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Forward

VALMET'S CUSTOMER MAGAZINE | 1/2018

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Editorial

Helping your business grow with sustainable solutions

Throughout Valmet's 220-year history, our experts have collaborated with you, our customers, contributing to significant development leaps in the pulp, paper and energy industries. They have led to new bio-based products, smaller environmental footprint, better user experience and safety, and continuous improvements in energy, water and raw material efficiency in production processes. We are proud of these achievements, and we are embracing the future by aiming to always be one step ahead in developing new, future-focused solutions that benefit our customers and the whole planet.

The shift towards a cleaner world and sustainable business practices is ongoing, and Valmet wants to be part of creating future solutions to strengthen this development. To achieve this, we are combining digitalization, our strong process expertise, and our unique offering of sustainable process technologies, automation and services. We want to enable growth, mitigate risks and create cost-savings for you through our sustainable offering and committed people working close to you.

We believe that being at the forefront of sustainable development and acting as a responsible corporate citizen is key to future business success – for you and for us. This magazine discusses the great achievements that our customers have reached with the help of our sustainable solutions. I want to thank all the customers who have again contributed to this inspiring issue!



ANU SALONSAARI-POSTI
SENIOR VICE PRESIDENT
MARKETING AND COMMUNICATIONS

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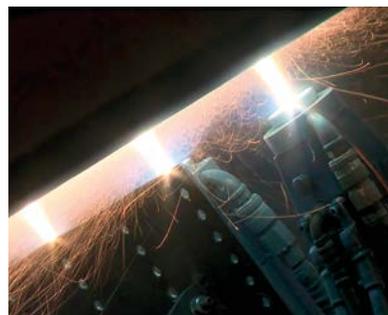


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In brief



A repeat order of OptiConcept M for Pratt Industries

Pratt Paper (IN), LLC has chosen Valmet to deliver OptiConcept M board production line with automation for Pratt's new green-field paper mill in Wapakoneta, Ohio, USA. The mill will use 100% recovered paper to produce lightweight and high-performance linerboard and corrugated medium. This will be the second OptiConcept M board production line for Pratt. The start-up of the new board machine, PM 17, is

scheduled for the fourth quarter of 2019.

"Start-up of the previous Valmet-supplied OptiConcept M in Valparaiso, Indiana, USA was exceptional. We have also been able to exceed some of the design features of the machine resulting in very good production figures. Both board machines in Valparaiso and Wapakoneta are showcases for the latest in 21st century paper-making technology," says **Anthony Pratt**, Global

Chairman of Pratt Industries.

Valmet OptiConcept M board making line is designed to use less water, electricity and raw materials. "We want to help many companies to meet their sustainability goals without sacrificing their high-performance packaging requirements. That's important not only for our environment but also for our customers who realize the importance of sustainable packaging," says Pratt.

Correcting curls with new moisturizer for self-adhesive laminators

Valmet IQ Converting Moisturizer is a new compact moisturizer for self-adhesive laminating lines. This application-matched solution corrects all kinds of curl and cross-direction moisture profiles and complements Valmet's quality management system offering for self-adhesive laminators.

"With IQ Converting Moisturizer, self-adhesive label manufacturers can control curl much faster and more accurately compared with conventional steam or spray systems. Its remoistening capacity is up to five times higher compared with conventional systems, making it an excellent choice for high-speed lines, too. The new moisturizer can be connected to CD/MD controls to stabilize product quality during speed and grade changes," says **Mikko Talonen**, Business Manager, Automation, Valmet.

Valmet IQ Converting Moisturizer is a compact micro droplet moisturizing system based on the industry's most advanced family of moisturizing systems.

Valmet launches
around
100
new products to the
market every year.

Towards carbon neutrality at Oulun Energia's biopower plant

Valmet will supply a multifuel boiler and a flue gas treatment plant to Oulun Energia's power plant in Laanila, Finland. The boiler with its auxiliary equipment will replace the Toppila power plant unit I, which will no longer meet the environmental requirements of the 2020's and will be removed from production. The new biopower plant will support Oulun Energia's objective of carbon neutrality, for which the company will gradually decrease the use of peat and eventually remove it from its assortment of fuels in the 2040's.

"The biopower plant will produce both electricity and heat through the cogeneration method. It is the best option in terms of overall economic efficiency for securing the heating of homes and buildings in Oulu for a long time into the future," says **Juhani Järvelä**, Managing Director of Oulun Energia.

The CYMIC circulating fluidized bed boiler will use biomass, peat and solid recovered fuel as its primary fuels. The boiler can also efficiently burn biomass alone. The flue gas cleaning system will enable fulfilling the tightening emission standards.

Improved boiler safety with the new recovery boiler leak detector

Valmet has introduced a predictive tool for detecting recovery boiler leaks - Valmet Recovery Boiler Leak Detector. This innovative diagnostics application with advanced analytics enables boiler owners to detect even the smallest tube leaks in an unprecedented way, resulting in significantly improved boiler safety and reduced damage risks. Currently, the leak detection solution is used by several pulp mills, and the results gained with it have been very positive.

"Valmet Recovery Boiler Leak Detector takes leak detection a major step forward by combining advanced mass and chemical balance calculations. This makes it an invaluable diagnostics tool for detecting leaks at their early stages," says **Timo Laurila**, Business Manager, Recovery Analyzers and Advanced Process Controls, Valmet.

Investing in high-quality roll cover production



Valmet is improving work safety and ensuring high-quality roll cover production also in the future by investing in the state-of-the-art equipment for polyurethane and composite covering in Jyväskylä, Finland. The investment was completed at the end of 2017.

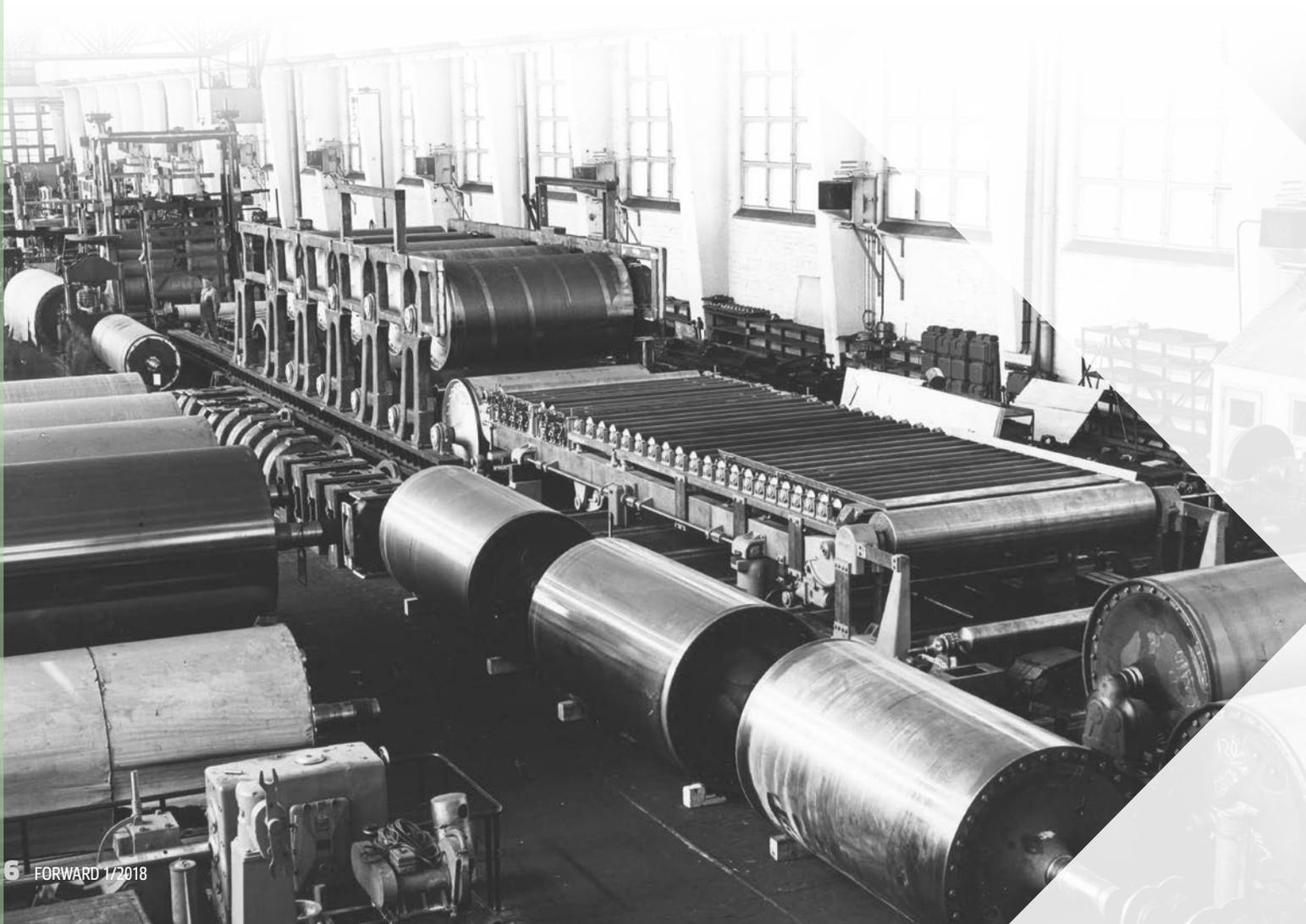
"The new equipment contributes to our ability to keep the quality level of our roll covers high also in the future and enables us to bring new roll covers to the market," says **Pekka Kruus**, Valmet's General Operations Manager for Rolls in Finland.

"The new equipment increases the sustainability of our operations, in terms of reduced waste and better energy efficiency. Furthermore, the production process becomes more flexible, giving us the possibility to shorten lead times. All in all, this investment further strengthens Valmet's service capabilities close to customers in Finland and near-by countries," says **Marko Lassila**, Valmet's Director of Service Operations in Finland.

In addition to Finland, Valmet has three other European roll service centers, providing high quality roll maintenance and roll covers. These centers are located in Sweden, France and the UK.

**INNOVATIONS BUILT ON 220
YEARS OF INDUSTRIAL HISTORY**

Customer needs drive **innovation**



Customer needs and global megatrends have been the driving force of Valmet's product development throughout the company's 220 years of industrial history. Resource efficiency and open innovation connect Valmet's product development and customers. New leaps in development are aimed at the Industrial Internet and digitalization. **TEXT** Helena Raunio **PHOTOS** Tomi Aho

Valmet's story began in 1797, when Tampereen Verkatehdas, a cloth factory that later became known as Tamfelt, was established. Tamfelt became a part of Valmet in 2009 through a corporate acquisition. So, Valmet's 220 years of industrial history began with the manufacturing of textiles, and this tradition still continues in Tampere, where Valmet Fabrics develops and manufactures machine clothing.

The Valmet of today was created through numerous corporate acquisitions, mergers and demergers. In its history, Valmet has, in fact, developed and manufactured nearly everything from aircraft to rolling stock and from chainsaws to cannons. Today, Valmet develops

and manufactures technologies, automation systems and services for the pulp, paper, board and tissue and energy industries.

Entering the market with a differential drive paper machine

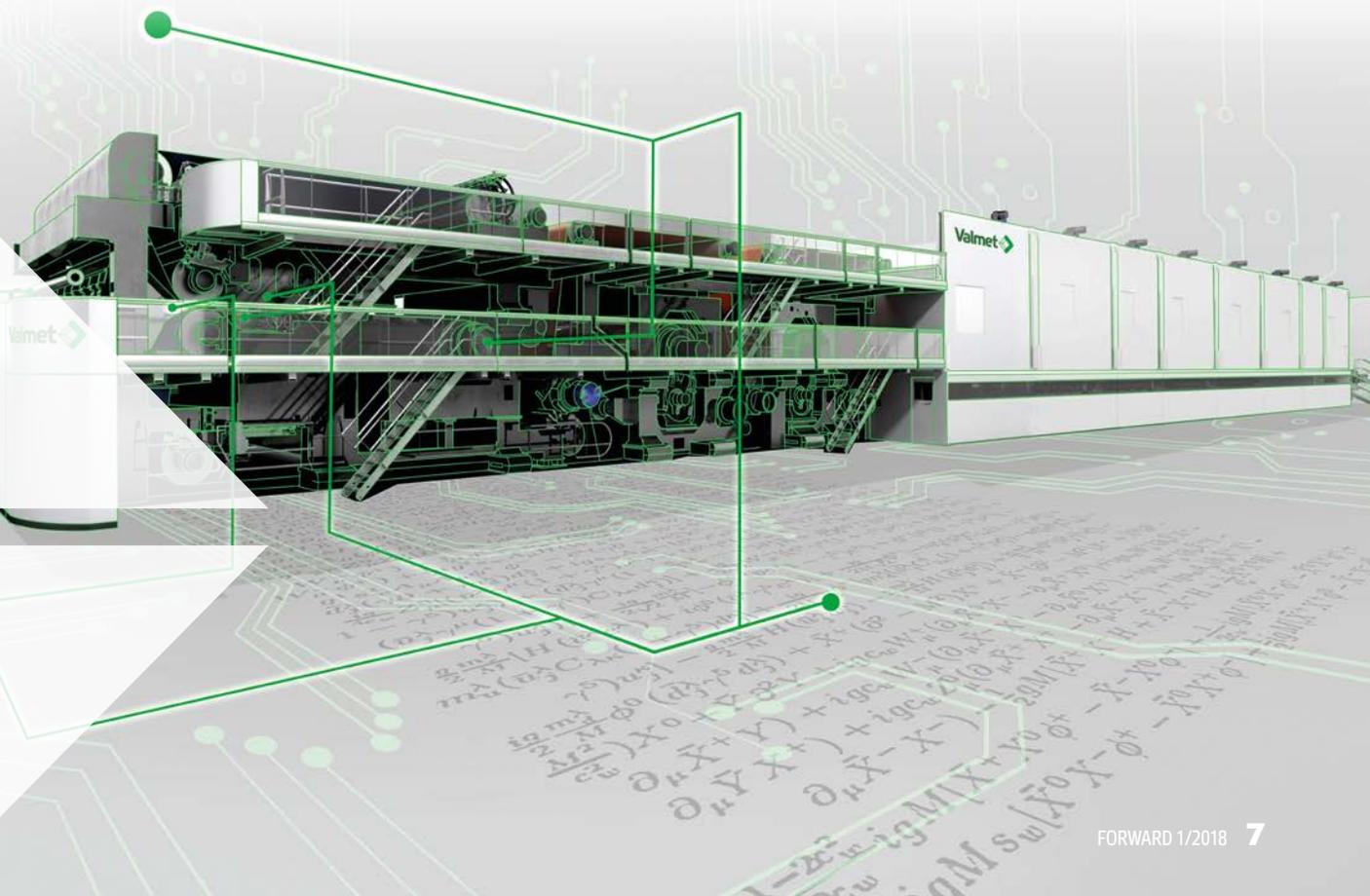
The first steps to manufacturing paper machines at Valmet were taken in 1946, when several metal workshops owned by the Finnish state were merged to form Valtion Metallitehtaat ("State Metalworks").

Already in the 1950s, Valmet entered the paper machine market with its own differential drive machine, in which each motor group worked steplessly, according to its own adjustments. This way, they could be adjusted accurately to the right speed. In the 1960s, Valmet expanded its own machine base, developed its research activities and networks, and increased its delivery capacity.

Valmet's pilot plants have offered a unique opportunity for product development. Since 1972, Valmet has had its own pilot paper machine. "With the help of the pilot paper machine, new ideas, even radical ones, could be tested at a smaller but truthful scale," says **Jouko Yli-Kaupila**, Valmet's emeritus Technology Director.

Economies of scale as a driving force of 80's and 90's

In the 1980s and 1990s, economies of scale were dominant in the forest industry: Ever wider and more efficient machines were constructed, and run with an increasing speed and efficiency. "New top-selling products were created when the hydraulic headbox and gap former, among others, were developed in the 1980s. As a result, we were





able to raise the machine speed, leading to increased production and better paper quality,” Yli-Kauppila says.

New solutions were also developed for example for paper machine rolls, especially to replace the stone roll in the press and to improve the durability of suction rolls.

The OptiConcept technology, launched in 1997, proved to be a super product. The paper machine was 25% faster than older machines. Thanks to industrial design the machine was also easier to use and maintain.

Involving customers

After the turn of the millennium, challenges to product development came from China, where narrower and slower machines were needed. At the same time, online trade started a downward trend in the consumption of writing and printing paper in the West. As a response to these changes, Valmet developed a modular machine concept, OptiConcept M, which is suitable for board, as well as writing and printing paper, with only small modifications.

A clear change has also taken place in customer wishes in this millennium: while in the 1980s, customers were interested in technology in itself, today they ask what can be accomplished with it.

“When developing technologies, we are working in closer cooperation with key customers and suppliers, as well as universities and start-up companies,” says **Ari Saario**, VP for research and development at Valmet.

Valmet has a total of 16 technology centers focusing on different subject areas in Finland, Sweden and Portugal. Every year, more than 400 man-years and €65 million are used for research and development.

↑ “As environmental requirements became increasingly stringent, the product development of paper machines started to focus on the machines’ raw material use, energy efficiency and water consumption,” says Jouko Yli-Kauppila, Valmet’s emeritus Technology Director.

The rise of resource efficiency

The interest in sustainability, resource efficiency, the circular economy and responsibility started to rise in the beginning of 21st century. The competition started on who uses the least amount of raw materials and energy.

“This also changed the focus of product development. And the change resulted in another leap, as we had to develop new types of tissue and board machines,” explains Ari Saario.

Another strong development trend is lightweighting. Instead of the number of tons, customers now look to performance. “You get larger amounts of products from the same amount of raw materials.”

New raw materials

Another current megatrend is pulp mills becoming bioproduct mills, in which valuable by-products are obtained from raw material streams in accordance with the principles of the circular economy and sustainability.

One important raw material separated in the process is lignin, which makes up 20–30 percent of wood. Lignin can be used to produce replacements for fossil plastic and carbon fibers, as well as to replace for example fossil substances in glues. In the LignoBoost process special equipment is used to separate lignin during pulp-making.

Pulp is not just pulp anymore, either: it can be micro- or nanocrystalline, or micro- or nanofibrillated cellulose. They provide new materials, for instance, for the textile industry.

A new trend can also be seen in manufacturing through 3D printing. It is being developed at a Valmet research center’s pilot plant in Sundsvall, Sweden. 3D printing is associated with many new generation devices. Metals can be used to print spare parts for machines, among other things.

“The new manufacturing technology means that a device part can be designed more efficiently than before, saving material,” Saario says.

Fuel flexibility at the forefront

Renewable forms of energy and energy saving are reflected in product development. The flexible use of fuels is at the top of power plant procurement criteria, together with cost efficiency.

Since the 1980s, product development has been driven by a significant cluster of the industry operating throughout the Nordic Countries, as well as a large number of experts working for technology companies, customers, universities and research institutes. There have also been several large-scale research programs in Finland related to power and recovery boiler processes.

“At that time, there was no shortage of creativity and boldness. Start-up initiatives were innate in companies, and controlled risks were taken. Products were also developed in connection with delivery projects,” says **Matti Rautanen**, who manages the networking of Valmet’s energy sector research work with stakeholders.

“Industrial Internet and digitalization are a special focus area in our R&D.”

Valmet’s current expertise in the energy industry, the focus areas of research and success culminate in multi-fuel boilers. “The wider the fuel base, the better customers can optimize from technical and economical perspectives what kind of raw material, and at what price, should be burned and which sidestreams should be utilized,” Rautanen says.

In the energy field, the company’s areas of special expertise include bubbling fluidized bed, circulated

fluidized bed and gasification technologies. As new items, various biomass refining technologies are being studied.

“The bubbling fluidized bed technology is suitable for fuels with a low thermal value, and the circulated fluidized bed technology enables a wider selection of fuels. The expertise has made it possible to raise steam parameters to a higher level,” Rautanen says.

Both in the energy field and in the pulp and paper industry, measuring technology and automation have been an essential part of the process. In maintenance operations, preventive maintenance and lengthening the operating cycles between maintenance breaks have been a focus of development.

A leap forward with Industrial Internet

New leaps in Valmet’s product development are aimed at the Industrial Internet and digitalization. “This year, Industrial Internet and digitalization are a special focus area in our R&D,” Ari Saario says.

Automation and measuring devices guide the pulp, paper and board industries into utilizing resources more and more efficiently. One part of Industrial Internet is virtual reality. With the help of diagnostics, services and maintenance have also taken a leap forward. ■

➤ Matti Rautanen and Ari Saario at Valmet’s R&D Center in Tampere specializing in energy and biotechnology. “A finished plant with its many technologies consists of a huge amount of different skills, competences and knowledge, which only become concrete in an installed, tested and completed plant ready to meet customers’ requirements. Therein lies the work’s core, charm and challenge,” says Matti Rautanen.

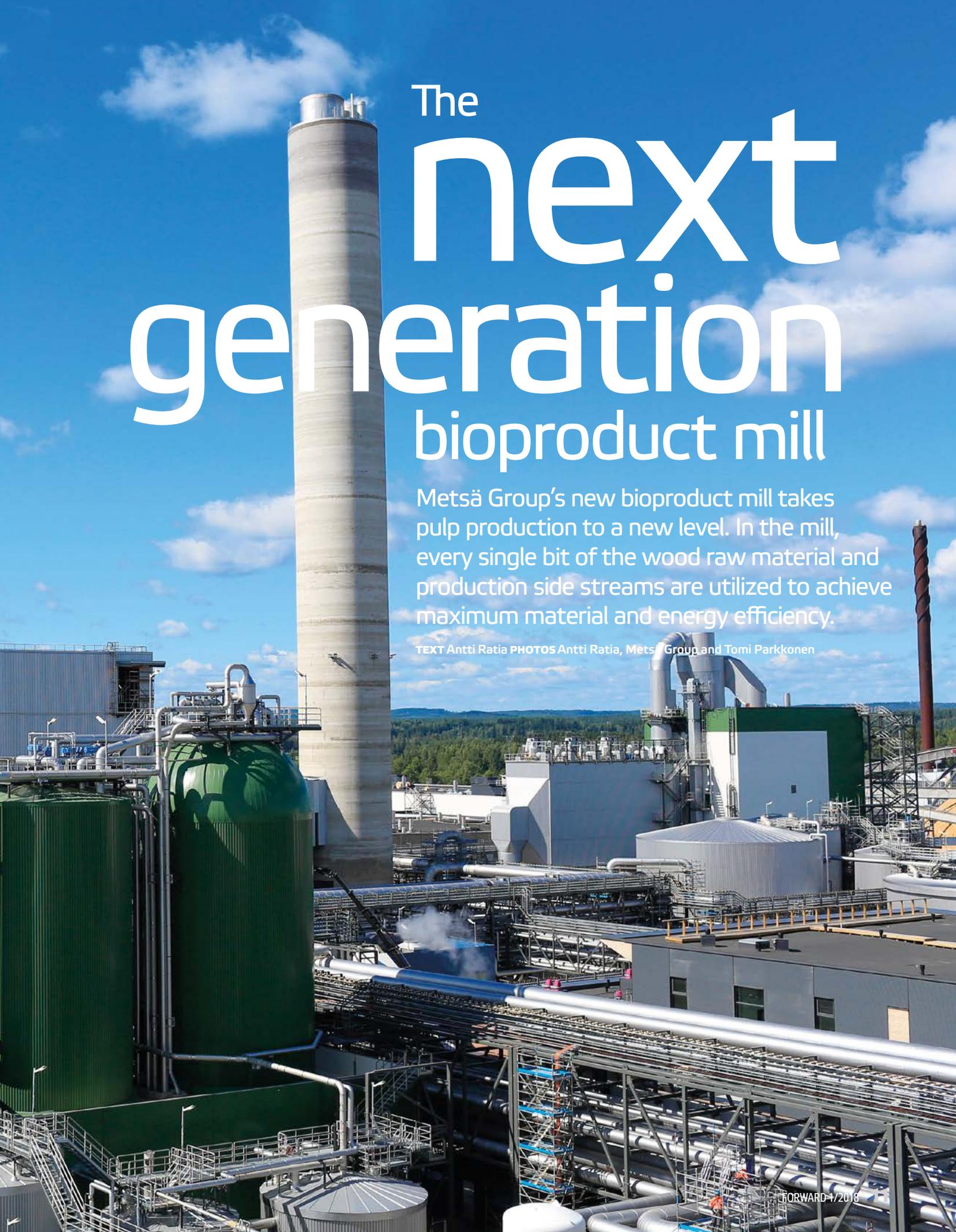




CUSTOMER'S VOICE

Moving forward together





The next generation bioproduct mill

Metsä Group's new bioproduct mill takes pulp production to a new level. In the mill, every single bit of the wood raw material and production side streams are utilized to achieve maximum material and energy efficiency.

TEXT Antti Ratia PHOTOS Antti Ratia, Metsä Group and Tomi Parkkonen

Äänekoski, a town of 19,000 people surrounded by lakes and vast softwood forests in Central Finland, is now home to Northern Europe's largest bioproduct mill. In April 2015, Metsä Group, a forest industry group focusing on tissue and cooking papers, paperboard, pulp and wood products, decided to replace their old pulp mill in the town with a modern, next generation bioproduct mill. At EUR 1.2 billion, Metsä Group's investment in Äänekoski is the largest investment in the history of the Finnish forest industry.

The old pulp mill had started production in 1985 and was therefore approaching the end of its operating life cycle. The choice was between a total renovation of the existing mill or then a new mill. The construction of the mill started in August 2015, and Valmet was chosen to supply some of the key technology islands to the new mill.

Metsä Group went through a traditional tendering process for the various key technology islands of the mill. "We have a long history of co-operating with Valmet at our pulp mills in Finland. Valmet has been a good and innovative partner for us. Valmet stood out from the competition by offering us the best technology within our budget, so it was a natural choice to partner with them when building the world-class bioproduct mill in Äänekoski," says Timo Merikallio, Project Director, Metsä Group.

The latest technology plays a key role

Metsä Group's decision to choose suppliers for the mill's key technologies was a deal for two. Valmet was chosen to deliver the recovery boiler, pulp drying line, gasification plant, lime kiln, sulfuric acid plant, and mill-wide automation system – all of it the latest technology and highly energy-efficient.

↓ Äänekoski recovery boiler supplied by Valmet is equipped with several high power features to enable 240 percent self-sufficiency for electricity.



“The bioproduct mill doesn't use any fossil fuels and it supplements Finland's total share of renewable energy by more than 2 percentage points.”



↑ “Valmet's commitment to safety showed during the project through the resources Valmet appointed to the site. Our lost time accident rate was below 14 per million working hours, which can be categorized as a good result in a project like Äänekoski,” says Camilla Wikström from Metsä Fibre.

The gasification plant produces biogas from bark, which replaces fossil fuels in the lime kiln. The pulp drying machine includes several new features that improve efficiency and usability. The largest part of the delivery was the recovery boiler with new high-power features. The boiler has a capacity of 7,200 t/ds and has an electricity production capacity of 250 MW. As a result, the mill can produce up to 1.4 times more electricity than it uses.

“The mill is a prime example of a contemporary bioproduct mill. In addition to high quality northern softwood and hardwood pulp, it produces other bioproducts. Also, it doesn't use any fossil fuels and it supplements Finland's total share of renewable energy by more than 2 percentage points,” says Bertel Karlstedt, President of the Energy and Pulp business at Valmet.

Mutual trust brings success

Metsä Group and Valmet agreed that the technology deliveries would be made using a tailored open book working model. It meant that Valmet and Metsä Group

practically sat on the same side of the table. Metsä Group bought the equipment and made subcontracting agreements, and Valmet steered and managed the operations at the site.

“The project was the largest I have ever headed. It was big, international and divided into hundreds of smaller contractor agreements. Our co-operation with the open book project model worked well. Valmet's ability to meet our requirements during the project was on a good level,” says Merikallio.

“Mutual understanding and joint project goals are essential. Metsä Group had really experienced project personnel. Even though we had some challenges during the project, at no point did they question our ability to solve them within the given schedule,” says Jari-Pekka Johansson, Valmet's Äänekoski Project Director. “Trust on both sides is crucial to achieve our common goals.”



“The mill is a prime example of a contemporary bioproduct mill. In addition to high quality northern softwood and hardwood pulp, it produces other bioproducts. Also, it doesn't use any fossil fuels and it supplements Finland's total share of renewable energy by more than 2 percentage point,” says Bertel Karlstedt from Valmet.



Dedication to safety

The total number of construction and project personnel at the site peaked at 13,500 people. Metsä Group had set high safety standards already in the bidding process.

“Valmet’s commitment to safety was noticed at an early stage. It showed also during the project through the resources Valmet appointed to the site. The accidents during the project were typically slips and trips. Our lost time accident rate was below 14 per million working hours, which can be categorized as a good result in a project like Äänekoski,” says **Camilla Wikström** who was the mill manager at the time of construction and has been recently appointed to SVP, Production, Pulp Business, Metsä Fibre.

“Safety was well managed and resources were well placed. For example, at the very demanding recovery boiler construction site with a lot of contractors, Valmet managed to work without any serious injuries. The attitude towards safety issues is the most important thing. With the right attitude, most accidents can be prevented, and Valmet demonstrated their ability to steer and handle health, safety and environmental issues well,” continues Merikallio.

Optimizing performance with Valmet’s automation

Metsä Group chose Valmet to deliver the key process technology and the mill-wide process automation system and related analyzers. The Valmet DNA automation system is the backbone of the entire mill and includes a secure back-up system for mill operations. Valmet also supplied a comprehensive information management solution that provides real-time data for maintenance and quality control.

“The mill is equipped with 1,500 sensors that measure bearing vibration. Our automation service agreement provides weekly status reports for Metsä Group’s maintenance personnel. This enables repairs and replacements before any breakdowns occur. Äänekoski mill also uses maintenance pads for easy access to information and reporting on the shop floor,” says **Tuomo Marjomaa**, Senior Project Manager at Valmet.

Start-up right on time

In August 2017, the Äänekoski bioproduct mill was started up a couple of minutes before the schedule set already two years earlier. The mill produces 1.3 million tonnes of pulp per year, along with other bioproducts such as tall oil and turpentine.

“I think success in this project was a result of good time management, the open book working model, our decision-making culture and interaction between people,” Jari-Pekka Johansson sums up.

“Projects like ours always include unexpected issues and challenges. We also had some, but the way Valmet handled them only increased my trust in them. I feel very positive as the mill has performed well and the ramp-up is nearly completed,” says Timo Merikallio. “Building these kinds of mills is always a different combination of technologies, and there isn’t only one way of doing it. I enjoyed working with Valmet; their professionalism and well-managed sourcing organization impressed me.” ■

CONTACT PERSON

Pasi Mäkelä
 Director, Pulp Mill Sales
 +358 40 505 4199
 pasi.makela@valmet.com

↑ “The project was big, international and divided into hundreds of smaller contractor agreements. Our co-operation with Valmet with the open book project model worked well,” says Timo Merikallio from Metsä Group.

⌘ Control room – Äänekoski mill has mill-wide automation solution with Valmet DNA and analyzers.

➔ Pulp Drying line – The high level of automation, e.g. automatic tail threading, in the drying machine allows the operators to start the machine with hands free, bringing safe and reliable operation.

New solution for making sulfuric acid

Metsä Group contacted Valmet to develop a solution to make sulfuric acid from the mill's own chemical circulation to increase its self-sufficiency in chemicals.

"The sulfuric acid plant producing process chemicals from sulfur compounds from odorous gases is a remarkable step towards closed chemical circulation and further improves the environmental performance of the bioproduct mill," says Timo Merikallio, Project Director at Metsä Group.

This project is an excellent example how Valmet is able to develop new innovative technology to meet customer needs.

"We had not done any internal R&D before we got the first query from Metsä Group. I am proud to say that we developed the solution literally from scratch and were able to deliver new technology within the normal project schedule,"

tells **Eevi Smolander**, manager for Valmet's mill wide NCG solutions.

In normal closed chemical circulation, the odorous gases are burned and recycled. Valmet delivered a technological solution that processes the odorous gases into sulfuric acid. The main challenge was to find the correct materials that are in contact with the 60–70 percent strong acid. Usually, sulfuric acid plants manufacture close to 100 percent strong acid, which is easier to handle and transport.

"So far the performance has been good. The technology works. The eye is now on the durability of the materials that are in contact with the sulfuric acid," says Merikallio.

The sulfuric acid plant is in conjunction with the odorous gas burner and can be run separately or simultaneously with the gas burner.



SsangYong C&B

optimized tissue machine press nip efficiency

A press roll cover upgrade and iRoll technology, used for nip profile optimization, enabled SsangYong C&B to improve tissue dryness and felt profiles, save energy, and increase tissue machine speed. **TEXT** Tatu Pitkänen

In line with its slogan “Clean and Best,” SsangYong C&B emphasizes getting the best achievable performance and quality at all times. The company is one of South Korea’s biggest tissue producers and converters.

Located in the city of Sejong, Jochiwon TM 4 produces consumer bath tissue in the 14–22 g/m² range. TM 4 has a wire width of 4,700 mm, two roll nips and a production capacity of 100 tonnes a day.

To optimize press nip efficiency for TM 4, SsangYong turned to Valmet. The main targets were to improve energy efficiency by lowering steam consumption through higher post-press dryness, and to get more uniform moisture profiles by improving dryness profiles. Moreover, the mill wanted to extend roll cover and felt lifetimes, which requires optimal performance of the press loading equipment.

Achieving all these targets would allow SsangYong to run the machine at a higher speed, too.

Harder press roll covers and a new grooving pattern

To find ways to improve press performance, Valmet analyzed the conditions that the roll covers were experiencing in the press section. Removing more water from the web generally requires a higher nip pressure. The cover material was changed from rubber to a harder polyurethane cover to enable higher load levels and extend the cover lifetime. Additionally, the grooving pattern of the cover was changed to enable efficient water removal.

The choice of cover stemmed from simulations run with Valmet’s PressSim and NipSim software. These tools make it possible to find the best combination of cover material, hardness and surface topography to maximize



Valmet Press Roll Cover PH offers energy savings and the longest run times.



“The results from cooperation with Valmet have been satisfying in terms of energy savings and increased machine speed. We are looking forward to continuing the development to improve the energy and production efficiency even further and to get more cost savings,” says Mr. Jong-Dae Byun, Director & Mill Manager at SsangYong C&B.

dewatering. The suction press roll was equipped with Valmet Press Roll Cover PF-V with a hardness of 15 P&J, with Valmet Press Roll Cover PH chosen for the second press roll, with the same hardness.

500th profile analysis with Valmet iRoll

To improve moisture profiles, Valmet analyzed the nip loading and the performance of the press equipment under dynamic conditions with portable iRoll technology. This marked the 500th case to utilize Valmet iRoll technology for online profile measurement. With iRoll measurements, it is possible to study profiles quickly and flexibly in real-life conditions with the old covers on the machine.

The iRoll data showed that it was necessary to calculate a new crowning shape for the press rolls on TM 4. This was done with Valmet’s CrownSim software, a sophisticated tool that can read existing cover and crown parameters, and calculate the required update from iRoll data to obtain the desired nip load profile shape. For TM 4, this approach meant that the roll covers could be equipped with optimal crowning when they were taken into use.

The iRoll analysis revealed the uneven press loading equipment performance, too. The second press nip loading was working correctly, but the suction press roll remained skewed, despite changes in loading levels and attempts to fix it with nip load parameters.

This was finally addressed by adjusting the height of the flexible joint for the front-side vacuum tubing. The mill

maintenance team added shims to prevent the tubing from affecting the nip loading, as well as checking and adjusting the alignment of the press area. These measures improved the symmetry of both the suction press nip and profiles.

Targets reached: energy savings and speed increase

SsangYong C&B achieved the improvement targets set for optimizing the press nip efficiency of their TM 4 tissue machine. The dry content and profiles improved, leading to energy savings through 5 percent less steam consumption. More energy savings came from a 5 percent decrease in roll drive loads. The nips now function better, as the skewed loading was corrected and crowning updated.

And finally, the machine speed was increased by up to 30 m/min.

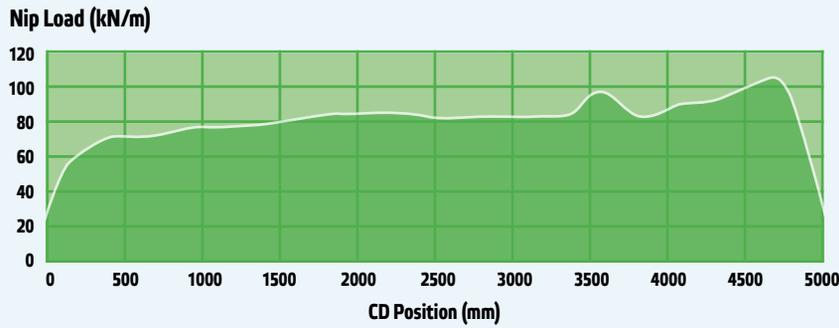
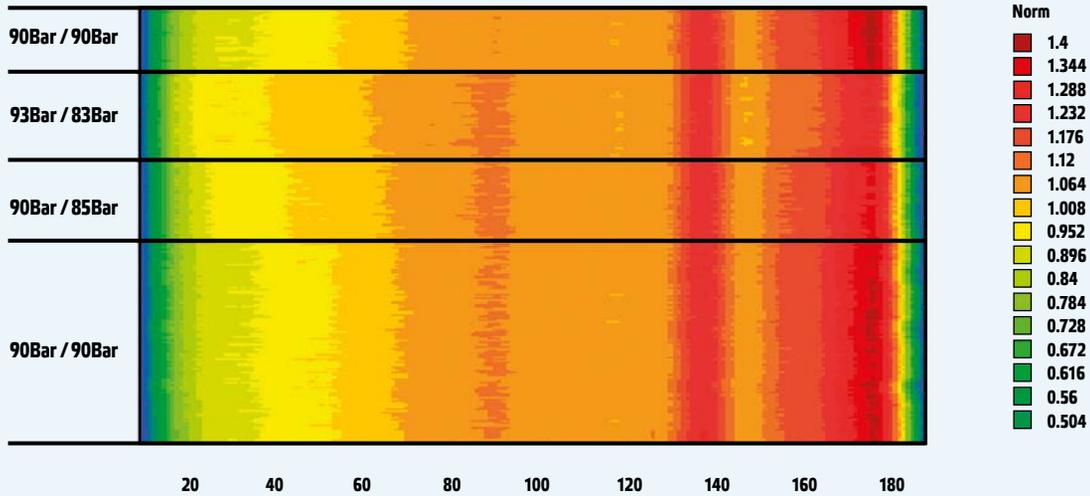
The payback from the cover upgrade and iRoll project has been clear. As a result, Valmet and SsangYong have agreed to continue to cooperate with the same approach for other tissue machine lines at the sister mill, Monalisa Co. Ltd. ■

CONTACT PERSONS

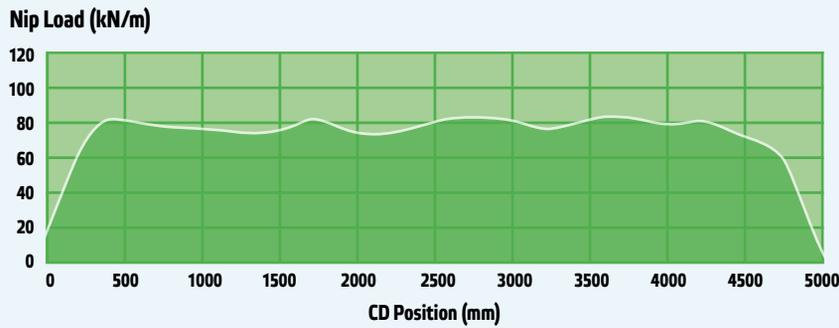
Tatu Pitkanen
Global Technology Manager
+358 40 869 7601
tatu.pitkanen@valmet.com

Kyoung-Seop Kim
Senior Manager
+82 1043597034
kyoung-seop.kim@valmet.com

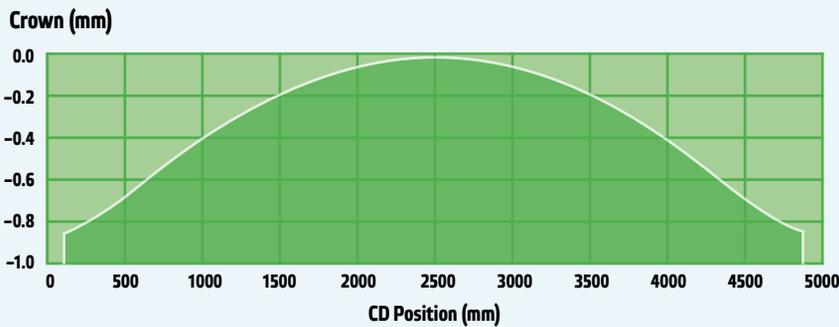
Suction press nip profile during load trials



Suction press nip profile during load trials, measured dynamically with iRoll portable, revealing skewed loading conditions.



Second press nip load profile measured dynamically with iRoll portable reveals low edge loading.



New optimized freeform crowning calculated using iRoll data. The target was to increase press nip load in edge areas.



Super heater coils of the recovery boiler.

Bottlenecks removed

with a successful recovery boiler rebuild

The recovery boiler rebuild at the West Coast Paper Mills in Dandeli, India, was conducted utilizing a computational fluid dynamics (CFD) analysis. The aim was to improve the availability of the recovery boiler, and to avoid frequent boiler shutdowns that required maintenance.

TEXT T Suresh and Gaurav Ghosh PHOTOS T Suresh

West Coast Paper Mills in Dandeli, India, produces paper for printing, writing, and packaging. They were facing bottlenecks in their recovery boiler operation: high metal temperatures and deformation in the superheater panels, secondary combustion, as well as leaks from the economizer. West Coast Paper Mills approached Valmet to study the boiler and to offer a solution to overcome the problems.

CFD analysis to determine the root causes for boiler inefficiency

“Instead of like-for-like replacement of the affected pressure parts, we recommended starting the project using computational fluid dynamics (CFD) process study to determine the root causes of the problems faced in the boiler operation. After the analysis, the scope and details of the rebuild could be defined,” explains **B Syamsundar**, Director for Service in the Asia-Pacific area at Valmet.

Valmet conducted the CFD analysis and process study on the boiler. The analysis identified a design shortfall in

“We started the project with computational fluid dynamics analysis to find the root causes of boiler inefficiency and then determined the scope of the rebuild.”

the existing combustion system that resulted in problems in the boiler operation. Based on the analysis, Valmet proposed design changes in the combustion system and to the configuration of the superheater panels.

Efficient execution

After the CFD analysis and boiler process study, Valmet was chosen to supply the rebuild. It included plant engineering, procurement of auxiliaries, manufacture of pressure parts, dismantling of existing components and installation of the new sections, excluding civil engineering. The project proceeded on schedule on three parallel fronts: furnace, economizer and super heater area.

The rebuild project included design changes in the secondary and tertiary air ports. New tubes were installed, and air ducts were modified as required. The economizer was replaced, and the primary superheater panels were replaced with optimized heating areas.

“The project was executed during the shutdown, as agreed in the contract, in very good cooperation between West Coast Paper Mills, Valmet, and the local sub-contractor. Due to a short turnaround period, the site works had to be programmed as round-the-clock activities. The main challenges with the schedule were around the superheater area. Originally, the plan was to dismantle the superheater panels using cranes, but due to significant deformation, it had to be dismantled manually. This meant a lot of changes to the dismantling plan,” says **T Suresh**, Project Manager at Valmet.

Safety first

Safety is a high priority for both West Coast Paper Mills and Valmet. “We adopted a lean, safe way of working

during the dismantling, erection and commissioning stages,” confirms Suresh. “Safety inspectors were deputed at site around-the-clock to ensure safe working conditions at all times.”

“Overall, I am quite satisfied with Valmet’s delivery so far. We had a successful hydro test in October 2017, all the project deadlines were met, and issues promptly addressed. Valmet, West Coast Paper Mills and the contractor on site showed good team work and a high level of quality, health, safety and environmental standards,” states **B.H. Rathi**, President, Technical for West Coast Paper Mills.

“At peak time, there were over 100 people involved on site. We had set high project delivery standards, and it was critical to plan the superheater shutdown well, in line with the original schedule. We are satisfied with the progress. Also, Valmet has helped us in coordinating the work between different teams. All the benefits are clearly visible in the safety records during the project phase,” confirms **Rajendra Jain**, Executive Director of West Coast Paper Mills.

On-time liquor firing start-up

Liquor firing started as planned in mid-November, followed by a successful final acceptance at the end of November. The performance of the boiler is very satisfactory. With the new combustion system, combustion in the lower furnace is better, and secondary combustion is reduced. Also, superheater steam and metal temperatures are under control. ■

CONTACT PERSON
Mr. B Syamsundar
Director, Service, Asia Pacific
Pulp and Energy
+91 8056016799
b.syamsundar@valmet.com



The recovery boiler rebuild proceeded in very good cooperation between West Coast Paper Mills, Valmet, and the local sub-contractor, and it is clearly visible, for example, in the safety records during the project phase.



← After an efficient project phase, liquor firing started up on-time at the West Coast Paper Mills.

↑ At peak time, there were over 100 people involved on site.

Shanying International and
Valmet get closer through

shared roadmap

Shanying International and Valmet have agreed to deepen their partnership to move Shanying's performance and process reliability forward. The practical implementation involves a shared roadmap with concrete action points.

TEXT AND PHOTOS Liu Jingwei and Sara Li

Shanying International is the third-largest producer of containerboard in China. In addition to containerboard, its business covers pulping, newsprint and coated paperboard production, as well as paper container processing. Shanying International and Valmet have been collaborating for over 12 years. Valmet has supplied six production lines in total for Shanying's Zhejiang and Anhui mills, and a new production line is under construction at Shanying's mill in central China.

Shanying International has experienced a period of rapid growth and expansion during the past year. To further move its performance and process reliability forward, Shanying has deepened its long-term partnership with Valmet. Together, they constructed a shared roadmap with concrete action points to achieve their goals. In practice, the shared roadmap means closer contact, deeper sharing of insights and information, and finding solutions to Shanying's needs together. The companies have agreed on common goals for the partnership and a common way to operate.

Annual Forum as a platform for exchanging information

To strengthen the communication between Shanying and its key partners, the company started an Annual Forum in 2017, intended to share insight and information on the latest technologies and development trends in the industry with its key partners. In 2017 and 2018, Valmet was invited to participate in the forum, introducing its latest clean technologies from solid waste to clean energy, Industrial Internet applications and the construction of the mill's solution ecosystem.

Shanying is also hosting a separate summit meeting for their and Valmet's senior executives to discuss Shanying's development plans and future needs, and to ensure a common course between the companies. The summit meeting also works as an arena for feedback.

Renewing co-operation models with Zhejiang mill

Shanying's Zhejiang mill and Valmet have been working together since the mill's first production line started up in 2006. As part of the shared roadmap and to further boost cooperation, in the past two years, Zhejiang mill and Valmet have developed new co-operation models to keep each other up to date.

From left to right: Mr. Huang Jinhong, PM13 Production Manager of ZheJiang Shanying Paper Co., Ltd, Mr. Lu Yong, Deputy General Manager of Zhejiang Shanying Co., Ltd., Mr. Yu Shuan, Mill Sales Manager, Valmet China.



"Valmet is a reliable, long-term partner for us. The new cooperation model further deepens our mutual trust, and we are very satisfied with Valmet's honest and responsible attitude," says **Lu Yong**, Deputy General Manager of the Zhejiang mill.

In practice, Valmet management team in China visits the Zhejiang mill every year to talk about the mill's annual plan and operational objectives. The Valmet Dialog platform is used to gather feedback from the Shanying team. All the work and projects are reviewed regularly by Valmet's regional management and the Zhejiang mill management team. Valmet has set up a dedicated mill team led by a Valmet Mill Sales Manager to set goals for mutual work through quarterly meetings.

Anhui mill starts dialogue with data to drive preventive maintenance

Shanying International decided to start piloting big data utilization and the Industrial Internet in 2017. At the same time, Valmet introduced its renewed Industrial Internet offering. The common interest resulted in an agreement on roll condition monitoring and grinding based on Valmet's Industrial Internet applications with the Anhui mill in early 2017.

The aim of the agreement is to move from repairs to preventive maintenance and to increase the roll uptime through systematic planning of roll grinding and maintenance. The agreement covers roll operation monitoring, lubrication monitoring, remote service and roll grinding services, as well as roll status and maintenance recommendations reports on five production lines at the Anhui mill. The Valmet DNA automation system is key to providing roll condition information through a common user interface. Valmet data analysis and roll experts work together to advise the mill personnel on suitable grinding or repair solutions.

"Valmet's experts have broad knowledge, extensive experience and advanced analytical tools. They interpret data from the site, such as vibration and hydraulic pressure, analyze it and recommend preventive maintenance solutions. It has improved our performance a lot," confirms **Liu Wenming**, Deputy General Manager at the Anhui mill.

In 2018, Shanying's Anhui mill has gone further in utilizing Valmet's Industrial Internet services. The mill has signed an energy-saving service agreement with Valmet, mainly for PM 5 and PM 6. Now, Valmet collects, filters and analyzes data from various channels to offer integrated solutions, such as optimizing the vacuum unit and dewatering unit in the wire section, to achieve savings on electricity and steam consumption. ■

CONTACT PERSON

Jingwei Liu
Corporate Account Manager
Head of Marketing and
Communications in China
+86 138 0130 0956
jingwei.liu@valmet.com

Quantum of the Seas sails with less emissions

Quantum of the Seas, one of the Royal Caribbean International's advanced cruise ships, sails between Shanghai, China, and several ports in Japan, using Valmet's DNA automation system and flue gas cleaning to ensure a safe and environmentally friendly journey for the passengers. **TEXT** Soili Städter **PHOTOS** Soili Städter and Royal Caribbean International



Behind the scenes and hidden from the passengers, proven technology plays an important role in making the journey on Quantum of the Seas safe and comfortable.

The vessel's machinery, air conditioning and emergency shutdown systems are controlled through the Valmet DNA process automation system, and Valmet flue gas cleaning technology limits the vessel's emissions.

"The automation system is integrated with the vessel's information management system, and also connected to other systems, via serial lines, like the diesel engines and the electric propulsion system. I like using Valmet DNA, since it is similar to using a Windows-based system. With its good graphical interface, it is easy to use," says **Mauro Zappala**, Chief Electrical Engineer on board Quantum of the Seas.

"The system is fully redundant, which makes it even more reliable to use. All critical parts are secured with redundancy."

Tracing trends from historical data

For Zappala, an important feature in the automation system is the Valmet DNA Operate Trend and Event Archive (TEA). DNA Operate TEA is a tool for analyzing and troubleshooting the process, which allows operators to monitor trends from the collected historical data.

The system also enables operators to archive all alarms and operator tracking data to enable viewing of trends, and for deeper analysis of the Alarm and Event history, when needed.

"This is a tool that should be used every day to become more efficient in operating the vessel. We can follow and trace any single tag, so we can get to the root of the failure. We are able to see how DNA Operate TEA works, and also learn more and educate ourselves. In addition, the system enables quick troubleshooting, which is essential for safe operation," Zappala explains.

"When you can go back in time and see exactly what has happened and why the values have changed, you can



↑ "I use the system eight hours a day. For me, Valmet DNA is very handy and fast to operate compared with other systems I have used," says **Omar Corrales**, Second Engineer on Quantum of the Seas.

improve your operation and avoid similar events in the future. This is certainly one of the tools people use most often," states Zappala.

There are several stations on the bridge where the operators can monitor the vessel's operation. From there, for instance, ship stability and tank levels can be observed. Responsibility for operations can be passed to the machine control room, if needed.

Functional descriptions are available online and are used for those activities that happen less often. Zappala finds the descriptions easy to use, since the information is safely stored and easy to access through Valmet DNA.

For maintenance, the most critical spare parts for maintaining the automation system are available onboard. "Valmet delivers spare parts quickly when needed," confirms Zappala.

Energy management system saves energy and costs

Quantum of the Seas uses Valmet's energy management system to improve the energy- and cost-effectiveness of operating the vessel. The system enables operators to monitor the vessel's energy flows in real time, explore performance and optimize energy consumption. For example, even the air conditioning in the restaurants is controlled by a Valmet DNA Energy Saving Scheduler.

Operating the vessel sustainably is one of the most important things for Zappala. "The user interface has dedicated pages for our energy management that show the key indicators, like energy consumption or availability of freshwater, and possible deviations. We can find the reasons for the deviations from the reports and then correct them."

← With Valmet DNA, Mauro Zappala can monitor the vessel's operations at all times, and utilizing the historical data makes development activities and troubleshooting possible.



“You can go back in time by utilizing the historical data and see why the values have changed.”

Scrubber for reduced sulfur emissions

Cleaning the flue gases with modern scrubbing technology that complies with environmental regulations is important on the Quantum of the Seas. The technology is used to reduce sulfur emissions from exhaust gas by using a washing process.

Valmet’s scrubber technology was delivered to the cruise ship through Wärtsilä. This hybrid scrubber can easily switch between open loop, when seawater is used as the wash water, and a closed loop that circulates the wash water.

“Depending on the legislation, we use the closed loop and change to the open loop, when possible. The hybrid model is a practical way for us to operate,” explains **Javier Caballero**, Second Engineer on Quantum of the Seas.

“When approaching a port, we have to make preparations for the closed loop. All information is transparent and available to the local authorities. We don’t have to prepare separate reports for them, since the system records everything automatically,” says Caballero.

The scrubber system is fully integrated into the Valmet DNA automation system. “The combination of the scrubber and automation makes my work easier. Emissions are easily visible on the Valmet DNA screens. And they are clearly below the limits,” states Caballero. ■

CONTACT PERSON
Per Syvertsen
 Manager Sales Support
 per.syvertsen@valmet.com
 +47 9529 8008





Co-creating value in Industrial Internet ecosystem

The amount of data is multiplying every day. The challenge is to know which data is relevant and how it informs decision making. To get the most out of data for its customers, Valmet is building an Industrial Internet partner ecosystem. The ecosystem brings leading industry players together to co-create new value adding applications and services for pulp, paper and board, tissue and energy customers. **TEXT** Marianne Valta **PHOTOS** Tomi Aho



“We are building a solution ecosystem to complement our Industrial Internet offering, and to co-create services that help our customers in moving their performance forward. By bringing the leading industry players together we can utilize data in a new way to discover hidden improvement potential. Our work with the Industrial Internet ecosystem has started well, and I believe we are on the right path,” says **Jari Almi**, Director, Industrial Internet at Valmet.

The first published pulp and paper ecosystem partners

are Tieto, a provider of manufacturing execution and enterprise resource planning systems, and Kemira, a global chemistry company. For the energy customers, Valmet has partnered with Swedish Energy Opticon to offer an online Energy Management Solution.

Added value through combining process and business data

The ecosystem partnerships are developed to create added value for customers by combining process and business data from different mill and plant systems and using the data to reduce raw material and energy costs,

“Combining process and business data helps our customers reduce raw material and energy costs, improve end quality, reduce downtime and optimize maintenance.”

improve end quality, reduce downtime and optimize maintenance.

Today, production process data from the automation system is mainly utilized for real-time process control according to set targets. On mill or plant level, there are also other important sources of data. Enterprise Resource Planning, Manufacturing Execution and Maintenance Systems provide data that is utilized from business perspective. On a company level, the data can be utilized for business planning and fleet management. Combining data from these systems creates new opportunities.

“The cooperation with our ecosystem partners increases the amount of data we can utilize for our customers’ benefit. This means we can offer completely new, valuable solutions. The more data we have, and the greater the amount of skills we can use in interpreting it, the better we are able to help our customers in challenging situations. The benefits are numerous. With the



The more data we have, and the more expertise we can draw on in interpreting it, the better we can help our customers in challenging situations,” says Juha-Pekka Helminen.

co-created solutions, our customers can optimize their energy and material use, plan maintenance activities, increase productivity and cut costs, amongst other benefits,” says **Juha-Pekka Helminen**, Director, Digital Ecosystem at Valmet.

Currently, several pilot projects with Industrial Internet ecosystem partners are starting or ongoing. In the pilots, Valmet and its partners are testing how to combine process data with mill and company level data, and how the data is used to enhance customer performance, for example in the papermaking process.

Word class data security solutions

To move business performance forward, data needs to be shared. Protecting customer data has been one of the main design principles for Valmet in developing its Industrial Internet applications and services.

“We understand that there can be doubts about sharing data. We have put special focus on data security, and we have processes in place for safe and protected way of saving and sharing data. For example, we never share customer data with our ecosystem partners without prior customer consent. We use the world’s leading service providers such as Amazon Web Services, because we take data security concerns very seriously,” explains Helminen. ■



“By bringing leading players together we can use data innovatively to discover potential for improvement,” explains Jari Almi.

Greenpac turns data to value

Greenpac Mill knows how to take a firm grasp of data and the possibilities it offers. They turned their data into a valuable asset and use it to prevent production losses with Valmet's Industrial Internet applications and with the help of Valmet Performance Center experts guiding the mill personnel via remote connection.

TEXT Kaisamajja Marttila



Started up just four years ago, Greenpac's Valmet-supplied PM 1 is a state-of-the-art recycled linerboard production line with full Valmet service support in the form of long-term service agreements and outsourced mill maintenance operations. The modern systems and measurements combined with advanced plant systems provide an enormous amount of data every second, and the mill was determined to put the data to good use. As a result, they've been able to accurately predict both small machinery failures and larger, critical ones, and thus avoid unplanned shutdowns and production losses, and operate in a more controlled manner.

Results through dialogue with data

Valmet Paper Machine Diagnostics, one of Valmet's Industrial Internet applications; is a software package that enables a paper machine to observe and track its own behavior. It indicates if the asset or performance of the process is within normal limits or not. Each machine component and process has a unique diagnostics approach and performance indicators. The indicators are carefully adapted to their specific function and designed to be as informative as possible.

Paper Machine Diagnostics combines existing data from several sources, like the machine control system, quality control systems and other mill level information systems. There is no need to install any new measure-

Case 1:

Lower press suction roll performance

Greenpac Mill noticed from the weekly analysis report that the press roll suction condition indicator had been showing lower performance for a while. They asked the Valmet Performance Center for guidance, and as Valmet's experts studied the case further, they suspected that the sealing strip of the suction chamber might be worn out, or the shell suction holes might be partially plugged. In the next scheduled shutdown, the suction roll was removed and exchanged for a new one.

Changing the suction roll based on the condition data prevented an unplanned shutdown of 24 hours that might have resulted due to the damaged suction roll. The estimated cost saving was USD 480,000. The suction roll maintenance report confirmed the suspected condition failure.



Case 2: Double doctor performance

An expert at the Valmet Performance Center noticed that the double doctor blade performance went into a critical state late one Friday night. The expert notified the mill immediately. As the double doctor performance indicator showed critical values, the mill workers kept a close eye on the doctor and operated it in a very controlled manner until the next planned shutdown.

As a result, major damage to the press was likely avoided. Also, a 48-hour unplanned shutdown was prevented, and the estimated savings were over USD 1,000,000.

Case 3: Hood exhaust moisture control

A Valmet Performance Center expert noticed an anomaly in the press section dryness, investigated further and discovered that the exhaust moisture measurement signal from the paper machine hood had collapsed. The expert notified Greenpac right away. The mill investigated the moisture measurement instrument and found it was faulty. They ordered a new part, and the instrument was repaired.

The actions taken prevented runnability problems that a malfunction in hood air balance and moisture accumulation would have caused, thus preventing production losses the estimated savings were more than USD 1,000,000.

ment devices just for this application. This live data is fed to algorithms that have been created based on Valmet's vast papermaking knowhow. The system creates timely reports that provide in-depth information about the machine performance and condition of the equipment, which can be used to predict and avoid production losses and increase the process reliability.

The application is complemented by support from Valmet Performance Center. If the machine's behavior is outside the set limits, Valmet experts check the process remotely and troubleshoot possible causes of process variations, solving abnormalities without delay.

The Valmet Paper Machine Diagnostics tool is available as a part of a Service Agreement. The scope of the agreement can include services for reliability, performance or new technology – or for all of them.

Valmet delivers improved predictability and reliability of processes and overall performance, leading to savings on time and money. ■

CONTACT PERSON
Toni Mäcklin
Manager, Reliability Services
+358 40 567 2946
toni.macklin@valmet.com

Greenpac Mill put the data to good use. They've avoided unplanned shutdowns and production losses and predicted both small machinery failures and larger, critical ones accurately.



At the heart of the coating kitchen are the two mixers.

Coating kitchen automation renewal enhances performance

Faced with end-of-life issues for its coating kitchen automation system, the Norske Skog mill in Bruck an der Mur, Austria, turned to Valmet for a replacement solution. The coating kitchen is a key process in the production of lightweight coated paper from the mill's PM 4, and reliability is vital to keep the machine running. **TEXT** Nigel Farrand

"End-of-life issues with the old system were compounded by difficulties in troubleshooting and lack of supplier support, so total replacement was the only option. We have other Valmet systems in the mill, and with the experience gained from them, Valmet DNA was an obvious choice," says **Horst Gottsbacher**, Automation Engineering Specialist at Norske Skog Bruck.

Machine restart on time

The first step towards the new automation system took place in 2015, when the system controlling starch preparation was replaced. The rest of the coating kitchen followed during a planned five-day shutdown of the paper machine over Easter in April 2017.

"We had 13 cabinets with over 2,000 I/O connections that had to be checked. It was a busy time, and as the cabinets were very close together, it was very crowded at times," remarks **Christian Trieb**, who is responsible for automation maintenance at the mill.

Good planning by the mill and Valmet paid off. At the switch-on of the Valmet DNA system, with the kitchen back on line, the first batch was a success and the paper machine restarted on time.

Operator driven improvements

Prior to delivery, there were two onsite workshops in Bruck with a two-week factory acceptance test in Vienna for mill operators, with Valmet specialists on hand to fill in gaps in the operating documentation. These were aided

by a simulator, where operators could test the operating procedures and get to know the system.

Many improvements, driven by the operators' expertise, were made in the logic, from improving valve switch points to making the timing of motor starts and stops more accurate. "The old system sequences were not very operator-friendly or flexible; now they can reset a sequence and restart it much more easily," says Gottsbacher.

Another big advantage seen by operators is the handling of alarms. "You might get several alarms if a motor stops; Valmet DNA shows the operator the initiating event – the first event leading to an interlock failure. It



“Since the Valmet DNA started up, we have never run out of coating color.”

makes troubleshooting faster and more straightforward,” continues Trieb.

Flexible and easy to operate

The main sequences and control loops for the batch mixing have been custom-programmed by Valmet. With two mixers sharing dosing pumps and flow meters, interlocking is very important. “They did a good job. It’s very flexible and easy to add or delete steps on the fly,” remarks Gottsbacher.

Recipes are prepared in Excel spreadsheets based on dry solids in the final sheet, which Valmet DNA uses to calculate dosages in the mix and execute the recipe automatically. Operators select recipes from dropdown menus, and the recipe report display shows the actual dosing values achieved. With over 40 recipes and as many as 18 different components, the system also keeps track of how much has been used. Variations in the recipe due to differences in raw materials are now taken into account with laboratory tests, entered directly into the system, which automatically update the recipe calculations to improve recipe accuracy.

“The old system had poor reporting and no possibility for trending. Now, production is very happy that they can see the process and recipe history to analyze and improve operations,” says Gottsbacher.

No more unplanned stops

Werner Krobath, the head of coating, is enthusiastic: “This new system is running excellently. After a trouble-free startup, the first batch was good and went directly to the paper machine. We had a few problems carry over from the old system, which earlier we could not solve. Now we have trends to see what has been going in the last few minutes or hours, or even for the whole year; this is a big advantage for us. Operators can now see the whole process on the big screen, which is especially useful during the unload process. Most of the guys have been here 20 to 25 years, but no-one wants the old system back,” he says.

The solid content of the coating color can be as high as 70 percent, which is a problem for the valves, pumps and pipes, but the system now makes it much faster to find and correct any faults. This is very important because if the coating kitchen stops, it can be only 30 minutes before the paper machine has to be shut down.

“It’s hard to calculate any savings, but with the old system, we did suffer unplanned stops. Since the Valmet DNA started up, we have never run out of coating color. All members of the project, both mill and Valmet personnel, worked really well together, and I have to say that this has been the best project I have participated in,” concludes Krobath. ■

CONTACT PERSON
Markus Kohl
Service Manager
+43 6641 8241 46
markus.kohl@valmet.com



Christian Trieb, responsible for automation maintenance in Bruck



Horst Gottsbacher, Automation Engineering Specialist



Werner Krobath, Head of coating processes



Defibrator implementation in record time

Luso Finsa, an MDF, chipboard and SuperPan producer in Portugal, started up its new Defibrator system for producing wood fiber in record time. A dedicated team and regular online meetings were some of the factors that led to this success.

TEXT Kerstin Olofsson PHOTOS Filipe Coelho and Henrik Högberg



Luso Finsa in Portugal is part of the Finsa Group, which is operating in the wood processing sector in Europe. Luso Finsa produces MDF, chipboard, and Superpan, a product that combines the best of MDF board and chipboard in one single product.

A Defibrator system is an essential part in a fiberboard line. The raw material, such as wood chips, is grounded in a pressurized disc refiner to produce wood fiber.

Luso Finsa previously had only one Defibrator system, which was operated in alternating cycles in order to supply both press lines, but increased demand meant that

they would ultimately need to increase their capacity. Luso Finsa chose Valmet to supply a new Valmet EVO 56 Defibrator system.

A sustainable choice

Finsa was already running a similar system at its facility in Spain. “Since we already had an EVO 56 Defibrator, we knew it was a good choice. We also have long experience of implementing projects with Valmet,” says **Tiago Almeida**, Mill Manager at Luso Finsa.

“Sustainability and environmental matters are also key factors for us in choosing suppliers and equipment. We have stringent requirements for reducing water and steam consumption, among other things. Because the EVO 56 has very low consumption of electricity, steam, glue, and water, it meets our demands.”

Right people in the right places

In November 2016, Luso Finsa ordered an EVO 56 Defibrator system from Valmet; it would be up and running only seven months later, in June 2017.

“A normal delivery time for this type of order is ten to eleven months, so the schedule was very tight,” says **Jan Laredius**, Senior Project Manager at Valmet. “We quickly concluded that it would be critical to communicate closely with Luso Finsa and put together a team with the right people in the right places. In addition to assigning people

“This project has even made it possible for us to exceed our customers’ quality requirements.”

◀ “Valmet did an excellent job of keeping to deadlines. They delivered flawless equipment, and their technical staff provided good support during the implementation and start-up phases,” says Tiago Almeida, Mill Manager at Luso Finsa.

with the right expertise, we found people who spoke Spanish or Portuguese.”

Effective online meetings

Valmet and Luso Finsa held weekly online meetings to ensure everyone participating in the project had the latest information.

“We discussed everything from the technical details to coordinated transportation. A lot of questions and ideas come up during a project, and this was an effective way to discuss them,” says Tiago Almeida. The fact that Valmet had Spanish-speaking and Portuguese-speaking personnel made this easier.

“It is one of the reasons that the project was such a success. We understood each other better in a linguistic sense, and this contributed to increased participation in meetings,” says Almeida.

Quality exceeded expectations

“The entire project proceeded according to schedule, and the Defibrator system was delivered on June 6. The first Superpan boards were produced with the new Defibrator on June 30.

“The quality was good from the very first boards, and this project has even made it possible for us to exceed our customers’ quality requirements,” says Almeida, who had never before been part of a project of this type that was implemented so quickly.

↓ Luso Finsa operates in the wood processing sector in Europe.



↑ “The EVO system has many benefits, as it has the lowest electrical, steam, resin, and water consumption for any given fiber quality on the market,” tell Jan Laredius and Markus Ajax from Valmet.

“We were able to make the tight schedule work because we had such a committed and expert team from Valmet and us at Luso Finsa. A contributing factor to the project’s success was that we analyzed all of the information in detail and were able to reduce the number of unexpected production stops. Valmet also provided support in the implementation, and our operators received good training.” ■

CONTACT PERSON
Jan Laredius
 Senior Project Manager
 +46 70 245 56 02
jan.laredius@valmet.com



Sappi Kirkniemi mill:

Tapping into a new fuel opportunity

A side stream from oil refineries – asphaltene – is now a cost-effective fuel at the power plant at the Sappi Kirkniemi mill in Finland. The high fuel flexibility of Valmet's CFB boiler plays a key role in this outstanding example of circular economy.

TEXT Marjaana Lehtinen

nity

Most people have probably never heard of asphaltene, a side stream of the oil refining process classified as a fossil fuel. The liquid stream can be treated to become a solid form and ground into different-sized fractions to be used in energy production.

“We were approached by Neste’s oil refinery plant in Porvoo and asked whether we would be interested in a

new fuel that might bring cost savings. The refinery has new processes in which it produces diesel fuel that is cleaner than ever, and asphaltene is a totally new reject from them. And yes, we were interested – as we always are – in finding new ways to improve cost efficiency,” says **Kalevi Merinen**, Power Plant Manager at the Sappi Kirkniemi mill.

Prior to this contact, Neste and Valmet had carried out combustion trials with asphaltene at Valmet’s R&D

“Valmet’s SNCR system performs well and has sufficient capacity so that we are able to control our emissions and stay well under the strict emission limits.”

Center in Tampere for Neste’s new Kilpilahti combined heat and power plant.

Multi-fuel boiler plays a key role

In 2014–2015, Valmet delivered a CYMIC boiler featuring circulating fluidized bed (CFB) technology to the Kirkniemi power plant. This multi-fuel boiler can flexibly use solid fuels such as bark from the mill’s debarking process, other wood-based fuels and coal. The delivery also included Valmet’s solution for dry flue gas cleaning, the GASCON baghouse filter.

“After Neste contacted us, we wanted to verify the usability of the fuel. We commissioned Valmet’s R&D department to investigate how high the proportion of asphaltene would be in our fuel mix,” Merinen recalls. Valmet’s study showed that it could be as high as 30 percent. “These results convinced us, and we continued our discussions with Neste. We also got the green light from our management for the investment that was needed to enable the combustion of asphaltene,” he continues.

The investment covered a new opening in the boiler and new conveyors. Valmet was awarded the contract to add the opening with its air and water cooling, as well as commissioning and supervision. “The fuel is so exotic that we wanted to ensure safe commissioning with Valmet’s professionals,” Merinen adds.

No fouling at all

The new fuel was taken into use at the plant in November 2017. It has partly replaced the use of pulverized coal and currently accounts for the maximum allowed share – 30 percent – in the fuel mix. The rest continues to be made up of coal.

Recently, Finland’s Minister of the Environment proposed that Finland should move its ban on burning coal for power from 2030, as agreed, to an earlier date of 2025. “If and when this happens, we will be able to use purely biofuels in our boiler. Asphaltene can be combusted with them, too,” Merinen points out.



→ “Asphaltene seems to suit the boiler perfectly. It burns very well. There is no fouling, although you would actually expect it, as the fuel is sticky and oil-based,” says Kalevi Merinen, Power Plant Manager at the Sappi Kirkniemi mill.

To date, the plant's experience with this new fuel opportunity has been very positive.

"Asphaltene seems to suit the boiler perfectly. It burns very well. There is no fouling, although you would actually expect it, as the fuel is sticky and oil-based. After running the boiler with the new fuel for a month, we checked the insides during our Christmas shutdown and found it to be perfectly clean. There were no visible signs of it having combusted asphaltene," Merinen says.

Emissions well under control

What about emissions, since asphaltene contains significantly more sulfur than coal? According to Merinen, NO_x levels have risen somewhat, resulting in an increased need for chemicals. "Valmet's Selective Non-Catalytic Reduction (SNCR) system performs well and has sufficient capacity for us to control our emissions and stay well under the strict emission limits."

The plant has calculated the return on its investment to be relatively short. "The investment and the combustion of asphaltene have been an economically rational decision. We wanted to increase the plant's cost efficiency, and this solution helps us achieve it," Merinen emphasizes.

In the future, Sappi Kirkniemi plans to keep the proportion of asphaltene at 30 percent of its energy production. ■

↓ Valmet has delivered a CYMIC boiler featuring circulating fluidized bed (CFB) technology to the Kirkniemi power plant. This multi-fuel boiler can flexibly use solid fuels. The delivery also included Valmet's solution for dry flue gas cleaning, the GASCON baghouse filter.

CONTACT PEOPLE

Ari Kokko
Director, Technology and R&D
+358 40 573 9114
ari.kokko@valmet.com

Asko Rantee
Manager, Product Management
+358 40 545 4589
asko.rantee@valmet.com



High degree of automation ensures usability



Reijo Simonen from Valmet, Harri Multanen from Outotec, and Mikko Savolainen from Yara worked closely together throughout the paste plant project.

Yara's Siilinjärvi mine invested in a paste plant for treating its tailings. The paste plant's process is controlled using a Valmet DNA automation system.

TEXT AND PHOTOS Soili Städter

Yara's mine in Siilinjärvi, Finland, produces approximately one million tonnes of apatite a year for manufacturing phosphoric acid and fertilizer. This creates ten million tonnes of tailings, a mixture of sand and water, which need to be handled as part of the production process. Before, the tailings were disposed of in a tailings storage facility as conventional tailings slurry. Thanks to the new paste plant, the solid content of the tailings can be increased from 45 percent to 70 percent, making it possible to deposit it as paste and extending the lifetime of the tailings storage facility. The water

separated from the sand is returned to the process in the concentrating plant.

The paste plant, which has been in use for a year now, is unique in Europe in terms of size. Outotec was responsible for the overall delivery of the paste plant, and Valmet delivered the process automation system.

“We had strict demands for the equipment. We wanted an automation system that is as compatible as possible with the concentrating plant in terms of functionality. The concentrating plant has been using Valmet automation, which made Valmet DNA a natural choice. In the future, we want to achieve an unmanned plant, which requires a great deal of automation,” says **Mikko Savolainen**, Automation Specialist at Yara.

Usability with Valmet DNA

Valmet DNA automation system enables the desired high degree of automation in the paste plant. To ensure usability, the process, alarm and operating stations as

With the Valmet DNA automation system, the desired high degree of automation is achieved in the paste plant.

well as networks have redundant backups: if one station stops working, another station replaces it. It is important to prevent power cuts, because the tailings slurry must be constantly moving.

The slurry is pumped by three massive PD piston pumps, each equipped with a 2.3 MW main motor. “Piston pumps are essential, because they keep the slurry moving. We wanted to integrate the pumps with the automation system, which meant replacing the pump supplier’s own logic with Valmet DNA. In the future, this will benefit maintenance and operators,” explains Savolainen.

Condition monitoring anticipates any faults

Condition monitoring is integrated into the automation system using the Valmet DNA Machine Monitoring (DMM) solution. “The goal of condition monitoring is to monitor the operation and condition of the process machinery, devices and field instrumentation, as well as locate any faults in time to fix them in a controlled manner during scheduled downtime. This helps us optimize the life cycle of the equipment,” says Savolainen.

Also, the condition of the oil in gearboxes and hydraulics is monitored. The equipment is used to comprehensively measure the characteristics of the oil, which enables early intervention if there are any problems.

A Wi-Fi connection and a wireless operating station enable remote connections from the field. “A comprehensive Wi-Fi network enables operating in the paste plant, and the operator is not tied to the control room,” Savolainen explains. Maintenance and tuning operations utilize remote options the most.

“Piston pumps pumping slurry, in particular, are suited for operating from the field,” **Eemeli Ruhanen**, Process Expert at Yara, chimes in.

Seamless factory testing together, quick start-up

Before start-up, Yara, Outotec and Valmet conducted factory testing together. Maintenance personnel from Yara participated in the testing, which enabled them to see the system in advance and get to know the new process. Water testing was conducted in the plant prior to start-up.

“I have never seen such quick commissioning in my life. All the participants were very motivated and really involved in the process. The plant was commissioned to full capacity after water testing in practically four days. Automation caused exactly zero problems for us,” states **Harri Multanen**, Project Engineer at Outotec.

Yara and Valmet are continuing to cooperate through a maintenance contract. “Maintenance takes place both on site and remotely. We are drafting a roadmap in cooperation with local maintenance staff to help us in planning investments. The concentrating plant and the paste plant have annual maintenance shutdowns, which means that work must be carefully planned in advance,” says Savolainen. ■

CONTACT PERSON

Reijo Simonen
Senior Project Manager
+358 10 676 1587
reijo.simonen@valmet.com



A Wi-Fi connection and a wireless operating station enable remote connections from the field.

21 and counting

Framework for success with CNIM

Constructions Industrielles de la Méditerranée (CNIM), a French leading builder of turnkey biomass and waste-to-energy plants in Europe, has chosen Valmet as a partner for delivering automation systems to waste-to-energy plant projects through 2018.

TEXT Lisa Kettman-Kervinen

Turin waste-to-energy plant in Italy. CNIM together with Valmet carried it out in 2011.

Over the years, CNIM has been very successful in the waste-to-energy and biomass-to-energy market in Europe. To date, 21 of these plants have been built in partnership with Valmet, and 100 percent of the new build projects since 2010 have been carried out together.

Gilles Cappadoro, Manager of CNIM Process and System, first contacted Valmet in 1997. "From 1997 to 1999, Valmet supplied the DCS hardware and applications for two waste-to-energy plants built and operated by CNIM in the UK and one in Italy." Again in 2002 and 2007, CNIM turned to Valmet for new waste-to-energy plants in Italy. At that time, CNIM began to develop the entire plant application internally.

Making collaboration count

"With the Energonut waste-to-energy plant in Italy in 2002, our partnership really started to solidify. The French Valmet team assisted and trained us with a very high level of cooperation, and Valmet's technical support has turned these projects into a success."

"Over the years, we worked with Valmet's technical and commercial teams to optimize the DCS structure and procedure," says Cappadoro. "To cooperate constructively, we needed to find an efficient way to do business together. Valmet teams are extremely adaptable, and its DCS product is very stable. Now that we know each other, trust is well established."

CNIM's **Jean-Pierre Robin**, head of DCS engineering and design, has been in charge of all projects since 2013: "Valmet has a valuable ability to listen and respond to specific requests. I appreciate the scalability and modularity of the solutions. Valmet has a powerful ability to stick to the notion of 'remote and distributed.'"

Expanding into new territory

In 2017, CNIM remained one of the most successful EPCs in Europe, winning contracts and taking strong

positions in Eastern Europe, the Middle East and Africa. Anticipating an increasing workload, CNIM selected some partners with which to sign agreements to be more efficient during the procurement phase.

Jean-Francois Ache, Head of Environment Purchasing at CNIM, describes the decision: "The DCS fulfills the criteria for critical plant equipment – requiring efficient collaboration from both parties and high-level interface with other equipment."

He goes on to explain how he evaluates potential suppliers. "For a key package like the DCS, it's all about performance: bid performance, realization stage performance, equipment reliability and after-sales service performance."

"Valmet addresses urgent issues in 'fast-track mode', understanding our evolving needs, proposing innovations for mutual benefit and making decisions with us beyond the current project," Ache says. "We signed the agreement with Valmet because of the performance of our long-lasting close business relationship. We took time to formalize it, enabling both parties to anticipate the challenges of executing projects beyond Europe."

11 years of cooperation

"We are now celebrating our 11th year of cooperation. CNIM requires a high level of partnership in the extremely competitive EPC market," says **Etienne Guyon** of Valmet France. "Valmet provides its state-of-the-art DCS technology. CNIM handles DCS project coordination, application and commissioning, while we handle hardware, system engineering and technical support for project execution. Syncing these roles requires a high degree of trust, teamwork and flexibility."

"Because a 'Shared Journey Forward' is Valmet's services approach, we have been working together to develop and create innovative solutions for our customers who operate power plants in challenging environments," adds **Hédi Azzouz**, Country Manager at Valmet. ■

CONTACT PERSON

Etienne Guyon
Sales Manager
+33 688 0649 05
etienne.guyon@valmet.com



Jean-Francois Ache,
Head of Environment
Purchasing at CNIM



Jean-Pierre Robin,
Head of CNIM's DCS
engineering and design



Gilles Cappadoro,
Manager of Process and
System at CNIM



Hédi Azzouz, Country
Manager France, Valmet



Etienne Guyon, Sales
Manager, Valmet

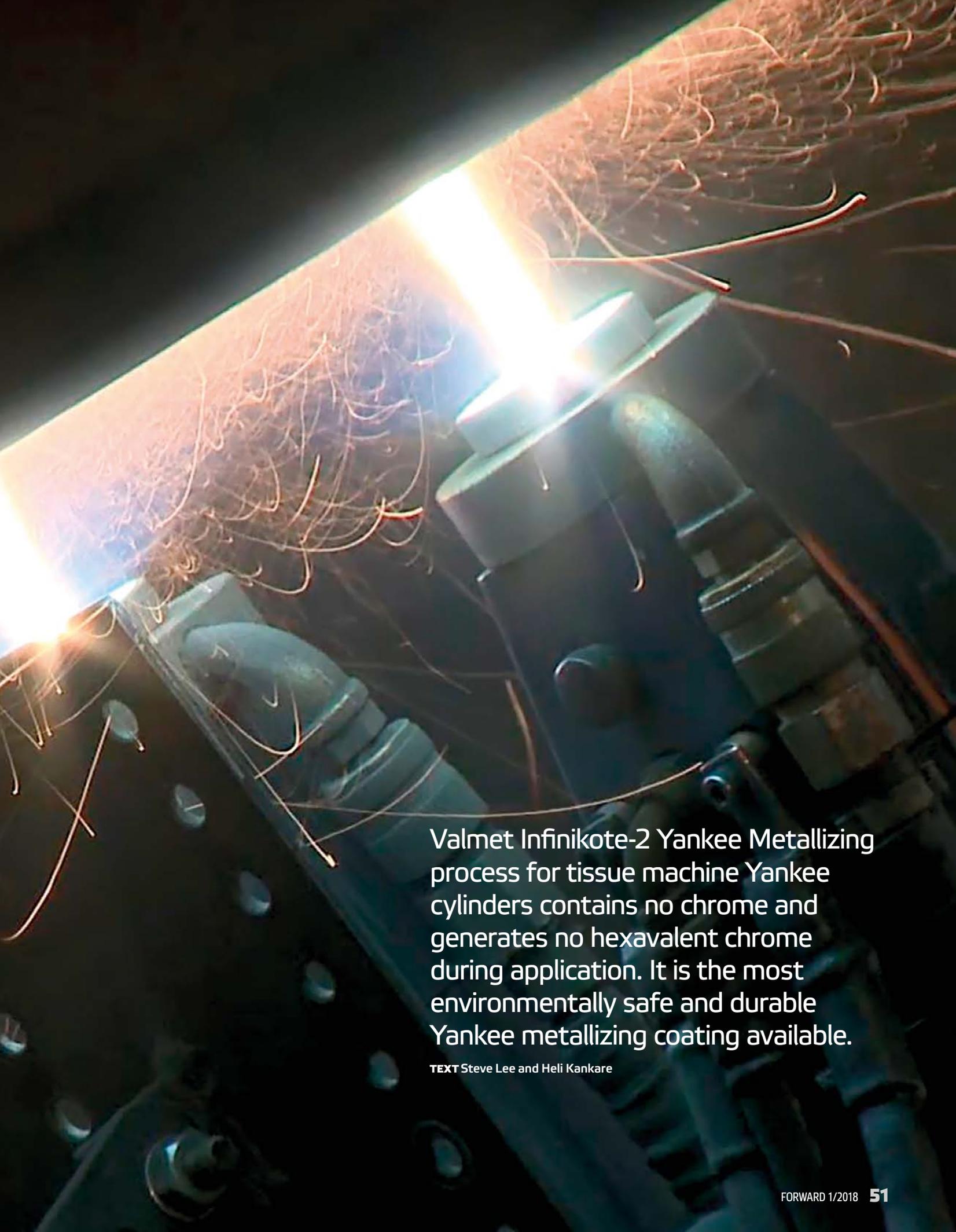


INNOVATOR'S VOICE

Get inspired

Beating chrome

in Yankee metallizing



Valmet Infinikote-2 Yankee Metallizing process for tissue machine Yankee cylinders contains no chrome and generates no hexavalent chrome during application. It is the most environmentally safe and durable Yankee metallizing coating available.

TEXT Steve Lee and Heli Kankare

Damaged Yankee cylinders in tissue machines impede production output and can have a detrimental impact on tissue quality. Cylinders with damaged surfaces are often metallized, particularly if the remaining cylinder shell is not thick enough or if further grinding may affect production capabilities. A recognized risk of metallizing is that during the process, potentially harmful hexavalent chromium is created. Chromium is a fundamental component of almost every iron-based hard-facing alloy.

Having recognized the potential risks associated with the thermal spraying of ferrous materials, Valmet embarked on a program to develop new alloys to beat chrome in Yankee metallizing. The new Valmet Infinikote-2 Yankee Metallizing process contains no chrome and generates no hexavalent chrome during application. It is the most environmentally safe and durable Yankee metallizing coating available.

For the safety of people and the environment

Yankee metallizing is on-site field services work on the customer's premises. "We identified the need to change the system to better ensure safety for customers and our employees, and to anticipate future environmental legislation. This led to the decision to invest in the development of new, safer materials for Yankee thermal spray coatings," says **Marko Heino**, Director of Field Services at Valmet.

A collaborative development team from Valmet's hard-coatings research and development group in Jyväskylä, Finland joined with Valmet's partners to create an outstanding team of world-class material scientists, metallurgists and manufacturing supply-chain partners.

"We wanted to invest in the development of new, safer materials for Yankee thermal spray coatings for the safety of people and the environment."

New metallizing material produces less dust and fumes and no hexavalent chromium.

Valmet Infinikote Yankee Metallizing

has been the market-leading Yankee cylinder thermal spray coating system for over 20 years. Its strengths are hardness, durability and heat transfer. Valmet Infinikote Yankee Metallizing is not just a "coating," but a unique patented material and application process. It provides superior tissue creping surfaces, and maintains the Yankee cylinder profile for longer, without the need for regular maintenance.

The same performance, but without chrome

The plan was to create a new generation of Yankee cylinder metallizing alloys, which must display quality attributes at least as good as those for our current Yankee metallizing process, but should contain no chromium-bearing constituents. Valmet Infinikote-2 Yankee Metallizing should equal or surpass the competition in all measured criteria for Yankee thermal spray coating performance.

The main goals were stable creping surfaces while still addressing environmental and safety concerns, with the same application process and a wider application window.

Key structural and surface characteristics for optimal Yankee performance were painstakingly reevaluated to ensure fundamental improvements in all crucial areas: wear and corrosion resistance, heat transfer, and surface tension.



“Groundbreaking collaborative development procedures enabled us to quickly design new alloy materials, optimize microstructures, and achieve our target performance metrics,” says **Andrew Cross**, Senior Operations Manager at Valmet’s Global Yankee Services.

Intensive development and exhaustive trials led to the identification of candidate materials best suited to the objectives. From these, the final formulation for the new chrome-free thermal spray material was created. “The test results with the new material are convincing, demonstrating significantly improved application characteristics, and meeting or exceeding all our key objectives,” says Cross. ■

CONTACT PEOPLE

Andrew Cross
Senior Operations Manager
+44 7921 049069
andrew.cross@valmet.com

Tommy Kallerdahl
Operations Manager
+44 1254 819053
tommy.kallerdahl@valmet.com

Peter Fournier
Senior Product Manager (North America)
+1 770 366 9696
peter.fournier@valmet.com

Results:

- 100% chrome free
- Dramatic reduction in dust production and fumes
- Lower coating contamination
- Superior coating structure
- Greater adhesive and cohesive strength
- Improved hardness

Valmet Field Services are services performed at customers’ sites. Yankee thermal spraying is an example of delivering field services, where safety, communication, and trust are the top priorities. Trust is earned every day, in every delivery, with continuous, solid performance.

Valmet investing in the future

Valmet is upgrading its pilot machines for making board, paper and tissue to support customers in moving their performance forward.

TEXT Katarina Åhsberg and Marika Mattila

Valmet's Technology Centers with pilot machines for board, paper and tissue are world-leading resources for cultivating and realizing new ideas and developing new technologies and solutions. But they are also useful for improving existing solutions and joint development together with customers, suppliers and other stakeholders.

To support Valmet's long-term plan to develop solutions that will take the industry to the next level, Valmet is investing in upgrades of its pilot machines for board and paper in Jyväskylä, Finland and for tissue in Karlstad, Sweden.

Towards more flexibility

The target of the upgrades is to add even more flexibility to the pilot machines, to give customers a wider variety of technical combinations and configurations to support the demands of papermaking today and tomorrow. They will also provide new ways to utilize the Industrial Internet and advanced automation solutions to bring new insights about production of paper, board and tissue, as well as to give more detailed analysis, and to improve training and process simulations.

Innovate, realize and optimize tissue production with technologies for all grades

Valmet Technology Centers are based on proven technologies supported by deep knowledge and long experience in the industry. Most commonly, in the customers' pilot trials proven technologies are applied in new ways or tested with new features. The tissue technology center in Karlstad recently celebrated its 1,000th pilot trial together with customers, which corresponds to more than 3,000 trial days.

With access to the best available technologies, efficient operating practices and highly skilled people, the technology center in Karlstad provides a creative environment for developing and testing new products, and improving product quality and machine performance. Over the years, a great number of the world's leading producers have optimized and verified their production processes there. The upgrade of the tissue pilot machine will offer tissue-makers even more possibilities to test and learn about the leading technologies.



"There will be several exciting innovations that our upgraded pilot machine will allow our customers to test at pilot scale," says Mikko Osara.

Testing and piloting environment for paper and board making

The Valmet Paper Technology Center in Jyväskylä, Finland, provides the most diverse range of testing and piloting services for board- and papermakers. The upgrade is aiming to increase the flexibility of the testing processes even more.

"With this investment, we will have a renewed pilot machine to introduce new solutions, especially for the wet ends of board machines, to meet needs for improved product quality and sustainability. There will be several exciting innovations that this platform will allow our customers to test at pilot scale," says Mikko Osara, Vice President of the Board and Paper Mills business unit at Valmet. ■

CONTACT PERSONS

Karl-Johan Tolfsson
R&D Manager (tissue)
+46 766 39 69 06
karl-johan.tolfsson@valmet.com

Pertti K Heikkilä
Senior Manager
Paper Technology Center
(paper and board)
+358 40 578 3632
pertti.k.heikkila@valmet.com



Quality never goes out of fashion

Valmet Dryer Fabrics are optimized for

durable and reliable performance

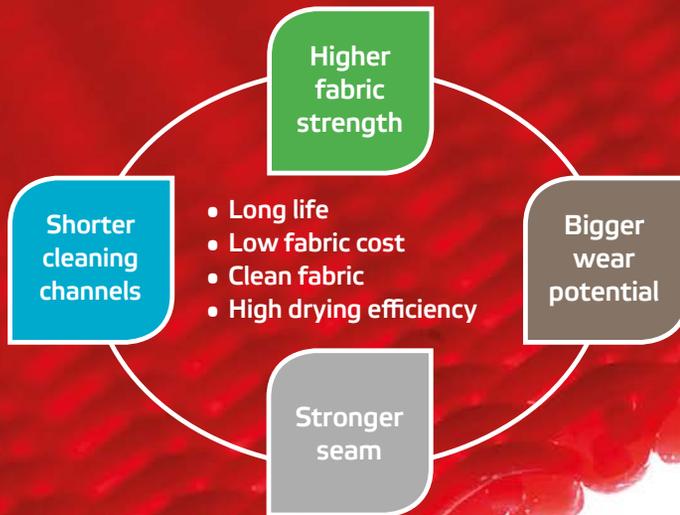
Durable and reliable dryer fabrics make the paper-making process predictable and minimize the need for unplanned fabric changes. Valmet has developed new products to ensure that dryer fabrics remain durable and reliable, even under challenging conditions. Valmet offers optimized, economical solutions that match customers' exact needs.

TEXT Juha Paavolainen and Marianne Valta

"Our customers appreciate easy tail threading, good runnability, long life and low fabric cost – regardless of their machine or the paper grade. The high quality of our dryer fabrics comes from our expertise dating back over half a century, and the millions of square meters of fabrics produced," says **Juha Paavolainen**, Valmet's Product Technology Manager.

The largest product group in Valmet's portfolio of dryer fabrics is the double-warp polyester (PET) fabrics - after the product name renewal called Valmet Dryer Fabric OR, OP and EOS.

Customer benefits of double warp fabric



Optimized materials for different operating conditions

Factors limiting the running time of dryer fabrics include hydrolysis, contamination, wear and damage.

“Our PPS-reinforced dryer fabrics are excellent for hydrolysis-prone positions. However, contamination and mechanical wear are sometimes even more crucial for the dryer fabric’s running time than hydrolysis, and for those challenges, we have developed a totally new material: MHR. It can withstand hydrolysis to a sufficient degree, but it measures notably higher in seam strength and loop elasticity than PPS. The double-warp structure of our dryer fabrics lets us optimize them for different operating conditions, and our professionals ensure that customers get the best product for their needs. Right now, we’re studying even more hydrolysis-resistant yarns to replace expensive PPS material, and it looks very promising,” says Paavolainen.

New products developed for recycled furnish

Using recycled furnish with a high sticky content and consequent use of latest high-pressure cleaners has changed the requirements for dryer fabrics. Going forward, Valmet is developing new materials and products aimed at matching these requirements.

“For example, our new Valmet Dryer Fabric DG has a relatively open sheet side surface to prevent dirt bridging

in between the yarn knuckles, while the machine side is smooth for good sheet runnability. Its unique weave pattern has been designed to improve the high-pressure cleaning effect by arranging weft yarns so that the water jet against the fabrics’ running direction is directed through the fabric. Valmet Dryer Fabric DG shares the double-warp structure and durable warp loop seam of other Valmet dryer fabrics to guarantee long life and low fabric cost,” explains Paavolainen.

The new edge reinforcement solution gives durability under harsh conditions

For a maximum running time and a stable performance of its dryer fabrics, Valmet has developed a new edge reinforcement material: Valmet Edge Seal TR. It has excellent heat, chemical and wear resistance, and its flexibility ensures good performance when the length or tension of the fabric is changed during the run, as well as while the fabric is bending around the rolls.

“Valmet Edge Seal TR consists of specially developed polymers, utilizing extensive laboratory testing to find the optimal properties. The next step, applying the material at the edges, is carried out with our modern equipment, tailor-made tools, and professionals in Finland and in China. We are aiming for nothing less than uniform edge quality with complete adherence and the best performance,” says Paavolainen.

To complement the wide range of dryer fabrics, Valmet offers fabric care and maintenance products and services. With a comprehensive range of on-site services, laboratory analysis for used fabrics, fabric guides, stretchers and HP cleaners, Valmet extends fabric life-times and makes its dryer fabrics a high-quality but also an economical choice. ■

CONTACT PERSON
Juha Paavolainen
 Product Technology Manager,
 Dryer Fabrics
 +358 40 559 3177
juha.paavolainen@valmet.com

Recharge

for moving energy
producers' performance
forward

Today's energy producers are facing many challenges: aging production facilities, cost pressures, challenging fuels, new emission regulations, and the rise of renewable energy sources. A recharge with Valmet can be an answer to these challenges.

TEXT Kristofer Sjöblom

"Recharge means finding improvements and new opportunities for our energy customers," says **Owe Asp**, Vice President of the Energy and Environmental Services business unit.

Valmet assists energy producers in recharging their heat and power plants, gasifiers, flue gas cleaning equipment, and other combustion and pressure part equipment. This includes field services covering everything from fast, on-call troubleshooting to planned, practical and strategic undertakings carried out on a continuous basis.

"We can also take full responsibility for shutdowns, and with new technology, we can recharge the capacity of our customers' assets. In addition, recharging the personnel with theoretical and practical training is an option," explains Asp.

A recharge moves performance forward

"Through real partnership and advanced products and services, a recharge can take energy plants' reliability and performance to the next level," tells Asp. "We have been in this business since 1841, and every year, we recharge approximately 200 power boilers around the globe. Based on our long experience and profound know-how, we can

help to improve our customers' everyday performance, and their profitability and sustainability in the long run."

Ensured availability, higher production, higher safety standards, fuel flexibility, reduced operating and maintenance costs, and reduced environmental impact are among the benefits that energy plants have achieved with a recharge.

"We have a global network of service professionals, who are always close by and ready to serve. Real trust is earned on site, every day, and therefore, we make sure to always go that extra mile and stay with the customer until everything works as expected," says Asp.

New names for Valmet's services

Valmet continuously recharges its own products and services to supply its customers with the best available solutions. Therefore, Valmet has renewed the names of its services. More descriptive names help in creating a fluent dialogue between customers and Valmet on a shared journey forward. ■

CONTACT PERSON

Owe Asp
Vice President, Energy and Environmental Services business unit
+46 31 50 13 34
owe.asp@valmet.com

Valmet's services offering for energy producers

Reliability Services	Performance Services	New Technology
Valmet Field Services	Valmet Performance Agreement	Valmet CFB Boiler Upgrades
Valmet Shutdown Services	Valmet Fuel & Combustion Management	Valmet Waste Boiler Services
Valmet Air Emission Control Services	Valmet Performance Center	Valmet BFB Boiler Upgrades
Valmet Maintenance Agreement		Industrial Internet Solutions
Valmet Inspection Services		
Valmet Burner Services		
Support Products		
Spare Parts		
Valmet Availability Management		
Valmet Learning Services		

Recharge means finding improvement and new opportunities for energy producers to move forward with good energy.

New ultrafiltration technology saves fresh water at tissue mills

Water is a scarce natural resource, and its consumption is something that needs to be considered in all industries today. Valmet's new ultrafiltration technology is a unique solution for decreasing tissue mills' fresh water consumption.

TEXT Marianne Valta

Valmet's ultrafiltration technology uses the tissue machine's process water to produce ultrapure water: permeate. The permeate is used for the wire and press sections' high-pressure showers instead of fresh water. The permeate is free from solid substances, turbidity and bacteria, and therefore helps to maintain the performance and efficiency of the tissue machine.

The first prototype Valmet Ultrafiltration Tissue will be finalized and transferred to Essity's tissue mill for test use during spring 2018.

Savings in water and energy

Ultrafiltration technology is already being used at mills producing, for example, printing or packaging grades. For tissue mills, Valmet's new cross-rotational ultrafiltration process is unique.

"Using permeate instead of fresh water decreases the overall water consumption in the tissue-making process and creates savings in the energy used for heating the fresh water. A modern tissue machine consumes 5–15 m³ of water per tonne of paper, but our solution decreases

the consumption by 1–2 m³," explains **Pasi Nurminen**, Technical Product Manager at Valmet.

New technology developed to improve sustainability

Valmet has developed the ultrafiltration technology for tissue mills under the EU-funded project SpotView. Other members of the Finnish consortium are VTT Technical Research Centre of Finland, XerChem and the hygiene and health company Essity (formerly SCA).

Valmet's ultrafiltration technology and its possibilities for purifying water in the tissue process have been verified at VTT's laboratories.

"Water is a scarce natural resource and its consumption is something that needs to be carefully considered in all industries today. In Europe, the P&P industries are strongly reducing their intake of fresh water. Modern tissue machines have various possibilities for saving water, and Valmet's technology provides a unique solution to further decrease their fresh water consumption," says **Antti Grönroos**, Senior Scientist from VTT.





Innovating through networking

Through research and technology development work, Valmet aims to ensure that it has an advanced and competitive range of technologies and services for customers; to enhance raw material, water and energy efficiency; and to promote the use of renewable raw materials.

“I see that being part of different networks is a must for our R&D activities. Our goal is to build a value chain by combining expertise from research institutes and our customers’ needs with our own technological expertise to develop successful innovations. Co-operation is also beneficial from the financial point of view. In the SpotView project, we have developed a solution that will decrease the use of water in the tissue-making process, and I’m looking forward to seeing how our customers will benefit from the technology,” says

Ari Saario, Head of Research and Development at Valmet. ■

CONTACT PERSON

Pasi Nurminen
 Technical Product Manager
 +358 40 510 7255
 pasi.nurminen@valmet.com

SpotView in brief:

- Intended to develop innovative and sustainable processes and technology components to optimize the use of natural resources, especially water, in selected industrial sectors
- Coordinated by Centre Technique du Papier CTP in France
- Funding from the European Union’s Horizon 2020 research and innovation program under the grant agreement No 723577

More information: www.spotview.eu

Revolution

in managing LNG supply chain

As liquefied natural gas (LNG) is becoming more important as an energy source, managing its supply chain becomes more and more important. Valmet DNA Integrated Operations revolutionizes the effective planning of LNG logistics based on data using a single system. **TEXT** Soili Städter

The world is looking for alternatives to oil as an energy source, natural gas being one of the options. LNG is natural gas that has been converted to liquid form to make storing and transporting it easier and safer. To minimize supply disruptions in Europe and to manage the increasing demand for LNG, the European Commission has published a Sustainable Energy Security package. One of its targets is to encourage supply and infrastructure development while reducing greenhouse gas emissions.

The supply chain of LNG involves production plants, terminals, liquefaction plants, and logistics operators. To ensure a smoothly working supply chain and to offer real-time data for everyone involved, when and where they need it, has been a challenge. Valmet DNA Integrated Operations solves these problems by combining all the necessary information into a single, intuitive user interface.

A single system for managing data saves time and money

Traditionally, natural gas has been transferred from production to end-users with pipelines. Today, vessels

are more often used for overseas transport. The supply chain includes liquefaction plants, transportation companies and storage houses. Comprehensive software is needed to monitor and master all the information between the parties.

Typically, companies use several IT and automation systems for each function. The pieces of information are then moved manually to one system – and further to another system. The process can seem endless – and frustrating as well.

Valmet DNA Integrated Operations was developed to solve these challenges. It helps users to manage data, optimize sourcing and plan logistics efficiently, saving time and money.

“With the help of real-time measurement data and online connections, we are able to gather all data in one place. The whole process becomes much more accurate and efficient because communica-





“Real-time measurement data and online connections allow us to gather all the data in one place.”

↑ Valmet DNA Integrated Operations combines all the necessary information in a single, intuitive user interface.

← “The entire LNG logistics process becomes much more accurate and efficient because communication via Valmet DNA Integrated Operations happens simultaneously between different parties,” explains Jani Hautaluoma.

tion happens simultaneously between different parties,” explains **Jani Hautaluoma**, Director of Process Automation at Valmet.

Better planning made possible

Based on the integrated information, it is possible to revolutionize energy transport. LNG producers can oversee sales according to demand or the price index. The number of vessels and trucks is defined to meet delivery demand. The buyer can schedule investments at the ideal time.

Logistics control means real-time delivery tracking. Jani Hautaluoma explains: “The truck driver’s mobile phone, for instance, is integrated into our system. The driver can check where and when the deliveries are needed, how much gas has to be delivered to each location, and much more.”

Every container can be followed with GPS tracking using a mobile tracking service. All relevant container information is saved in Valmet’s system, including the volume of the container, pressure class and recommended service intervals.

Valmet’s software is able to bundle all the data and share it selectively with the right people. Correct and timely information means controlled risk management.

Part of Valmet’s Industrial Internet offering

In the first phase, Valmet built the software solution for small-scale LNG infrastructure, which is operationally quite challenging. DNA Integrated Operations is one of Valmet’s Industrial Internet solutions for handling big data in order to analyze, prioritize and utilize it.

“Behind this innovation, there is extensive expertise in process automation, the process itself and the whole industry,” says Hautaluoma.

The first deliveries are underway already. Valmet will supply DNA Integrated Operations, for example, for Gasum’s LNG operations in the Nordic countries. All measurement data connected to the LNG terminal operations of Gasum’s subsidiary Skangas can be collected and controlled centrally.

“The successful basic engineering phase convinced us of Valmet’s ability to fulfill our needs for collecting data centrally for our other supporting systems, like the energy management and ERP systems,” says Pertti Norjos, Chief Information Officer at Gasum Group. ■

CONTACT PERSON
Jani Hautaluoma
 Director, Process Automation
 +358 40 4860307
 jani.hautaluoma@valmet.com

THE STORY
OF
ISSUE

The ever evolving necessity

Toilet and facial tissue are things that most of us take for granted, but you may be surprised to learn they are actually relatively new inventions. While tissue paper itself dates back less than a century, there is a much longer record of humans relying on paper for personal cleansing. **TEXT Aaron Kahn**

It perhaps comes as little surprise that the Chinese, credited with first developing the pulp papermaking process more than 2,000 years ago, are also believed to be the first to use paper for personal cleansing. The first recorded use of toilet paper dates back to sixth-century China. During the Tang Dynasty, three hundred years later, an Arab traveler in the region commented that the Chinese “do not wash themselves with water when they have done their necessities; they only wipe themselves with paper.”

Still, it would take several centuries before the world saw anything resembling toilet paper as we know it today. For many years, people turned to other paper instead. Following the rise of printing, for example, many people relied on repurposed newspapers and books.

The introduction of toilet paper as a commercial product occurred in 1857, when American inventor Joseph Gayetty began selling packets of paper in individual sheets, marketed as “Gayetty’s Medicated Paper.” Others eventually began producing this variety of brown, rough and thin paper in countries around the world. In fact, many of us may have personal memories of this toilet paper, which could still be found in certain parts of Europe as late as the 1970s.

Folds that changed everything

The first tissue products as we’d recognize them today were invented and produced by the American paper manufacturer Kimberly-Clark, which developed cellulose as a replacement for cotton in sanitary products during World War I. Their major innovation was the creping process, in which paper was “micro-folded” in the course of production. This breaks down the rigidity

of the paper and increases the volume, making it both softer and more absorbent than Gayetty’s paper of 60 years earlier.

In 1920, Kimberly-Clark released the world’s first commercially available tissue product, the sanitary pad Kotex. It was made possible thanks to the new creping process and the work of two men at the company: Frank Sensenbrenner and a young Austrian immigrant named Ernst Mahler. By layering several sheets of tissue, they developed a soft pillow with much greater absorbency than the traditional cotton wool. Four years later, Kimberly-Clark followed the success of Kotex with the disposable handkerchief Kleenex, which remains the market-leader in facial tissues today.

Customer experience drives development

In the years following the advent of the creping process, tissue products quickly became popular with consumers, leading many manufacturers to take notice. From the United States, tissue production expanded to Europe in the first half of the twentieth century, and ultimately to every other part of the globe as well.

Tissue production continually evolved throughout this period to keep up with increased market demand and to provide an improved customer experience. As today, manufacturers worked to meet shifting consumer tastes, and tissue industry trends came and went along with other consumer fads. One memorable example was the pastel-colored toilet rolls designed to match bathroom interiors that gained popularity in the 1960s.

However, a constant in development has been the search for production methods that deliver paper that is both strong and soft. For toilet as well as facial tissue, strength and absorbability is essential to ensuring the paper can do the intended job while keeping hands clean and dry. At the same time, it also needs to avoid causing discomfort in delicate areas of the body.

Valmet’s role in tissue history

Valmet began producing its first paper machines in the years after the World War II, but it was not until the late 1960s that the company made its first major mark in the history of tissue production. This came with the introduction of new forming technology – a major breakthrough in the preparation of base paper for tissue products.

In the decades since, Valmet has repeatedly been responsible for production innovations that have led to higher standards for both product quality and manufacturing efficiency. Today, the challenges in the tissue industry are greater than ever, with growing demand in maturing markets and the need for more sustainable production globally. Thanks to close cooperation with tissue-makers around the world and advanced development with pilot machines, Valmet continues to lead the way, producing new, flexible solutions for stronger and softer tissue with even greater resource efficiency. ■



EXPERT'S VOICE

Food for thought



Jon Williams, Partner,
Sustainability & Climate
Change at PwC UK

A new era in electricity – pathway to decarbonization

Societies are becoming increasingly electrified, as economies are moving away from petrol and diesel due to decarbonization. How are businesses chipping in and doing their bit in the fight against climate change? TEXT Vesa Puoskari

“**T**here are still companies that see fighting climate change as a downside. In my opinion, for businesses there are many more opportunities than risks.

We have to transition our economies to a low-carbon model, which will generate new markets, technologies and customers,” explains **Jon Williams**, Partner in Sustainability & Climate Change from the UK business consultancy PwC.

Williams says that enterprises operating in high-carbon sectors like coal, oil and gas, heavy manufacturing, steel and chemicals are under the greatest threat of losing assets. “As those sectors will face significant constraints on their ability to emit carbon in the future, there is a risk that their assets will become less valuable than they are today.”

Meanwhile, there are plenty of opportunities for new technologies and business models.

“New regulations will drive growth in renewables, low-carbon transport, energy efficiency and all the technologies that go with them. Companies that adapt to these trends by looking for new opportunities and diversify their business into energy efficiency, technology and renewable generation will manage the transition more smoothly and stay on the track of economic growth. If you remain heavily invested in fossil fuels, chances are you will underperform,” Williams predicts.

He adds that the role of the forest industry is absolutely key to tackling climate change through sustainable forestry management, innovation and using manufacturing side streams in energy production. “I see sustainable and profitable forestry as entirely compatible with the battle against climate change.”

Several forest industry companies are developing innovative products made from forest fibres, and many new bio-products, such as biofuels, biochemicals and biocomposites, are now being made from side streams that decrease the need for non-renewable materials.

For example, Valmet has developed LignoBoost technology that makes it possible to extract lignin from pulping process side stream. Lignin can be used as raw material for bio-based materials and chemicals. There are also technologies for bioethanol, biocoal and bio-oil production help to replace non-renewable fuels and materials.

Updating business plans

In business, it is crucial to minimize risks and maximize opportunities. A wide range of stakeholders, and particularly investors, are putting pressure on companies to recognize the impact of climate change in their strategy, businesses and financial plans.

Williams highlights the role of boards of directors and top management in steering companies through the transition.

“If climate change is seen as a priority for the business through risks or opportunities identified, then the board and management should ensure that there is stronger governance around these issues. I think that in five years, if there is a company with a board that is unable to articulate the impact of climate change on the business, I would expect investors to vote against them.”

The Task Force on Climate-related Financial Disclosures (TCFD) asks companies to disclose how they are adapting to the impacts of climate change and new regulations.

“I think that you will see a dramatic increase on pressure that investors are putting on the companies particularly in Europe and in the US. TCFD provided a framework for companies to disclose to stakeholders and particularly to their investors and lenders what kind of impact of climate related changes will bring and in what extend they will generate or reduce costs and revenues.”

“Currently, 150 financial institutions have signed up to the TCFD, with assets of USD 82 trillion – a significant amount of capital asking for companies to disclose,” he says.

Progress in decarbonization

The Paris Agreement on mitigating climate change came into force in November 2016. Currently, 174 of the 197 countries who signed the agreement have ratified it. The aim is to limit global warming to well below 2 °C.

“The aim of the Paris Agreement is to avoid the physical impact of climate change through stricter regulations

to significantly reduce emissions of carbon dioxide. To do that, we need plans both at national and global levels. The most helpful part is the regular consolidation of the actual progress of targets set for every five years.”

“The good news is that in the last 2–3 years, we have been decarbonizing at a rate of around 2.8 percent, so we are pretty close to the rate needed for no more than a 3 °C rise in global temperatures.”

According to the PwC Low Carbon Economy Index, the average decarbonization rate was around about 1.3 percent from 2000 to 2015. However, more ambition is needed: to comply with the Paris Agreement, the annual average decarbonization rate of G20 countries needs to be 6.5 percent per year, if we are to limit temperature increases to 2 °C.

Speeding up renewables

At the global level, there is a need for roughly USD 1 trillion additional investment every year up to 2030 to fund clean energy, and USD 5-6 trillion to finance clean infrastructure.

Williams points out that especially China has been putting a lot of effort into decarbonizing its society over the last five years. As a part of the “war on pollution,” it has halted construction of coal-fired power stations between 2016 and 2020.

The main driver for action in China is that air pollution and air quality are becoming a big political and health issue. China decarbonized at just over 6 percent in 2016, so it will be the second fastest decarbonizing economy in the world behind the UK.

“Action will certainly continue in China, as they now have a national emissions trading system. Thanks to the new regulations, we will begin to see short- and medium-term impacts on industrial sectors there,” he explains.

“But I also think that if China continues to increase its global presence politically, it seems an opportunity for China to take a leadership role in fighting climate change. That would also encourage other large countries to do the same.”

China is maintaining its lead in installing the most renewable energy power capacity, and has overtaken the US as the world largest consumer of renewables. Bloomberg anticipates that renewable energy penetration will reach 55 percent in China and 38 percent in the US by 2040.

“In the US, the reality is that that climate action will continue at the state, city and business levels,” Williams adds.

Electrifying society

Society is becoming increasingly electrified as economies move away from petrol and diesel. We will eventually

“New regulations will drive growth in renewables, low-carbon transport, energy efficiency and all the technologies that go with them.”

reach the point where the demand for fossil fuels drops dramatically, and electricity demand will go up.

According to Bloomberg New Energy Outlook, global power demand will grow by 58 percent by the year 2040. Wind and solar will account for 48 percent of installed capacity and 34 percent of electricity generation worldwide by 2040.

“This process is an interplay between technologies and the environment. Firstly, we have to look at how electricity is generated. There will be big changes in the use of fossil fuels, as well as dramatic growth in wind, solar and tidal energies,” Williams says.

Increased use of electric vehicles will require better electric grids and battery storage.

“In the past ten years, there has been a dramatic improvement in those technologies. In the next ten years, we could get to the point where electric vehicles are comparable in cost to petrol and diesel cars, with equal performance in speed and mileage.”

Another core issue is the advancement of energy efficiency. “We have to understand where power is needed and how to manage the power load, on both the industrial and residential sides. For example, I don’t have to charge my car in the afternoon when power is needed somewhere else. To do so efficiently, we have to be able to use smart grids.”

Smart grids consist of controls, computers, automation, and new technologies and equipment working together to allow two-way communication between utilities and their customers. The new technologies can respond rapidly to fluctuation in demand for electricity in the grid.

Williams concludes that global warming is one of the biggest threats that we have ever faced. “However, I am optimistic that with the right policies, positive attitudes and the right companies, we have a good chance for staying within the 2 degrees of global warming to avoid the dangerous climate change.” ■

Around the world

Valmet's first large volume chip storing system in Portugal

A new large volume chip storing system delivered by Valmet has improved the chip feeding into the cooking plant at The Navigator Company's pulp mill located in Figueira da Foz, Portugal. Having an automated system will improve the chip quality and safety, as no bulldozers or front-loaders are used.

Wet end rebuild for Sappi Gratkorn Mill in Austria

Valmet will supply a wet end rebuild with installation for Sappi Gratkorn Mill in Austria. The goal of the rebuild is to improve paper machine (PM 9) efficiency, reliability and energy efficiency. The start-up of the rebuilt machine is scheduled for 2019.

Automation and data collection solution to Gasum's biogas plants

Valmet will supply a Valmet DNA automation system to three biogas plants owned by Gasum. The delivery also includes a Valmet DNA Integrated Operations solution for centralized data collection and container logistics management to all of Gasum's biogas plants and gas filling stations in Finland and Sweden. The solutions will enable Gasum to centrally control and collect more information from its operations. The company will also be able to manage its growing filling station network outside its pipeline network.

Upgrading Aranda marine research vessel's control and machinery monitoring system

Valmet will upgrade the Aranda marine research vessel's control and machinery monitoring system to meet current needs as part of a renovation project for the vessel. Valmet's delivery includes the upgrade of the Valmet DNA control and machinery monitoring system, training and commissioning. The system is used to control and monitor the vessel's machinery and monitor alarms.

A flue gas cleaning system to Vantaan Energia's biopower plant

Vantaan Energia Oy chose Valmet's flue gas cleaning system to its biopower plant in Vantaa, Finland. The delivery is part of a rebuild that enables the plant to reduce its use of fossil fuels significantly and increase the share of bio-fuel in its energy production cost-efficiently. The flue gas cleaning system will improve the plant's energy efficiency and district heating capacity, in addition to reducing its emissions. The system is expected to be taken into use in February 2019.

New measurement and analyzer technology for BillerudKorsnäs in Sweden

Valmet will supply 36 online measurements, consistency transmitters and analyzers to BillerudKorsnäs's new board machine in Gruvön, Sweden. With advanced and best-available measurement and analyzer technology, the mill will be able to achieve the very high board quality goals set for the machine.

Anti-surge and load-sharing control for Nyagangazpererabotka in Siberia

Valmet will supply anti-surge and load-sharing control for Nyagangazpererabotka's gas compressing process in Nyagan, Western Siberia, Russia. Accurate and efficient solutions will enable the plant to save electricity in gas compression.

New chipping line and chip handling system for Sappi Saiccor in South Africa

Sappi's Saiccor pulp mill in South Africa has chosen Valmet to deliver its new high capacity chipping line and chip handling system. The upgrade targets to increase the chipping capacity, to improve chip quality and minimize wood losses. The chipper will be delivered and installed at the end of 2018, and the start-up is planned for January 2019.

What is happening in the global pulp, paper and energy industries? *Around the world* demonstrates some of the events and projects where Valmet has worked together with customers to move their performance forward.

Automation and electrification for KSS Energia in Finland

KSS Energia has chosen Valmet to deliver a turnkey automation and electrification to its unmanned Siikakoski hydro power plant in Kouvola, Finland. "We were looking for a turnkey delivery with the widest possible scope from one supplier, as our own organization is quite small," says Kari Dansk, Production Manager, Energy Services, KSS Energia.

Valmet information management system for Neste in the Netherlands

Valmet has supplied an information management system for Neste's newly acquired plant in Sluiskil, Netherlands. The plant is used for storage and pre-treatment of renewable raw materials for the company's renewable diesel refineries.

Boosting sustainability at Shanghai Zhuyuan in China

Shanghai Zhuyuan Wastewater Treatment Plant 3, which is currently under construction in China, has ordered eight Valmet Dry Solids Measurement (Valmet DS) units. With this online solution, the new plant will be able to boost sustainability by using lower amounts of polymers and less energy in centrifugation and sludge incineration.

OptiConcept M containerboard making line for Shanying International in China

Valmet will supply an OptiConcept M containerboard making line for Shanying International Holdings Co., Ltd. in Jingzhou, China. New production line (PM 21) with a wide automation package is designed to produce high-quality testliner grades. The start-up of the machine is scheduled for end of the year 2018.

A waste-fired boiler to Shanying Huazhong Paper in China

Valmet and Shanying International Holdings Co., Ltd. have signed a contract regarding a delivery of a mill waste-fired boiler plant to Shanying Huazhong Paper's paper mill, in Jingzhou, China. The new waste-to-energy boiler plant will supply electricity for the paper mill and enables the mill to utilize all of its mill waste in energy production.

Valmet delivers Bale Testers to Smurfit Kappa

Valmet and Smurfit Kappa have signed an agreement for the delivery of eight Bale Testers in Central Europe to check the incoming waste paper deliveries. The purpose of this collaboration is to improve the waste paper quality. Tested are moisture-, ash-, plastic- and lignin content so that a quality classification can be made at the earliest stage of delivery. This leads to a stable and foreseeable production process.

Moisturizer systems for SCG Packaging in Thailand

SCG Packaging in Thailand has ordered three Valmet IQ Moisturizer systems with moisture CD control to its PM6 and PM7 at Wangsala mill and PM11 at Prachinburi mill. With the new solution, the mills will be able to improve the board quality on paper machines.

Key solutions for three containerboard machines in China

Valmet will supply board machine key technology including headboxes, press sections and machine control systems for three new containerboard machines in China. Two of the machines will be producing liner and one will be producing fluting. The start-ups of the machines are scheduled for 2019.

About Valmet



Valmet's year 2017

The year 2017 was a special one for Valmet, with a celebration of the company's 220 years of industrial history. The first roots of Valmet were established in 1797, when Tampere Clothing Factory was founded and the paper machine clothing business got its start.

Throughout its long history, Valmet has had a crucial role in moving several industries forward with the help of its unique offering, combining leading process technologies, services and automation solutions. Many innovations created by Valmet's experts in collaboration with the customers have led to significant leaps in the pulp, paper and energy industries. Valmet is proud of the past and embracing the future by aiming to always be one step ahead in developing new, future-focused solutions that benefit the customers and the whole planet.

A year of growth

Like every year after the demerger, also in 2017 Valmet's comparable EBITA and the comparable EBITA margin increased compared to the preceding year.

The year was extraordinary for the board, tissue and paper technologies as orders increased by 44 percent amounting record-high EUR 1,035 million. While the Paper business line accounted for 22 percent of orders received in 2016, in 2017 the share was 32 percent. Orders received increased also in the stable business, i.e. Automation and Services. Orders received of the Pulp and energy business line, in turn, decreased.

Geographically, China's share of Valmet's orders received increased compared to the previous year, and was now 17 percent. EMEA (Europe, Middle East and Africa) together with North America accounted for 67 percent of orders received in 2017.

Widening global footprint close to customers

Valmet's way forward is based on must-wins that Valmet is focusing on: Customer Excellence, Leader in Technology and Innovation, Process Excellence, and Winning Team.

In 2017, Valmet concentrated on the global implementation of its new services approach, Shared Journey Forward, introduced in 2016. As part of this program, Valmet renewed its Industrial Internet offering and started to build a related ecosystem with leading partners in the field. Also, Performance Centers for each customer industry were established as a channel to the Industrial Internet services. Valmet has systematically widened its global footprint close to the customers in recent years. As Asia-Pacific continues to be one of the major growth areas for Val-

Valmet is a leading global developer and supplier of services, automation and technologies for the pulp, paper and energy industries. Our more than 12,000 professionals around the world work close to our customers and are committed to moving our customers' performance forward – every day.

met, a new Services center was inaugurated in Indonesia in September 2017.

Sustainability leadership received recognition

Valmet's mission is to convert renewable resources into sustainable results. This means that with the help of the process technologies, services and automation, Valmet's customers can develop and produce recyclable and sustainable products from renewable raw materials. In that way, Valmet is also at the heart of the circular economy.

In Valmet's first four years as an independent company, the company has

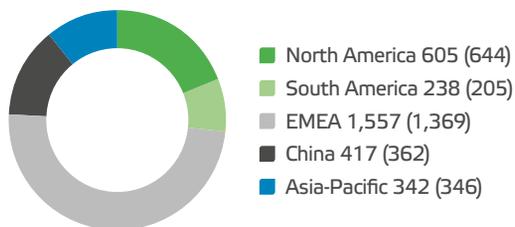
concentrated on sustainability risk mitigation in its operations. Valmet has worked a lot to ensure sustainable procurement practices globally, to drive a strong safety culture, and to develop its people, R&D and Health Safety and Environment (HSE) processes to ensure and strengthen a responsible way of operating globally.

Valmet's strong progress in sustainability has been globally recognized, and Valmet was selected in the Dow Jones World and Europe Sustainability Indices for the fourth consecutive year in 2017. Valmet was also selected to the Ethibel Europe Sustainability Excellence Index for a

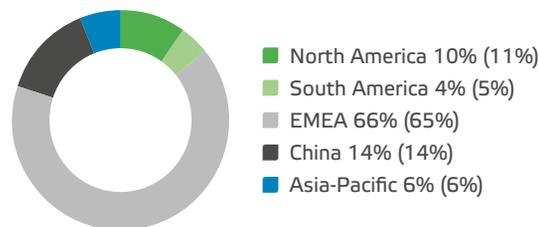
second consecutive year as one of the 200 ethical investment targets, and received an A-rating in the CDP Climate rating for its work to mitigate climate change.

The shift towards a cleaner world and sustainable business practices is ongoing, and Valmet wants to be part of creating future solutions to strengthen this development. By combining digitalization and its strong process expertise, Valmet ensures optimized production with maximized resource efficiency and minimized environmental footprint in the customers' production processes – and in the company's own operations – every day.

Net sales by area, EUR million



Personnel by area, %



Forward

VALMET'S CUSTOMER MAGAZINE

FORWARD

Valmet's customer magazine

PUBLISHED BY

Valmet Corporation
PO Box 11
FI-02151 Espoo, Finland
Tel. +358 10 672 0000

ADDRESS CHANGES

valmet.info@valmet.com

EDITOR-IN-CHIEF

Anu Salonsaari-Posti

MANAGING EDITOR

Kaisa Tikkanen

EDITORIAL BOARD

Anu Salonsaari-Posti
Leena Marttinen
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ENGLISH LANGUAGE

EDITOR
AAC Global

LAYOUT AND ART WORK

Neutron Design

PRINTING

Libris Oy
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Printed on MultiArk Silk
115/250 g/m²

Supplement printed on
Lumiforte 115 g/m²

Printed on December 12,
2017



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ADDRESSES

Valmet Corporation,
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ISSN

0356-2751 (Printed)
1458-8013 (Electronic
version)

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