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results pulp & paper

The Metso way to develop products is based on the cooperation and combination of engineering and industrial design, where one plus one equals more than two.
Read more on page 9.

Design boosts safety, usability and cost-effectiveness

Our target is to provide our customers with sustainable, fit-for-purpose products and services. We also want to be a forerunner and technology leader with solutions that meet our customers' needs, not only today but also in the future. This means continuous investment in research and development, extending from exploring new opportunities in the field of biomass utilization to new approaches in engineering.

Industrial design is one of the tools that we utilize when developing new products. In fact, Metso has been one of the pioneers in applying industrial design to equipment for the process industry.

Industrial design is often understood as something that relates to the appearance of a machine, which is quite right, but for us industrial design means much more. We apply industrial design in the development of machines to suit customers' practical everyday needs with solutions that reduce the total cost of their investment.

In addition to cost-effectiveness, user-friendliness is one of the cornerstones of industrial design. It means improved safety for the operators, and it means machines that are easy to use, maintain and service. All this results in a better working environment for employees and finally in machines which are more efficient and profitable.

User experience is one of the themes that we associate with industrial design. While we cannot offer our readers a user experience through this magazine, I believe that the articles describing our recent products where industrial design has been applied, like the new Opti product family for papermakers or the Advantage tissue machine selection, will provide a reading experience and further explain how our products and services can help our customers reach their business targets.

Jouko Yli-Kauppila
Vice President, Technology & IPR Coordination
Pulp, Paper and Power

in this issue

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Ji'an Group's new PM 3, the world's fastest coated board machine, enables the company to enter the growing Chinese coated board market. Read more on page 22.

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Reporting latest orders

Board machine rebuild for Obeikan Paper Industries in Saudi Arabia

Metso will rebuild the PM 1 cartonboard machine at the Riyadh mill of Obeikan Paper Industries in Saudi Arabia. The rebuilt production line will be fully operational by the middle of 2013.

The main target of the rebuild is to improve end product quality, increase capacity and reduce production costs.

"This investment is aligned with Obeikan's strategy to keep the mill up-to-date in technology in order to remain within the competitive environment of paper industries," says **Mohammed Al-Mowkley,** General Manager of Obeikan Paper Industries.

The 3.4-m-wide (wire) PM 1 produces white lined chipboard in the basis weight range of 180-450 g/m^2 at the design speed of 600 m/min. The current annual production level is 170,000 tonnes and capacity after the rebuild will be 220,000 tonnes per year.

Metso's delivery will comprise a rebuild of the press section with a new SymBelt shoe press to increase dry content after the press section. The delivery will also include a new curtain coating station with a one-sided gas-heated air dryer. The new multilayer curtain coating unit adds two coating layers to the web at the same time in a non-contact operation with no speed restrictions. Metso will also take care of installation supervision, commissioning and start-up of the rebuilt machine.

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HengAn orders four tissue production lines

Metso has been awarded a repeat order for four complete tissue production lines for HengAn Group in China. Two of the lines will be located at Shandong HengAn Paper Co., Ltd, in Weifang City, Shandong Province, and two at HengAn Wuhu Paper Co., Ltd, in Wuhu City, Anhui Province. Start-ups are planned to be successive, with the first in December 2013 in Weifang.

"We want to continue our relationship with Metso, who is actively developing the tissue machine technology," says **Xu Lianjie,** President, HengAn.

"We are very proud that HengAn has once again trusted Metso technology to support its continued growth in the tissue industry," says **Anders Björn,** President, Metso Paper Karlstad.

The new lines will add another 240,000 tonnes a year of high-quality facial, toilet and towel grades to HengAn Group's total production. This will consolidate its position as China's leading tissue producer. The raw material for the new machines will be virgin pulp. The order follows the successful start-ups of four similar tissue lines at the company's Anhai mill in Fujian Province and Weifang mill in Shandong Province in 2006, 2007, 2008 and 2009.

Metso's delivery will comprise four tissue production lines featuring Metso's stock preparation equipment and Advantage DCT 200 tissue machine. Each machine will include an OptiFlo II TIS multi-layer headbox, a Metso Yankee cylinder with deep rib for highest energy efficiency, an Advantage AirCap hood, an Advantage WetDust dust management system and an Advantage SoftReel P reel. The tissue lines will also feature Metso's new MicroBar refiner segments for short fiber refining and VacuFox polyurethane roll covers for tissue machine press sections.

The new lines will have a width of 5.6 m and an operating speed of 1,900 m/min.

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Slab press and baling line rebuild for AS Estonian Cell

Metso will supply a new slab press and a baling line rebuild for AS Estonian Cell in Kunda, Estonia. Start-up is scheduled for July 2013.

"The order confirms Metso's strong capabilities as a world leading supplier of slab press and baling technology for the pulp and paper industry and BCTMP (bleached chemi-thermomechanical pulp) producers in particular. The order received is the fourth slab press unit sold in the last twelve months," says **Andreas Lindstedt,** Sales Manager, Metso.

Metso's delivery will include design, supply and assembly of the equipment, including a slab press and a partial baling line. The project will also include relocation of existing machinery to enable Estonian Cell to make full use of their new equipment. The new slab press and upgraded baling line will produce over 500 air dried tonnes of bleached aspen BCTMP per day.

The equipment to be supplied, together with Metso's experience and know-how of slab press and baling technology, will enable AS Estonian Cell to continuously produce high-quality bleached aspen BCTMP and improve availability of existing equipment.

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Metso to provide multi-year mill maintenance to Greenpac Mill in the USA

Metso and Norampac have reached an agreement in principle in which Metso will supply the mill maintenance services for Greenpac Mill in Niagara Falls, NY, in the United States. With this mill maintenance agreement Metso will establish and manage all maintenance systems and procedures at the mill.

The new linerboard machine at the Greenpac Mill will be supplied by Metso; this order was announced in 2011. The machine is scheduled to start up in the third quarter of 2013. The agreement includes recruitment of all maintenance personnel prior to start-up. Upon start-up, Metso will assume full responsibility for the mill maintenance operations for the entire production facilities at the Greenpac Mill.

"We are pleased to be collaborating with Metso to create a unique world-class operation at our Greenpac site. The outsourc-

ing of maintenance is the first of its kind for Norampac and its partners in North America – after visiting a similar world-class site in Europe we were convinced of the benefits, performance and customer satisfaction with Metso maintenance operations, which will further contribute to the project's success," says **Marc-André Dépin,** President and Chief Executive Officer of Norampac.

The Metso mill maintenance model optimizes the use of Total Productive Maintenance (TPM), Metso's streamlined reliability centered maintenance (Applied RCM) and condition-based maintenance. The model ensures the highest possible equipment efficiency and cost optimization.

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Grade conversion rebuild from newsprint to lightweight coated grades for Norske Skog in Australia

Metso will supply Norske Skog with a grade conversion rebuild from newsprint to lightweight coated (LWC) grades of their PM 2 machine at their Boyer mill in Tasmania, Australia. After several phases of rebuild, the rebuilt production line will be fully operational during the first quarter of 2014.

The main target of the rebuild is to convert the newsprint machine into a competitive lightweight coated paper (LWC) production line. The delivery also includes a cooperation agreement aimed at achieving the key objectives of the conversion.

The future capacity of the PM 2 machine after the rebuild will be 140,000 tonnes of lightweight coated grades per year.

Metso's delivery will include a rebuild of the existing machine calender and a new ValSizer sizing section, a coating preparation and supply system, a TurnDry Compact air dryer, an OptiLoad calender, a ValReel reeler, a WinBelt C winder and parent roll handling equipment.

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Reporting records

Zhanjiang Chenming PM 1 sets another world speed record for woodfree uncoated paper

On November 16, 2012, the Metso-supplied PM 1 fine paper machine at Zhanjiang Chenming Pulp & Paper Co., Ltd. in Zhanjiang City in China set a woodfree uncoated machine 24-hour world speed record of 1,808 m/min. During the record-breaking run, the 11.15-m-wide PM 1 produced woodfree uncoated printing paper at a basis weight of 70 g/m^2.

Zhanjiang Chenming PM 1 also held the previous world speed record for woodfree uncoated paper. The PM 1 was started up on September 1, 2011.

The PM 1 features Metso's paper making and automation technology from headbox to reel, air and chemical systems and

Zhanjiang Chenming's world speed record machine PM 1.

two WinDrum Pro winders. The annual dimensional production capacity of PM 1 is close to 600,000 tonnes of woodfree uncoated printing paper.

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Reporting start-ups

Metso-supplied tissue line efficiently started up at Xiamen Xinyang Paper in China

Xiamen Xinyang Paper's new Metso-supplied tissue machine came on stream one week ahead of schedule on September 10, 2012, in Xiamen City, Fujian Province, China. Only nine days later, after five days of continuous operation, the machine reached the operating speed of 1,900 m/min.

"We are very satisfied with the new record we have set for the process of commissioning, start-up and speed-up," says **Chen Qi,** Chairman of Xinyang Paper Corporation.

"This start-up process that took place in record time is the result of very good cooperation and efficient team work between Xiamen Xinyang Paper and Metso's personnel. It also proves that our technology is optimized for customer needs, efficient installation and highly efficient production," says **Stefan Ziegel,** Project Manager, Metso.

Metso's delivery comprised a complete production line with stock preparation equipment and an Advantage DCT 200 HS tissue machine, including an OptiFlo II TIS multi-layer headbox, a Metso Yankee cylinder, an Advantage AirCap hood, an Advantage WetDust dust management system and an Advantage SoftReel reel. The delivery also featured Metso's patented Advantage ViscoNip pressing technology and BlackBelt shoe press belt. The production line will be optimized to enhance final product quality and save energy.

The delivery also comprised an extensive automation package, including Metso DNA machine, process and integrated drive controls, and a Metso IQ quality control system with a Metso IQ Scanner and a Metso IQ Fiber sensor.

With a width of 5.6 m and a maximum operating speed of 2,000 m/min, the new production line will produce 60,000 tonnes a year of high-quality facial, toilet and towel grades. The raw material for the new line will be virgin pulp.

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Cartonboard line starts up at Shandong IP & Sun Food Packaging in China

The Metso-supplied complete cartonboard production line, PM 26, for Shandong IP & Sun Food Packaging Co. Ltd., successfully came on stream on September 19, 2012 in Yanzhou City, Shandong Province in China. The grade produced during the start-up was base paper for 300-g/m^2 folding boxboard. Coated A grade was achieved within less than a week of the start-up. Within three weeks of the start-up the machine exceeded the dimensioning capacity over a period of 24 h. In five weeks, another milestone, speed over design speed for 24 h, was reached.

The new 6.85-m-wide (wire) PM 26 has an annual production capacity of approximately 550,000 tonnes of folding boxboard and art board grades in the basis weight range of 170 to 350 g/m^2. The design speed is 950 m/min.

Metso's delivery included a complete coated board making line from three headboxes to reel with stock preparation and approach flow systems, air systems, a coating color preparation system and two winders. A comprehensive Metso automation package comprised process, machine and quality controls.

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Boardmaking line starts up at Liansheng Paper Industry in China

On October 28, 2012, Liansheng Paper Industry (Longhai) Co., Ltd started up its new Metso-supplied containerboard production line, PM 5, at its Longhai site in Fujian province in China.

"The PM 5 start-up was successful with a stable operating process. The desired targets were achieved. I hope that we can continue the very good cooperation with Metso also in the future," says **Rongjun Xue,** Project Manager of Liansheng Paper.

The new 7.25-m-wide PM 5 has an annual production capacity of approximately 350,000 tonnes of recycled testliner in the basis weight range of 100 to 140 g/m^2. The design speed is 1,200 m/min.

Metso's delivery included a complete boardmaking line from headbox to reel with air systems, a size supply system, a quality control system and a winder.

The PM 5 testliner production line features a novel two-layer forming process, with only one hybrid forming unit, equipped with the new OptiFlo layering headbox. With this innovative technology a two-layer web can be produced with only one headbox, providing excellent profiles due to a unique dilution system and good formation due to a new type of hydraulics.

Production Manager **Wang Guimin** (left) and Project Manager **Rongjun Xue** in front of PM 5 that was recently started up at Liansheng Paper.

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Evaporation plant and recovery boiler started up at Eldorado's Três Lagoas site in Brazil

The Metso-supplied evaporation plant and recovery boiler for Eldorado Celulose e Papel S.A. were started up successfully on December 1, 2012, at Eldorado's Três Lagoas mill in Brazil. The mill's official inauguration ceremony was held on December 12 and attended by a large number of high-level guests. The Três Lagoas mill, the largest single-line pulp mill in the world, relies on Metso's cutting-edge equipment in its recovery line.

The evaporation plant, with a capacity of 1,600 tonnes/hour evaporated water, is the largest single line evaporation plant in the world with the purpose of concentrating black liquor up to 80%

Metso-supplied evaporation plant and recovery boiler at Eldorado's Três Lagoas site.

dry solids content for efficient and low-emission combustion in the recovery boiler.

The recovery boiler is also among the largest in operation in the world and has a black liquor burning capacity of 6,800 tonnes of dry solids/day and steam generation of 1,109 tonnes of steam/hour. The steam will be used in the pulp manufacturing process and in power generation to supply the entire mill and produce a significant amount of power surplus. Additionally, the recovery boiler has high chemical recovery efficiency, making the mill economically and environmentally sustainable.

Celso Tacla, Area President, South America, Metso's Pulp, Paper and Power segment, explains that "the Eldorado project was a success since it overcame major challenges, such as the large-size equipment that came from different parts of the world, requiring extremely well-executed logistics."

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First Metso Advantage NTT tissue line to be started up at Fabrica De Papel San Francisco in Mexico

The Mexican tissue producer Fabrica De Papel San Francisco is preparing to start up its third Metso tissue production line. It will be the world's first tissue line based on the Advantage NTT concept, which enables high bulk and softness properties while providing energy savings compared with conventional or structured tissue grades.

"After our good experience with two Metso Advantage DCT tissue machines, we are now prepared to take the next step for quality by producing tissue products with higher bulk and softness, with the aim of producing top end products. The Advantage NTT concept also has a higher production capacity compared with the dry crepe tissue concept," says **Dario Palma y Meza Espinoza,** Director of Operations, Fabrica De Papel San Francisco.

"We have had a very long and fruitful relationship with Fabrica De Papel San Francisco and we are naturally very excited to be supplying the first Advantage NTT technology and supporting their ambition to supply high-quality products produced with less energy and fiber. Fabrica De Papel San Francisco has a very strong and knowledgeable team," says **Jan Erikson,** Vice President, Sales, Metso.

The project is proceeding according to plan and the new tissue production line will start up in Mexicali, Mexico, at the end of the second quarter of 2013.

Metso's scope of supply comprises a complete 2.6-m-wide Advantage NTT tissue machine which will add another 30,000 tonnes per year of bathroom tissue, napkin and towel grades to Fabrica De Papel San Francisco's existing production capacity.

The company already operates two Advantage tissue machines at their Mexicali facility.

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Reporting awards

The OptiFiner Pro refiner has started a new era in LC refining.

Metso's OptiFiner Pro refiner wins innovation award

Metso is the winner of the prestigious 'Palme d'Or' Innovation Award that was presented by ATIP, the French Paper Industry Technical Association, for its OptiFiner Pro refiner. ATIP awarded the 'Palme d'Or' Award to Metso in its innovation contest, arranged in connection with the ATIP congress in October, 2012. Highly regarded in the European pulp and paper industry, the ATIP Innovation Award is selected by a committee consisting of paper mill managers, R&D directors, technology directors and production managers from the French paper industry.

Since its introduction in 2010, Metso's revolutionary low consistency refining concept with the OptiFiner Pro refiner has established a totally new level of performance for low consistency refining. In conventional refining, fibers have to travel the full length of the refining zone and some fibers suffer excessive impacts leading to increased fines, weakening of the refined fibers and inefficient delivery of energy to the fiber. OptiFiner Pro feeds the pulp through the segments, evenly distributed across the bars, directly in the refining zone where fiber treatment occurs. All the stock is treated evenly, providing higher refiner loadability and better energy efficiency. Documented results have shown that one OptiFiner Pro can replace two traditional refiners and deliver electrical energy savings of over 20 % with a refining result which is the same as before, or better.

OptiFiner Pro is suitable for all kinds of LC refining applications, including short hardwood fibers as well as recycled fibers requiring fibrillation at low refining intensities. Three different extremely compact and quiet running capacity models are offered for maximum flexibility in installation and application. As well as energy and raw material savings, eliminating two refiners halves maintenance and wear-part replacement costs in one installation.

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What do we need industrial design for?

Kalevi Ekman, Professor
Aalto University, School of Engineering
Aalto Design Factory

The year 2012 was Helsinki's year as the World Design Capital. People are interested in Finnish design and even the statistics on tourism during the design year prove this. The World Design Capital designation is unique as it emphasizes the wider significance of design for the urban environment, economy and residents.

Of the varied events supporting the design concept during the design year, the HI Design 2012 exhibition sticks in my mind in particular. There are many companies in the technology industry in Finland that extensively utilize design in the development of their products and business, but which are hardly ever discussed in this context. A full-length tram, a lift, forklift trucks, welding machines, dentists' dental units and a troop carrier, for example, were all displayed at this exhibition. So what is the significance of design in these kinds of products?

Two things are evaluated before significant investments are made: what are the possible profits and risks? Let's take an example: a car is possibly the most complex investment good acquired by an individual. A car contains thousands of parts and components, sensors, materials, joints, fittings, actuators and wiring harnesses. We don't necessarily know too much about these things, and we may not even want to know. A car needs to function in the most unpredictable operating conditions and situations. When evaluating possible profit, in addition to vehicle mileage alone, various immaterial values, such as comfort, sportiness, versatility or status value, enter the picture. Possible risks are unreliability, expensive faults that reoccur frequently or rapid decline in value. My statement that is based on experience is that industrial design can effectively increase the amount of profit gained by the driver from the investment and decrease the associated risks.

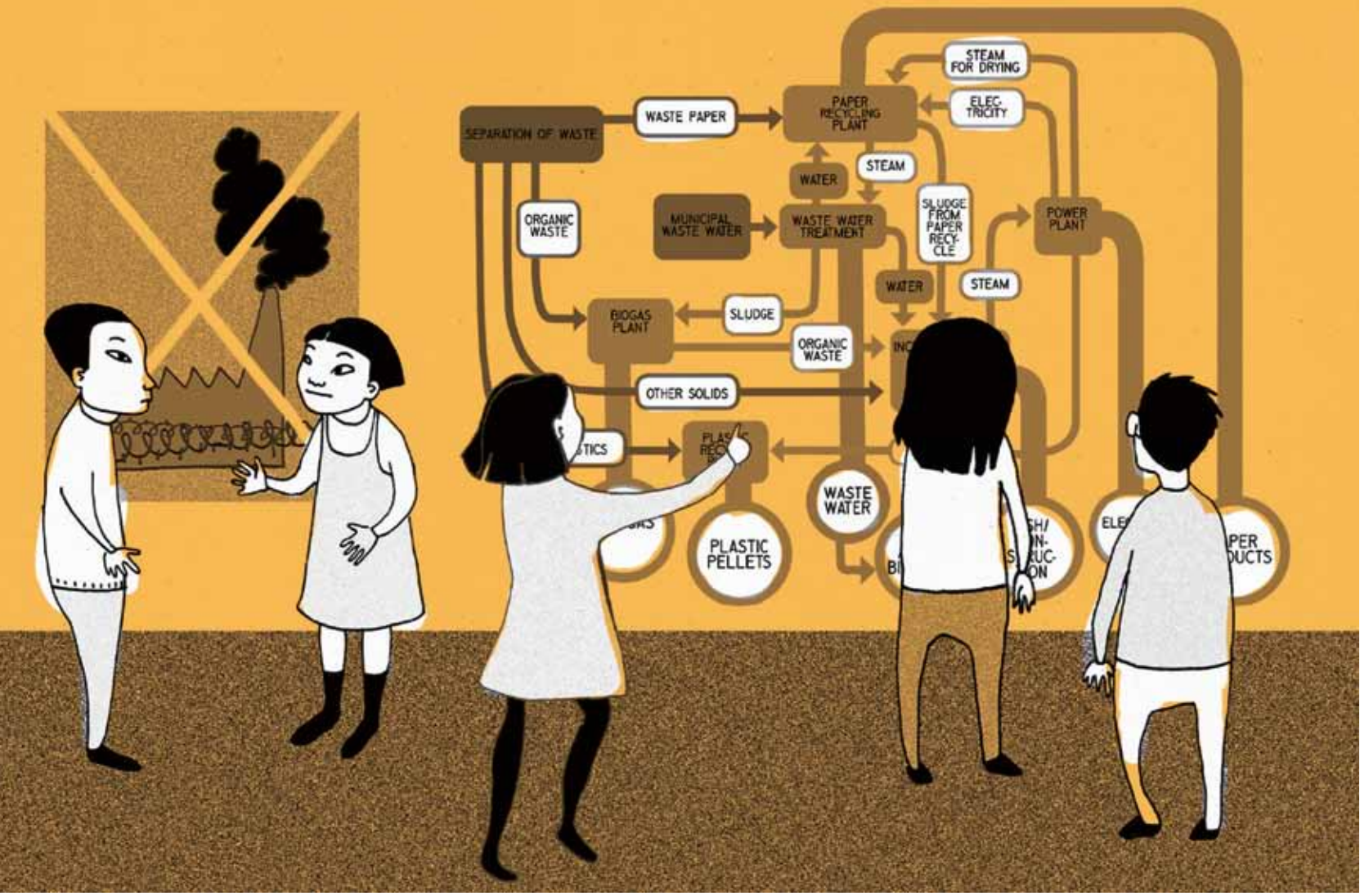
The more complex a machine system or production system is, the more challenging it is to design and implement a system with simple, sound and elegant product architecture that is guaranteed to function and enables the user to gain maximum profit.

An industrial designer has a key role in the product development group, made up of members from various fields. Industrial design students learn a lot about the methods that are used to ascertain machine systems' operating situations and user-experiences. User surveys help target product development efforts into the right areas. When a designer understands what is really needed, he or she will be able to create a simplified user interface and have the confidence to leave out features that he or she might have included "just in case".

Industrial design as a part of product development is, above all, the management of the entire product. Modern products require technology performance to be extended over many fronts: the features of the materials, electronics packing density, optimization of durability, vibration control, control of manufacturing quality and costs, surface treatments, product packaging and computer-aided design and the associated management of product data. A designer's visual communication skills help to intensify interaction in team work in both the local and global development environment. This enables highly-optimized sub-areas of technology to be glued together beautifully with no gaping holes at the seams.

Every single object made by man has also been designed, either consciously or unconsciously. We need to ask whether we want this to be done by well-meaning amateurs or design professionals? Anyone can learn to play a musical instrument or football, or how to do DIY for renovation projects, but the difference between such people and a symphony musician, professional footballer or carpenter is nevertheless huge.

In addition, professional industrial designers are continuously furthering the design capacity of the organization. This ensures proactive creation of the best solutions for users and customers.



Industrial design is so much more than meets the eye

TEXT Marjaana Lehtinen

Industrial design is often too narrowly understood. It is actually a synonym for high performance, productivity, safety, usability and competitiveness. Well-designed equipment and services help all user groups to get their jobs done better and faster.

The walls of the **Metso Industrial Design Center** in Järvenpää, Finland, are covered with drawings of paper machine parts. These drawings represent just a tiny proportion of the thousands of pieces of equipment that have been designed and supplied to customers around the world over the past 40 years or so. There is no match for Metso and its predecessors' long experience in industrial design in the field of pulp and paper technology.

continued overleaf…

"The starting point is for the designer to understand the user's needs and challenges", says **Petteri Venetjoki,** Chief of Industrial Design.

"The Metso way to develop products is based on the cooperation and combination of engineering and industrial design, where one plus one equals more than two. Industrial design is like a development method that uses skills from different disciplines. Designers, with their artistic and user-oriented product design skills, are an important part of this," says **Petteri Venetjoki,** Chief of Industrial Design at Metso. "For us, industrial design goes much deeper than the visual appearance of an object that can only be seen on the outside. We pay attention to a wide range of strategic viewpoints. Industrial design is like an architecture and on this we build a product that meets the customers' requirements. We choose the right features and solutions and make them fit together so that the entirety works in the optimal way."

When a product represents merely a technical solution and no attention has been paid to work safety or the pleasantness of the working environment, the end result will not be as good as it would have been if all the aspects had been considered at the same time. "Our target is to design and supply solutions that are based on customer and user needs, taking environmental and social responsibility into account. If a product is designed according to these principles, it will reflect Metso's brand and values."

The brand factor also works the other way around, benefiting the customer who is investing in Metso's equipment. If the customer shares the same values as Metso, the two parties can pull together to promote sustainability. This way of working also results in fewer risks for the buyer.

"A high-quality product shows that the manufacturer believes in the product and has invested in its development. Top quality means that the customer can rely on the fact that the product has been manufactured with sincerity and pride," Venetjoki notes.

Different user groups have different needs

All machines, user interfaces and services, to name a few examples, used at a pulp or paper mill can be regarded as tools. In order to successfully create an efficient tool, an industrial designer will start by examining the context in which the tool will be used, by whom and for what purpose, and also consider how the tool can be made pleasant to use and how it can reduce any mental and physical stress experienced by a user.

"The starting point is for the designer to understand the tool's user groups and their needs and challenges. We have taken the time to listen to our customers, especially those in China, by carrying out studies at several mills," Venetjoki explains.

Different users value different tools and features that enable them to carry out their own tasks successfully within the organization. For example, directors making decisions about investments want to know how an investment will help their company succeed in the future and provide competitive advantage, what the return on investment is and how risks can be minimized. Production managers are interested in technical solutions that feature high runnability with minimal breaks and how quickly the staff learn to run the line. Service and maintenance managers, in turn, are concerned with how well the line functions and how quickly solutions can be found for possible problems.

"It's important for a customer to understand that the product or service that they are planning to buy has to be suitable for the whole organization and serve every user group's goals in the best possible way. Just comparing investment figures is too narrow-sighted."

The ValZone metal belt calender is an example of a product where engineering and industrial design have worked together to create something new, both in view of technology and visuality.

"A good example is the OptiConcept M papermaking line that requires 40% less space than earlier versions. Consequently, this means that there is less need for hall space, resulting in building cost savings," Venetjoki points out. "Also, since the line is smaller in size, less material is used in its production. And an optimized process means that the line consumes less energy, water and other scarce resources."

According to Venetjoki, there is huge potential for planning and carrying out investment projects more cost-efficiently at pulp and paper mills. This potential can be tapped by looking at each investment from the viewpoint of each user group within the mill organizations. The effects of each investment on the whole investment project must also be understood.

Good design provides clear benefits

Good design, created by multidisciplinary teams, pays off in many ways. One of the most significant benefits is the lowering effect that it has on the customer's total investment costs.

"A good example is the OptiConcept M papermaking line that requires 40% less space than earlier versions. Consequently, this means that there is less need for hall space, resulting in building cost savings," Venetjoki points out. "Also, since the line is smaller in size, less material is used in its production. And an optimized process means that the line consumes less energy, water and other scarce resources."

Features such as accessibility, safety, usability, understandability, clarity, learnability and visuality are not solved with technical specifications but through industrial design. If the chance of human errors can be reduced in the running of the process, this will usually have a clear effect on line efficiency. "And if we can decrease any strain and stress experienced by operators and thus improve their occupational wellbeing, sick leaves will decrease. According to studies, occupational wellbeing is one of the areas with the most untapped potential for enhancing productivity."

A good user experience is the next step towards good usability. For example, in a paper mill environment, this can mean that all parts of the line fit together seamlessly and can be used in the same consistent way in all situations. This will increase the feeling of safety and control experienced by the users, which in turn reduces stress.

All the above benefits have an effect on a customer's total efficiency, line availability, profitability and competitiveness. A well-designed line will enable a mill to produce optimal quality in a cost-efficient and reliable way, keep its promises to its customers and ensure its success also in the future.

Design can harm or help the environment

But where is industrial design heading? Is there something new and exciting to look forward to?

"The integration of paper technology processes with other processes that people need, such as heat and electricity production, waste and wastewater treatment or biorefineries, will improve cooperation with surrounding communities and open up new business opportunities for our clients."

"I think that a multidisciplinary approach in the pulp and paper industry will become increasingly important. For example, the integration of paper technology processes with other processes that people need, such as heat and electricity production, waste and wastewater treatment or biorefineries, will improve cooperation with surrounding communities and open up new business opportunities for our clients," Venetjoki says. "This would also

"Many people understand the significance of industrial design in a very limited way. It always feels great when I can make somebody understand the many opportunities offered by industrial design."

improve the pulp and paper industry's image, increase its transparency and make it an even more solid member of the community. In this multidisciplinary approach, industrial design is not a separate function as it is involved in all development work."

Venetjoki emphasizes the fact that industrial design is not something that is exclusively the concern of the designer. All parties involved should consider their solutions in terms of individuals, communities and ecosystems. Industrial design can unify and lead our ways of thinking.

"Design can be regarded as one of the most effective ways to harm the environment or to help it. Businesses try to sell more products with more product variations, using more and more natural resources. Poorly-made products waste natural resources, whereas well-made products minimize the use of natural resources. "

A well-designed product can be distinguished by its success on the market, money-making capabilities for the customer and Metso, and its minimal use of natural resources during its life cycle. A well-designed product is both economically and ethically sound.

The "Good Mill" of the future embraces ethical values

How can the industry be integrated with towns and cities with the aim of providing people a good life and an unpolluted environment? The answer lies in the Good Mill, a visionary concept, based on real needs and opportunities.

Metso, in collaboration with Aalto University in Finland and Aalto Tongji Design Factory in China, has created an eco-efficient urban planning model that embraces ethical values. In this model the urban environment, our industry and sustainability have been integrated in a new, innovative way.

The goal of this work was to create a foundation for an ecological, urban community in which our industry is an integral element in the heart of a metropolis. The team created a bold and futuristic design for a mill that takes people's needs into account and is located in the middle of a conurbation. The mill is like an urban facility where the waste and wastewater produced by people are processed into energy or new products. The processing of waste produces value, "upcycling", which is more than just recycling.

A dream assignment in mind

Petteri Venetjoki decided to become an industrial designer because he enjoys drawing, painting and doing things with his hands. He joined Metso 15 years ago, and has enjoyed all the challenges related to unleashing the improvement potential in paper machine equipment and related services.

"Many people understand the significance of industrial design in a very limited way. It always feels great when I can make somebody understand the many opportunities offered by industrial design," he says.

Although Venetjoki has been involved in hundreds of product development projects during his long career, there is one project that would be a true dream assignment. The assignment would involve designing a community where the borders between the esthetic community, consisting of the working and living environments, and the unaesthetic community, consisting of the industry, have been removed. "If this type of community could be created one day, then the quality of our life and the state of our environment would improve in one go."

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Last year Metso's tissue business passed several important milestones. Tissue machine number 200 was sold to China. A total of 50 Advantage DCT tissue lines have been sold worldwide since the launch in 2005, and seven customers have bought two or more machines. HengAn Paper of China added four new Metso machines to their previous four installations. Hayat Kimya, Turkey, reached a world speed record of 2,210 m/min. After constantly shortening the time to reach full production speed at installations worldwide, Xiamen Xinyang, China, set the current record of nine days from first paper to guaranteed speed with their new tissue machine. These results speak for themselves. The Advantage DCT concept is here to stay.

The Advantage DCT

CONCEPT CROSSES BORDERS IN TISSUEMAKING

TEXT Katarina Åhsberg

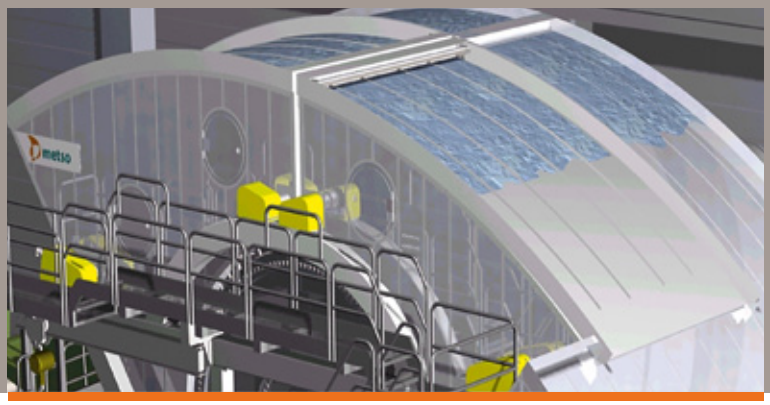
Prepare for the future
The Advantage DCT concept has become the industry benchmark. The response from the market has been very positive, especially when it comes to tissue quality, performance, and cost efficiency. Our journey to create a more sustainable future will of course include some challenges but even more opportunities lie ahead.

The value of long-term investments in Best Available Technology cannot be underestimated. Utilizing leading technologies will not only reduce the costs and environmental footprints of today but will also make sure that tissue producers are well prepared to meet the environmental legislation and energy efficiency as well as the quality and safety requirements of tomorrow.

Continuous efforts to develop new and more capable technologies are essential for future tissue production. But development is not only about inventing new products and services - it is also about how to design, combine and use the technology in a more effective way. Ensuring a design that is safe, user-friendly, easy to maintain, providing efficient production of high quality products in the most cost-effective way. Industrial design has become a natural and essential part in the development of new tissue processes. For the Advantage DCT concept, industrial design is applied both to conceptual principles and to actual machine features.

A holistic approach

The knowledge on how to design, combine and use technologies and systems has a major impact on consumption figures as well as costs. A holistic approach utilizing Best Available Technology, Best Operational Practices and Best Mill Design is the key for more sustainable tissue production. With



Industrial design applied for safety, usability and visual appearance
The Metso Advantage DCT tissue machine is characterized by the curved hood, providing a unique solution for dust removal. Industrial design has enabled combining safety and usability with attractive look.

wide process knowledge and full control over the technology, including tissue machine, automation, auxiliary equipment and systems, electrification, training, purchasing and project management, you can reach full integration and compatibility between design and equipment as well as best value for money.

… to reach new heights
When the Advantage DCT concept was launched back in 2005, Metso was the first tissue machine supplier to introduce a tissue machine model offering several choices of production capacity, under its own brand. Key factors in the development work have been modularization and industrial design. By designing components in modules it is easy to put parts together or replace one component with another, almost like playing with Lego. But modularization has also improved the manufacturing and operational processes from development to installation and service. Last year's new records are an acknowledgement that we are on the right track.

Unique shape provides unique functions
On a smaller scale, industrial design and modularization have been more focused on developing safe and more user-friendly products that are easy to install, operate, and maintain. The Metso Yankee hood (Advantage AirCap) is a product where all these features have been realized.

The word "design" often entails the assumption of a special look or appearance. The Advantage AirCap Yankee hood has a very distinctive look with its typical curved shape. But the curve isn't only there to give an attractive and characteristic Metso look; it also provides a unique function.

As everyone knows, tissue production generates dust. Dust that can not only cause fire hazards, but also endanger the health of the people working at the machine and breathing in the air. To reduce the fire risk the hot Yankee hood area needs to be cleaned quite frequently. Normally this is done by the machine operator, climbing up to the hood roof and blowing the dust away from the top surface. The dust blown away consequently spreads into other areas in the machine hall and needs to be taken care of – again. The safety risk is significant from several points of view: the climb, the heat, the risk of inhaling the dust and last but not least, the risk of fire. From an efficiency point of view, taking care of the same problem twice is a waste of time.

Looking attractive by chance
The Advantage AirCap Yankee hood provides a unique solution that uses water to regularly flush the dust away. That's where the curve comes in. Also, the canopy hood covering the dry end of the machine needs to be cleaned, which made it natural to incorporate the dry end into the curve too. The unique and attractive shape that today has become a classic feature of Metso tissue machines was actually created almost unintentionally. The basics of industrial design are functionality and performance; the "attractive look" is an added bonus. The use of flushing water, normally once per hour, has eliminated the personnel's risk of climbing on a hot surface and the exposure to dust in the air as well as reduced the need for cleaning and maintenance.

The Advantage AirCap hood was designed mainly to optimize energy efficiency, produce high-quality tissue, and reduce emissions to the atmosphere. However, by utilizing the industrial design approach and functionality we can now add improved safety and a better working environment as well as savings in cleaning and maintenance as additional benefits.

Target: decreased environmental impact, optimized process and improved working conditions
The most recent installation of an Advantage AirCap hood was performed at Disley Tissue, UK. The reason for the investment was to increase the production significantly without affecting the current energy consumption.

"We chose Metso because they provided the best technological solution for the hood replacement and dust system; improving the health of our employees, reducing our impact on the environment and improving our cost base considerably. Metso is working positively, hand in hand with our engineering team, to ensure the best solutions for the safest and quickest installation within the existing machine house," says **Chris Wickham,** Managing Director of Disley.

The installation was combined with an Advantage WetDust dust system and will support Disley Tissue in decreasing environmental impact, optimizing the process and improving working conditions.

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The first ever OptiConcept M line goes on stream

TEXT Marika Mattila

Xue Rong Jun, Project Manager of Fujian Liansheng: "The whole start-up was perfect. After stock was first fed into the machine, it took fewer than three hours to get the web on the reel."

A Metso-supplied **OptiConcept M** production line, PM 6, for Liansheng Paper Industry in China, was successfully started up on December 12, 2012.

On December 12, 2012, Liansheng Paper Industry (Longhai) Co., Ltd. started up their new containerboard production line, PM 6, at their Longhai site in Fujian Province, China. This is the first start-up of Metso's novel OptiConcept M production line, representing a new way to design, build and operate a paper machine.

The PM 6 start-up set records right from the outset. "The whole start-up was perfect. After stock was first fed into the machine, it took fewer than three hours to get the web on the reel, and we had a very good start-up speed of 800 m/min. No paper tails were seen on the hall floor during the start-up period," proudly reports **Xue Rong Jun,** Project Manager of Fujian Liansheng.

The PM 6 OptiConcept M line is designed for high productivity at low operating cost. Its innovative industrial design and engineering facilitate assembly of the production line. "The installation required 30 to 40% fewer working hours than a conventional project," comments Xue Rong Jun.

Usability and safety are also at a new level. For instance, the design allows for easy, fast and safe changing of wear parts, which reduces the duration and cost of maintenance shutdowns. "The design of the walkways is very ergonomic and spacious. They are on one level, with no need to run up and down stairs, so the machine is very safe and convenient to operate and maintain. Since there are no cantilevering beams at the wet end, the drive and tending sides are symmetrical, and the machine drive side is much more spacious than it is in a traditional machine construction," says Xue Rong Jun.

Metso's delivery included a complete OptiConcept M boardmaking line from headbox to reel, with air systems, a machine control system, a quality control system, two winders and Metso clothing.

The new 7.25-m-wide production line has an annual production capacity of approximately 300,000 tonnes of recycled fluting in the basis weight range of 65 to 100 g/m^2. The design speed is 1,200 m/min.

Liansheng Paper Industry (Longhai) Co., Ltd. is a subsidiary of Fujian Liansheng Paper Co., Ltd. The company was founded in 1999 and is based in Zhangzhou, China. PM 6 is the third Metso-supplied production line for Fujian Liansheng.

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Power producers are faced with a tough challenge. Global energy demand is growing, natural resources are diminishing and environmental legislation is tightening.

Metso offers a **Greener** side to power generation

TEXT Hanna Sahlsten and Marjaana Lehtinen

Today, there are new, exciting ways for the fossil fuel-dominated power industry to reduce and cut its dependence on non-renewable energy. Heat and electricity can be generated sustainably, yet profitably.

In the past, it has been difficult to balance environmental compliance with economic performance. Metso's solutions enable power producers to reduce environmental impact, while fulfilling their mission to produce energy competitively.

"Our mission is to create practical, realistic and economically sound ways to generate power using bio-based raw materials and thereby complement the usage of fossil fuels," says **Jyrki Holmala,** President of Metso's Power business line. "The world's largest biomass boilers come from Metso, but we are also Europe's leading provider of medium- and small-scale power and heating plants using biomass and fuels derived from recycled waste."

With advanced energy management controls, plants can reduce fuel consumption and at the same time increase capacity to become more competitive. Environmental monitoring and reporting systems enable these plants to take care of their responsibilities.

40 million tonnes of greenhouse gases avoided annually

"During the past ten years, we have delivered more than 13 GW_{th} of boiler capacity

Power producers can reduce their environmental impact and still achieve their financial targets.

Renewable energy accounts for ever increasing share of energy supply in Germany. Power plant in Bad Arolsen powers the community with local renewable biomass fuels.

Metso offers boiler technology, fuel handling systems, flue gas cleaning systems as well as global services. According to **Jyrki Holmala,** President of Metso's Power business line, the company can deliver bioenergy systems in any size.

that utilizes renewable fuels and reduces emissions associated with fossil-fuel-fired boilers," continues Holmala. "In practice, this CO_2 neutral energy production has helped to avoid 40 million tonnes of greenhouse gas emissions annually, corresponding to emissions from over 24 million cars."

This is possible thanks to Metso's fluidized bed boiler technology and its ability to convert various renewable raw materials, such as forest residuals, reed canary grass and municipal waste, into energy. Such flexibility allows multiple fuel options and makes it possible for power producers to gradually move from fossil fuels to renewable energy production.

New conversion technologies are here

"Bio-based fuel sources can be found in all corners of the world, and we aim to create technology that can efficiently and sustainably utilize these local resources globally. To fully cover all possibilities within the biomass fuel range, we are constantly looking for ways to expand our technological base and geographical coverage," Holmala explains.

In most countries, the current infrastructure to generate power and heat is based on coal and heavy fuel oil. Metso has created solutions to make these existing power and heating plants greener by using different kinds of biomass as fuel.

For example, the award-winning gasification power plant in Lahti, Finland, uses solid recycled fuel to efficiently generate electricity and district heat. Metso supplied the main equipment, including a mill-wide automation system. This pioneering solution reduces CO_2 emissions by an estimated 410,000 tonnes a year compared with the same amount of electricity and heat generated using coal.

Another example is the Metso-supplied gasification plant in Vaasa, Finland, where biomass will be introduced as a second raw material source at a conventional coal-fired plant. The plant will be started up this year and will be the biggest of its kind in the world. Its 140 MW capacity is enough to heat about 10,000 single-family houses even during the coldest winter spells.

It is also possible to produce bio-oil from wood-based biomass using fast pyrolysis technology. The bio-oil produced can be used to substitute heavy fuel oil, for example, in district heat plants.

Bioenergy holds the trump card

When it comes to sustainable power production, Holmala believes that the sector offers unlimited potential to help the world shift to sustainable power production with lower CO_2 emissions.

"Metso started with wood, and we see even more options in the future. There are several agricultural waste fuels, such as by-products from sugarcane and rice production, that can be further utilized to meet the demand for global power production," he says.

Holmala thinks that Metso holds the trump card in the attractive bioenergy sector: "Bioenergy production is not dependent on the wind or sun, and can offer stable energy streams for both local and global operations. It also creates jobs and new business opportunities for local operators as well as for fuel providers. All forms of sustainable energy are important. In the end, it comes down to providing practical options for environmentally friendly power production and caring for the future."

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Cherry blossoms with Nippon Paper Ishinomaki mill in the background.

PHOTO BY PEACE BOAT

The Great East Japan Earthquake struck off the northeast coast of Japan at 2:46 p.m. on March 11, 2011. The earthquake also triggered huge tsunamis that left close to 20,000 people dead or missing, caused immense destruction along Japan's Pacific coast and created over 300,000 refugees. The earthquake also caused extensive damage to several paper mills and halted their operations.

TEXT Tokiko Horiuchi

Japan's paper industry recovering after the natural disaster

The powerful earthquake was also felt in Tokyo, about 400 km from the seismic center. Fortunately, the earthquake did little damage to the Metso Paper Japan Tokyo office and it was able to resume normal operation already the following week. Metso immediately set up the Earthquake Task Force and helped to collect accurate information on the safety of customers located in the devastated area where communications were down and on the damage experienced. Some days later the situation became clear and Metso sent relief supplies to the customers, including drinking water and emergency food. Several mills had suspended operations and the damage to three paper mills with Metso-supplied machines and facilities, Nippon Paper Industries Co., Ltd.'s Ishinomaki mill and Iwanuma mill, and Mitsubishi Paper Mills Ltd.'s Hachinohe mill, was especially severe.

As the recovery of local infrastructure progressed, Metso sent the first group of engineers to investigate the situation and to support recovery work at the beginning of April. The boilers at Nippon Paper's Iwanuma mill were damaged by the earthquake but the damage to the paper machines and main equipment was comparatively slight. Nippon Paper immediately moved forward with its repair efforts with related suppliers, including Metso. In spite of many challenges, the mill was able to bring a paper machine back into service already a month after the earthquake and successfully restored one machine after another in April and May 2011.

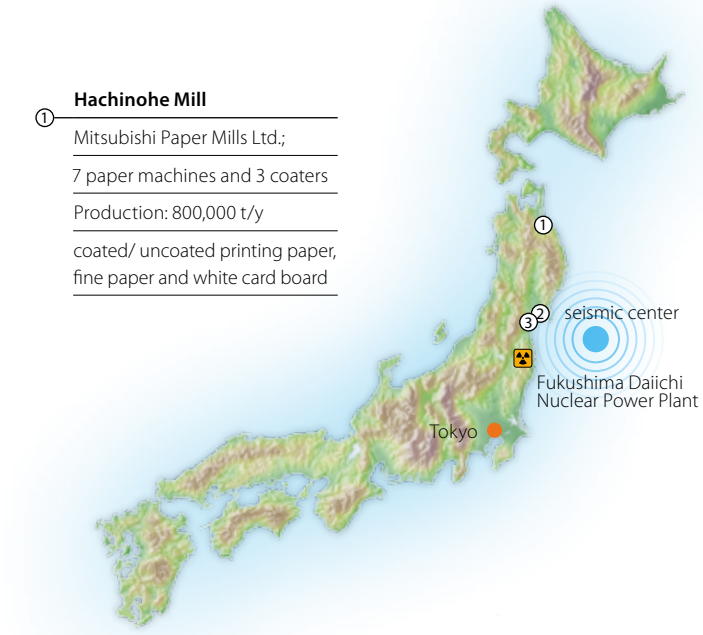
The first floor of Hachinohe, Mitsubishi Paper's flagship mill, was submerged in water from the tsunami and the mill suffered significant damage to its electrical system and loss of inventories, especially products and raw materials. In addition they lost most of their paper documents and data related to the equipment. "We need your full support to recover the mill," said **Kunio Suzuki,** CEO of Mitsubishi Paper, while visiting the Metso Paper Japan Tokyo office at the end of March.

The main gate of the Ishinomaki mill was flooded by several meters of tsunami water an hour after the earthquake.

Immediately after its investigations, Metso started to arrange for the parts and equipment required by the mill to be delivered as soon as possible. In six months 90% of production had already been recovered and the last machine was restarted in November 2011, a month earlier than originally planned.

The damage to Nippon Paper's Ishinomaki mill was the most severe because it was hit directly by a tsunami that was several meters high and much debris was scattered throughout the site. **Yoshio Haga,** President of Nippon Paper said, "On seeing the catastrophe first hand in late March, I was stunned for a moment; but once we saw that the advanced N6 machine (delivered by Metso in 2007) was undamaged, we quickly regained confidence that the Ishinomaki mill could be put back into operation." His announcement regarding the reconstruction provided relief and hope to the people living in Ishinomaki city, one of the worst affected cities in the region.

From late March, work to remove the dirt and rubble that was deposited by the tsunami in the grounds of the mill was started with heavy equipment



① Hachinohe Mill

Mitsubishi Paper Mills Ltd.;

7 paper machines and 3 coaters

Production: 800,000 t/y

coated/ uncoated printing paper, fine paper and white card board

② Ishinomaki Mill

Nippon Paper Industries Co. Ltd.;

6 paper machines and 2 coaters

Production: 850,000 t/y

mainly coated/ uncoated printing paper, fine paper

③ Iwanuma Mill

Nippon Paper Industries Co. Ltd.;

3 paper machines

Production: approx.457,000 t/y

mainly newspaper

and the help of personnel from the whole company. After a detailed investigation of damages, Nippon Paper drew up a recovery plan together with Metso and other suppliers. Power was restored to the mill when the in-house generator was brought back into operation in August.

Significant time and energy was required in the recovery process because it was as if the mill was being built again from the beginning within a short time. In September 2011, the first paper machine PM 8 resumed operations. PM N6, one of Japan's largest and newest papermaking machines supplied by Metso, restarted up in March 2012. Finally, the recovery project with six paper machines and two coater machines was fully completed in August 2012, 17 months after the disaster.

"It goes without saying that the personnel at the mills were going through a very tough time in their private and public lives during the project. And it was very challenging for us too," says **Michio Imai,** President of Metso Paper Japan. "Firstly, these projects were unexpected and huge and needed to be completed as quickly as possible with limited time and workforce. To solve this problem we asked retired engineers to work with us temporarily during the project. Secondly, we must always observe Metso's HSE policy in order to ensure our employees' safety at all times. However, the working environment in the area was not ideal, due to unstable infrastructure, short supply of local food and accommodation, continuous after-shocks, and concerns about radiation. To help solve this problem, the engineers brought their own food and worked with radiation meters to make sure that the level was within the safe range.

N6 restarted! The Nippon Paper personnel gathered to celebrate the event, among them President **Yoshio Haga** (standing and holding the sign as second from left).

"Regardless of all the challenges, we were able to fulfill the mission of three mills and we would like to thank all of our customers and our personnel whose tremendous efforts and good morale enabled the quick recovery. We would like to continue working with activities that meet the needs and expectations of customers and society," says Michio Imai.

And finally we extend our sincerest condolences to all of the victims, and pray for rapid restoration of normalcy in the affected areas.

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SCA Ortmann's problems resolved by Infinikote

TEXT Tommy Kallerdahl

Like fireworks - thermal spraying in action.

Back in 2000, SCA Ortmann in Austria frequently faced a problem with chatter marks on the Yankee on their PM 4. Even though the Yankee dryer was only eight years old, the problems became so serious that it required regrinding – twice a year. After several years of regrinding, the situation finally became untenable and demanded a permanent solution once and for all. As SCA Ortmann had applied thermal spraying on their PM 9 earlier, with good results, they decided to spray the PM 4 Yankee dryer too, with Infinikote from Metso.

"Today we have nearly no Yankee wear. Both machines have been running trouble-free for more than 12 years without regrinding. We are very satisfied with the result and so is our machine operator who handles the Yankee dryer with care and makes sure the creping operation is well center-lined," says **Josef Berger,** Operation Manager, SCA Hygiene Products GmBH.

SCA Ortmann is located in Pernitz, a one-hour drive from Vienna. The mill has two tissue machines producing bathroom tissue, napkins and hankies. PM 4 is the widest tissue machine in Europe with a sheet width at the reel of 6.92 meters. Consequently, it also has the largest Yankee dryer. The machine is running 100% recycled pulp at 1,870 m/min and it produces 91,000 tonnes per year.

The work on PM 4 commenced on February 29, 2000, and finished on March 10. Eight Yankee experts performed the task using Metso's renowned Farros MZA grinding machine and six spray guns to apply the Infinikote.

The result was what you can expect from a high-class process like Infinikote. The papermaking surface is excellent and the Infinikote coating has greatly extended the life of the dryer and the continuous run time of the machine. The problem with chatter marks is now just a distant memory.

SCA Ortmann applied Infinikote thermal spraying to eliminate grinding twice a year.

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World's fastest

coated board machine offers exciting opportunities for Ji'an Group

PM 3 - the world's fastest coated board machine at a mechanical design speed of 1,200 m/min.

"Cooperation between Metso and Ji'an has resulted in great achievements," says **Feng Junxian,** Deputy General Manager of Ji'an Group.

The Ji'an Group Co., Ltd's new PM 3 enables the company to optimize its raw material costs and to become a major producer of coated board. The novel curtain coating technology provides the mill with more furnish options to choose from.

TEXT Jouni Kemppainen, Pauliina Purola and Marjaana Lehtinen

Shu Junming, Vice General Manager of the Ji'an Group Paper Business Unit.

Ji'an's containerboard production line, PM 3, went on stream in November 2011, and its curtain coating process was started up in early January 2012. The 7.25 m-wide Metso OptiConcept machine is located at the company's Papermaking Operation Center in Haiyan County, Jiaxing City in Zhejiang Province, China. Its daily production capacity is approximately 1,900 tonnes of coated and uncoated white top testliner in the basis weight range of 130-280 g/m^2, mainly without virgin fiber. The ratio between coated and uncoated board is currently 50:50, but the mill's target is to produce 70% coated and 30% uncoated board.

PM 3 is the world's fastest coated board machine, with a mechanical design speed of 1,200 m/min. It features an OptiLayer multilayer curtain coating unit that applies two coating layers on the web simultaneously in a non-contact operation with no speed restrictions. Curtain coating provides full coverage for brown base sheets. The uniform-coverage coating layer makes it possible to run the machine without expensive bleached fiber in the furnish.

Cooperation between the Ji'an Group and Metso has been close and fruitful since the mid-2000s. In 2006, Metso supplied Ji'an's PM 2, followed by the delivery of PM 1 in 2008. Ji'an currently produces containerboard on four machines, three of which have been supplied by Metso. The company's annual production capacity amounts to around 1,650,000 tonnes.

"In the past few decades, the Chinese paper industry has taken huge development steps by introducing advanced production lines, also including those from Metso," says **Feng Junxian,** Deputy General Manager of the Ji'an Group. "We at Ji'an have also benefited from this advanced technology."

Ji'an chose Metso to supply the new line for clear reasons. "First, Metso has the technology and the capability. Second, earlier cooperation between Metso and Ji'an has resulted in great achievements," explains Feng Junxian.

Many interesting challenges yet to overcome

PM 3 now enables Ji'an to enter the Chinese coated board market, which is expected to grow in the future. The mill's long-term objective is not only to replace uncoated grades with coated ones but also to acquire market share from higher-quality virgin-fiber based board grades. The company aims to improve its product quality and produce more board for its own packaging operations. However, there are many challenges to overcome before achieving all this.

"First, demand for coated board in China has decreased this year, which naturally affects our production plans," Feng Junxian points out. "Second, this is the first time that we are using the curtain coating technology and the first time ever that the blade-curtain-blade coating concept is being used in the world. We need to successfully benefit from the technology in full and make the new grade fit the market and be accepted by it."

Metso's delivery scope to Ji'an PM 3

- Broke handling pulpers
- Compact hydraulic headbox for Fourdriniers and hybrid formers
- 3-ply multi-Fourdrinier forming section with shoe blade technology
- Press section with two straight nips
- Dryer section with single- and double-fabric dryer groups
- Hard-nip calender
- Film sizer
- Paper machine air drying equipment
- Coating section
- Two blade coating stations
- 2-layer curtain coating station
- Energy-efficient air dryers
- Soft-nip calender
- New type of reel with an integrated reel spool storage
- Automation system for process and machine controls
- Quality control system with headbox and moisturizer profilers
- Condition monitoring, web break monitoring as well as valves and retention analyzers

"We were left with a good feeling about Metso's commitment and service. Whenever there was a problem, we worked it out together. Our cooperation has been very positive throughout the entire project" says Wang HanMin.

"Since the market is huge and the competition fierce, supply sometimes exceeds demand. To stand out from the competition, you need to produce high-quality board at a competitive price."

New technology has technical and profit-making potential

After some teething problems regarding stock preparation and learning how to run the new machine, PM 3 has reached its full design capacity and runs at a speed of over 1,000 m/min. As there is still a lot of potential to improve the process, the company will continuously aim to enhance product quality and optimize cost.

One of the key drivers for the investment was to optimize raw material costs by being able to use cheaper OCC-based furnish instead of more expensive virgin fiber.

"We have calculated that the cost savings will be from around 200 RMB to 300 RMB per produced paper tonne on the basis of the price of the furnish. We can see both technical and profit-making potential in the new technology," Feng Junxian adds.

Ji'an now has the ability to produce something unique

"It would have been very difficult for us to be competitive with traditional coating technology," says **Shu Junming,** Vice General Manager of the Ji'an Group Paper Business Unit. "In order to face the future challenges and tough competition, our production line has to be more capable and able to produce something unique. Our customers want high quality at a low price. We can only meet these customer requirements with curtain technology."

Shu Junming emphasizes the role of supplier support. "With a new paper machine, especially in a greenfield mill, huge demands and requirements are placed on the staff related to the operation, training and technology support. Metso's brand is very good, not only because the company supplies good machines but also because it can supply the latest technology and share its extensive experience."

Wang HanMin, Vice General Manager of Ji'an Group, underlines the novelties of PM 3, such as the curtain coating technology, the VacuBalance vacuum-assisted forming board and a new type of a reel.

According to Shu Junming, the key factor in improving efficiency lies in improving the operators' skills and helping them to become familiar with the machine and how it works. "I valued Metso's work and support during the sales, project and start-up phases and I continue to value it now during the warranty period. The company has also given us a lot of knowledge and introduced some new ideas – all of which are helpful for our company. I hope that Metso will continue to support us and that we can create a good future together."

World premiere of VacuBalance and a new type of reel

PM 3 features several innovative solutions developed by Metso which are being used for the first time at a Chinese paper mill. In addition to the curtain coating technology, other novelties include the VacuBalance vacuum-assisted forming board and a completely new type of reel. In fact, this is the world premiere of these two solutions.

"The forming section featuring the VacuBalance forming board with three high-pressure vacuum parts has worked well, in fact, even better than the older versions on our other machines," remarks **Wang HanMin,** Vice General Manager of the Ji'an Group. "In general, I think that the reel is good, and its structure occupies less space. Its biggest advantage is that it is very convenient to operate, repair and maintain." The most visible novelty of the reel is its integrated reel spool storage. Thus, the accessibility has been improved because the height of the reel is significantly lower compared with conventional reels.

Wang HanMin is responsible for the equipment at Ji'an, so he is very interested in all improvements and new features. "The vibration detection system (Sensodec 6S on- and off- line condition and runnability monitoring system) installed on PM 3 is very useful. If there are problems, it provides us with information and enables us to figure out solutions," he says. He also praises the structure of PM 3 as it is easy to maintain and he expresses special thanks to Metso's installation staff.

"We were left with a good feeling about Metso's commitment and service. Whenever there was a problem, we worked it out together. Our cooperation has been very positive throughout the entire project. I have also been engaged in projects with other machine suppliers, and I think that Metso is wise using more Chinese engineers than the other suppliers do. It is always an advantage to know about local habits and ways of communication," says Wang HanMin.

Plans to invest in packaging

The Ji'an Group has extensive future plans, not only regarding its coated board production but also its packaging operations. Ji'an intends to build more than ten new packaging plants in China and aims to be among the top 3 companies in the Chinese packaging business. Being able to use high-quality coated board that has been produced cost-efficiently at the Group's own mill will naturally be an invaluable asset in reaching this goal.

"We don't have to use Ji'an's board in our products. But if our board is better than the other brands available, then of course we prefer to use it," says **Xia ShuangQuan,** Deputy General Manager of Zhe Jiang Xiang Heng Packing Co., Ltd, one of Ji'an's packaging mills.

The box plant has been using Ji'an's board since the introduction of curtain coated paper board on PM 3. According to Xia ShuangQuan, the board's folding and burst strength as well as evenness (brightness uniformity) are good.

"The most important property in coated board is its printing property, such as printing ink adhesion and the re-appearance of the mesh point, followed by smoothness and brightness. Stiffness is helpful when it comes to packaging, package shaping and printing," Xia ShuangQuan continues. "If the board has good stiffness, it will run more smoothly during the whole printing process. Therefore, what I value most are runnability and the brand, since a good brand stands for good material."

The future looks good for the Ji'an Group. Seamless cooperation between the manufacturer and users of the board makes it easy to enhance the quality and characteristics of the products. An open-minded approach to new ideas and technologies gives the company a sharp competitive edge.

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Read more about the curtain coating technology applied at Ji'an Paper in Results Pulp & Paper No. 3/2012.

Xia ShuangQuan, Deputy General Manager of Zhe Jiang Xiang Heng Packing Co., Ltd.

Opti™
for papermakers

TEXT Marika Mattila

Metso has a diverse and unique range of solutions to support all the customer needs in papermaking. To simplify the range of products, Metso has started to unify its offering of main paper and board making process sections under the Opti product families which provide proven quality, operational reliability and cost savings. The Opti product families combine solutions for customers, ranging from small paper producers to the largest integrated mills. All the Opti solutions and technologies are designed with the papermakers' specific needs in mind – solutions that offer economic and environmental advantages for business.

Opti – the selection for your value-adding papermaking process

METSO IS UNIFYING ITS PAPERMAKING OFFERING UNDER ONE NAME

Unifying process will take place gradually

"The product families will be launched gradually, following the pace of renewals, mainly before the end of 2013," says **Petri Ristola,** Director of Marketing and New Products. Ristola adds that the Opti product families will consist of members from the whole paper making line, from stock preparation to roll wrapping machines. The product range will not be reduced but it will be rationalized by means of modularity. The change will clarify Metso's active offering. The change has been set in motion with two product families: OptiFlo headbox family and OptiSizer sizer family.

Opti means optimal solutions for specific business needs

Metso will keep providing and improving fit-for-purpose papermaking solutions – Opti combines the solutions and provides the quality you can trust. The Opti product offering is based on years of intensive research of our customer requirements and businesses as well as the possibilities provided by new technologies. "There are smart and optimal solutions for

OptiFlo headbox product family – forerunner of a modular, unified product family approach

The new OptiFlo headbox family brings together our unrivaled expertise and new technology, opening the door to improved quality and increased productivity in all applications including gapforming, Fourdrinier- and hybrid forming, as well as multilayer forming applications.

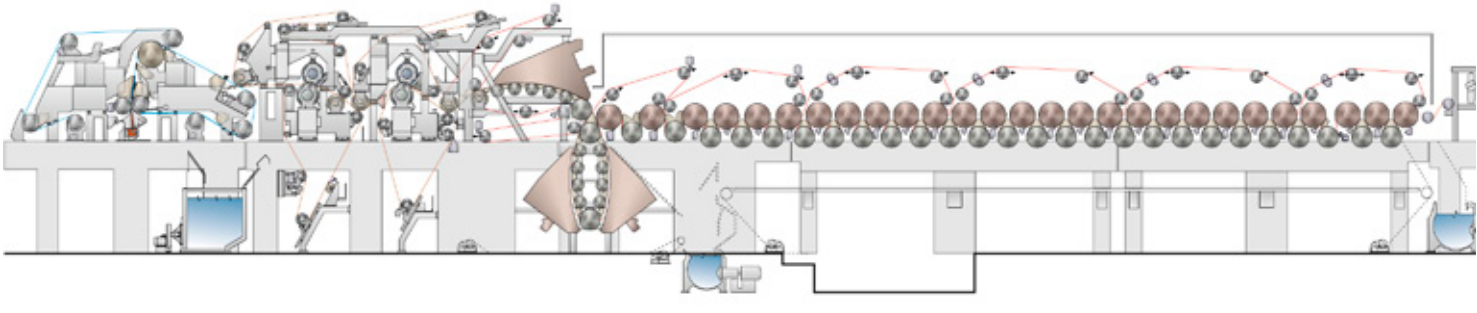
The modularity of OptiFlo headbox construction makes later upgrades possible, keeping pace with changing production needs or control technology. The same headbox ensures optimum utilization even if production or quality targets change later. With OptiFlo, you can reach targeted improvements in productivity and quality right after start-up.

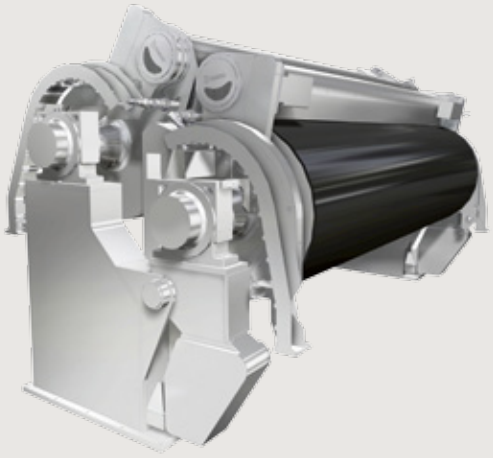
OptiFlo headbox family

- OptiFlo Fourdrinier headbox
- OptiFlo layering Fourdrinier headbox
- OptiFlo Gap headbox
- OptiFlo layering Gap headbox

Read more about Metso's latest OptiFlo headbox for Fourdrinier on page 28.

OptiConcept papermaking line from pulping to roll handling.





OptiSizer sizer family
– robust and modular, with high functionality and quality

Metso's OptiSizer sizer family comprises proven technologies for film, spray and pond sizing applications – the optimal range of solutions to cover diverse customer requirements. The newest member of Metso's OptiSizer family, OptiSizer with spray application is an excellent example of a modular, cost-efficient solution. 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. The contactless application method has numerous advantages for our fluting and testliner customers providing better strength properties, lower life cycle costs, higher production capacity as well as easier maintenance and use.

The comprehensive and modular OptiSizer family combines industry-leading sizer solutions that will serve the demands of papermakers also in the future. Customers receive value for their investments.

OptiSizer sizer family

- OptiSizer with spray application
- OptiSizer with film application
- OptiSizer with pond application

building or modernizing the paper or boardmaking process to best meet the business requirements – to achieve better cost-efficiency, to shorten an investment's payback time and to ensure that market is retained. With its solutions that cover all stages of the process from pulping to roll handling, Metso's unified Opti product offering provides the right answers," Petri Ristola concludes.

Petri Ristola is happy to introduce the new Opti product family concept.

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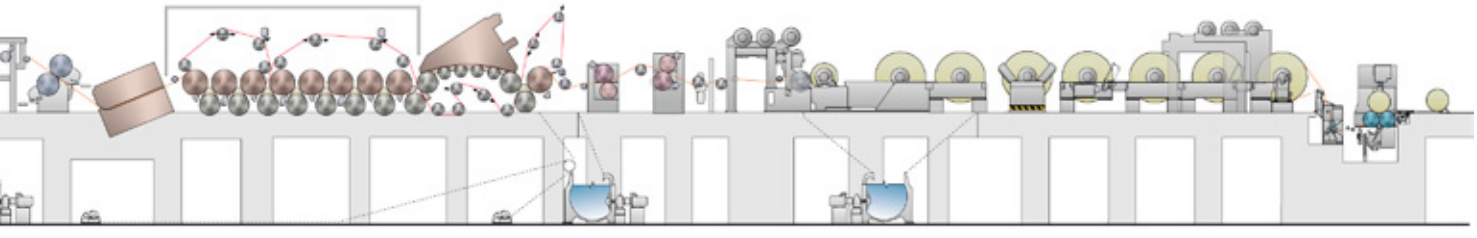

Opti™
for papermakers

TEXT Nigel Farrand and Kati Railevirta

The OptiFlo headbox family introduces a new level of performance with a modular construction developed to meet growing productivity and quality requirements of high quality paper and board machines. The latest member of the family is the OptiFlo Fourdrinier headbox. A mix of the proven technology and new ideas are the cornerstones of this new Metso headbox.

Top performance with the new Metso OptiFlo Fourdrinier headbox

The headbox plays a key role in producing high quality paper and board products. Designed to produce perfect visual appearance with good profiles across the entire machine, the OptiFlo Fourdrinier headbox delivers improved paper quality and increased machine productivity. Production and quality targets are reached quicker after start-up and with fewer web breaks and less broke; high machine efficiency being secured for a fast return on investment. The advanced design of OptiFlo makes later upgrades possible to handle changing production needs or new control technology with the minimum disruption in production. The same headbox can ensure optimum utilization even though production or quality targets may change later.

Modular construction

Having supplied some of the world's fastest and widest paper machines, Metso knows that strong design is the key to obtaining the most reliable headbox operation. Now, with the modular construction, the best "fit-for-purpose" solution is assured with the right strength of construction, and precision can be matched to narrower machine widths and lower speeds too. This makes OptiFlo the ideal choice for a wide range of grades easily scalable to individual machine requirements and production targets. Available with single or two-layer capabilities and suitable for both Fourdrinier and hybrid forming sections, the design is very compact making it ideal for rebuilds as well as new machines. With quick and straightforward installation, an OptiFlo headbox will provide improved reliability with easier maintenance for many years of operation.

Better CD profiling control with ejector dilution plus improved turbulence generation maximize wet end performance.

Better quality

The secret behind the 30% better CD profiling accuracy is OptiFlo's ejector type dilution system and patented CD dilution profiling with edge feed control. Unlike traditional designs, profiling water is delivered to every primary tube. The redesigned hydraulics using accelerating secondary tubes provide better turbulence and flock breaking power and deliver a more uniform and stable headbox jet to the wire. Raw material quality potential is maximized and good formation without streaks or stripes enhances end product properties for perfect visual appearance.

Higher productivity

Increased machine speeds and better runnability are made possible by the excellent web uniformity achieved by the OptiFlo headbox. Quicker tuning at grade change, and more uniform web edges providing a wider reel trim, further maximize production capacity potential. Unplanned downtime is minimized with the easy operation and good cleanliness of the headbox to allow extended operation times and shorter maintenance shutdowns.

Lower lifecycle costs

Considerable energy savings are gained with OptiFlo's ejector dilution system, more efficient tube design and reduced internal pressure losses. Recirculation is minimized and overflow pumping eliminated. The result is a 50% reduction in energy consumed by headbox losses. Lower operating costs are also achieved with OptiFlo's simplified maintenance requirements and exceptional component accessibility to make service easier and shutdowns shorter.

On the roll already

With two OptiFlo Fourdrinier headboxes started and several more on order, OptiFlo is on the road to success, strengthening Metso's already established reputation as technology leader and builder of the world's best paper making machinery.

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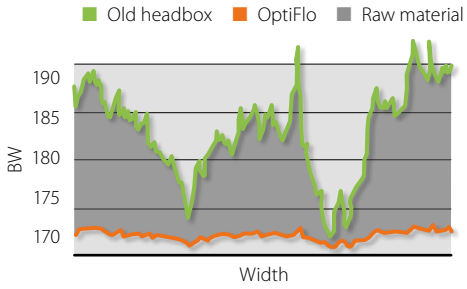

In addition to using less energy, the OptiFlo headbox achieves appreciable raw material savings.

1. OptiFlo Fourdrinier headbox
2. OptiFlo layering Fourdrinier headbox
3. OptiFlo Gap headbox
4. OptiFlo layering Gap headbox

Key design goals during development

- Good access to every maintenance position
- Quick access from the side doors
- If damaged, the apron plate is replaceable
- Actuators can be maintained from machine floor

The OptiFlo development team at the forefront of headbox design.

TEXT Anne Paloheimo-Seppänen

Metso, with its decades of experience, is the global market leader in disc filter bags. Metso's offering covers all thickener applications in mechanical pulping and recycling operations, as well as save-alls. You will be able to find the perfect match for all kinds of disc filter sectors, whether you need a bag for easy applications or more demanding ones. Let's take a closer look at WavStar, the corrugated filter bag.

THE CORRUGATED
WavStar boosts filter bag capacity

The secret of WavStar lies in its unique fabric corrugation. "This increases the sector surface area by 29%, enhancing capacity by 10-25%," says **Antti Mäkinen,** Product Sales Manager at Metso. The corrugation also facilitates filter cake removal.

Heat-resistant fabrics for top performance

The fabrics are made of heat-resistant materials, which feature excellent breaking strength and chemical resistance properties. They ensure high runnability and performance, even in tough conditions, such as in TMP/CTMP and groundwood processes. The bags are fitted with acid-proof or Kynar (PVDF) zippers and sewn with Teflon yarn.

Mixed polyester for easy conditions

WavStar bags are also available in mixed polyester when the bags do not need to be resistant to high temperature and strong chemicals, such as in save-alls and DIP processes. Mixed polyester bags ensure the same high capacity and performance properties as heat-resistant bags.

For new disc filters and upgrading

WavStar bags are suitable for new filters and upgrading. "They suit all filter sectors on the market," Mäkinen says. Depending on the desired capacity increase, either a single sector or several sectors with WavStar bags can be combined with conventional flat-surface segments in a disc filter. A good alternative to installing an entirely new filter in a process line is to retrofit existing sectors with WavStar bags.

Targets are achieved

WavStar disc filter bags have been used as the standard bag in many mills in Europe and East and South East Asia. "The results speak for themselves, capacity increase has been as targeted and maintenance has been as easy as promised," concludes Mäkinen.

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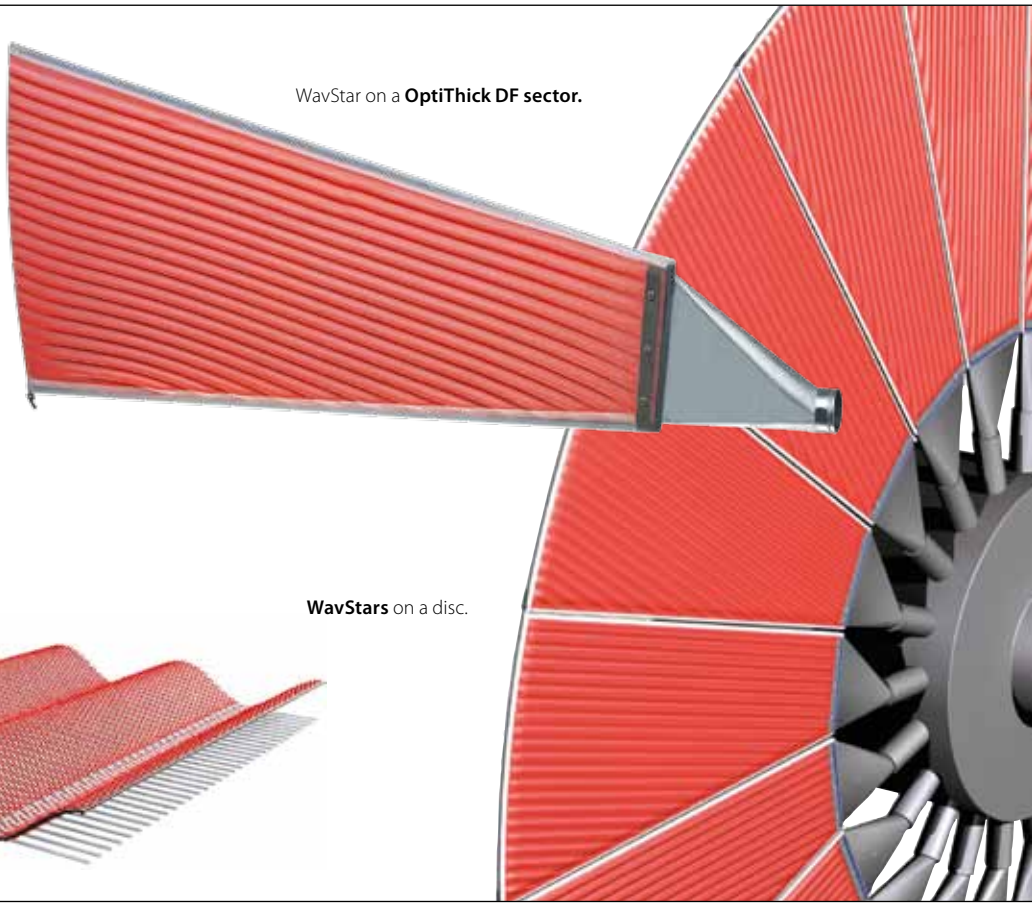
Key benefits of WavStar

- High capacity
- High pulp discharge consistency
- Good filtrate quality
- Cost-effective retrofit
- Easy maintenance and service



WavStar on a **OptiThick DF sector.**

WavStars on a disc.

WavStar structure.

TEXT Marjaana Lehtinen

Some papermakers prefer woven dryer fabrics, while others prefer spiral ones. Whatever the preference, both types are now available from Metso. Let's welcome OptiSpiral F and the other spiral fabrics to the product family.

Spiral fabrics supplement Metso's dryer fabric offering

Metso spiral fabric offering

Long spiral with high contact area	Improved heat resistance	Improved performance against contamination	Excellent heat resistance
OptiSpiral F (flat) 1,500 - 15,000 m^3/m^2h 90 - 900 cfm	OptiTemp SPF (flat) 1,500 - 15,000 m^3/m^2h 90 - 900 cfm	OptiClean SPF (flat) 1,500 - 15,000 m^3/m^2h 90 - 900 cfm	SaunaStar SPR (round) 1,500 - 15,000 m^3/m^2h 300 - 900 cfm
			
PET spiral yarns	PET material with extra high stabilization against hydrolysis	PET spiral yarns, which contain fluoro polymers	100% PPS spiral and connection yarn

"We are delighted to be able to provide our customers with spiral fabrics for their dryer positions, as this fills a gap in our dryer fabric portfolio," says **Petri Nieminen,** Product Manager, PMC, Dryer Fabrics. "To date, we have delivered about 50 of these new spiral fabrics, and feedback from our customers has been very positive."

Just as the name implies, a spiral fabric is manufactured of spirals, supported with cross-directional straight yarns. The fabric is not woven on a weaving machine. Filler yarns inside the spirals adjust air permeability.

Metso offers different spiral fabrics applications for Unorun groups and double-felted groups, and for positions that require improved or excellent heat resistance or improved performance against contamination – always according to the specific needs of each customer.

Improvements to traditional spiral fabrics

Compared with a woven dryer fabric, a spiral fabric offers various advantages. It stays more open longer and has more wear potential. A spiral fabric also tolerates distortion and adapts to misaligned rolls better than a woven fabric.

"Additionally, a spiral fabric is better at handling problems, such as paper wads, since the fabric is stronger than the seam of a woven dryer fabric," Nieminen points out. "And as the 'seam' is the same as the rest of the spiral fabric, there is, of course, no seam area wearing."

Although spiral fabrics in general are nothing new on the market, Metso's innovative products feature some major improvements. The relatively thick traditional spiral fabrics carry a lot of air, which is only beneficial if the amount of evaporated water is high. Therefore, the spiral yarns used in the OptiSpiral family are long and flat. A clearly larger contact area improves heat transfer and consequently lowers steam consumption.

Also, non-twisting dog-bone-shaped filler yarns are more durable against high-pressure showers than traditional filler yarns. Since this new filler yarn design does not have sharp or thin edges that are prone to cracking, all high-pressure cleaners can be freely used.

Spiral fabric special applications supplied by Metso.

Backed by decades of manufacturing experience

Metso chose a German spiral fabrics manufacturer, whose staff has a decade of experience in these products, as its co-operation partner. The technology and machines used in the process represent the very best. This enables Metso to concentrate on customer-specific issues, such as correct sizing, heat setting, high quality edges, seam and elongation properties. And, as always, high quality, proper seaming devices and correct packing method can be guaranteed when the most important production phases and quality inspection take place at Metso premises in Tampere, Finland. Finally, smooth delivery is ensured with highly experienced and well-organized logistics management. The current annual capacity of spiral fabrics amounts to 60,000 square meters, but this can easily be increased as demand grows.

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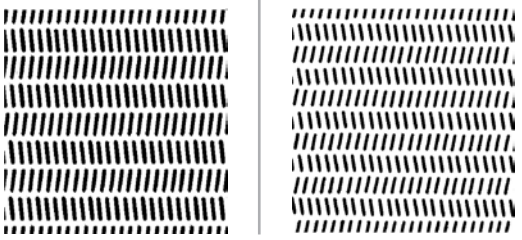
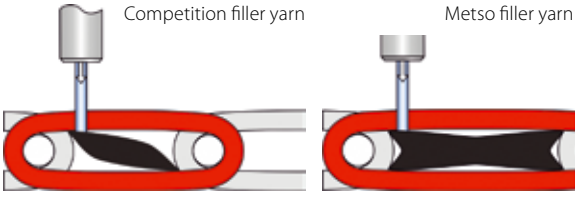
	Metso spiral	Standard
Spiral monofilament	0,43 x 0,70	0,43 x 0,70
Spiral size	6,75 x 1,80	5,20 x 1,80
Contact area	37%	27%



High contact area gives better sheet support and heat transfer.



High pressure cleaning: Metso's "Dog Bone shaped" filler yarn does not have sharp edges prone to fragmentation. Therefore OptiSpirals can be freely used with all HP-cleaners with maximum pressure.

TEXT Ulf Eriksson

Metso launches a new standard bearing pack for the large refiners

During the development of the largest of the Evolution Defibrators, the EVO 70/74, a new bearing pack called EvoPack was also developed. It is now a standard component on all large Metso refiners.

The new bearing pack on the RGP 68 DD Double disc refiner, the RGP 82 CD Conical disk refiner and the EVO 70/74 Evolution Defibrator features a fourth bearing, which enables substantially increased loadability and/or lifetime.

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TEXT Kerstin Eriksson

The new DeltaCombi screen is the largest of its kind ever built. In spite of its size, with a fine-screening area of 6 m^2 and a design capacity of 2,500 adt hardwood per day, it is actually a space-saving investment. And now the first DC16 screens are being installed at Suzano Maranhão in Brazil. Start-up is scheduled for the second half of 2013.

DeltaCombi DC16 will streamline future screening plants

Like earlier combined screens, the DeltaCombi DC16 screen is designed for efficient separation of knots, uncooked chips, shives, metal and stones and other undesirable debris in accept pulp. The advantage of screening with low screen basket height is retained although DC16 is larger than previous types of screens. This is well-proven on smaller screens.

A novel feature of the new screen is its secondary feed connection, which allows the feeding of coarsely-screened pulp that is entering from the following fine-screening stage. This pulp is fed directly to the fine screen without passing the coarse screen basket, resulting in increased screening capacity.

Because the DeltaCombi DC16 can replace several smaller primary screens, it can save space in spite of its size. Fewer primary screens reduce maintenance requirements.

Easy and safe inspection

The drop-in unit, which consists of bearing assembly, rotor, coarse screen basket and stator, can be lifted out as a unit. An eyebolt is mounted at the end of the shaft to facilitate correct and safe lifting. All parts can then be easily inspected and the slots beneath both the rotor and coarse screen basket can be measured and adjusted all round.

David Lindkvist, Project Manager for the DeltaCombi DC16 development project, checking one of the screens in the Metso workshop before delivery.

Controlled operation optimizes energy consumption

The motor on the DeltaCombi DC16 is equipped with a frequency drive, which allows the speed to be varied to optimize energy consumption. The frequency drive includes an electrical torque limitation, which protects the screen basket when the machine is clogged. As an option, this electrical torque limitation function can also be obtained by a soft starter, which slowly starts the DC16 before accelerating to operating speed.

The screen is fitted with a single motor and the gearbox is positioned below the screen housing, which facilitates easy maintenance compared with other types of screens. The open-rotor design reduces the need to flush the machine when sudden stops occur.

The DeltaCombi DC16 is set to streamline the screening plants of the future. Among other features, the DC16 is a user-friendly, high-capacity, combined knot and fine screen designed to reduce maintenance requirements and save space and energy. It is robust and modular and designed to operate in the toughest of circumstances.

DeltaCombi DC16 features

- Combined knot and fine screen with only one motor
- Excellent knot and shive removal efficiency
- Low reject thickening
- Operates with high consistency and at high capacity
- Open rotor design
- Robust, modular design
- Secondary feed
- Adjustable slots beneath rotor and coarse screen basket.

DeltaCombi DC16 connections

1 Fine reject (outlet)
2 Accept (outlet)
3 Fine reject (outlet)
4 Coarse reject (outlet)
5 Feed (inlet)
6 Secondary feed (inlet)

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TEXT Marjaana Lehtinen

Combustion of recycled wood and solid recovered fuel in a boiler may lead to increased fouling and corrosion of furnace walls, superheaters and economizers. With Metso's new, pioneering Corrosion Management solution, it is possible to minimize the corrosion risks involved by using these cheaper, lower-quality fuels. It also means maximizing fuel flexibility, optimizing fuel economy and lowering the environmental impact.

A new way to tackle fuel challenges and manage high-temperature corrosion online

In developing the intelligent Corrosion Management approach to fuel and corrosion management, Metso has put together the know-how of its power boiler, automation and measurement device experts in a way that no other supplier has done before.

"Until now, it has been possible only to monitor temperature and pressure differences in the boiler, and the boiler has been run with just minimal dynamic information about possible corrosion problems. By incorporating our long experience in various fuels and processes, online measurement technology and process automation systems, we have been able to create an eye that provides more information about what is taking place inside the boiler," says **Jaani Silvennoinen,** Product Manager, Intelligent Solutions, Power Generation.

The work started with superheater corrosion management, but according to Silvennoinen, the plan is to expand the solution also to other boiler parts.

New: an online analyzer

An integral part of corrosion management – the eye that sees all – is the new Metso CorroRed analyzer. Located on the flue gas pass, it measures online total chlorine and effective sulfur concentration from the flue gas. It also calculates the flue gas S/Cl ratio for corrosion risk and rate evaluation.

"This information is available for the plant operator on the process automation system display. If there is a corrosion risk with the fuel, the system sends out an alarm," Silvennoinen explains.

There are two alternatives that the plant operator can choose from. The first one manipulates the conditions in the superheater area with Metso's CorroStop sulfate injection system. This injects ferric or aluminum sulfate to the upper furnace upstream of the superheater to mitigate high-temperature corrosion. The second alternative is to change the fuel mix and co-fire with peat or coal.

Utilization of the CorroStop additive has provided excellent results. In a customer case, a 90 MW_{th} BFB boiler runs on biomass, such as bark, wood chips and forest residues in co-combustion with recycled wood. See an overall example of the life-cycle cost calculation (on the right).

"However, we have to keep in mind that this particular CorroStop reference represents the first-generation corrosion management solution. In this, the additive control is based on flue gas SO_2 and HCl measurements just before the baghouse," adds Silvennoinen. "Currently, we are carrying out a pilot project at another power plant with CorroStop and the Metso CorroRed analyzer. We will inform about those results later."

Superheater Corrosion Management with CorroStop Example of life-cycle cost calculation for a typical 90 MW_{th} HYBEX power plant.
Steam 34 kg/s, 90 bar, 510°C
Fuels: recycled wood, bark, sludge, saw dust, forest residue
8,500 operation hours per year
Investment: EUR 700,000
Annual operation, maintenance and chemical costs: EUR 200,000
Investment payback time: 4-6 months
EUR 1.2 million/year savings on fuel costs when lower-quality fuel is used (fuel price at EUR 18/MWh => EUR 16/MWh)
Benefits: added income through cheaper fuel and longer superheater lifetime

Life-cycle cost calculation example.

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At your service

Frame agreement concluded in 2012; Sappi Kirkniemi relies on Metso for effective maintenance

In common with many industries, the pulp and paper industry faces major challenges in improving the economics of their operations. As new technology, equipment and automation provide the tools to improve production, papermakers are seeking other ways to release money and resources to concentrate on their core business of making paper. Sappi's Kirkniemi mill in Finland is no exception and has been quick to take advantage of Metso's skills and expertise to maintain critical machinery and secure production line availability.

TEXT Nigel Farrand

At the beginning of 2012, Metso's relationship with Sappi's Kirkniemi mill entered a new phase with the start of a frame agreement covering various services and spare parts for the three papermaking lines. An existing program for suction roll seals utilizing Metso's innovative FlexSeal, had already provided evidence of the opportunities for wear part inventory savings, and further opportunities were recognized. After two years, the mill has been very satisfied with the durability, availability and cost of FlexSeal.

continued overleaf…

The Kirkniemi mill, located in southern Finland, 70 km west of Helsinki, started in 1966 with one paper machine and today produces 730,000 tonnes per year of coated papers with three machines. The mill has a well-known track record in product innovations resulting from cooperation with customers as well as machinery and raw material suppliers. Metso has been a valuable partner since the beginning, supplying paper and stock preparation machinery as well as automation.

A question of skills

"We need Metso's expertise, especially in the maintenance of tail threading equipment. We have our own maintenance department but the skills needed are not available in-house and are only utilized during major maintenance shutdowns on a yearly basis," says **Leo Järvenpää,** Mill Maintenance Engineer. PM 2, producing coated (LWC) magazine paper under the brand name Galerie Brite, is a typical case. In June 2007, Metso had installed its 1000th state-of-the-art FoilForce1 tail threading unit on Kirkniemi's PM 2; the mill was already familiar with the technology having similar systems on the other two machines. This challenging project was to replace the former guide plate-based tail threading and to pick the sheet tail up at the last dryer cylinder to carry it all the way to the calender and reel. The primary goal of the project, to improve the operational reliability and safety of the tail threading process was met. June 2008 saw the twin-fabric area of the machine's dryer section upgraded from rope-assisted to Metso's latest TailDoc tail threading system. At the time, break times were reported to have been cut by 35% and with one year of operation, TailDoc had not needed any servicing. Very reliable equipment is a two-edged sword for a mill maintenance department, as having equipment you can forget about means that members of the maintenance department are not familiar with the equipment, if and when this is necessary.

A solution that is easy to work with

The tail threading maintenance agreement with Metso combats the problem of unfamiliarity with reliable equipment. "In future, Metso will perform an audit of the automated tail threading on all three machines and present us with a maintenance plan for the next shutdown and suggestions for other improvements. They use our tag numbers so they are very easy to understand," says Järvenpää. A fixed price for the service crew from Metso

TailDoc tail threading units thread the sheet tail through the machine with the help of compressed air.

FoilForce tail threading units are based on the use of foil technology for basic vacuum generation and compressed air for machine-direction vacuum control. The FoilForce system is fully automated and developed with operator safety in mind. FoilForce tail threading units can be located at the open draws of any machine section (dryer, coater, reel or calender) depending on customers' needs. Variations in the basis weight or width of the tail have no effect on the success of tail threading.

TailDoc tail threading units, for double-fabric dryer sections, thread the sheet tail through the machine with the help of compressed air. A doctor blade separates the sheet tail from the cylinder surface with the help of a counter-directed air flow and guides the tail to the next fabric nip. Nozzles placed in the blade holder area create a tail stabilizer zone that settles the tail, prevents cross-machine sway and ensures fast tail tensioning and smooth transfer.

and availability of spares from Metso's nearby Kerava warehouse provide an easy solution to the yearly maintenance shutdown and guarantee the availability of the automated tail threading equipment. Emergency service with short response times is also covered in the agreement, making the right skill set and equipment expertise available when needed.

Metso's Kirkniemi frame agreement covers

- FlexSeal suction roll seals
- Tail threading
- Refiners & deflakers (exchange units and spare parts)
- WinBelt belts
- Air systems for PM 3
- Slitter management
- Grinder segments
- Doctor blades
- Fabrics

"This kind of service from Metso is so effective it makes no sense for us to try to do it ourselves, and we are also confident that we are applying the latest technology as Metso keeps the systems up to date," says Leo Järvenpää, Mill Maintenance Engineer.

Inventory savings

An important area of savings is in reducing the mill-owned stock of spare and replacement parts, as they are "eaten" from the mills own inventory. Metso guarantees availability from the Kerava service stock. The agreement also covers refiner and deflaker shaft units and loading devices, a perfect example of the possible inventory savings. These replacement units would previously be held in the mill's own spare part stock for literally years before being needed at very short notice. As well as the non-earning expense to the mill, the condition of long-held units was always questionable. Now, the mill can rely on fast delivery on demand of replacement units, as well as spare parts, from Metso. Previously-stocked units are used as needed with Metso purchasing exchanged units for later use. Metso's task is to keep the required number of parts in stock at all times. With 19 refiners and 5 deflakers to look after, mill inventory costs will be drastically reduced and the condition of replacement shaft units and loading devices is assured.

Better planning

"Overall, the service agreement with Metso allows us to plan better, sometimes years into the future and reduce maintenance shutdown surprises," says Järvenpää. "Service is done properly and as agreed with fixed pricing, and any other major actions identified along the way can be planned now we know what to expect." Service planning can now be done for all three machines, taking advantage of common actions when Metso service personnel are on site. "Metso knows our machines and the way we work, which makes things easy. Operators log any problems into our SAP-based maintenance system and Metso personnel familiar with the mill know exactly where to go." With the first major shutdown in the agreement, Metso will first perform the audit and provide the mill with a comprehensive report of planned actions and cost. Then, well prepared and with the necessary parts, a Metso service team will be ready to ensure the tail threading equipment continues to deliver fast and trouble-free recovery from infrequent breaks for another year.

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OptiFiner Pro is so quiet, that **Wolfgang Leitner,** Mill Technologist (on the left) and Project Leader **Walter Kronsteiner** need to get very close to hear it in operation.

Refining innovation at Mondi Neusiedler

TEXT Kati Railevirta and Nigel Farrand

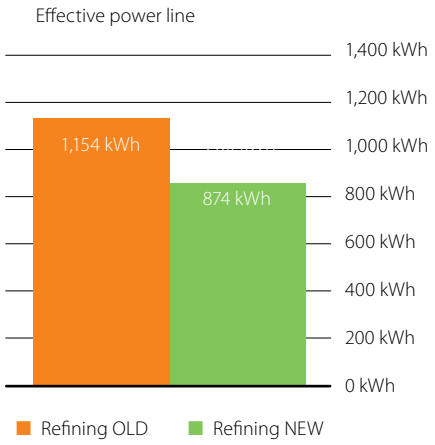
A new higher capacity OptiFiner Pro refiner that was started up in Austria in the summer of 2012 has been delivering astounding results both in terms of quality and energy savings.

The Theresienthal mill of Mondi Neusiedler produces about 280,000 tpa from two paper machines, PM 5 and PM 6. The bigger machine, PM 6, started up in 1982, and after a complete rebuild in 1995 to a gap former machine with triple layer headbox (the first on fine paper) and shoe press, the machine currently produces mainly 80 g/m^2 high quality copy paper. Refining plays a decisive role in developing the fiber properties of the eucalyptus furnish to the machine and is a major energy consumer in the mill. With several OptiFiner Pro installations up and running, Metso introduced the larger capacity OptiFiner Pro 3 in 2011. Mondi Neusiedler was quick to see the potential for energy savings and promptly commenced on a project to replace existing short fiber refiners. Early in the justification phase it was realized that it was possible to replace all 3 refiners with just one OptiFiner Pro 3.

Long-term goals

"Innovation has always been a key driver for Mondi Neusiedler," says **Erwin Sversepa,** Production Manager. From the 1960s when the mill, working together with Rank Xerox, developed the first dry toner copy paper, to today with new grades for digital printing, Mondi Neusiedler has always been at the forefront of product and process development. In conjunction with high quality, production efficiency is high on the list of priorities at the mill. "As with most European paper producers today, a major objective is the reduction of energy consumption, and over the last 10 years we have had the ambitious goal to reduce specific energy consumption by 15%. At

"The time had come for a technological breakthrough," says **Erwin Sversepa,** Production Manager.



With the same refining conditions, the mill achieves 24% energy savings.

the same time we have focused on quality and total efficiency, i.e. how to develop the fibers, optimize paper properties and improve the overall efficiency of the production line," says Sversepa.

Technological breakthrough

In 2004 the mill took the first crucial step by shifting from mixed to separate refining on PM 6. Following an extensive study and the resulting comparison of technological performance from three potential suppliers, the mill has worked together with Metso to improve refining, and in particular the fillings design, to optimize strength and reduce energy consumption. "The excellent results of cooperation with Metso reconfirmed our common vision of the importance of hardwood refining and we had been successful but now the time had come for a technological breakthrough," says Sversepa. Metso's answer was OptiFiner Pro, the revolutionary new design providing a better refiner loadability and higher energy efficiency than any other refiner. Unlike conventional refiners, stock is fed evenly through the OptiFiner Pro segments and across the bars, directly into the refining zone where fiber treatment occurs and all fibers are treated evenly. A remarkably higher installed power and throughput is possible, and together with high utilization of the whole refining area and all bar edges, this increases refining intensity.

OptiFiner Pro on trial

According to Project Leader **Walter Kronsteiner,** it was easy to conduct a trial with Metso. "They have experts and a technology center in Finland where laboratory trials can be comprehensively compared with our actual production conditions in order to justify our investment." The trial parameters employed in Metso's technology center on the mill's pulp were meticulously duplicated with the existing refiners at the mill. This gave the mill a firm baseline for comparison and justification calculations. In addition to standard laboratory tests, such as tear and tensile measurements, the mill relied heavily on evaluation of fiber morphology through microscopic analysis. "Knowing how the fibers develop in refining in addition to the pulp properties was an

The evaluation of fiber morphology through microscopic analysis gives mill technologists insight into how fibers develop in refining. (Photo courtesy of Mondi Neusiedler GmbH)

Metso's innovative OptiFiner Pro.

essential part of the trial," says Kronsteiner. The trial showed that for the same physical pulp properties, OptiFiner Pro could achieve a 60% reduction in no-load power and a 20% reduction in effective power compared with the existing refiners. "It was quite easy to quantify these savings in euros and justify the purchase, and our record of previous achievements with Metso made me very confident of the outcome," says Sversepa. The decision to go ahead was made and installation on the PM 6 eucalyptus refining line was completed in the summer of 2012.

Results confirmed

"With OptiFiner Pro we have achieved 24% energy savings with the same refining result. The increase in hydraulic capacity means we have also been able to slightly increase machine speed – earlier attempts used to last only one or two days before the lack of refining capacity led to problems on the machine," says **Wolfgang Leitner,** Mill Technologist. With confirmed energy savings, excellent machine runnability and no reduction in quality, the focus is now on throughput and flexibility. Fine tuning is a step-by-step process, making small operational changes and through microscopic analysis to optimize the refiner fillings design. New modes of control also play a significant part in optimization. "With calculations on the specific edge load available on the control room displays, we have the perfect tool for the operator to get the best refining result," says Leitner.

Short payback

In addition to energy savings and increased production, reduced maintenance and wear part replacement contribute to the return on investment. "Since the number of refiners is reduced from 3 to 1 and we have confirmed that the lifetime of OptiFiner Pro fillings is at least equal to the old refiners, maintenance costs have been reduced by two thirds," confirms Sversepa. The conservative estimate is that the whole project payback time will be about one year. Planning for a second OptiFiner Pro is already under consideration. Innovation has guided Mondi Neusiedler for many years and will continue to do so in the future as well.

A revolution in LC-refining technology

Efficiency	Higher capacity	Reduced energy
The OptiFiner Pro refiner increases the number of fibers that receive proper refining treatment.	The OptiFiner Pro concept enables remarkably higher installed power and throughput, raising the refining efficiency.	The LC-refiner concept uses a smaller rotor because of the improved fiber flow and reduces the no-load power by almost 50% compared with similar-capacity traditional refiners.

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Mondi's Uncoated Fine Paper business can trace its roots back to 1793 when a "paper mill for special quality paper" was established at Klein-Neusiedl in Austria, a site which lent its name to the Neusiedler company . Today, Mondi Neusiedler GmbH comprises two mills, the paper mill at Theresienthal and a paper and pulp mill in nearby Kematen. Two paper machines in Theresienthal produce mainly high-quality photocopier and digital printing papers, while colored papers are manufactured at Kematen, where there is also a pulp mill producing chlorine-free magnesium bisulfite pulp from saw mill residues. The core market has traditionally been in cut size with the paper production of both mills finished at Theresienthal; however the increase of print-on-demand digital printing is rapidly increasing the share of paper sold on reels.

Headbox reconditioning yields 30% better dry weight profiles

TEXT Akhil VP, Anssi Tuuri

Small things really do make a big difference. For example, the right headbox adjustments and careful cleaning alone can significantly improve the overall performance of a production line. ITC Bhadrachalam in India proved this point with the headbox of their BM 1 which was thoroughly tested and reconditioned in cooperation with a team of Metso's service experts.

"After Metso's servicing, our slice jamming problem has been significantly reduced," says **S.V.R. Krishnan,** Deputy General Manager at ITC Bhadrachalam.

The mill is part of ITC Paperboards and Specialty Papers Division, a leading manufacturer of packaging and graphic boards in South Asia. It has a production capacity of 375,000 tonnes per year of virgin and recycled board. BM 1 is 3.75 meters wide with a design speed of 350 m/min. It produces cupstock, coated board, and kraft paper in the basis weight range from 170 to 360 g/m^2.

At ITC Bhadrachalam, BM 1, which is 33 years old, had been experiencing problems with quality rejections, frequent slice jamming, and profile variations. In addition to solving these issues, the mill also wanted to reduce web breaks and improve machine runnability.

Metso had previously carried out headbox service and reconditioning on ITC Bhadrachalam BM 4. Pleased with the results, the mill naturally chose Metso for this job as well. In April 2012, a service team from Metso Thailand carried out the work during a three-day service shutdown. Metso's local staff in India was represented by **Santosh Tiwari.**

Dry weight profiles on ITC Bhadrachalam BM 1 showed a 30% improvement after headbox reconditioning. The basis weight 2-sigma has improved by 25%.

Tests reveal headbox condition

The tests at ITC Bhadrachalam had two targets. The first was to reveal the mechanical condition of the rectifier roll headbox; the second was to identify the mechanical faults causing flow disturbance in the slice jet and poor CD paper profiles.

The headbox was examined in detail. Investigation of the slice opening revealed that it was distorted. Bending, grinding and polishing the apron front edge allowed the team to remove the defects and recondition the apron to its original shape.

Visual inspection of the top slice beam revealed that it was too short, which can cause flow disturbances, profile problems, and stock leakage. Metso recommended replacing the slice lip with a longer one so that it would be wider than the pond. This would create some margin for end clearance adjustment. The internal flow surface was also polished, and the breast roll and forming board realigned.

Targets exceeded

The test results helped the team define the reconditioning need and make the necessary repairs. The results have been positive.

"After Metso's servicing, our slice jamming problem has been significantly reduced. Dry weight profiles have improved by 30%, and the basis weight 2-sigma has improved by 25%," says **S.V.R. Krishnan,** Deputy General Manager at ITC Bhadrachalam.

The mill has also observed that headbox reconditioning and better dry weight profiles have enhanced runnability, improving productivity. Web breaks have fallen by 10%.

Such a major improvement in dry weight profiles has a number of positive effects. Better profiles reduce the amount of fibers and thus reduce raw material costs. Better dry weight profiles also improve runnability and shorten recovery times from web breaks, thereby increasing production.

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Significant benefits for tissue machines with the new roll covers

TEXT Juha Ruotsi

Metso's new polyurethane cover materials extend running periods and reduce maintenance and energy costs on tissue machines.

Tissue machines represent one of the most demanding application points when it comes to press roll covers. They are usually faster than machines producing printing paper and board. Their press rolls usually have a rather small diameter, leading to an extremely high loading frequency of the nips. The operating environment of the cover is challenging due to water, steam and the heat generated by the Yankee cylinder.

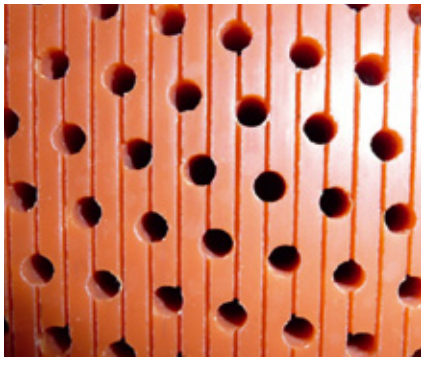
Furthermore, a great number of operational requirements are placed on the roll covers. For example, the suction roll nip acting as the 1st press must raise the dry content of the web to 40–45 percent. When it comes to runnability and quality requirements for tissue paper, the covers must be evenly hard and significantly softer than the covers used in machines producing printing paper or board. The pressure level in a nip formed with a soft cover is low, which is beneficial for paper thickness, for example.

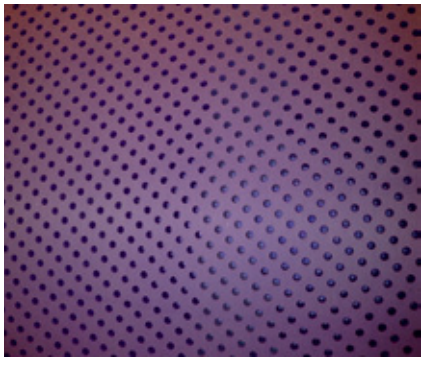
The aforementioned factors often lead to short grinding intervals due to wearing or changes in cover hardness, an insufficient dewatering capacity and cooling problems related to the roll in the 2nd nip. In addition, other problems have been caused by sudden debonding of roll covers especially in the press roll in the 2nd nip.

The unbeatable wear resistance of the new cover materials

Polyurethane took over the press roll surface positions in printing paper machines already a few decades ago. However, covers suitable for tissue machines have been more uncommon. In recent years, Metso has actively developed new polyurethane materials suitable for tissue paper applications, and now these materials offer indisputable benefits when compared to older products on the market.

The best possible wear resistance and even hardness are the most important qualities in the process conditions that the suction roll and press roll positions in tissue machines are subjected to. The wear resistance of Metso's modern polyurethane materials is unbeatable. Their grinding intervals can be even twice as long as with traditional covers.





Metso's VacuFox TIS roll cover for press suction rolls (on the left) and PressHusky roll cover for press rolls.

Hardness remains even

The new products do not harden in use like most traditional rubber covers; instead, the hardness remains even despite the demanding operating conditions. When it comes to hardness, most polyurethane coatings are applied using a different P&J value compared to traditional rubber coatings. This does not mean that they act differently in a pressed nip, but the material's response to the P&J hardness measurement is different.

In tissue paper applications, traditionally only holes have been made on the suction and press roll covers to reach a sufficient water handling capacity. The strength properties and softness of the covers have set limits for grooving, and cracking in the neck areas between the grooves as well as groove closures have been noted earlier on grooved covers. In Metso's new polyurethane materials, a high strength level and special groove geometry enable using grooves also in soft covers.

The water handling capacity reached by using grooves is important especially in suction roll positions where the roll cover handles most of the water. As dewatering in the roll nip is intensified, the need to dry the paper with the heat energy of the Yankee cylinder decreases, resulting in lower production costs.

Lower maintenance and energy costs

Press rolls traditionally equipped with internal water cooling have posed probably the biggest challenge for the technical features of the covers. Cooling has been essential in order to prevent overheating of the cover due to the viscous nature of the cover materials. One common prob-

Metsä Tissue Mänttä switches to polyurethane covers in press rolls

Over the years, the Metsä Tissue Mänttä mill in Finland has also become familiar with many of the aforementioned cover problems and challenges often encountered on tissue machines. Metso and Metsä Tissue have a long history of collaboration in roll maintenance and roll cover development projects.

Metso delivered the first VacuFox TIS polyurethane cover to the Mänttä mill at the end of 2010. A cover equipped with suction holes and grooves was installed in a press suction roll position on PM 9 in January 2011, and the cover functioned flawlessly for a full operating period of one year.

The roll cover was noted to be in extremely good condition during service grinding in January 2012. The operating period of earlier covers in the position in question had usually been six to eight months.

After a successful start new polyurethane covers were introduced to other roll positions as well. Metso has subsequently delivered five new-generation polyurethane covers to the tissue machines in Mänttä. One of the covers was installed in a press suction roll and four in the press rolls in the 2nd nips.

"Metso's polyurethane covers have worked well and met our expectations. The most significant benefits have been longer grinding intervals and the elimination of roll cooling in the 2nd press positions," Process Engineer **Reijo Vessari** from the Metsä Tissue Mänttä mill explains. Furthermore, the softness of the covers has proved to be beneficial with regard to paper thickness.

Thanks to their positive experiences, Metsä Tissue plans to replace all traditional rubber covers with new-generation polyurethane covers as the rolls are recovered.

The most significant benefits offered by Metso's polyurethane covers have been longer grinding intervals and the elimination of roll cooling in the 2nd press positions, **Reijo Vessari** from the Metsä Tissue Mänttä mill explains. **Eero Hartikainen** from Metso on the left.

Metsä Tissue Mänttä in short

Metsä Tissue belonging to the Metsä Group produces tissue and cooking papers. The company's mills are located in Finland, Sweden, Germany, Slovakia, Poland and Russia.

The Mänttä mill, established at the end of the 19th century, has four paper machines. PM 1, PM 9 and PM 10 produce tissue papers and PM 7 cooking papers.

The tissue machines represent the two-nip concept where the 1st nip is formed by a press suction roll located against a Yankee cylinder and the 2nd nip by a press roll located against a cylinder. The performance of the machines has been enhanced by several rebuilds, the latest of which was carried out on PM 10 in 2010.

lem has been the cooling effect of the water cooling system on the roll body. As a result, water manages to enter the cover and make its way between the connecting layers. This has often led to sudden debonding of the cover.

Metso's new polyurethane cover designed especially for press rolls generates only a fraction of the heat usually generated in the press nip when using traditional materials. The internal water cooling of the roll is not needed even at high speeds, and coating problems related to cooling are thus eliminated. Water cooling becoming unnecessary leads to considerable savings in the form of reduced maintenance and pumping costs, for example.

Furthermore, the rolling resistance of the cover in the nip is lower, meaning that the energy need of the drive motors running the rolls decreases and thereby energy costs are also reduced.

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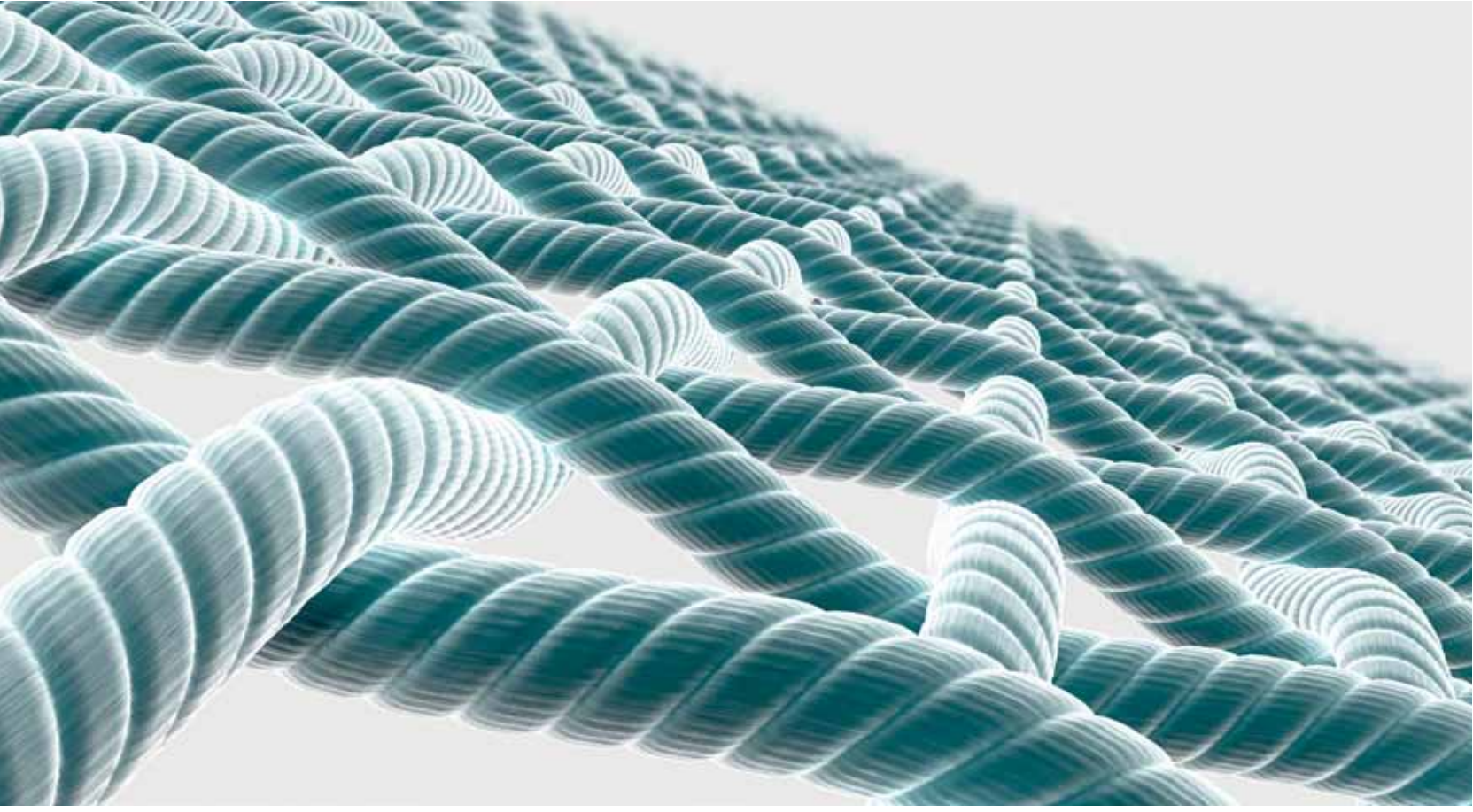


A new fabric change system improves work safety

TEXT Pekka Kortelainen

Installing a new fabric change system on a paper machine will not only improve work and product safety but also significantly shortens the fabric change time, as demonstrated on a paper machine in Europe.

Today, paper mills put a lot of emphasis on work safety. A safety audit revealed that the fabric change on this particular machine involved many difficult stages, and thereby lowered work safety. To fix this, the mill and Metso came up with an idea for a new type of fabric change system.

The new system consists of fabric change equipment and covers, and a new way of packing the fabrics, all developed by Metso. The package includes all the fixed and telescopic poles needed during the fabric change. The mill's hands-on experience of fabric change problems was invaluable in finalizing the system design.

Smoother and faster

The installation of the new system took two days under Metso's guidance. During the first change of the bottom and top fabrics, both paper machine and fabric experts from Metso were present. Everything went smoothly, and the fabric change was over an hour faster compared with the old way.

"The project went very well. It was punctually planned and implemented by us together with Metso. The combination of our hands-on experience in changing the fabric and Metso's machine and fabric know-how led to a successful end result," says one of the mill's managers.

fewer fabric changes enable the machine to run for nearly 50 additional production hours per year. The investment has been profitable, and the payback period has been short.

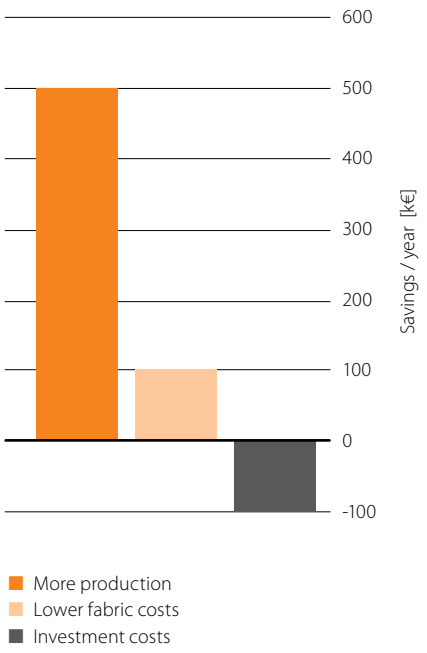
"Of course, financial savings are important. However, the most important thing for us was to improve work safety," points out the machine's production manager.

The new equipment and packaging adds to work safety in itself. Also, thanks to good instructions and guidance on the various work phases during the fabric change, every member of the staff now knows his or her task, which speeds up the work and further improves safety.

Lower environmental impact

In the new system, the packing boxes and poles of the fabrics are recycled and reused after inspection. Earlier they were left at the mill. "The new and the old way cost about the same, but through recycling, we are able to lower our environmental impact," adds **Pekka Kortelainen,** Product Technology Manager, Forming fabrics, Metso.

"In cooperation projects, the supplier's expertise is important. However, equally important is the ability to listen to the customer and, above all, understand the customer's needs, as took place in this project. We are very satisfied with the implementation of the project and the operation of the system," the production manager concludes.



Savings gained by installing forming fabrics in a new way.

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Savings and a short payback period

The system has now been in operation for almost a year and has shown its capabilities. With the bottom fabric, the change time has shortened by about 2-2.5 hours, and with the top fabric, by 1-1.5 hours. The new system makes it possible to install the long bottom fabric into the machine so that there is no creasing, which could cause paper quality problems or, in the worst case, lead to a premature fabric change.

Thanks to less creasing during the fabric change, fewer fabrics are needed, bringing savings of over EUR 100,000 annually. And what's more, faster and

More than 100 stories of success with **iRoll Portable runnability analysis**

TEXT Tatu Pitkänen

iRoll Portable allows paper and board makers to analyze profiles online, and to do this quickly and cost-effectively without any equipment investment. The excellent performance of iRoll Portable has already been proven more than 140 times. This article summarizes the benefits of iRoll Portable and describes the celebrated 100th iRoll Portable case at Gold East Paper Mill in Jiangsu, China.

Variations in the web tension profile, coat weight profile or parent roll hardness profile affect the efficiency of the paper making process. These variations can lead to web breaks, flutter, wrinkles, and rolls of poor quality, which means lost production. "iRoll technology provides precise information about CD and MD profile variations and makes it possible to conduct online process trials and tuning to solve them. iRoll Portable analysis enables the improvement of coat weight, nip load, web tension and parent roll hardness profiles without large capital investments," explains **Tatu Pitkänen,** R&D Project Manager, Coaters at Metso.

The iRoll instruments provide a complete CD profile for each full turn of the roll. The measured profile information is transmitted with a wireless link via a receiver to a PC for analysis. iRoll Portable runnability analysis is a complete measuring and analysis package, including installation of sensors and electronics, measurements, data collection and analysis, including recommendations for further process development. Data is immediately available during the measurements as color maps. The quick and easy viewing of the data also makes profile tuning quick and easy.

"iRoll runnability analysis is suitable for all paper and board grades, and provides several benefits for paper and board makers and maintenance experts," says Pitkänen. These include fast tracking of profile related problems in reeling and winding, finding the causes of tension profile related runnability problems, optimizing the tension profile to improve runnability, monitoring the condition of the sizer nip online, producing better coat weight profiles and higher end product quality, yielding a more saleable product and cost savings.

Gold East Paper Jiangsu aims at improved performance with the 100th iRoll Portable

Gold East Paper Mill in Jiangsu is one of the leading manufacturers of coated woodfree papers with three paper making lines and annual capacity of almost 2 million tonnes. Excellent quality has always been the top priority for Gold East Paper. In order to improve the shipping roll quality and runnability even further, parent roll hardness profile optimization studies were performed with iRoll Portable technology.

Parent roll hardness profiles before and after off-line calenders were studied at the Dagang mill. The aim was to find tools for the best possible runnability and roll quality in winding. According to earlier estimation by the production experts of Gold East Paper, the parent rolls sometimes had high hardness on the edges at the bottom of the parent roll. On the other hand, the edges also had a tendency to go soft at the top of the parent roll. The iRoll data showed that the soft edges, in particular, created a risk for bottom wrinkles at winders during the top set. By straightening the profile, the winder runnability and roll quality could be clearly improved.

The quality of base paper and coated rolls was studied to find out reasons for possible profile variation from earlier sources before calenders. Base paper rolls from two paper machines were compared as well as coated rolls. The reasons for occasional parent roll edge shifting were also examined using the coated roll profiles, as the skewness is a typical source for edge shifts. According to the measurements, the base paper rolls from one PM had a slight skewness, and it was concluded that this creates a risk for edge shifts.

As a result of the extensive iRoll study an action list was compiled to address each item that was found:

- New practices for performing off-line multinip calender profiling were learned and tested in practice, which helps to remove the hard edges on parent roll bottoms and soft edges on top. Optimized profiling contributes to even better customer roll quality and winder runnability.
- Coater reel challenges were addressed with focused rebuild and service recommendations that aim at a more robust reeling process and removal of the skewed roll profiles.

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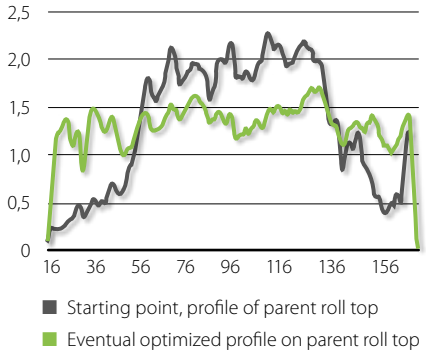
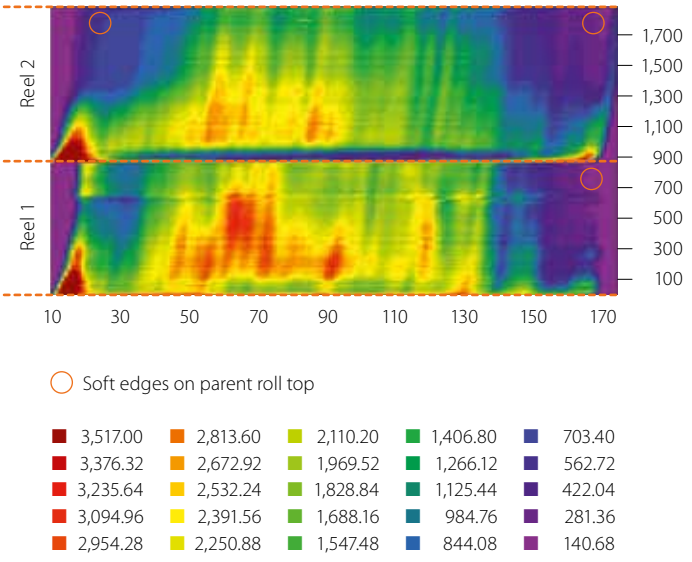
Benefits of iRoll runnability analysis

- Suitable for all paper and board grades
- Quickly tracks profile related problems in reeling and winding
- Finds the causes of tension profile related runnability problems
- Optimizes tension profile to improve runnability
- Monitors condition of the sizer nip online
- Produces better coat weight profiles and higher end product quality
- Creates a more saleable product and cost savings.



Optimizing the parent roll structure was easy as the results could immediately be seen from the iRoll Portable online data. The green graph above illustrates the improved hardness profile at the top of the parent roll and the blue graph shows the starting point.



A color map of iRoll hardness profiles of two parent rolls after multinip calendering. Hard edges are shown in red at the start of both rolls. Soft edges are shown in blue at the top of the parent rolls.

Gold East Paper and Metso experts gathered to summarize the results after the successful 100th iRoll Portable measurement case. Team from left to right: **Li Xinping, Wang Chang, Kaale Nieminen, Tatu Pitkänen, Lin Yusong, Markus Nylund** and **Zhang Yanjun.**

Austria's Smurfit Kappa Nettingsdorfer mill uses an online causticizing chemical analyzer and optimization controls, both supplied by Metso, to achieve higher white liquor strength, lower liquor consumption and energy savings in the evaporation stages.

Online analysis

optimizing controls keep causticizing on course

TEXT Mark Williamson

When a ship's captain sets a bearing for the next port, the ship could theoretically head in a straight line if there were nothing to deflect its course. But a captain knows that is not reality, as hard-to-predict winds and ocean currents usually sidetrack the ship. The rudder has to be adjusted from time to time to make sure it stays on a track and doesn't miss the final destination. Operators of a kraft pulp mill causticizing plant have a similar and tricky course to steer in order to make sure the initial chemical reaction produces the right liquor strength as much as three hours in the future. Keeping the chemical reaction rate on course by fine tuning the controls has a lot to do with the final outcome.

The operators at the Smurfit Kappa Nettingsdorfer unbleached kraft pulp mill near Linz, Austria have found a new navigation tool with a Metso Causticizing Analyzer, which indicates the chemical reaction progess, coupled with Metso Causticizing Optimizer control to help them steer that course to even and higher white liquor strength. The 240,000 tpy batch digester mill produces furnish for linerboard production at the mill site. With the online analysis and controls the mill has leveraged that increase in alkali strength in order to decrease white liquor consumption, thereby reducing the black liquor evaporation load and saving energy. The new analyzer and optimization controls were added to the existing Metso DNA distributed control system in the latter part of 2011 and tested into early 2012.

Steam savings the driving force

Rudolf Bito, Pulp Mill Production Manager, says that steam energy saving in the evaporators was the main economic driving force for the project. The liquor evaporation capacity was sometimes limited, especially with wet wood in the spring. Although there could be production increases and other benefits later on, the ROI was mainly based on reduced energy consumption.

In a causticizing process, long time delays and lack of frequent process chemistry readings are the main difficulties

Rudolf Bito beside the Metso Causticizing Analyzer, formerly known as kajaaniALKALi.

that operators face. Bito explains that, after the lime is added to the slaker, the final liquor strength is not known for over two hours. Actually, it is exactly 2 hrs and 50 minutes at the maximum production rate for this process. "Time lags were always a problem for the operators to handle. The lime addition was either too late, too high or too low. With sampling after the slaker, the results would be much faster," he says. The mill had previously installed a conductivity-based liquor measurement, but that inline probe could not provide the robust measurement needed for controls due to chemical fouling and calibration shifting. A well-proven measurement with multiple sampling points was needed for improving the performance of the optimizing controls.

For accurate and repeatable chemical test results the mill decided to install the Metso analyzer which has become somewhat of an industry standard with well over 100 installations. This would provide a solid measurement base for the controls from the slaker to the white liquor storage tank. The analyzer is essentially an automated online chemistry lab which uses industry standard methods. No calibration is required. The analyzer uses standard Scan 30:85 to measure the levels of sodium hydroxide, sodium sulfide, and sodium carbonate in the liquor. Then it calculates effective alkali (EA), active alkali (AA), total titratable alkali (TTA), causticizing efficiency (CE%) and sulfidity (S%).

The sampling points are as follows:

- Green liquor to slaker
- Lime milk (first causticizer)
- White liquor to filter (third causticizer)
- White liquor to digesters

The measurement update cycles are programmed according to their importance in the process control strategy. The first three are used in the optimization control; the final white liquor strength readings are used as a final check.

Managing time delays

There are long time delays between the unit operations in a causticizing process and, during those elapsed periods, time-dependent chemical reactions are taking place. To achieve stability during changing production conditions, the sampling of process input and output conditions and the controls must be timed-coordinated and responsive to those changes.

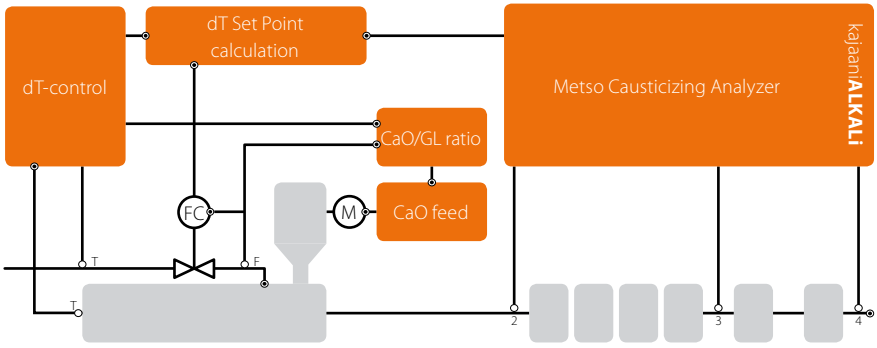


Figure 1. Slaker control
Slaker temperature difference (dT) controls set the initial chemical reaction rate which is crucial for the success of the causticizing efficiency control in the rest of the plant. The analyzer also samples the green liquor.

Stabilizing the initial reaction rate in the slaker is crucial for success. Since the slaking reaction is exothermic - producing heat - the temperature will increase as the reaction progresses. To accurately regulate the chemical reaction by lime addition, it is important to measure the reaction temperature increase from the green liquor temperature as fast as possible at the top of the slaker. This measurement point was selected because it provided the fastest and strongest temperature reaction to lime/green liquor ratio changes. The green liquor temperature is time-delayed to coincide with the slaker measurement point so that it is a true measure of reaction heat generation. The delta T (dT) measurement used for control is the difference between this slaker temperature and the green liquor temperature. The output of this control adjusts the lime feed as a ratio of green liquor flow. This type of time-delayed feedforward control smoothes out production rate changes.

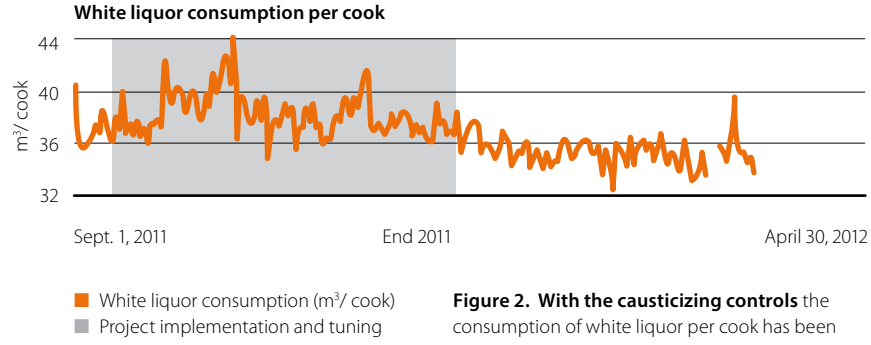


Figure 2. With the causticizing controls the consumption of white liquor per cook has been reduced, as a result of an increase in liquor strength.

The control schematic of the slaker control is shown in Figure 1.

The dT target is adjusted by a cascade control loop that ensures the causticizing efficiency (CE) of the first causticizing vessel is on target. That first vessel CE target is, in turn, supervised by the next CE measurement. The degree of causticization is determined using Goodwin's curves which define the theoretical maximum CE. This model is built into the system.

The causticizing controls are implemented in the Metso DNA system which is the millwide automation system.

Higher liquor strength, reduced usage, less energy

As reported by Bito, the primary objective of the project has been achieved already. Figure 2 shows the steady decrease in white liquor consumption per cook, thereby lessening the load on the evaporators and saving steam energy. This decrease in liquor consumption corresponds to an increase in liquor strength. The effective alkali has increased from about 115 (grams per liter, as NaOH) to about 118 to 119 with a target of 120. "With what we have seen so far, the investment return is achieved. We are confident we will gain more," says Bito. Most importantly, the operators have confidence in the controls. As an extra benefit, he expects to see an increase in the operating time between white liquor filter washes. "That will make the operators happy, as that is hot and heavy work," he quips.

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METSÄ BOARD KYRO BM 1, FINLAND

Energy-efficient coating drying for Metsä Board rebuilds

TEXT Heli Anttila

Metsä Board has increased its cartonboard capacity by 150,000 tpa to 935,000 tpa with investments made at three cartonboard mills in Finland. The Metsä Board Simpele rebuild was completed in June 2011, Kyro in November 2011 and Äänekoski in May 2012. At the Kemi linerboard mill, production was refocused to coated grades after an investment made in 2011. This has been a success and Metsä Board's state-of-the-art paperboard capacity, including the Kemi mill, today totals 1.31 million tpa.

The Simpele mill was the first mill to introduce PowerDry Plus air drying technology in its earlier rebuild in 2006, and now, after the new rebuilds, the PowerDry Plus technology is also successfully in use at the Kyro and Kemi mills.

In the Metsä Board Kyro BM 1 rebuild, a PowerDry Plus air dryer was selected to replace the gas IR dryer in coating station 1. A PowerDry Plus air dryer was also chosen for the coating drying for a new coating station 3. Replacement of the infrared dryer at coating station 1 will provide annual energy savings of 4,800 MWh, as well as excellent drying capacity, runnability and end product quality.

Air drying brings energy savings

PowerDry Plus is a one-sided air dryer for all paper and board grades, for new machines as well as rebuilds, enabling over 50% energy savings compared with infrared dryers. PowerDry Plus has been developed to replace IR dryers in the drying of coated paper, providing improvement in energy efficiency, evaporation capacity and in end product quality.

"We had previous experience with Metso's air drying technology and the new PowerFloat Plus nozzle design, so we trusted the energy saving calculations and decided to choose PowerDry Plus dryers for our machine. Metso's guarantees on energy savings, drying capacity and runnability have all been fulfilled. We are happy to work with Metso," says **Raimo Salmi,** Technical Manager of Metsä Board's Kyro mill.

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Metso around the world

Power generation

Indonesian PT Cikarang Listrindo orders two power boilers to fulfill local electricity needs

Metso will supply PT Cikarang Listrindo in Babelan outside Jakarta in Indonesia with two power boilers with a total capacity of 270 MW_e. The delivery will also include a Metso DNA control system. The investment will increase the company's electricity production by approximately 30%. The plant is due to commission in 2016.

The order is a major breakthrough for Metso into the power generation industry in Indonesia. PT Cikarang Listrindo selected Metso due to its expertise and ability to supply quality solutions fit for local needs.

"I am very glad that we have concluded the tender evaluation process by appointing Metso as contractor. We are very pleased with our discussions with the highly-experienced Metso team on how to meet our local needs. We can now all focus and work on the project and have it completed in a timely manner and to our satisfaction," says **EC P'ng,** PT Cikarang Listrindo's Technical Director.

Biomass power plant for Värnamo Energi to double green electricity production

Metso will supply Värnamo Energi AB with a biomass power plant for combined heat and power production in Värnamo in Sweden. The start-up of the plant is scheduled for autumn 2014.

Metso's delivery will include a complete power plant, including installation, training and commissioning. The plant will have a thermal output of 13.4 MW_{th} for district heating and an electrical output of 3.6 MW_e. The plant will use local forest residues such as bark and wood chips as fuel.

"This is an important investment in the future of Värnamo and in the environment," says **Gunnar Crona,** Chairman of Värnamo Energi. "As a result of this investment 100% of the area's district heating will be produced with biomass. In addition, we will produce approximately 20 GWh of electricity annually, which means a doubling of locally produced green electricity."

"We feel confident in Metso as a supplier," says **Göran Hansson,** CEO of Värnamo Energi. "This is Värnamo Energi's largest investment ever and it will ensure that we can continue to supply our customers with heating at a competitive cost. The municipality of Värnamo will also get a modern, well-performing district heating production facility that will be able to fulfill its task for many years."

Mining

Mobile flexibility in Portugal

The Metso track-mounted crushing plants like LT1415S can be easily transported between the company's four quarries.

The tightening economical and ecological restrictions today affect quarries worldwide. To meet these demands and secure operational flexibility and cost-effectiveness, one of the leading Portuguese quarry and cement companies, SECIL-BRITAS, has invested in full-scale mobile crushing and screening fleet from Metso.

"Using the Lokotracks, we are able to meet three main targets: produce all end products that our customers ask, move the equipment flexibly between our quarries, and exploit effectively even the smaller quarry areas," comments **Franclim Carmo Nunes Venda,** Director of the company's four southern plants in Algarve.

"When the demand of aggregates is low, we can now circulate smoothly one team of operators and equipment between our quarries and save costs for cost-efficient operation."

In the touristic area of Albufeira, over 10 hectares of the uppermost parts of the Ferreiras quarry have been restored by planting a number of trees on the old benches.

"Being obliged to operate the quarry in a much smaller area, we could now dismantle the old stationary plant, and utilize effectively the rock deposit under the plant with Lokotracks," Nunes Venda adds.

Automation

Marubeni Power Development Australia trusts Metso's professional service capabilities

Marubeni Power Development Australia Pty Ltd. has chosen Metso to upgrade the automation system at its Smithfield Energy Facility in Smithfield, New South Wales, Australia. The company chose Metso to supply the upgrade thanks to Metso's professional and reliable service capabilities, long cooperation as well as existing system compatibility and upgradability. For example, the existing I/O modules can be fully reused.

Operated by Marubeni Australia Power Services Ltd, the 162 MW Smithfield cogeneration plant produces electricity for the national grid and process steam for an adjacent cardboard recycling plant. The plant is fueled by natural gas.

Metso supplied the plant's existing control system, featuring maxDNA technology, in 1996–97. It has now come to the end of its life cycle and needs to be upgraded. The refurbished control system will be commissioned in June–August 2013.

Marubeni Australia Power Services Ltd. is a subsidiary of Marubeni, which is involved in the handling of products and provision of services in a broad range of sectors.

metso
Expect results

Jussi Salojärvi, Metso Industrial Design Manager

Designed with safety and usability in mind

As with all Metso products, the new **OptiConcept M** paper and board making line, is designed with end users in mind. Operator safety and usability were the main drivers in our development of this innovative machine concept. Everyday tasks are safer and easier, noise levels lower and ergonomics enhanced. Maintenance actions are much simpler thanks to spacious walkways and improved accessibility.

OptiConcept M is an economic investment that ensures improved safety levels and reduced environmental impact. "For paper and board makers, it creates higher employee motivation, optimized accessibility and maximized productivity," explains ***Jussi Salojärvi***, Metso's Industrial Design Manager.

www.metso.com/opticonceptm