metsä Board Husum mill in Sweden is another mill producing coated printing paper, which had similar problems with wear at backing roll edges as Stora Enso Veitsiluoto did. The line includes an offline coater with four blade coating stations. The backing roll wear problem was most severe on the first and second stations, for which the rubber-covered backing rolls had to be changed every 240-430 hours operating time.

CoteCondor was first installed on the second station, where it was operated for 1,530 hours, which is four times longer than the normal operating cycle of the rubber-covered backing roll. Even then, the cover was not significantly worn during the operation. During grinding, only 0.3 millimeters of the diameter was removed, which was much less than usual. Runnability and coating profiles remained good throughout the operating cycle.

The customer was impressed by CoteCondor and has already ordered a second cover for their stations.

"Since the CoteCondor was taken into use, we haven't had to worry about how long the rolls will last. This has made it much easier to plan roll changes in a controlled manner," note **Andreas Zakrisson,** Operating Technician, and **Thomas Bolén,** Roll Manager, Husum.

ALINA AND JINSONG SHARE THE FIRST

# Metso Tissue Technology Award

**TEXT** Katarina Åhsberg

In line with Metso's ambition to provide sustainable solutions for the tissue making industry, Metso has established the Tissue Technology Award. The purpose of the award is to promote the work of university students and scientists in developing environmentally sound products applicable to tissue making processes. The first award was dedicated to energy efficiency innovations and the first winners received their awards at a ceremony at the Tissue World conference in Barcelona, Spain, in March.


**Alina Hagelqvist,** Sweden, and **Jinsong Tao,** China, received the first Metso Tissue Technology Award from **Jan Erikson,** VP Sales, Metso (center).

"Very thorough work has been conducted to go through all the applications and we ended up with two innovations of equally high quality. Therefore, we decided to split the award," says **Anders Björn,** Vice President, Tissue Machines, Metso.

The USD 25,000 prize was shared by **Alina Hagelqvist,** PhD, at Karlstad University, Sweden, and **Jinsong Tao,** PhD, and associate professor at State Key Lab of pulp and paper engineering South China University of Technology.

Alina, whose work focused on sludge wastewater treatment in the pulp and paper industry, was very happy to share the award with Jinsong Tao. "This means a lot to me because it is an acknowledgement that my work is of interest for the industry. It has also given me the opportunity to meet Dr. Jinsong Tao, whom I hope to establish research collaboration with. Hopefully, this could also lead to extended collaboration between Karlstad University and Metso in the future."

"My work has so far mainly focused on efficient handling of sludge from wastewater treatment in pulp and paper mills. In particular, I have devoted myself to the engineering part of the production of biogas from the sludge. This I hope to develop with questions about regulations regarding permissible uses of the biological residue that remains after the production of biogas, especially if different raw materials are mixed in the process, such as forest industrial sludge and municipal sewage sludge."

Jinsong, who was recognized for his extensive work in the development of models and methods for improved energy utilization for the Chinese paper industry, was proud to be chosen as a first recipient of the award. "I am very excited and inspired by the award. It emphasizes that research in energy saving is meaningful. With the prize I will continue to do further research on energy saving in Chinese tissue mills to help them save energy and achieve sustainable development".

"China is an important tissue production and consumption area, which is predicted to be the biggest market in 2015. In my work at State Key Laboratory of pulp and paper engineering at South China University of Technology I have done extensive energy saving research for paper mills. The work includes savings of steam, electricity, and water based on a mill-wide energy system three-phase model."

"Sustainable development is crucial for the tissue industry globally and it takes a wide perspective and open minds to explore new areas for innovation. Both these innovations are well in line with Metso's strategy for sustainable development," says **Marco Marcheggiani,** President, Tissue Mills, Metso. "With this award we hope to attract people outside our own organization to participate in the important work of creating sustainable solutions for the future of tissuemaking." ▢

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The next Tissue Technology Award will be granted in 2015, so take the opportunity to file your application well in time.
You can find more information and file your application at **www.metso.com/tissueaward**

INCREASED GLOSS BY THERMAL SPRAYING WITH HS600

# Hard, dense and smooth with high paper brilliance

**TEXT** Tommy Kallerdahl

Low surface finish is an important parameter, especially when using MG or Wet Crepe Cylinders. A hard material that is grinded to a very low surface finish ensures that the sheet is in contact with a greater percentage of the cylinder surface and can be removed from the cylinder more easily. At Papeterie de Raon, thermal spraying with HS600 supplied by Metso improved the paper gloss (brilliance) by 50%.

**Pascal Aubert,** Maintenance Manager , Papeterie de Raon and **Jukka Keskinen,** Product Sales Manager, Metso Cernay are pleased with the improved paper gloss.

Papeterie de Raon, located in Raon-l'Étape in the north eastern part of France, was established in 1889 and currently has two paper machines. PM 4 was installed in 1954 and PM 5 in 1974. PM 5 was rebuilt with a new wet end supplied by Metso in 2003 and the Yankee was replaced by the original supplier in 1993. The mill produces one-side glossed paper based on 100% recycled paper and 18- 40 g/m$^2$ wrapping paper for the food industry.

In 2003, the PM 5 MG was sprayed for the first time but then faced problems with run-out and vibrations, and then with wear after 2009 and the edges had to be repaired. The problem of worn edges reappeared and Raon decided to re-spray the MG in 2012 and chose the HS600 supplied by Metso. The doctors were also refurbished during the application.

"After the application of HS600 we have achieved much higher gloss (brilliance) on the paper. The gloss is measured with a Zehntner gloss meter and we have reached a 50% increase in gloss. The HS600 made it possible to polish the surface to a roughness of Ra 0.08 µm and this, together with the high wear resistance, is the reason for the high gloss achieved. The application was very professional, the project well-prepared and the technicians professional, very flexible and provided good reporting. I do not regret our choice and I would strongly recommend the HS600 if I was given the opportunity," says **Pascal Aubert,** Maintenance Manager, Papeterie de Raon.

HS600 thermal coating was developed by Metso for applications on MG & Wet Crepe Cylinders. It is a Nickel Chromium/Chrome Carbide composite applied by a hypersonic process. Due to the very low porosity of less than 0.05%, HS600 has the ability to be polished to very low surface finishes. This produces glazed and wet crepe paper to the very highest quality standards and has very good release properties for wet crepe papers. HS600 is the best possible thermal sprayed coating that can be applied to the surface of MG or Wet Crepe Cylinders and with its hardness of 67 to 69 Rockwell C it offers the best wear protection available.

Metso currently has 15 references of HS600 running worldwide. □

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METSO MEETS THE DEMAND FOR

# Bioethanol plants

## AND GREEN COAL WITH EXPERIENCE AND NEW TECHNOLOGY

**TEXT** Kerstin Eriksson

Today the focus in the emerging biorefinery area is in second-generation biofuel for the transport sector; other end products will become interesting as the industry matures.

**High-quality, water-resistant** green coal pellets produced with a high level of security.

Bioethanol plants are operated in various forms, they can be anything from companies in the chemical and oil industries to forestry companies facing the fact that the demand for some of the traditional products is decreasing. The challenge is to find new revenue sources. Using e.g. residues from the forest to produce various forms of biofuels or other useful and marketable products has proven successful.

"Metso's focus is on second-generation biofuels, primarily ethanol. Green coal is also a priority as this product will reduce $CO_2$ emissions significantly in the future. Green coal can primarily be used as a carbon-neutral and environment-friendly fuel in power plants to replace up to 45% of the fossil coal. During the past year, Metso has been in contact with over 70 companies interested in building pilot, demonstration or commercial-scale biorefinery plants. This has already resulted in nineteen systems sold",


**The production of chemicals** and materials, e.g. polymers and plastics from biomass, contributes to a more sustainable society.

"Metso's focus is on second-generation biofuels, primarily ethanol. Green coal is also a priority as this product will reduce $CO_2$ emissions significantly in the future. Green coal can primarily be used as a carbon-neutral and environment-friendly fuel in power plants to replace up to 45% of the fossil coal," says **Rickard Andersson,** Vice President, Bio Business Development, Fiber business line.

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**The driving force for developing biorefineries and three main routes**

"Metso is developing processes and equipment in three main routes where the end products are second-generation bio-based transportation fuels, chemicals and materials via concentrated acid hydrolysis of biomass and green coal. Our technology is today mainly suitable for the initial steps of the process chain: pretreatment and feeding of biomass into pressurized reactors, separation of liquids and solid reaction products, and separation and recovery of steam", says Andersson. The solutions develop all the time to include more sub-processes in the biorefinery chain, through co-operation with customers and own development work.

The key driving force for producing transportation fuels from biomass and green coal is to reduce global warming through reduced emissions of fossil carbon dioxide. The production of chemicals and materials, e.g. polymers and plastics from biomass, contributes to making the society more sustainable. A finite resource – fossil oil – is replaced by renewable biomass. Moreover, several countries would like to reduce their dependence on fuel imports.

**Metso has proven technology for annual fibers and forest products**

Most of the potential biorefinery projects are looking at agricultural and forest industry residues as feed stock. "Metso has experience and proven technology for annual fibers and forest products and can mainly supply equipment to the front end of a biorefinery", says Andersson.

There are several process solutions, but the hydrolysis stage will be a key first process unit for all variants. C5 (xylose) och C6 (glucose) sugars will be the key intermediates. From these, not only ethanol can be produced, but also many chemicals that will be important as the industry develops.

**Refining of biomasses to green coal**

Three different methods are available for refining of biomasses to green coal. Torrefaction is a process where biomass is heated without oxygen, breaking its fibrous structure, removing vapors and volatiles, and giving it coal-like physical properties. Hydro Thermal Carbonization (HTC) method is torrefaction in liquid phase and takes place in a pressurized reactor. Steam Explosion (SE) is a method where the biomass is heated with steam in a pressure vessel and then blown to atmospheric pressure breaking the material structure.

Metso primarily uses the steam explosion method as pellets produced by this method have many good physical prop-

"This plant clearly demonstrates that products traditionally based on petroleum can be manufactured to the same standard using biomass. Thus this new plant serves as an important contribution to a sustainable Bio-Economy", the Federal Minister of Research **Annette Schavan** said during the inauguration of Clariant's bioethanol plant.


**The demand for** bio-based transportation fuels, like E85, is increasing.

erties. For example, the quality is high, it is water resistant and the manufacturing process maintains a high level of security. Metso already has the technology required and successful pilot trials have been conducted.

**Breaking ground into a new market**

In July 2012, Clariant, the Swiss speciality chemicals company, inaugurated Germany's largest second-generation bioethanol plant. With an annual production of 1,000 tonnes, the plant will produce climate-friendly cellulosic ethanol from around 4,500 tonnes of agricultural waste, like wheat straw. The pretreatment system in the plant is supplied by Metso. This project is a good example of Metso breaking ground into a new market with proven and improved technology, while at the same time reducing the environmental impact. Tests were done in Metso's Sundsvall pilot plant and the result was a really good end product after the pretreatment stage. The biofuel produced at Clariant (second-generation bioethanol), cuts $CO_2$ emissions by about 95% compared to fossil-based fuels without competing with food production. There is no "food or fuel" issue as plant waste is recycled. "This plant clearly demonstrates that products traditionally based on petroleum can be manufactured to the same standard using biomass. Thus this new plant serves as an important contribution to a sustainable Bio-Economy", the Federal Minister of Research of Germany, **Annette Schavan** said during the inauguration.

**Strong demand in the future**

If the established national climate targets for the share of bio-based transportation fuels by 2020 would be met exclusively by second-generation bioethanol, it would require 130 billion liters. This volume will not be achieved. A more reasonable estimate, made by McKinsey, is 25 billion liters of bioethanol from lignocellulosic materials by 2020. The announced demand would require building more than 300 second-generation bioethanol plants based on cellulose within the next ten years. Building that many plants may not be possible, but the demand will grow, the market is there and the driving forces will increase. Emissions from power producers in the EU have been regulated by a directive which comes into force in 2016. The limit values for nitrogen and sulfur oxides and particulates are thereby tightened, making it beneficial for power plants to replace hard coal with biomass in the near future.

Metso is investing in its growing bio organization to cope with pressure from the market. The company has many products suitable for second-generation bioethanol and pellets plants. The possibilities are many and the demand is strong. Metso will meet it with experience and new technologies. ◻

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# Metso
## around the world

## Automation

**Green Energy Group orders Metso's valves again for its geothermal power plant installation in Kenya**

Metso has already won its 10th repeat order from the Norwegian company Green Energy Group AS for Neles rotary control valves and triple eccentric disc valves.

The valves were tested in the company's pilot plant in Kenya, where the valves will control the steamy process flow coming from the boreholes drilled into the ground. The loosened soil from the ground can include silica and sand, which sets special requirements on the valves to be able provide accurate control ability in such rough conditions. One of the challenges in these applications is the silica scaling.

"Not many valves are able to operate in this type of environment," says **Snorri Einarsson,** Product Manager, Steam Systems, Green Energy Group AS.

Green Energy Group is famous for building up geothermal power plants quickly due to its unique modular concept. This year Green Energy Group is delivering four geothermal power plants and has received an order for five more plants for next year.

**Metso wins two major automation package orders from SCG Paper in Thailand**

SCG Paper has ordered two large automation packages from Metso to be installed on Siam Kraft PM 16 – a new OptiConcept M machine from Metso at the Ban Pong mill in Ratchaburi, and for the upgrade of TUPI PM 9 at the Wangsala mill in Kanchanaburi. The goal of the automation packages is to increase the production capacity and modernize the existing control system.

Both automation packages include Metso's automation system with continuous condition monitoring of field instruments, quality control systems, Neles and Jamesbury valves for on-off and control applications. All valves are equipped with pneumatic cylinder actuators and intelligent positioners or limit switches. The upgrade delivery for TUPI PM 9 at the Wangsala mill also includes consistency measurement.

Metso has a large installed base for process automation products and valves especially in the Thai pulp and paper industry, with customers like SCG Paper, which has a pulp mill and several paper mills in the area.

## Power generation

**Metso-supplied world's first commercial LignoBoost plant successfully starts up at Domtar in the USA**

Domtar has successfully started up a commercial-scale LignoBoost lignin separation plant at its Plymouth, North Carolina mill, in the USA. This is the first commercial installation of a LignoBoost plant in the world and the technology is supplied by Metso.

The LignoBoost plant is integrated with the pulp mill and separates and collects lignin from the pulping liquor. This provides the Plymouth NC mill with numerous benefits. Lignin is a high-quality bio-based alternative to fossil fuel based materials. Separation of a portion of the mill's total lignin production also off-loads the recovery boiler, and allows an increase in pulp production capacity.

Domtar's production of BioChoice lignin began in February with a targeted rate of 75 tonnes a day. A wide range of applications and markets for BioChoice lignin are being developed including fuels, resins, and thermoplastics.

"The technology has been developed by Innventia in Sweden, in association with Chalmers University of Technology. Metso purchased it and is furthering the development. We continue to work together to refine the technology to develop new lignin applications in partnership for current and future customers. LignoBoost has generated a great deal of interest in the pulp & paper industry globally and this is a major breakthrough for all parties involved in this first-of-a-kind project," says **Gene Christiansen,** Senior Manager, Business Development Innovations at Metso's Power business line for North America.

## Mining and construction

**Fully truckless, mobile crushing and conveying system is safe and economical solution in Italy**

Operating the primary section up in a steep quarry face created a major challenge for the Italian company Marocca Costruzioni. A totally truckless, economical and safe solution was found by choosing a Metso Lokotrack track-mounted jaw plant and connecting it to a unique and flexible mobile conveying system.

The family-owned Marocca company has exploited the limestone deposit since 1921. A wide variety of high-quality aggregates are marketed for concrete, asphalt and road works along the Lazio and Toscana provinces.

After trying conventional trucking to move the limestone after primary crushing down to secondary processing, it was quickly discovered that trucks were a costly solution, consuming a lot of tires and fuel. An alternative solution was crucial for the quarry's future.

"Based on studies of available options, it became clear to us that Metso's mobile primary crushing and conveying system would provide us with the biggest benefits and the capacity, economy and reliability we were looking for," comments Managing Director **Alberto Marocca** of Marocca Costruzioni.

**Metso's mobile primary crushing** and conveying system consisting of Lokotrack LT140 jaw plant and Nordberg LL12 mobile conveyor feeds the crushed limestone to the stationary field conveyor.

metso
Expect results

# Metso in China 80 years of sustainable partnerships

The year 2013 is a special one for Metso. It was exactly 80 years ago when we received our first order from China. Since then, we have had the privilege of becoming a trusted local business partner to some 1500 process industry companies, contributing to the phenomenal development of China's key industries and infrastructure.

**We sincerely thank our customers for their trust in us during the past decades, and look forward to building on our joint achievements to ensure the next 80 years of sustainable development in China.**

To find out more about Metso in China, visit **www.metso.com/80**