

Moving to a higher level
of tissue making 16

The world's first DeNOx
scrubber for recovery boilers 20

Successful grade
conversion 34

Forward

VALMET'S CUSTOMER MAGAZINE | 2/2018



Fuel
flexibility
to power the
future 10

Editorial

Innovation through collaboration

Every year, many medias list innovations that have made the world better. The lists of just last year's innovations are amazing – especially the social innovations that improve people's lives. The website Mashable's list includes an edible drone for delivering humanitarian aid to disaster areas, and a wheelchair that enables its user to stand.

Behind the greatest innovations are often teams of talented and passionate individuals who build on each other's ideas. People in the teams have different backgrounds, and by bringing together their skillsets, they can create new approaches and solutions that none of them could have invented alone.

In the same way, Valmet's teams and our customers' teams collaborate to create new solutions to convert renewable resources into sustainable results. Sustainable packaging, solutions for replacing plastics, renewables-based energy production, emissions reduction, and new solutions for wood fiber utilization are all areas we work on together to enhance sustainability and make people's lives better.

In this magazine, we will introduce a number of new solutions and innovations that our customers have taken into use. Also behind these innovations are passionate and professional Valmet and customer teams who have together created something special and experienced the great feeling of truly successful teamwork – that feeling when everything works together!



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In this issue 2/2018



Improving energy production planning with Industrial Internet 27

Stora Enso Sunila makes the most out of lignin 40



Shaping the industrial world virtually 62

- 4 **In brief**
- 6 **Innovators of the digital evolution**
For decades, Valmet has been at the forefront of developing digital solutions, and it carries further even in the era of the Industrial Internet.
- 10 **Focus on fuel flexibility**
Turun Seudun Energiantuotanto invested in a multifuel power plant that features high fuel flexibility.
- 16 **Moving to a higher level of tissue making**
To qualify for the near ultra-premium bath tissue and paper towel market, Orchids Paper equipped their new greenfield plant with a new Advantage QRT tissue line.
- 20 **Rising to the challenge to limit emissions**
The first in the world DeNOx scrubber for recovery boilers has performed even better than expected at Sunpaper's Yanzhou mill.
- 24 **One plus one is more than two**
To ensure its paper machine roll reliability and availability, the Kerinci mill in Indonesia has entered a full-scope roll service agreement with Valmet.
- 27 **Optimized means profitable at all times**
Two of Finland's biggest energy producers have improved their production planning utilizing the vast opportunities of the Industrial Internet.
- 30 **Automated icebreaking**
Arctech Helsinki Shipyard has built four new icebreakers that use Valmet DNA automation system to ensure safe operation in harsh conditions.
- 32 **Thorough planning brings success**
Södra Cell Mörrum's dissolving pulp line has been upgraded with new brown-stock washers that increase production capacity.
- 34 **Lighter. Stronger. Kruger.**
Kruger converted their newsprint machine to board machine to produce the finest 100-percent recycled high-strength linerboard.
- 38 **Breaking records**
SCA Ortviken's paper machine PM 5 is breaking production records with a new Valmet IQ Slice Profiler system.
- 40 **Sunila makes the most out of lignin**
Stora Enso is the first company to produce kraft lignin with an extremely high dry content.
- 43 **Improving press performance step by step**
After a four-phase improvement project, Thai Cane Paper enjoys lower steam consumption and better runnability in its PM 2 press section.
- 46 **Optimized production at full speed**
EcoPaper got all the benefits of the new Valmet Sizer Applicator Beams.
- 48 **Finding the sweet spot for refining**
Valmet Pulp Analyzer shows the route to better refiner management at Pankaboard mill.
- 50 **Successful system migration with the first redundant Profinet**
CP Kelco's new automation system includes Valmet's first redundant Profinet extension for production line motor controls.
- 52 **Recox+ recovery boilers for peak performance**
By combining technology, automation and services, Valmet can provide a complete recovery boiler solution with relentless performance.
- 56 **Up for the challenges of cellulosic ethanol production**
Valmet's BioTrac system contributes to both the quality and quantity of the ethanol produced.
- 60 **Newcomer challenges the biodryer belt market**
Valmet has combined its expertise in biodryer manufacturing with its industrial fabric experience.
- 62 **Expert's voice**
- 66 **Around the world**
- 68 **About Valmet**



Two more Valmet containerboard machines to Nine Dragons

Nine Dragons Industries Co., Ltd., China, has chosen Valmet to supply two more containerboard production lines with related automation systems to its mills in Dongguan and Quanzhou. The two new containerboard production lines will be designed to produce high-quality testliner grades out of 100 percent recycled raw materials. The orders for the four previous machines were published in 2017.

"Nine Dragons is committed to produce high quality containerboard products. We can deliver this promise with Valmet's technically advanced board machines. Advanced technology and the modern and distinctive industrial design were certainly important factors in these decisions," says Mr. MC Liu, Deputy Chairman and Chief Executive Officer of Nine Dragons.

Development of bio-oil into transportation fuels to new level

Valmet and Fortum are developing a technology to produce advanced, high-value lignocellulosic fuels, such as transportation fuels or higher value bio-liquids. The technology is seen as one of the most competitive and efficient ways of producing advanced lignocellulosic biofuels to meet European targets for reducing greenhouse gas emissions.

The project is a natural continuation of the consortium's earlier bio-oil project

with VTT Technical Research Centre of Finland, which resulted in commercializing integrated pyrolysis technology for production of sustainable bio-oil to replace heating oil in industrial use. Now Valmet and Fortum have agreed on joint development with Preem, a Swedish refinery company.

Valmet and Fortum's role is to develop and commercialize production technology for upgraded pyrolysis oil suitable e.g.

as refinery co-feed, based on a thermal pyrolysis technology platform. Preem will focus on processing the upgraded pyrolysis oil into transportation fuels under refinery conditions with feasible technology.

The combined research projects are co-financed by Business Finland in Finland and Energimyndigheten in Sweden. Successful commercial developments are expected from the project by the end of the decade.

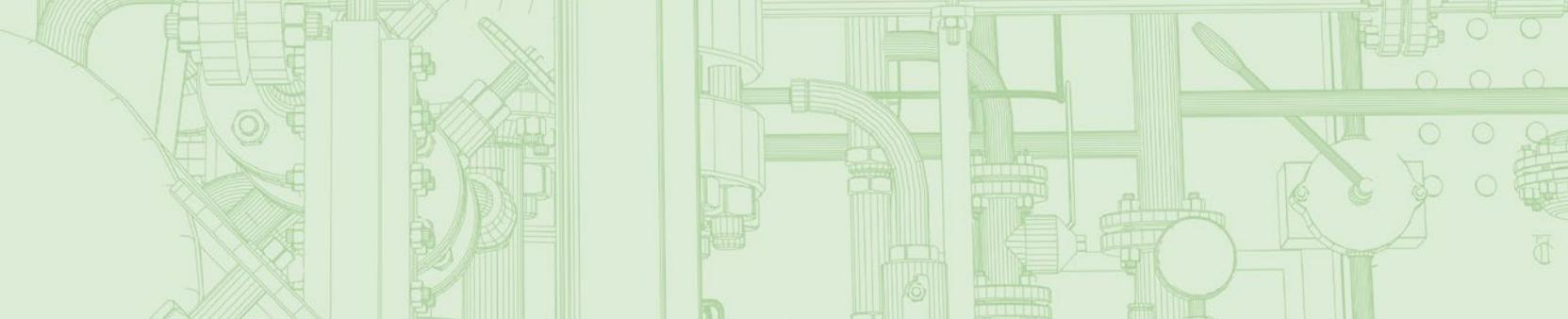
New online solution for lime mud moisture measurement at pulp mills

Valmet has developed an innovative online solution for measuring lime mud moisture, Valmet Lime Mud Moisture Measurement. It can be used to monitor lime mud filter performance on the conveyor belt to improve lime mud quality. The new solution is also applicable as a feedforward measurement for lime kiln power control. Through more accurate power control, it is possible to optimize energy consumption and gain significant energy savings.

The new lime mud moisture measurement has already proven its capabilities in pulp mills. According to customers, its correlation with laboratory measurements has either been on a very high level or the lime mud moisture measurement is even more accurate. Lime mud filter operations can be seen immediately in the moisture measurement level. Moisture sensor cleaning is not needed, not even in a dusty environment.

Valmet hires nearly
400
summer trainees in 2018.

For the fourth consecutive year, Valmet is participating in the Responsible Summer Job campaign that challenges companies to increase the amount and quality of summer jobs offered in Finland.



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.

WestRock Florence in USA chooses Valmet's linerboard production line

WestRock Company has ordered a linerboard production line with a wide automation package from Valmet for its mill in Florence, South Carolina, United States. The delivery will include a state-of-the-art kraft linerboard machine to replace three older, narrow-width paper machines.

WestRock Florence anticipates the new machine will produce 644,000 metric tonnes of kraft linerboard annually. The investment will significantly increase the mill's efficiency, end-product quality and service levels. Start-up of the new machine is scheduled for the first half of 2020.

First ever Valmet-delivered flash dryer started up

The first ever flash dryer for purely fiber delivered under the Valmet brand has been started up with fiber at Stora Enso's biocomposite plant at Hylte Mill in Sweden. Stora Enso decided to invest in full-scale production after seeing strong customer demand for higher volumes of pulp pellets production, to be used as a renewable replacement for plastics. The dryer will dry from 43 percent to 93 percent dryness.

"The design of the dryer system has been adapted to fit the new equipment into the existing plant and with other machinery in the production line. We have utilized the knowhow we have from flash drying in the panel-board industry," says **Marika Levander**, Senior Project Manager at Valmet.

Berneck reaches panel mill efficiency with Valmet woodyard equipment



Brazilian Berneck, specialized in MDP, MDF and HDF panels production, has acquired a new debarking drum from Valmet to its Curitibanos facility. Berneck already had a Valmet supplied debarking drum in Araucária. Valmet equipment combines high technology and high-quality wood debarking bringing more competitiveness to Berneck's panel production lines.

Daniel Berneck, Director of Industrial Panel Division, says that Valmet's solutions offer an excellent cost benefit to its output. "We have studied several types of debarking processes and noticed that Valmet's drum provides the best cost benefit. It offers a high-quality debarking procedure meeting our MDF panel mill needs."

"This new piece of equipment is bigger compared to the previous one," he says. According to Berneck, Valmet's machines are extremely reliable. "We have not faced any significant issues neither with the debarking drum nor with the chipper. We are rather pleased with Valmet's equipment robustness. Those pieces of equipment practically work 24/7, delivering exactly what they were designed to do."

"I have noticed how happy major paper producers are with Valmet. That is why Berneck invested in a new front-end system in Curitibanos. This undoubtedly reveals our high level of satisfaction with Valmet," Daniel says.

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

Innovators of the digital **evolution**



Valmet has been at the forefront of developing digital solutions for its customers ever since 1960s. The launch of Damatic distributed control system (DCS) in 1979 laid a solid foundation for the company's digital development that is continuing now in the era of the Industrial Internet.

TEXT Vesa Puoskari PHOTOS Tomi Aho, Tomi Parkkonen and Valmet

Valmet has a long history in the digitalization of process industries. The background lies in 1960s, when Valmet's first automation solutions came to the market. In 1990s, with the DCS in place, it was possible to embed intelligence and advanced information into the production processes.

"We like to think that we have been working towards

Industrial Internet for a very long time, as we truly have been pioneers in supplying digital services and equipment to our customers," confirms **Sakari Ruotsalainen**, President of the Automation business line at Valmet.

"In 1979, we took a giant leap forward by becoming the second company in the world to launch distributed control system. Already then, we were able to integrate various machinery control systems into our DCS. This technology has been continuously renewed and further developed. These days, it is called Valmet DNA," says Ruotsalainen.

Integrated automation system as foundation for digital development

The advanced DCS built a solid foundation for Valmet's digital development. The advantage of an integrated automation system is that it enables the mill personnel to operate the machinery and the plant seamlessly. The system is used to monitor and control the production process at a mill or plant.

"For example, there can be over 30,000 measuring and control points in the customer's pulp production processes connected to the control systems. And the Valmet-delivered paper machines are equipped with quality control systems measuring and controlling properties like



"We develop tools to improve the flow of data and increase our understanding of how to run machines and plants even more intelligently."

the paper thickness, basis weight, gloss and moisture to constantly optimize paper quality, machine stability and process efficiency," says Ruotsalainen.

"In addition, we have highly professional experts who are also able to support customers in controlling their production processes. We have over 500 online remote connections to our customers' processes, so we can monitor and advise them how to optimize and run their machines more efficiently."

Long-term R&D and cooperation with customers

Long-term R&D work and co-operation with customers have brought Valmet to where it is with digitalization today.

"Thanks to the early digital approach, we have been able to continuously develop and integrate new functionalities and subsystems, like condition monitoring, into our DCS. That helps our customers to take full advantage





"In the field of the Industrial Internet, the idea is to launch the first version of a software application quickly and then update it constantly in cooperation with our customers," Jari Almi points out.



"Thanks to the early digital approach, we have been able to continuously develop and integrate new functionalities and subsystems, like condition monitoring, into our DCS," says Sakari Ruotsalainen.

of the integrated process automation system. Our comprehensive understanding of our customers' production processes is also one of our definitive strengths," he points out.

Industrial Internet – a dialogue with data

The next step in digitalization has been to improve the visibility and profitability of a plant's or mill's operations by analyzing and utilizing data to an even wider extent for the customer's benefit. Based on its knowhow on process technology, automation and services, Valmet has developed a comprehensive offering of Industrial Internet applications and services. Valmet has also recently established five remote service centers - called Valmet Performance Centers - for energy, pulp, paper and board and tissue customers, as well as for automation.

"We are developing advanced analytics tools to improve the utilization of data and increase our understanding of how to run machines and plants even more intelligently and efficiently than today. The aim is to cut the costs of raw materials and energy, minimize unplanned shutdowns and reduce the number of web breaks," explains **Jari Almi**, Director of Industrial Internet operations at Valmet.

Agile application development

Almi emphasizes the importance of taking an early proactive role in creating an integrated digital technology platform. "We are running the entire automation system through a single platform. We have coherent process automation data available, which is also important for the development of new Industrial Internet applications," he notes.

"For example, process data from a customer's produc-

tion line can be analysed and visualized for KPI follow-up and decision making. The customer can also benchmark the performance of a machine against the entire machine fleet. The Industrial Internet offers excellent tools for decreasing variation between different machines in the fleet, but also for improving the productivity of mills or plants," he explains.

Almi points out that in the field of the Industrial Internet application development, Valmet is moving towards agile software development processes. "The idea is to launch the first version of a software application quickly and then update it constantly in cooperation with our customers. This is a new philosophy compared to the traditional product development."

Towards plant-wide optimization

Ruotsalainen estimates that with digitalization there will be new opportunities, especially in the field of advanced process control, predictive maintenance and plant wide optimization.

"For example, bioenergy production is growing rapidly. Our customers are using several kinds of fuel mixes that can cause corrosion and be harmful to the power boiler. To prevent failures, we have developed analyzer equipment to measure the combustion process as well as control and optimization models. The new technology and applications guide operators to use the proper fuel mix and substances to minimize the corrosion impact," Ruotsalainen explains.

"This service combines our experience in analytics, automation and energy, and it includes versatile performance monitoring applications for the fluidized bed boiler, a fuel management system for solid fuel, condition monitoring, and other DCS features designed for power plant automation." ■

Precision measurements began with sauna thermometers

For Valmet, precise measurement was already a focus area in the 1950s, when the Instrument Works in Tampere, Finland, started producing Valmet sauna thermometers. Between the 1950s and 1980s, Valmet manufactured close to one million thermometers; practically every Finnish home and a large number of homes abroad had one in their sauna.

CUSTOMER'S VOICE

Moving forward together





Focus on **fuel flexibility**

The new multifuel boiler plant at Turun Seudun Energiantuotanto (TSE) is an excellent example of the best features of CFB technology, such as the possibility to use whatever fuel is currently available at the lowest cost.

December 1, 2017 marked the start of commercial operation at TSE's new NA4 power plant in Naantali on the southwestern coast of Finland. Its production capacity is 146 MW_e of electricity and 250 MW_{th} of heat. The planned annual production amounts to 800 GWh of electricity (net) and 1,550 GWh of heat.

"The main driver for the investment was the 50-year-old pulverized coal fired plant with its three blocks was reaching the end of its life cycle. We had to figure out how to ensure district heat deliveries in the future in an economical, efficient and sustainable way," says **Tapani Bastman**, Managing Director of TSE.

↓ "The availability of the boiler has been 100 percent. The boiler runs very well either with 100 percent coal or 70 percent biofuels, and there have been no combustion issues," says Tapani Bastman.

Combating climate change

TSE produces district heat and electricity for Turku and Naantali and the surrounding area, as well as process steam for the needs of nearby companies. It is owned by Turku Energy, Fortum Power and Heat, and Turku's neighboring municipalities of Raisio, Kaarina and Naantali. The company's 15-kilometer district heating tunnel is one of the longest in Europe.

Another driver was the desire to combat climate change and replace coal as a fuel with renewable energy sources – mainly local biofuels – in the long run. Additionally, the Finnish Government has decided that the use of coal in energy production will be prohibited by law in 2029.

"For all these reasons, we wanted a multifuel power plant that would feature high fuel flexibility and enable us to burn all kinds of biofuels together with peat or other fuels when it is no longer possible to use coal," Bastman continues. "In Finland, there are changes in energy taxation every time there is a change in government. Market prices swing back and forth based on political decisions, so we cannot rely on one fuel – we need a solution that enables us to change the fuel mix flexibly."

Mixing fuels flexibly

TSE opted for circulating fluidized bed (CFB) technology to fulfill its fuel flexibility requirement. The company chose Valmet to supply the boiler island, as they considered its tender to have the best ratio of quality to price.

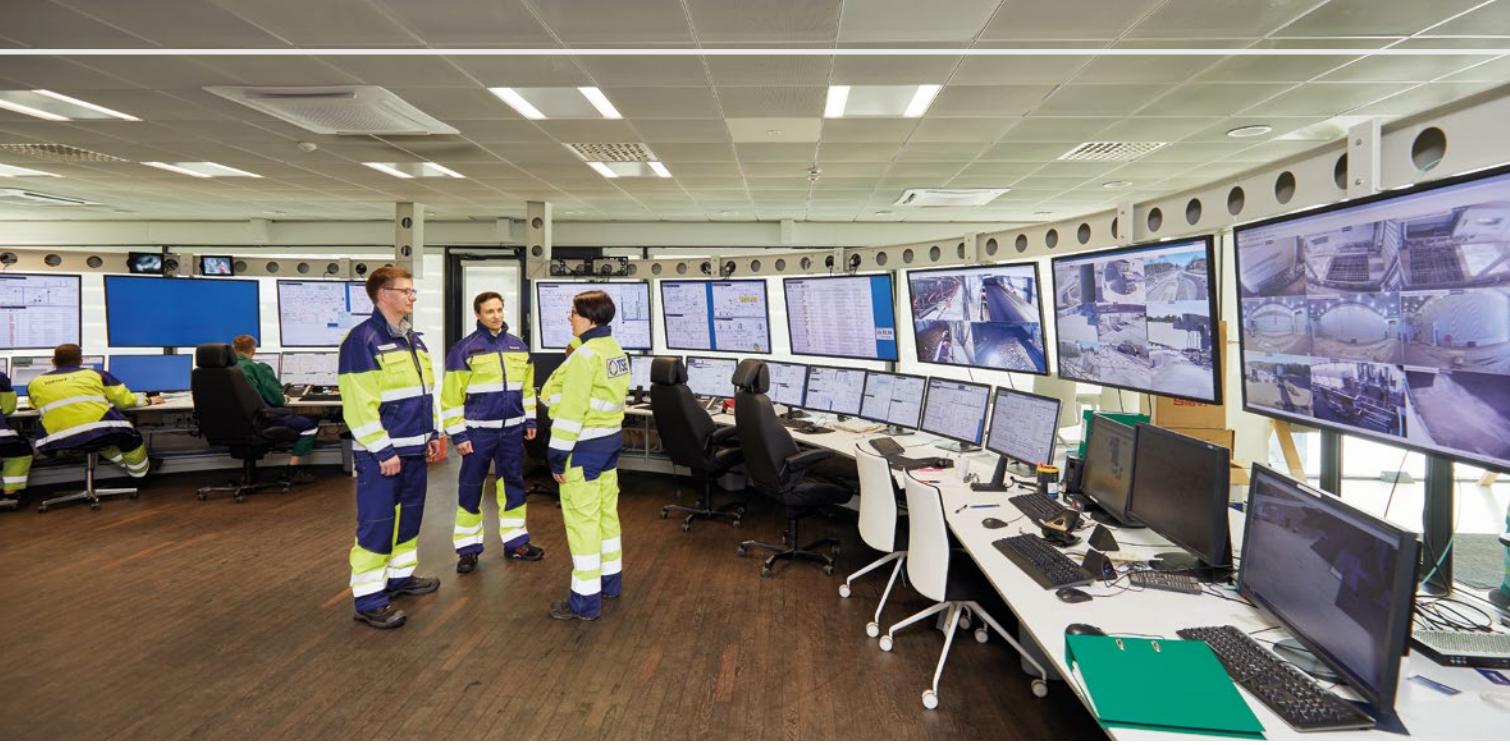
Valmet delivered a CYMIC boiler with 100-percent coal firing capacity and a design fuel mixture that also



The LTIF (lost time incident rate) for the project between Turun Seudun Energiantuotanto and Valmet was only 2.13 incidents per million working hours, which is a world-record result.

“We are convinced that Valmet’s solution that features both automation and boiler technology works best for us.”





includes wood-based biomass (0–75 percent), agro-based biomass (0–15 percent), peat (0–95 percent) and solid recycled fuel (0–5 percent). "Our target is to run the plant 70 percent on biomass. In order to run purely on biomass, we would have to make an additional investment. In the meanwhile, we have other interesting fuel alternatives to consider, too," Bastman adds, but he prefers not to disclose what they are.

Valmet's delivery also included flue gas cleaning systems and a wide range automation solutions, for example for monitoring emissions and managing energy consumption. The letter covers TSE's production units outside Naantali, too. "We are convinced that Valmet's total solution featuring both automation and boiler technology from the same supplier works best for us," Bastman says.

High efficiency with demanding fuels

The new CFB boiler was designed to feature both high efficiency and high reliability, regardless of the demanding fuel mix. High reliability is ensured through low-maintenance boiler components and redundant design in the auxiliary equipment.

The power plant consists of a reheat steam system, a two-stage district heat system, and by-pass lines to produce only heat when necessary. The steam parameters were selected to be quite high compared with the fuel quality: main steam at 555 °C/160 bar, reheat steam at 555 °C/40 bar. The thermal capacity is 390 MW_{th}.

Some of the design fuels, such as agro-biomass and SRF, contain quite high amounts of chlorine (0.2–0.4 percent), representing a risk of high-temperature corrosion in the finishing superheater and finishing reheater, especially as the steam temperature in both superheated and reheated steam is quite high, at 555 °C.

In order to mitigate the risk of high-temperature corrosion, both the finishing superheater and reheater surfaces are located inside the bed material in cyclone

loop seals. The bed material protects the heat surfaces against corrosive gas components.

Project completed on time and budget

The extensive project was completed on time and on budget. "As a whole, the project went well, and cooperation with Valmet was open and constructive. I would especially like to point out that the LTIF (lost time incident rate) for the whole project was 2.13 incidents per million working hours, which is a world-record result," Bastman says.

100 percent boiler availability

Due to turbine issues, the boiler has been running at a lighter load (60–70 percent) than planned. "However, the availability of the boiler has been 100 percent. The boiler runs very well either with 100 percent coal or 70 percent biofuels, and there have been no combustion issues," Bastman remarks.

During the first months of its commercial operation, the NA4 power plant has been run with a varied fuel mixture, consisting of 70 percent biofuels, 4 percent peat and 26 percent coal. The biofuel has been a mixture of different forest wood chips, bark and sawdust.

The multifuel capability and flexibility with different fuels and fuel qualities has been achieved well. The NA4 plant is able to operate with a wide fuel range, and at the same time achieve guaranteed steam parameters.

The old coal-fired power plant blocks NA1 and NA2 are no longer used. TSE's next challenge is to figure out what to do with the coal-fired NA3 unit. According to Bastman, there has been talk about adding a flue gas condenser to the NA4 unit to increase its district heat production and replace NA3's capacity. ■

↑ In addition to the CYMIC boiler, Valmet's delivery also included flue gas cleaning systems and a wide range automation solutions, for example for monitoring emissions and managing energy consumption.

→ TSE's CYMIC boiler has 100-percent coal firing capacity and a design fuel mixture that also includes wood-based biomass, agro-based biomass, peat and solid recycled fuel.

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Increasing expertise through holistic learning

Valmet is providing Turun Seudun Energiantuotanto Oy with operator training tools for the customer's Naantali 4 boiler plant. The Learning Services delivered by Valmet include Valmet Training Simulators and Valmet Online Learning courses for Naantali's CFB boiler.

"To give our operators the best possible expertise to successfully operate our new CFB boiler, we decided to invest in operator training tools from Valmet," says Tapani Bastman, Managing Director of Turun Seudun Energiantuotanto.

"At Valmet, we believe in taking a holistic approach to learning. We use several learning techniques to enhance engagement and help our customers develop their process knowledge and safely practice routine and emergency procedures. Our training simulator is an effective tool for implementing uniform operating strategies and making sure operators are confident in performing their tasks," says **Lisa Manson**, Product Manager for Training and Simulators at Valmet.



Scope of Valmet's delivery

- CYMIC boiler
- Flue gas cleaning systems
- Valmet DNA automation and safety interlocking systems
- Valmet DNA Information Management
- Valmet DNA Emission Monitoring
- Valmet DNA Fuel Data Manager
- Valmet DNA District Heating Manager
- Valmet DNA Energy Management
- Valmet Training Simulator
- Valmet Online Learning
- Valmet Performance Agreement

Flexible and sustainable CFB technology

"The new boiler plant of Turun Seudun Energiantuotanto is an excellent example of CFB technology's best benefits: flexibility in fuels, high energy efficiency and low emissions", says **Ari Kokko**, Director, Technology and R&D at Valmet.

"We have developed CYMIC technology and boiler components for a couple of decades targeting high reliability and flexible operation. When developing the technology, we wanted to enable flexibility and freedom to select fuels which are available at the lowest price now, and also in the future."

Design fuels of CFB technology are forest residue, dried wood, bark, agro biomass, peat, coal and solid recovered fuel.



**“The start-up went very well, and
the machine produced sellable
paper from the first roll.”**

Moving to a higher level of tissue making

To qualify for the ultra-premium bath tissue and paper towel market, Orchids Paper equipped their new greenfield plant in Barnwell, South Carolina, with an Advantage QRT tissue line - technology that is new to the market. TEXT AND PHOTOS Katarina Åhsberg

Orchids Paper, an American manufacturer of both branded and private label tissue products, set a target to be a national supplier of paper towel, bath tissue and napkins and qualify for tissue products in the near ultra-premium segment. A significant part of their strategy was the new greenfield plant in Barnwell, South Carolina, equipped with a new Advantage QRT tissue line from Valmet. Having a tissue line that enables sustainable and cost-efficient production of bath and towel tissue helped them to land a contract with a major customer club.

Planning a new facility includes hundreds of different decision points. To have a smooth project, Orchids Paper decided to go with one main supplier for the complete package, which included mill engineering, stock prepa-

ration, automation and the tissue machine, as well as training, start-up and commissioning.

"It was very important for us to have a supplier capable of turnkey projects. In my view, Valmet is clearly the world leader in terms of design and execution. They pay attention to the details, are proud of what they do, and care about the well-being of our company," says Jeffrey S. Schoen, CEO of Orchids Paper.

A new technology for tissue making

As Advantage QRT technology was new to the market, pilot trials in Valmet's Tissue Technology Center in Sweden played a major role in Orchid Paper's decision.

"The pilot trial was important in demonstrating that we could make towel and bath tissue from recycled fiber. We tested different products and furnish with up to 100



The Advantage QRT line in Barnwell will have a capacity to produce 5-6 million case units with 35 – 38 000 tonnes of tissue.

percent recycled fiber, and it convinced us that it was the machine we needed,” explains **Eric Diring**, Vice President of Operations at Orchids Paper.

The new machine is an integral part of Orchid’s strategy to penetrate the ultra-premium bath tissue and paper towel market. “One of the reasons for buying a QRT line was its low operating cost relative to other related tissue processes. In private label production, it is very important to be viewed as a low-cost producer, so this is a competitive advantage,” Diring says.

Outstanding start

The start-up of the new tissue line went very well, and the machine produced sellable paper from the first roll. The high tissue quality was the reason why Orchids Paper qualified to deliver bath products to Sam’s Club only two weeks after starting the machine. Sam’s Club is an American membership-only retail warehouse club owned and operated by Walmart, and named after Walmart’s founder, **Sam Walton**.

Building on that success, Orchids qualified for kitchen towel in August and started shipping in December. Today,

Orchids is delivering ultra-premium bath tissue and kitchen towel products to customers in the warehouse club, dollar store, and grocery store channels, and it expects to add more.

“What impressed me most with the QRT machine is the quality of the paper. It has helped us sell to new ultra-premium customers in a tough market. The machine has delivered the quality I expected and continues to improve as we continue to maximize its capabilities,” says Diring.

“The support from Valmet was outstanding. Their dedication and focus to get the paper machine started up on time was impressive. Even when we had issues, everybody was quick to rally around and solve the problem. All worked with the same dedication, and you couldn’t tell the difference between the mill team and the Valmet team except by the green shirts,” says **Brian S. Merryman**, Site Manager at Orchids Paper.

“It’s unique; it’s different”

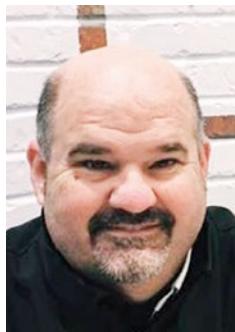
Absorbent rate is a key selling point and differentiator for tissue products. This product has higher stretch, and



Jeffrey S. Schoen,
CEO of Orchids Paper



Brian S. Merryman,
Site Manager at
Orchids Paper



Eric Diring, Vice
President of Operations
at Orchids Paper



the absorbency is great. The machine makes exactly what we were told it would. It's unique; it's different. There are qualities that are superior to anything out there. We are constantly learning and making things better," Merryman says.

"It also makes life in converting much easier. We get the caliper without too much embossing. The big difference with the QRT machine is that the more you rush to get the caliper, the more stretch you get in the product".

Also with recycled fibers

The QRT line is handling recycled fibers very well. Orchid Paper's target is to use 25 percent broke – the cleanest fibers, coming directly for the converting lines. But they also want to produce tissue with other types of recycled fibers. A de-inking line allows them to run premium and ultra-premium products with different types of fiber streams than just virgin fiber. The optimization of the de-inking line is still ongoing, which includes running in continuous mode. However, once the recycled fibers get into the machine, it runs fantastically.

The Barnwell team is convinced that the QRT technology is the technology of the future: a new way to help people get access to better paper products at a reasonable cost.

Schoen summarizes it for us: "We have achieved the goals we set before start-up, and we are looking forward to future achievements and learnings from QRT. We have met the expectations we had: to become a national player, to supply a larger percentage of our business in the premium and ultra-premium product segments, and to be a low-cost producer. QRT technology positions us well to increase our market share and achieve our long-term goals." ■

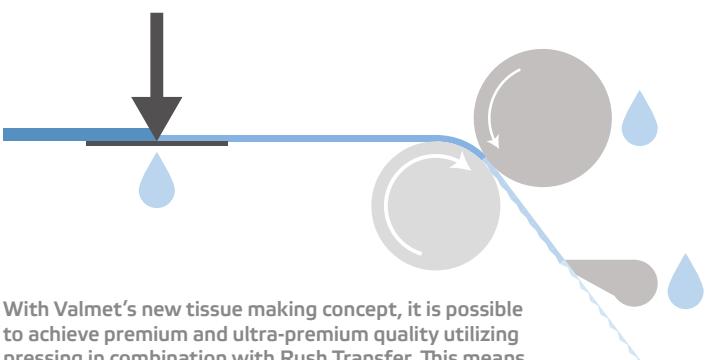
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Premium products at a reasonable cost

"Normally, the recipe to reach the highest bulk and absorbency is to avoid pressing and to use hot air through the web for drying. However, Advantage QRT uses a combination of wet pressing, a structured fabric and Rush Transfer to achieve premium and high-premium products with high bulk and absorbency. The process uses a significantly lower amount of energy than comparable structured processes with through-air drying," explains **Hans Ivarsson**, Project Manager at Valmet R&D.

Scope of the delivery

- Mill Engineering
- Advantage QRT tissue line
- Valmet DNA automation system with quality control system
- Stock-preparation system including de-inking line
- Training, start-up and commissioning



With Valmet's new tissue making concept, it is possible to achieve premium and ultra-premium quality utilizing pressing in combination with Rush Transfer. This means significantly lower energy consumption compared to other structured tissue processes.



The first in the world
DeNOx scrubber
has performed even
better than originally
anticipated.

Rising to the challenge to limit emissions

To meet the new, very tight NO_x emission limits for its recovery boilers, Sun Paper turned to Valmet. The DeNO_x scrubber for recovery boilers, the first in the world, has performed even better than originally expected.

TEXT Lotta Forssell PHOTOS Naveen Chenna and Sun Paper

Shandong Sun Paper is a Chinese pulp and papermaker with six major product lines for premium coated packaging paperboard, printing and writing papers, household and industrial papers as well as specialty fiber dissolving pulp. The environmental department of the local government had set new emission limits for Sun Paper and the recovery boilers at the company's Yanzhou mill. The new NO_x emission limit is about half of the level that can be reached with advanced combustion technologies. To reach the new limits, Sun Paper wanted to go for new De-NO_x-technologies.

Valmet has long experience and plenty of references in recovery boiler scrubbers for removing sulfur oxides (SO_x) and dust, as well as for heat recovery from flue gas. "In conventional power boilers, NO_x levels can be

reduced with selective catalytic (SCR) or non-catalytic reduction technologies (SNCR). These technologies have been tested for recovery boilers, but a solution that would be both technically and financially viable hasn't been found – at least not yet," explains **Juhani Viiala**, Senior Manager, from Valmet's Flue Gas Cleaning team.

"We had done development work and some testing for NO_x scrubbers years ago, and when the opportunity rose to work with Sun Paper, we were happy to utilize our development results," Viiala continues.

Finding the most suitable solution

Technically, it is possible to use either chlorine dioxide (ClO₂) or ozone (O₃) as NO_x oxidizing agent in the flue gases. After careful consideration and internal evaluation of the costs and operability, Sun Paper decided to choose the ClO₂-based NO_x scrubber process.

"The emission levels achieved have been even lower than originally expected."

"Using ClO₂ as the scrubber oxidizing agent at chemical pulp mills has several advantages. The chemical is already available at the mill site as it is used for bleaching, it is fairly inexpensive compared to other oxidizing media, and the active chlorine turns inactive during the oxidation process, which practically has no effect on the environment," Viala explains.

"Valmet was the first company that offered this technology. The most important aspects for choosing to partner with Valmet in this project were trust and our confidence in Valmet's experience in developing new processes, their technology, their professionalism, and their way of working," explains **Hongjin Liang**, Mill Manager of the Yanzhou Kraft Pulp Mill from Sun Paper.

On-time start-up

Valmet has delivered several projects, large and small, for

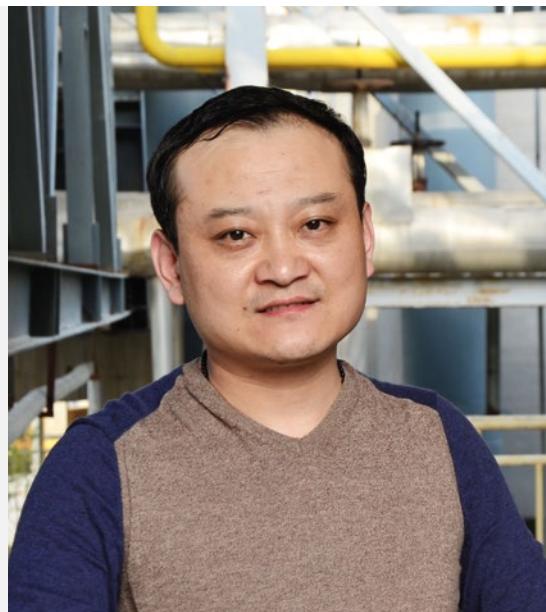
Sun Paper over the years, and they have a lot of experience of dealing with different business units of Valmet.

"As this project is the first of its kind installed anywhere in the world, we were aware of all the challenges that are associated with development of the process design. However, there were no major surprises during commissioning and start-up, and the process started running successfully on time," Hongjin Liang explains.

"Development projects like this require mutual trust and joint effort. Our good cooperation with Sun Paper was key in successful project implementation. I can say we truly worked together in taking this new technology into use," Viala says.

Results even better than expected

The first Valmet-delivered NOx scrubber was started up in late 2017, and the results were very positive right from



← Wu Wenchun from Sun Paper (in the middle) together with Valmet and Sun Paper start-up teams in front of the relocated paper machine.

↖ The Sun Paper Yanzhou pulp and paper mill is located in Shandong province, China.

↑ "We have confidence in Valmet in developing new processes," says Hongjin Liang, from Sun Paper Yanzhou mill.

the start. The emission levels achieved have been even lower than originally anticipated. Optimization of the process conditions has achieved a DeNOx efficiency of up to 90 percent.

"The De-SO_X-NO_X process has worked successfully during the recovery boiler operation. We are happy to recommend Valmet for this kind of project, and we are already taking the same technology into use in two more recovery boilers," Hongjin Liang concludes.

Successful relocation of a specialty paper machine

Another display of the good cooperation between Sun Paper and Valmet is the relocation and upgrade project of a specialty paper machine with an annual capacity of 200,000 tonnes at Sun Paper's Yanzhou mill in Shandong Province, China. Originally, this machine, delivered by Valmet, was started up at the Suzhou mill 20 years ago. After rebuilding, the machine produces virgin fiber-based, high-weight coated and uncoated specialty paper. It has a trim width of 3.8 meters and a design speed of 1,000 meters a minute, and it features an offline coater.

The relocation and rebuilding project started up one month ahead of the original schedule in March 2018. Sun

Paper was very happy with Valmet's deliveries, including relocation services for the main paper machine, the winder, upgrade services for the quality control systems and Valmet DNA, and the dryer section mechanical drive system. The rebuild included tail cutter and tail threading systems, and a monitoring system for web breaks in the sizing area. Additionally, the delivery included a Turn-Float Air Turn, a coating color preparation system, and an IQ Profiler for the calender.

"The successful startup of this project was the first step in upgrading Sun Paper's old capacity in 2018. The one month ahead of schedule start-up was due to the cooperation of the entire project team and the hard work of all the employees, as well as strong support from the Valmet team. The smooth start-up of this project has laid a solid foundation for future good cooperation between Sun Paper and Valmet," says **Wu Wenchun**, Production Manager from Sun Paper. ■

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Teamwork for success

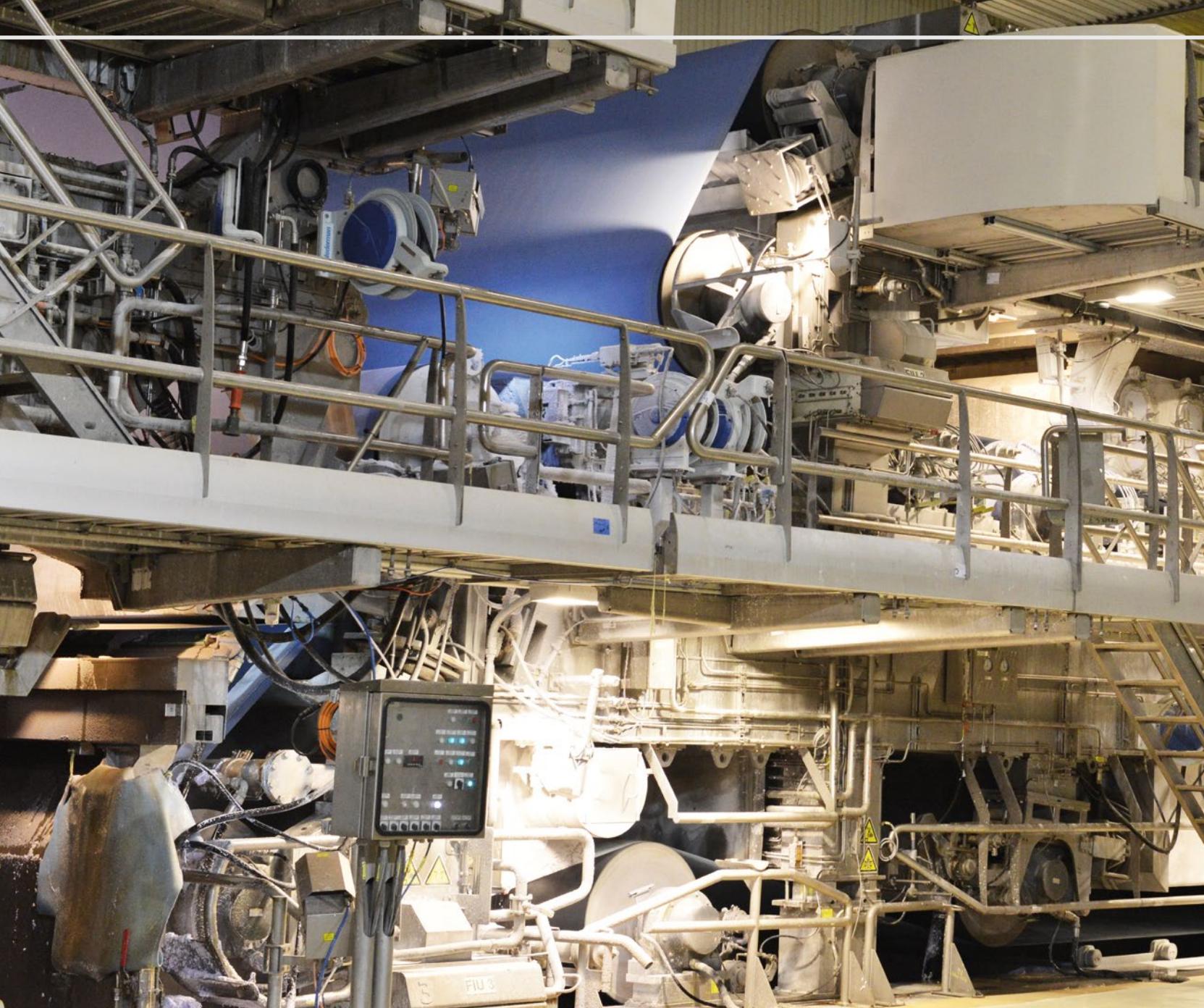
Naveen Chenna (left) and **Mikko Raiko** were two Product Engineers developing the NO_X scrubber solution for Sun Paper.

"It was great to work as a team and learn from each other. My background is in chemistry, and Mikko had the needed process knowledge. We also had other colleagues from our teams who brought their expertise to this project," Chenna explains.

"One of the challenges we had, was the tight schedule. We had six months for the needed R&D work. Sun Paper believed in Valmet and the developed solution. It is great to see the equipment has performed very well and has exceeded all expectations," Raiko continues.

When working together with the customer, it was possible to design a practical modular solution that is easy to operate.

Raiko and Chenna reveal what they learnt during this development project. "It is important to keep the concept as simple as possible. From the start we needed to focus, focus and focus. We needed to manage all the wishes and ideas, and also have courage to cut some things out," they conclude.



**One plus one
is more than two**



↑ Valmet's roll service agreement with Kerinci combines roll maintenance and remote condition monitoring services, ensuring the best benefits from predictive maintenance. The mill can save money through fewer unplanned shutdowns and longer lifetimes for rolls.

As part of the APRIL Group, a globally leading pulp and paper manufacturer, the Kerinci mill produces up to 2.8 million tonnes of pulp and over a million tonnes of printing and writing paper every year.

Valmet began helping Kerinci with roll maintenance in 2014 on a consulting basis. When their PM 3 started up in 2016, the cooperation extended into a full roll service agreement, including remote condition monitoring and technical support.

"With this change, we wanted Valmet to move from an advisory role to having real responsibility for roll maintenance and workshop operations. Valmet is in charge of roll availability at our mill, for instance, by planning and executing the schedules and budgets for the roll changes," says **Pasi Ahonen**, Mill Manager at Kerinci.

To ensure its paper machine roll reliability and availability, the Kerinci mill in Indonesia has entered a full-scope roll service agreement with Valmet, including a condition monitoring system. This is Valmet's first roll service agreement combining roll maintenance and remote condition monitoring, and the results can already be seen in improved performance.

TEXT Sari Lehtonen-Lammi

PHOTOS Piek Rinaldi, Daisy Yang

Level of support pays for itself in profitability

Roll service is a specialized area of expertise and usually not the core competence of the mills' own maintenance resources.

"The reason for this service agreement is to gain value from predictive maintenance. The level of support pays for itself in increased profitability when we can avoid problems and unplanned shutdowns. Based on our location, we are not going to outsource everything, especially when we have a maintenance team of more than a hundred competent people of our own," Ahonen points out.

Long-term contract maximizes customer value

Under the roll service agreement, Valmet takes full

"We don't need Valmet for changing the rolls. We have our own team for that. We need Valmet's advice and experience to avoid unwanted surprises."

responsibility for roll management and maintenance operations, as well as for technical support in developing roll maintenance. This includes planning the annual shutdown, as well as on-site and off-site service operations.

"We will also develop and maintain a five-year maintenance plan for all paper machine, winder and pulp dryer rolls, with scheduled roll exchange plans and cost estimates," explains **Malcolm Anderson**, Site Manager from Services at Valmet.

"Our goal is to build a long-term and full-scope roll management contract that adds value to the customer's processes through better roll maintenance capacity, and improved reliability and availability," Anderson continues. "One benefit, for instance, is that most of the rolls can be serviced on-site at Kerinci."

The value comes from the competence

"We don't need Valmet for changing the rolls. We have our own team for that. We need Valmet's advice and experience to avoid unwanted surprises," says Ahonen, describing the reasons behind the agreement. "As for value, it is mainly a question of competence: it's much wiser to depend on people who do this as their main job and have long experience in roll maintenance," he comments.

Benefits of condition-based maintenance

An important part of the agreement is the remote condition monitoring, which consists of machine and vibration analysis as well as a monthly report of the machine's health with the findings of the analyses, on-site visits and

▼ Teaming up for a shared journey forward. Valmet Service's Site Manager Malcom Anderson works closely together with Kerinci's own maintenance team. This cooperation is one of the most highly praised parts of the agreement.

on-call support. Valmet Condition Monitoring provides 500 measurement points per machine, checking the trends and vibration changes through a secure remote connection.

"Using remote analysis, our customers get improved visibility over the condition of their equipment. This way, problems can be detected before they develop into machine failures," Anderson emphasizes.

"As a result, we can plan maintenance operations based on real needs, and not just on regular schedules," Ahonen adds.

One plus one is more than two

This is the first time that roll maintenance and remote condition monitoring services have been combined into one Valmet roll service agreement.

"We think that one plus one is more than two, and that, in this way, we can offer all the benefits of predictive maintenance in one contract," says **Krister Sällinen**, Director of Automation Services at Valmet. "With vibration-based online condition monitoring, we can identify the root causes of vibrations that interfere with the machine's runnability. For instance, vibrations in the press may be caused by felt problems, rather than the rolls themselves."

"Our customers save money by having fewer unplanned shutdowns, and better availability and longer lifetimes for their rolls."

A shared journey forward

At the Kerinci mill, the Valmet on-site team works closely together with the mill's own maintenance people – teaming up for a shared journey forward!

"One of the best aspects of Valmet is its people. Together, Valmet and our maintenance team provide on-site competences that can ensure roll availability, reliability and high performance," Ahonen says, describing his satisfaction.

The Kerinci mill works with three Valmet paper machines, which all rely on the Valmet roll service agreement with remote condition monitoring. The scope of this agreement is developing all the time, depending on the mill's needs. As the next step, full shutdown support is being considered and tested. ■



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Optimized means profitable at all times

Two of Finland's biggest energy producers, Helen and Vantaa Energy, have improved their production planning with a Valmet DNA Energy Management solution utilizing the vast opportunities of the Industrial Internet.

TEXT Marjaana Lehtinen

This Industrial Internet application combines plant data with data from external sources, such as the electricity market and weather service providers.



↑ Helen's Salmisaari power plant and Kellosoaari reserve power plant in Helsinki.

In late February 2018, the temperature plummets to -21.4 °C in Helsinki. It is the coldest day of the winter, and the need for electricity and district heat goes up accordingly. Helen Ltd, part of the Helen Group owned by the city of Helsinki, makes sure that both of them are produced efficiently and optimally in its four large combined heat and power (CHP) plants and 11 heating plants. There are also heat and cooling accumulators to balance heat and cooling production.

A key role in managing this diverse production palette is played by the Valmet DNA Energy Management system supplied by Valmet and its Industrial Internet ecosystem partner Energy Opticon. It is a modern, modular database software system offering energy companies tools for forecasting loads and prices, optimizing energy production, and trading electricity. It utilizes the vast opportunities offered by the Industrial Internet by combining plant data with data from external sources, such as the electricity market and weather service providers.

Improved efficiency, cost savings and continuous profitability

Helen has many plants and uses several fuels with different prices. Calculating the optimal ways to produce electricity and heat is a complicated process that is not possible with Excel spreadsheets or mental calculations alone.

"We expect the new system to improve our efficiency, bring fuel cost savings, and decrease the use of emission

allowances. With today's low electricity prices, it is important to run production more precisely, and continue to be profitable, regardless of weather conditions and changing electricity prices," says **Ari Joona**, Leading Advisor at Helen.

"We wanted a system that gives us automatic plant startups based on calculations. Additionally we wanted to improve our short- and long-term planning and get more accurate plant models," explains **Panu Oksman**, Group Leader at Helen.

After only a few months' use, the experiences have been positive. "The new system provides us with the framework for our production and has become one of our most important applications in our planning operations," adds Joona.

Optimal fuel mix

Another energy producer using DNA Energy Management is Vantaa Energy, a major utility company owned by the cities of Vantaa and Helsinki in Finland. It produces electricity and district heat at its Martinlaakso power plant and new waste-to-energy plant, and it runs several heating plants during cold spells.

Earlier, the company used Excel-based systems for short- and long-term production planning. A modern solution that provides links with external data sources and takes into account the many changing factors in power generation aroused much interest.

"The price of electricity changes daily, and temperatures go up and down, affecting the district heat demand. The many fuels that we use – waste, coal and natural gas



↑ Vantaa Energy's Martinlaakso power plant in Vantaa.

– should be combined optimally, and there are also heat accumulators to consider. It is not possible to manage this complex palette just by trusting your gut feelings. Optimization is therefore of great significance for us,” points out **Pekka Karjalainen**, Development Engineer at Vantaa Energy.

Planning up to 10 years now possible

Today, data collection from various sources, analyses and reports generated by the new system have a big role in managing production. The reasons are clear: “Being able to run the plants optimally means that we save a lot of money on fuel costs and can reduce our CO₂ emissions. The system is automated and provides us continuously with optimization data whereas manual work was earlier needed, too. This provides us with more up-to-date information, improving the quality of our operations and building a basis for our daily electricity trading,” Karjalainen adds. “The solution is a very good and reliable tool for our long-term

planning, which extends up to ten years from now.”

Karjalainen highlights the benefits of the simulation database in making calculations about future investments and their possible profitability. The offline function allows for the possibility to simulate different production possibilities under different conditions, and with different electricity prices, temperatures and availabilities. “All combined, the system has fulfilled our high requirements and expectations in supporting our business processes,” he concludes.

The new Valmet DNA Energy Management system is one of the milestones on Valmet’s shared journey with Vantaa Energy and Helen.

Over the years, Valmet has delivered advanced automation, boiler plant and environmental system technologies, as well as services, to both companies. ■

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More for the customer

The DNA Energy Management solution is a prime example of Valmet’s Industrial Internet offering. It enables CHP plants to plan and forecast their energy production optimally and become more proactive.

The solution is based on Energy Opticon’s unique technology and supplied by Valmet. “Customers have easier access to Energy Opticon’s product internationally, with local service in their own language from Valmet. Through this cooperation, more customers can increase performance and save money, time, energy and CO₂ emissions around the world,” says Energy Opticon’s CFO, **Moa Dahlman Truesdale**.

“By combining Energy Opticon’s production optimization solution with Valmet’s know-how on customers and their processes, we can together offer our customers more added value,” adds **Tiina Stenvik**, Director of Plant Performance Solutions at Valmet.

Dahlman Truesdale continues: “Our products complement each other well. Valmet is a trustworthy and professional partner who shares our values, making this a true partnership.”



What is the Industrial Internet ecosystem?

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 energy, pulp, paper and board and tissue customers.

Customers gain added value when process and business data from different mill and plant systems is combined and utilized to discover hidden improvement potential. Valmet’s first published ecosystem partners are Tieto, Kemira and Energy Opticon.



Panu Oksman, Helen



Ari Joona, Helen



Pekka Karjalainen,
Vantaa Energy

Automated icebreaking

Arctech Helsinki Shipyard delivers four new icebreakers for Sovcomflot in Russia with Valmet DNA automation system to ensure safe, reliable operation in harsh conditions.

TEXT Soili Städter PHOTOS Timo Kauppila



Arctech Helsinki Shipyard in Finland has put its world-class expertise in Arctic shipbuilding into action to construct four icebreaking vessels for Sovcomflot, the largest shipping company in Russia. Arctech Helsinki Shipyard is a leader in marine technology and emphasizes cooperation in construction with owners, operators and partners. To date, it has built more than 80 icebreakers with dedication and professionalism.

The four new ships are for the North-East Sakhalin Offshore oil and gas field region, where they will serve Sakhalin Energy Investment Co., Ltd., the operator of Sakhalin-2. Arctech is responsible for the design, construction, testing and commissioning of the vessels, which all benefit from the advanced Valmet DNA automation system.

Reliability in harsh conditions

Automation plays a significant role in supporting the safe operation of the ships in harsh conditions, working in thick ice and temperatures as low as -35 °C. The vessels also act in emergency situations – for evacuations, fire-fighting and helicopter operations.

One of the new ships, the icebreaking supply vessel *Gennadiy Nevelskoy*, mainly supports oil platforms in the Sea of Okhotsk, transporting supplies and cargo, and clearing paths in the ice. The three stand-by ships, *Stepan Makarov*, *Fedor Ushakov* and *Yevgeniy Primakov*, serve the platforms with cargo and crew. They are designed for rescue operations and oil spill recovery.

Automation contributes to safety

"In modern vessels, it is essential to have an automation system that functions without failures in all situations. These vessels are equipped with high-tech solutions that must be controlled with reliable and safe automation," explains **Matti Melander**, Designer, Electrical Systems, Automation, Arctech.

Markku Oksama, Automation and Commissioning Engineer at Arctech, is very satisfied with Valmet's automation system: "Every vessel has 4,000 alarms, so they



↑ In modern vessels, it is essential to have an automation system that functions without failures in all situations.

need a decent system to control them all. In my opinion, Valmet DNA is the choice."

So many alarms and a vast amount of data mean that redundant stations and networks are needed to ensure smooth operation. The main operator tools are the displays with accurate, up-to-date information.

Years ago, a "dead man's switch" was introduced. Every 30 minutes, the engine room operator had to press a switch to confirm that everything was fine. Now, that switch is connected to Valmet DNA.

Using data for improvement

The Valmet DNA Operate Trend and Event Archive (TEA) provides users with event history data as trends that can be replayed and analyzed. According to Markku Oksama, these trends are constantly monitored: "DNA Operate TEA gives us a lot of information. When something unexpected happens, we can trace the root cause. It is a great tool, like watching a video and learning," he says.

The power management system is fully integrated with Valmet DNA, which helps the crew monitor the fuel consumption and power flow. Reports can be prepared based on specific needs. Data is available, but it has to be selected and processed.

Oksama explains: "Service actions and scheduling are available in the automation system. For example, we can easily track exactly which parts are wearing out. And we can plan maintenance work so that we don't have to change all the same parts at the same time. Now, we are able to monitor the pumps, fans, compressors – all the equipment that has operational data."

Mutual trust leads to success

The project between Arctech and Valmet has proceeded according to the plan.

Arctech and Valmet have a history of projects together, which also helps. "Trust is the foundation of our cooperation," Oksama says. ■

Marine know-how since the 1750s

Valmet's roots in marine know-how date back to the 1750s, when a small shipyard was established at the Viapori fortress on the islands outside Helsinki, Finland (now a UNESCO World Heritage Site known as Suomenlinna). In early 20th century, the shipyard came under the ownership of the Finnish state and became part of the state metal factories, later Valmet. Now, over 200 years later, Valmet provides reliable marine automation and innovative flue gas cleaning solutions to marine operators around the world.

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Thorough planning brings success

Södra Cell Mörrum's dissolving pulp line has been upgraded with new TwinRoll presses in the brown-stock washing area, which will increase the production capacity. The installation followed after very careful planning. TEXT Kristofer Sjöblom

Södra Cell's Mörrum pulp mill commissioned Valmet to deliver and install three new TwinRoll presses to replace four wash filters. The project was carried out during fall 2017 on Södra Cell Mörrum's dissolving pulp line, which produces dissolving pulp from hardwood.

"The new equipment is part of a major investment to increase the production capacity of our dissolving pulp line," says **Anders Jepsson**, Manager of Project at Södra Cell Mörrum.

Södra Cell Mörrum is a state-of-the-art Swedish pulp mill with two fiber lines for production of paper pulp

"The start-up went well, and we're happy with Valmet's start-up organization."

and dissolving pulp. Line 1 produces dissolving pulp from hardwood for the production of cellulose-based textile fibers. Line 2 produces long-fiber paper pulp from softwood.

Successful start-up

Most of the installation took place during an 18-day shutdown. The two old wash filters were dismantled and the new wash presses installed. The shutdown was preceded by careful preparations.

"We kept to the schedule, thanks to careful planning. Planning and structure are the cornerstones in a project like this, where installation takes place in an existing plant. Everyone involved has done a great job," says Jeppsson.

Valmet built a large platform around the wash presses as part of the project. This was done to provide Södra Cell Mörrum's employees with better access to the machinery.

"The platform is a great installation that improves our work environment. All in all, we now have what we wanted to achieve good access to the wash presses," says **Sören Einarsson**, Operations Representative at Södra Cell Mörrum.

"Planning and structure are the corner stones in a project like this, where the installation takes place in an existing plant," says Anders Jeppsson, Manager of Project at Södra Cell Mörrum.



Work during the shutdown was followed by start-up, and now the guarantee trials are also completed.

"The start-up went well, and we're happy with Valmet's start-up organization. A certain flexibility is always necessary during start-ups like this, and Valmet provided it. The training was also good. The guarantee trials turned out well, and so far everything looks positive," says Jeppsson.

Excellent collaboration

The brown stock washing upgrade required teamwork between Södra and Valmet, and the collaboration went well.

"We enjoy a good cooperative atmosphere where we find solutions together. This is especially important in a project of this type, where many hours are devoted to planning. The careful planning that was carried out prior to the shutdown is a good example of a success factor for future projects," explains Jeppson. ■

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↑ New TwinRoll presses in brown-stock washing for increased production capacity.



Lighter. Stronger. Kruger.

The interest in lightweight linerboard is on the rise in North America. In response, Kruger converted their newsprint machine to board machine to produce the finest 100-percent recycled high-strength linerboard on the market. TEXT Kaisamaja Marttila PHOTOS Kaisamaja Marttila and Éric Massicotte



Kruger has over 50 years' experience in the packaging industry. They put that experience to good use when they entered the market with their premium XTR linerboard in 2017. Having a strong customer base caused high expectations. But when the bar is high, it feels even sweeter to succeed.

"We met the market's expectations," explains **Gino Lévesque**, Vice President of manufacturing at Kruger. "We promised our customers lightweight, high-strength board, and that's what they got. And trust me, they did all kinds of testing when they got the sheets for the first time."

PM 10's grade conversion journey started five years earlier. After initial planning, it became obvious that their best newsprint producing machine, at the Trois-Rivières mill in Canada, was the most suitable candidate for conversion. "Valmet presented us an integrated, overall solution in terms of technology and were willing to take a kind of calculated risk, too," Levesque says, explaining the rationale behind the choice of supplier for the reconstruction project. Kruger also took advantage of Valmet's piloting services to develop the right rebuild scope. "Valmet's pilot machine in Finland was adapted to show the different grades that could be produced on PM 10", says **Anish Patel**, Superintendent of PM 10.

The transformation that works – and why

Grade conversion adds an extra layer to the complexity of a rebuild project, as the mill has to adapt and learns the tricks of the new grade. "With liner, there are more parameters to control than with newsprint. If the printer is complaining, it's easy to go and fix things. In packaging, there are plenty of customers, and you have to make sure that every parameter is under control. You can never tell which deviations can lead to large stresses in the box manufacturing," Levesque explains.

"With our grade conversion, we met the market's expectations. We promised our customers lightweight, high-strength board, and that's what they got," says Gino Lévesque.



"The machine gives us flexibility to change over from light to heavy weight without the downtime that comes from changing the equipment. It increases efficiency," says Anish Patel.

To ensure a smooth transformation, the operators received thorough training during the six-week shutdown. Both Levesque and Patel praise the team spirit. "We had the right people in the right place. We have a good mix of young engineers in the team, and we also have experienced papermakers to help with problems that young engineers fresh out of school haven't come across yet," Patel says.

Success comes from having good expertise on both sides. "Being one team with Valmet has been the key. This is not a customer-supplier relationship – it's a true partnership," says Levesque.

The team was put to the test when some challenges arose. "Valmet had a positive and collaborative attitude, despite the challenges we went through with the OCC plant. There was no blame game involved, and we saw how Valmet's team adapted and tried to help in any way possible," Levesque continues.

Kruger has also taken advantage of Valmet's knowhow after the initial tune-up period by having a Valmet expert on-site to help with further optimization of the machine.

Surpassing industry standards with innovative technology

Kruger's ambitious target is to be among the best linerboard mills in North America and to provide their quality-conscious clientele a strong, stable, flat sheet with the best strength-to-basis-weight ratio. The technical scope of the rebuild was crafted with that in mind.

"Kruger did the choice of implementing the latest technology available and had dedicated proper resources to exploit the full potential of that technology," says Levesque.

"We have excellent sheet formation, and the new dilution headbox means excellent CD profiles. We had some

"With our grade conversion, we met our customers' expectations."

issues with the pick-up. They were resolved by changing the felt design, and apart from that we've had very good experiences with the OptiFormer forming section with shoe and blade technology," Patel says. He is also happy with the retrofitted shoe press. "Obviously, it has provided us with more capacity with more dryer sheet, and it has been straightforward to use. The first sleeve exceeded its warranty life, and it was in excellent condition considering the beating it experienced during the start-up," he continues.

During the start-up, the mill was forced to push the upper and lower limits of the machine. "It showed to us that the machine has the flexibility and ability to run within wide limits. We were able to go as low as 88 gsm or as high as 171 gsm or over. We do not have to play with the tilt, rod design or all these different elements every time we change grades. It gives us a certain flexibility to make the transition from light to heavy weight without the downtime that comes from changing the equipment. It increases efficiency," Patel says.

More capacity with steel cylinders

Kruger chose steel cylinders instead of cast iron cylinders for their rebuild. The machine had a footprint that it had to fit within without moving the current reel and winder. In order to reach their target capacity, they needed to get the highest efficiency for drying. The thinner shell of steel cylinders enables higher heat transfer.

"The steel dryer cans are performing well. We were initially a bit concerned, but in nine months of operation,

we haven't had any issues," Patel shares his experiences. The use of OCC as raw material made them concerned about cleanliness. "We haven't had any sticky issues. The doctors are new, which definitely helps, and we have fabric cleaning devices making sure that fabrics stay clean."

The paper machine has good evaporation rates, and they've been able to meet or exceed the machine speeds that we guaranteed.

Attitude for going forward

When asked about the success of the project, Levesque says: "Marketwise, we are now providing a solution to the market that makes people talk about us. But, we have the attitude to keep moving forward."

Patel feels the same. "We're continuing to make the board better and taking advantage of all the new technology we have on the machine. Valmet DNA is a very powerful tool for collecting data, and we're using it for optimization. While we are producing a very high quality product, Kruger is committed to pursue the development of this product line in order to exceed the customer requirements regarding the low basis weight high strengths ratio."

And how does the future look for Trois-Rivières PM 10? Very good, as long as they keep delivering the results. ■

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↑ Kruger's PM 10 in Trois-Rivières Mill produces 100 percent recycled, lightweight liner-board.



◀ In March 2018, Kruger's PM10 reached an important milestone as it reached a monthly production record of 1,024.9 metric tonnes/day.



"It feels good to succeed together"

"My task is to help Kruger to get the most out of their machinery," tells **Jukka Muhonen**, Senior Paper Technology Manager at Valmet. "I started to work with the team already in the start-up, and after that we've successfully worked together to make the ramp-up period faster. I help to optimize the paper machine running parameters, so that the production and quality targets are achieved. I also support the operators in their daily tasks and maintenance planning and share the best practices I've learned during my career. Troubleshooting is also big part of my work. You could say that I'm the customer's gateway to Valmet. I have access to the wide Valmet expert network, and that brings in extra muscle to problem solving."

"I've really enjoyed my time here. I feel as an equal member of the team, and it feels good to succeed together. The mill team cultivates culture of co-operation and openness, and it makes daily work easy and very effective."

Stefan Östman is very pleased with the new slice lip control system.



Breaking records

SCA Ortviken's paper machine PM 5 is breaking production records with a new Valmet IQ Slice Profiler system.

TEXT Sören Back and Nigel Farrand PHOTOS Sören Back

SCA Ortviken in Sweden, a producer of coated and uncoated publication papers, needed to modernize the end-of-life slice control on the headbox of its paper machine PM 5. As the existing slice control was a 17-year-old Valmet Jetmatic system, it was natural to look at upgrading it to a Valmet IQ Slice Profiler. The installation and the start-up of the new system went

smoothly and, since April 2017, PM 5 has a stable and modern system to control the basis weight profile.

Stable solution with minimal maintenance

PM 5 at SCA Ortviken started operating in 1986, producing newsprint. Today, the machine, with a gap former wire section and a trim width of 8.6 meters, produces 42–80 g/m² paper at approximately 1,300 meters a minute. The main part of the production is high-end uncoated and lightweight coated papers for demanding printing applications. Only a minor part of production is standard newsprint.

"Over the years, we have of course upgraded PM 5, but the headbox was still the original one," says **Stefan Östman**, Control System Engineer at SCA Maintenance. "In 2000, we added a Jetmatic slice lip control system from Valmet, which has worked well but was getting old, especially when it comes to the electronics. It was also getting increasingly difficult to get spares, so replacement was the only option. We wanted a stable solution with minimal maintenance requirements that would last for many years."

"We examined the market to see which system would suit us best, and after a thorough evaluation, we chose Valmet's IQ Slice Profiler. Valmet showed that the existing 118 headbox actuators on PM 5 were in such good condition that they only needed calibrating and adjust-

ing. We also did not want a third supplier in addition to Valmet and the quality control system manufacturer," says Östman.

Easy installation and start-up

It took four days during a mill maintenance shutdown in 2017 to change the slice lip control system on PM 5 to the Valmet IQ Slice Profiler. For Ortviken, this meant calibrating and adjusting all the existing actuators and giving them new control cards, changing all the field cabling and installing optical fiber cables between the field cabinets, as well as setting up the new interface, new buses and a new process station for the system. The power supply for the field equipment was also changed.

"The installation was easier than expected, and the startup went smoothly," Östman continues. "Our new IQ Slice Profiler gives us a quicker response than before. To be on the safe side, we made sure to have the possibility of a remote connection and service from Valmet, but we haven't needed them, as everything has run without any problems. From our control room, we have full control of all systems and the knowledge that they are working as they should. Proof of this is that we have broken production records several times since installation." ■

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The upgraded slice lip control with all 118 headbox actuators.

IQ Slice Profiler for better runnability during coating and converting

IQ Slice Profiler is a modern, precision system for controlling the basis weight profile across the web. Each actuator has a powerful microadjuster that changes the position of the slice lip in steps of 0.1 micrometers. The whole system is very robust, with minimal need for maintenance. Good control of the basis weight profile provides a solid basis for optimizing all other profiles, which in turn gives better runnability during coating and converting. To date, more than 250 IQ Slice Profiler systems have been delivered to mills all around the world.



Support at all times through service agreement

Valmet's roadmap and service agreement approach to product life-time planning eases upgrades and planned replacements of customers' end-of-life equipment. Tailored to individual customers' needs, Valmet's service agreement can cover everything, from periodic and emergency maintenance with guaranteed response times, to complete lifecycle support for customers wanting the latest technology and the opportunity to benefit from new measurement and control methods. Using remote connections, Valmet's specialists are always on hand for advice and support at all times, which, combined with nearby service centers, ensures maximum system availability and uptime.

The system lifecycle roadmap is a key element of a Valmet service agreement that helps users to stay aware of their current system status and assign priorities for possible upgrades or component replacements. The ability to budget well ahead of time and keep systems up to date ensures that the best advantages can be taken of new developments, while cost-effectively maintaining system reliability and performance.

Future projects identified at SCA Ortviken already include a Valmet IQ Slice Profiler for another machine, and other system upgrades, as well as the replacement of break camera systems for two machines.

Sunila makes the most out of **lignin**

A large, rounded mound of dark brown, granular material, likely lignin, occupies the lower half of the image. The texture appears fine and slightly uneven.

Stora Enso's kraft lignin,
Lineo™ by Stora Enso, is a
highly versatile product with
numerous potential uses.

Stora Enso's Sunila Mill produces kraft lignin with Valmet's LignoBoost™ technology. In 2018, Stora Enso launched their dry lignin product, Lineo™ by Stora Enso, which is an excellent alternative to fossil-based raw materials in a wide range of applications.

TEXT Antti Ratia PHOTOS Antti Ratia, Stora Enso and Valmet

Stora Enso's Sunila softwood pulp mill is one of the company's mid-range production units in Finland. Its annual production capacity of 370,000 tonnes is not among the industry giants, but it has an agile and flexible technological setup that meets the market demand. Over its 80-year history, the mill has always had a special role in taking new technologies into use.

"Everything that is made out of fossil-based materials today can be made out of wood tomorrow. It's Stora Enso's strategy and aim for the future," says **Jarmo Rinne**, Development Director at the Sunila Mill. "We are moving away from being a bulk kraft pulp producer into more specific product segments. All of our Nordic pulp mills have their own roles and product segments that they focus on. Sunila's specialties include strong Nordic kraft pulp and kraft lignin, together with turpentine and tall oil".

The Sunila Mill's lignin production is based on Valmet's LignoBoost™ technology. The lignin is extracted and washed, then dried to a fine powder. Stora Enso constructed an automated big bag filling system to facilitate transport for further use of the lignin in high-value products.

Project with a strong R&D nature

Stora Enso had been involved in lignin research work for

years, and the planning of this lignin extraction investment started in 2011. In 2013, Stora Enso and Valmet agreed on a LignoBoost plant delivery to Sunila, and production began in January 2015. Today, Sunila's annual kraft lignin production capacity is 50,000 tonnes, making it the largest in the world.

Jarmo Rinne says that Valmet was really the only true provider for the technological solution they were looking for. The key elements in Stora Enso's decision-making process were Valmet's R&D knowledge and the LignoBoost plant it delivered to the Domtar Plymouth mill in USA.

"I was impressed by the professionalism of Valmet's project team. Even though Valmet had already built a similar industrial plant in the past, both parties knew from the beginning that this project would have a strong R&D nature," says Jarmo Rinne.

Lignin for valuable end products

Stora Enso is the first company to produce kraft lignin with an extremely high dry content – up to 97 percent. The lignin produced at the Sunila Mill is both sold to other users as a raw material and used as a biofuel in the lime kiln, which has significantly decreased the mill's CO₂ emissions.

Stora Enso's Lineo™ lignin product was launched in early 2018 and was named "Bio-Based Product of the Year" at the Bio-Based World News Innovation Awards in March 2018. Lineo™ by Stora Enso is the first wood-



Stora Enso produces kraft lignin at its Sunila Mill.

"Valmet was really the only true provider for the technological solution we were looking for."

based product that can replace oil-based phenolic adhesives, which are used for example in plywood, oriented strand board, laminated veneer lumber, paper lamination and insulation materials.

"We have achieved the targeted product quality"

"Throughout the entire Sunila Mill LignoBoost project, Valmet and Stora Enso have been working very closely together, in a solution oriented way on optimizing the process design and on identifying potential problem areas. Working with Stora Enso has challenged and helped us to develop our technology even further, and we are continuing to work closely together in various development activities," says **Hanna Karlsson**, head of Valmet's LignoBoost team.

"All in all, the project has gone really well, and it was a pleasure working with Valmet. The quality of the product has reached the specifications that we were promised.

Naturally, we are continuing to develop the parameters based on end-product needs.

Our staff are also gaining more experience in running the plant as we go forward.

But we have already achieved the target in product quality we were aiming for," Rinne concludes. ■

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"Everything that is made out of fossil-based materials today can be made out of wood tomorrow," says Jarmo Rinne, Development Director at the Stora Enso Sunila Mill.

Lignin is future

Lignin is a renewable, wood-based, non-toxic alternative to fossil-based materials. Lignin is a complex macromolecule, and it is the most abundant natural aromatic polymer. In nature, lignin acts as the glue that binds cellulose and hemicellulose together. Lignin can be separated during the kraft pulping process and then utilized in various applications as an alternative to fossil-based raw materials. For example, refined lignin can be used as a replacement for phenols, which are used in resins for adhesives in, for example, plywood and veneer applications.

Working together towards the common goal



"In this project, we utilized the learnings from our first LignoBoost delivery to Domtar, but we had also areas that were done for the first time ever. It was a pleasure to work with Stora Enso's team, as they were very professional and experienced, and showed true commitment towards the common goal.

All in all, the project went well and the start-up was successful, but the R&D nature of the project is visible in the fact that the process still needs some finetuning. Naturally, there were challenges along the way. For example, installing the equipment inside an existing, Alvar Aalto designed, building was not easy, but with 3D laser scanning and careful layout planning, we were able to achieve a good end result," explains **Jari-Pekka Johansson**, who was Valmet's Project Manager in this project.



"Valmet is our partner and gave us good service and support for these improvements," says Sontaya Tunsaranuwat, Production Department Manager at Thai Cane Paper. From left: Yutthapon Sittiwatjana, Paper Technology Manager, SEA region, Valmet, Sontaya Tunsaranuwat, Production Department Manager, Thai Cane Paper, Vithoon Boonyasart, Paper Machine Manager – Thai Cane Paper, Poranart Kongsmai, Product Sales Manager, Valmet.

Improving press performance step by step

After a four-phase improvement project, Thai Cane Paper enjoys lower steam consumption, better runnability, higher paper dryness, longer felt lifetimes, and vacuum energy savings in its PM 2 press section.

TEXT Yutthapon Sittiwatjana, Peerapoj Warathumpitak and Chaiwat Foongkiatchai **PHOTOS** Tawatchai Mansorn



From left:
Poranart
Kongsmai,
Product Sales
Manager – Paper
Machine Clothing
and Performance
Parts, Valmet,
Sontaya
Tunsaranuwat,
Production
Department
Manager, Thai
Cane Paper,
Vithoon
Boonyasart,
Paper Machine
Manager – Thai
Cane Paper,
Yutthapon
Sittiwatjana,
Paper Technology
Manager, SEA
region, Valmet.

Operating the press section of a paper machine is demanding, but it offers chances for optimization. The main factors affecting performance are the press felts, roll covers and vacuum system. Changing any of them immediately impacts the others, and ultimately the overall performance of the press section.

Thai Cane Paper is a subsidiary of Packaging Business in SCG, one of the largest kraft paper producers in Thailand. They had been having challenges with the press section of their PM 2. Press felt lifetime was too short, dewatering was poor, and sheets tended to drop off during pick-up or follow the top-ply wire. There were also issues with felt marking.

The mill tackled these problems step by step in close cooperation with Valmet's Laem Chabang Service Center and global experts.

Focus on press felts and dewatering

Due to the high Uhle box vacuum capacity of a turbo blower installed in 2014, existing traditional felt designs were not performing well. Their lifetime had dropped from 60 days to just 35 days, and average paper dryness after the press was 47.6 percent, sometimes dropping as low as 44.7 percent.

Valmet's study and felt trials showed that the felt designs were quite open and ran dry, as there was not

enough hydraulic pressure under the nips. Valmet Press Felt SPMs with a 100-percent woven laminated structure and special soft paper-side yarns were installed. The felt design matches the vacuum capacity, carries more water and is more compressible under nip load to create effective hydraulic pressure. An optimized felt batt combination and a soft top-side base weave minimize felt marking even when the felt is dry.

Optimizing the vacuum system

The next phase focused on the vacuum system to eliminate paper drop-off from the pick-up roll and its tendency to follow the top-ply wire due to the poor vacuum capacity of the transfer suction box. To cope with them, the mill had to open a vacuum pump.

Changing to perforated Uhle box covers improved Uhle box dewatering with less air flow and less vacuum system control tuning, and closed the extra vacuum pump. Vacuum optimization increased felt lifetimes, too.

Further improving sheet dryness and roll performance

To further improve sheet dryness and roll performance, a Valmet Press Roll Cover PP was installed on the second press. Combining it with the Valmet Press Felt SPM and the optimized vacuum system immediately improved operating results. Average dryness after the press immediately rose from 49 to 51.6 percent. The total drive load of

the second press fell to 14 percent. With the new covers, press rolls can be operated without water-cooling, which saves money.

Training ensures high performance in the future, too

During the final phase of the project, Valmet trained the mill staff to maintain the results and high performance.

"Valmet is our partner and gave us good services and support for this improvement. So, we would like to thank the Valmet team for providing this four-phase approach to our PM 2," says **Sontaya Tunsaranuwat**, Production Department Manager at Thai Cane Paper.

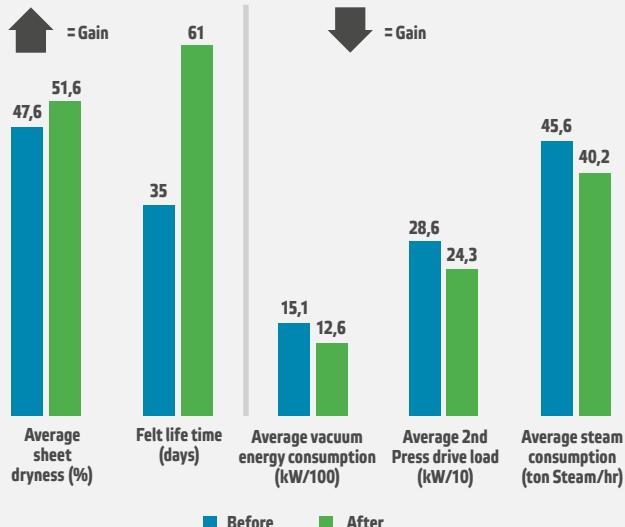
Lower steam consumption, longer felt lifetime, energy savings

All in all, the results of this project have been impressive. The biggest is the average steam consumption decrease, down from 45.6 to 40.2 tonnes an hour. Suitable felt air permeability combined with vacuum optimization using perforated covers and vacuum control system modifications have allowed the mill to permanently close the vacuum pump without sheet drop-off problems. With a vacuum level recommendation for the Uhle boxes and the Valmet press felts and roll covers, the mill has achieved higher dryness after the press and extended felt lifetimes, along with improved quality. The Valmet press felts and roll covers have also improved nip dewatering and reduced drive loads, resulting in energy savings.

On this Shared Journey Forward, every factor – press felts, vacuum optimization, roll covers, service, training, cooperation between the mill and Valmet – was vital for the successful outcome. ■

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Summary of benefits



The average steam consumption decreased from 45.6 to 40.2 tonnes an hour.



Optimized production at full speed



EcoPaper's Ion Ciolan (middle) is very pleased with the renewed film sizer and Valmet's capability to solve the problem. He is pictured here with Antti Räisänen, Product Specialist (left), and Petri Heikkilä, Engineering Manager (right) from Valmet.

EcoPaper's liner and container board machine 1 in Zarnesti, Romania, got all the benefits of the new Valmet Sizer Applicator Beams: availability, runnability, energy savings, and ability for full production.

TEXT Heli Kankare PHOTOS Teemu J. Nieminen

EcoPaper S.A. manufactures corrugated board, using 100 percent paper and board waste products as their raw material. Their PM 1 at Zarnesti mill was suffering from a poorly performing film sizer that had been used as pond sizer due to the problems. The mill decided to order a process performance study from Valmet to solve the problem.

"We had a lot of problems with our film sizer, and we needed to run it as a pond sizer so we could only run at the maximum 500 meters a minute machine speed. We really needed a solution, and I'm happy Valmet could

"We are not just happy with our rebuilt sizer – we are proud of it."

offer it to us," explains **Ion Ciolan**, Project Manager at EcoPaper.

Valmet carried out the study and recommended new composite applicator beams for the sizer. "The study results were clear, and when we saw the beams in Valmet's assembly room in Järvenpää, that was the final step in the decision. We wanted Valmet's state-of-the-art composite sizer beams."

Tools to optimize production

The new film sizer application beams were installed and started up in October 2017, and now the sizer works perfectly. They can now run the machine at the full 1200 meters a minute speed. The benefit of the beams is that now they do not have deflection caused by heat expansion, meaning there are no profile defects.

Ion Ciolan describes the benefits they have noticed: "We have saved a lot of energy now that there is no excess water to evaporate in the drying section. The runnability in sizer area has improved significantly, and another major benefit is that we can now use dyes in the sizer to produce the colored board our customers want. This really gives us good tools for optimizing our production."

"We are proud of the rebuilt sizer"

Ion Ciolan is convinced by Valmet's way of working: "Valmet has demonstrated outstanding performance throughout this project. It was our first experience with Valmet, but it definitely won't be the last. We have now entrusted Valmet with sizer consumables, like Valmet Sizer Roll Cover SH covers for our sizer rolls, sizer rods and sealing blades. At the moment, we have an ongoing winder upgrade project to get the winder to perform in sync with our board machine, which Valmet is also doing."

EcoPaper Zarnesti PM 1 now produces liner and container board with a basis weight range of 80–170 g per square meter, a wire width of 5.4 m, and a full design speed of 1,200 meters a minute. We are not just happy with our rebuilt sizer – we are proud of it," says Ciolan happily. ■

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New composite beams gave new life to the old film sizer.

Finding the sweet spot for refining

Valmet Pulp Analyzer (Valmet MAP) shows the route to better refiner management at Pankaboard mill in Eastern Finland. TEXT Nigel Farrand

Valmet Pulp Analyzer provides paper, board and tissue makers with fast and precise online updates of key fiber and papermaking furnish properties.

The Pankaboard mill, located in Lieksa, Eastern Finland, is a world leader in the production of high-thickness folding boxboards and uncoated cartonboards for packaging, graphical and industrial applications, and food service products. The mill's continuous product development and innovations have ensured that products from their two distinctly different board machines, BM 2 and BM 3, always meet customers' precise needs. As part of this philosophy, Pankaboard recently installed a Valmet Pulp Analyzer (Valmet MAP) to help provide better refiner control of the multiple furnishes of the board machines.

Good drainability reduces breaks

The main target of refining is to improve the bonding ability of the fibers, so that they form a strong, smooth sheet of paper with good printing

properties. At the same time, the degree of refining affects the drainability and drying of the sheet, with the multiple furnishes and forming zones in the board machine adding further complexity.

Freeness, the primary indicator of drainage potential, is now measured online by Valmet MAP to help machine operators set the refining intensity for the results they want to achieve. This avoids excessive refining of the top and bottom ply furnishes which, as well as wasting energy, results in a more compact fiber network, which can reduce dewatering in the middle layer, leading to blistering and delamination in the dryer.

"The refiners need to be operated continuously in the sweet spot for best furnish quality and good drainability," says **Tomi Hankaniemi**, Production Manager at Panka-board. "Our primary objective was to reduce blowing breaks caused by poor drainability."

Online freeness measurement

The Valmet MAP analyzer was installed in April 2017, with a total of 12 automatic samplers measuring freeness at multiple points on both machines after pre-refining and machine refining for the top and back plies, as well as after the middle ply, enhancement pulp, broke pulp and groundwood pulp refining. The analyzer cycles through the samples automatically, providing sequential measurement updates for all 12 points in about one hour.

"We ran laboratory correlations during the first two months with roughly 15 different pulp grades and mixes," says Hankaniemi. "The results were so good that we haven't



"Runnability has improved on both board machines, as well as sheet quality."

had to do any further checks since then."

The hourly freeness values for the 12 measured points are displayed as trends on dedicated displays in both machine control rooms. "Operators now know exactly what is happening and can see the results of control actions almost instantly. Earlier it was sometimes difficult to know whether a change had been made or what effect it had," says Hankaniemi.

Operators now actively use the trend information to adjust refining energies, made easier now that the freeness limits for BM 2 are marked with red lines on the display. "It's still quite new, but we've determined freeness limits for the top and back plies on BM 2, and our operators can see exactly where they are. Breaks due to excess moisture have now been reduced. They still happen occasionally, but we can now better determine the cause."

Standardized measurement method

Valmet MAP automates the TAPPI T227 standardized measurement method to provide reliable and accurate freeness results with the high availability of an online analyzer. Not only providing a high degree of repeatability, the standardized measurement provides freeness results that are comparable between different mills. The modular design also allows other fiber property measurements to be added to the standard platform and utilize the same automatically sampled points in the process.

Timo Pursiainen, Maintenance Engineer, reports no significant problems during the first nine months of operation. "It was a pretty straightforward installation, and

the simple maintenance only involves monthly cleaning, taking an hour or so," he says.

ROI measured in months

"One positive surprise has been how much more information the device gives us and how effective and repeatable it is," says Hankaniemi. "Runnability has been improved on both board machines, with fewer blow-induced breaks. And that has improved sheet quality."

When asked about the return on investment, his cautious reply is, "It's measured in months! It was certainly a good purchase!" ■

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Forerunner in automation

The Pankaboard mill, established already in early 1900s, has always been open to new ideas in developing its business. The first-ever Valmet Damatic Classic automation system was delivered to Pankaboard mill in 1979. The system has been operating ever since and will now be upgraded to Valmet DNA in several stages by mid-2019. The upgrade enables Pankaboard to develop its customer need-based and flexible operating model more cost efficiently.

Successful system migration with the first redundant Profinet



"Our previous experience with Valmet and the desire to standardize control room operator stations made Valmet the best choice," says Pekka Rönkä, CP Kelco's Project Manager.

CP Kelco replaced an end-of-life automation system on its CMC production line in Äänekoski, Finland, with Valmet DNA. The delivery included Valmet's first redundant Profinet extension to DNA for production line motor controls.

TEXT Nigel Farrand

CP Kelco's plant in Äänekoski produces carboxymethyl cellulose (CMC), a water-soluble polymer derived from cellulose, having significant applications in almost all industries from medicines and food products to papermaking and oil drilling. The Äänekoski plant has three production lines, two of which already had process automation systems from Valmet.

As the control system on production line 4 had reached the end of its life, the decision was made to replace it with a Valmet DNA distributed control system (DCS). "Our previous experience with Valmet and the desire to standardize control room operator stations made Valmet the best choice," says Pekka Rönkä, CP Kelco's Project Manager. In addition to two existing automation systems in Äänekoski, Valmet also supplied the control system in 2008 for CP Kelco's greenfield CMC plant in Taixing, China.

System and media redundancy

CP Kelco decided to include Profinet motor controls in Valmet's scope of delivery for the plant in Äänekoski. While Valmet had already delivered several Profinet solutions to paper, chemical and food industries, this was to be the first redundant Profinet implementation.

Valmet took total responsibility for the system's network design, which is critical to ensuring trouble-free and correct operation of all network components. Duplicate process stations on the ring network provide system and media redundancy, while Profinet's Configuration in Run (CiR) allows the device removal, replacement or re-parameterization while the system is running.

"I had trust in Valmet. We conducted the system factory acceptance test (FAT) during December in Valmet's nearby service facility in Jyväskylä, and it went very well," says Rönkä. With the FAT concluded, installation of the system commenced on production line 4, starting with twenty motor controls at the beginning of 2017. During a



One of the 50 motors controlled by Profinet in the Valmet DNA automation system.

second shutdown in summer, an additional thirty motors were added to the system with Profinet switches on two redundant rings.

Replacing motor control modules on the fly

"We now have the ability to reset tripped motors from the control room, to read information from controllers like the number of starts, and to have real-time diagnostics information. A big benefit of the redundancy is the possibility to replace a motor control module on the fly without stopping the process," declares Rönkä. "We are very satisfied – we got what was promised".

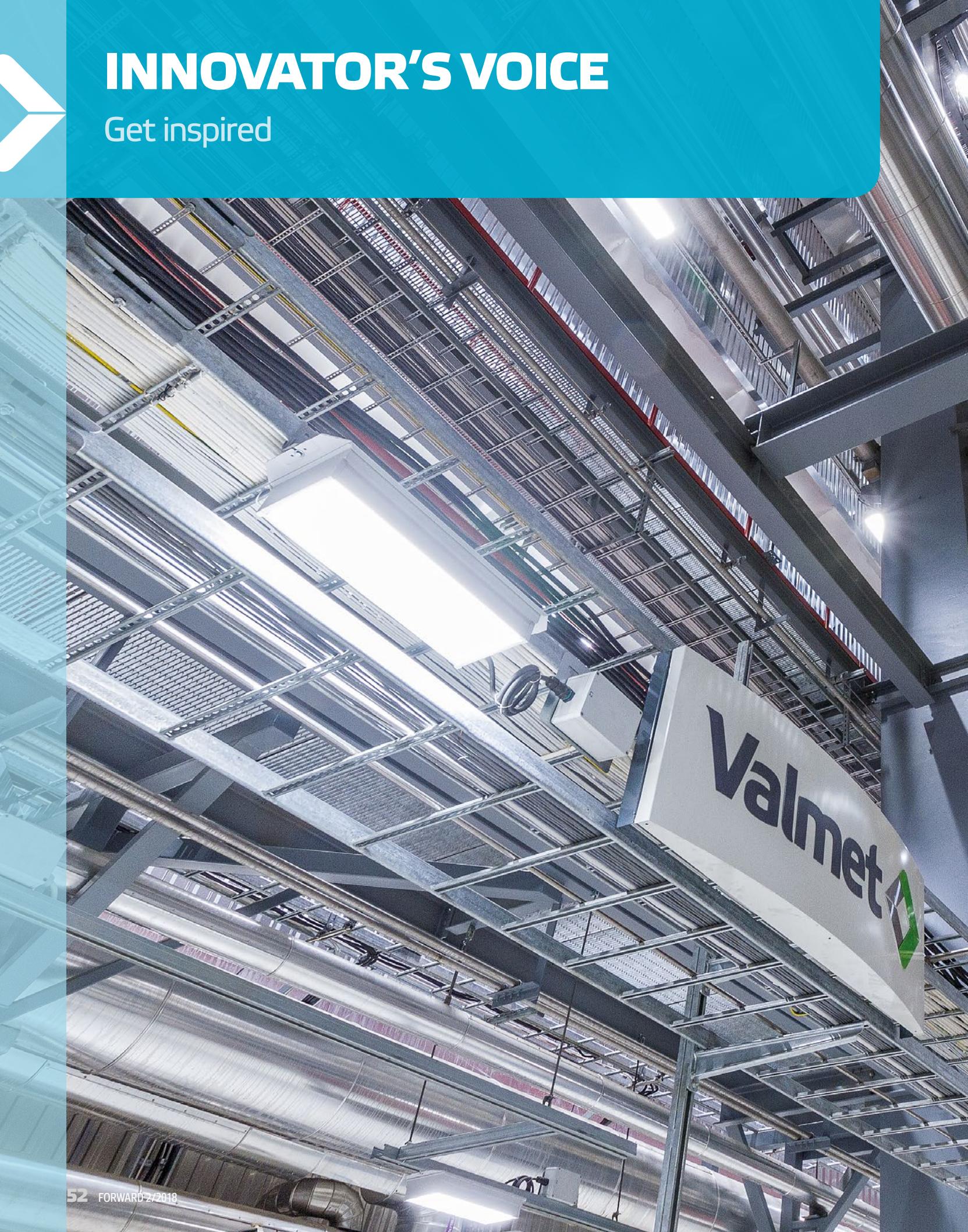
The start of the CMC process is a batch process where recipes and sequences are a key part of the control. After completion of the different reaction steps, the product is dried, ground and bagged as technical-grade CMC. With more than a thousand I/Os in addition to the Profinet extension, Valmet DNA on production line 4 has performed to expectations. "The Profinet addition to the system replacement was very worthwhile, the cabling was simpler, and as the motor controls were totally new, it made the job easier. Overall, it was a very good project." ■

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"Valmet DNA, with the Profinet extension, has performed to expectations."

INNOVATOR'S VOICE

Get inspired



RECOX+

recovery boilers for peak performance

By combining technology, automation and services expertise, Valmet can provide a complete recovery boiler solution with relentless performance.

TEXT Lotta Forssell

The requirements for chemical pulp production are changing rapidly. Chemical pulp producers are looking for more efficiency from the basic operations – better reliability and higher performance, as

well as a safe operating environment. Additionally, the environmental regulations – for example, for emissions into air and water – are getting tighter, and society's expectations are higher when it comes to issues like odor control.

These requirements also impact the design and use of recovery boilers. The recovery boiler can be described as the heart of the mill. It's a vital part of the chemical cycle and steam production, and its operations impact the whole pulp production process and the mill's profitability. Nobody wants to have the heart broken – and the pulp mill can't afford the recovery boiler breaking down, as it disables the entire mill.

"Our new concept, called RECOX+, combines our total offering, including boiler technology, automation



↑ Valmet Smelt Spout Cleaning Robot is an example of technology that provides both safety and efficiency.

and optimization solutions, as well as our comprehensive services offering, to ensure a complete solution and relentless performance of our recovery boilers,” explains **Teemu Toivo**, Director of Sales for the Recovery business unit.

Tailoring together with the customers

Over the years, Valmet has continuously developed its recovery boiler technology, automation features and related services together with customers to meet their toughest demands and expectations. Many of these features are linked to the performance, reliability and safety of the boiler operations.

“There is no ‘one-size fits all’ when it comes to pulp mills and recovery boilers. For some customers, we tailor the boiler for high electricity production, but for others a robust design is the deciding factor. We offer state-of-the-art technical features more as modular options. This enables us to work together with each customer to design the boiler that best suits their needs,” explains **Pekka Rikkinen**, Director of the Recovery Boiler technology unit.

One example of new technology that improves the safety, efficiency and productivity of the recovery boiler is Valmet’s Smelt Spout Robot. It efficiently removes smelt deposits from recovery boiler smelt spouts in a carefully designed sequence, without the need for operating personnel to be exposed to this dangerous procedure.

Optimized recovery boiler for chemical pulp mills

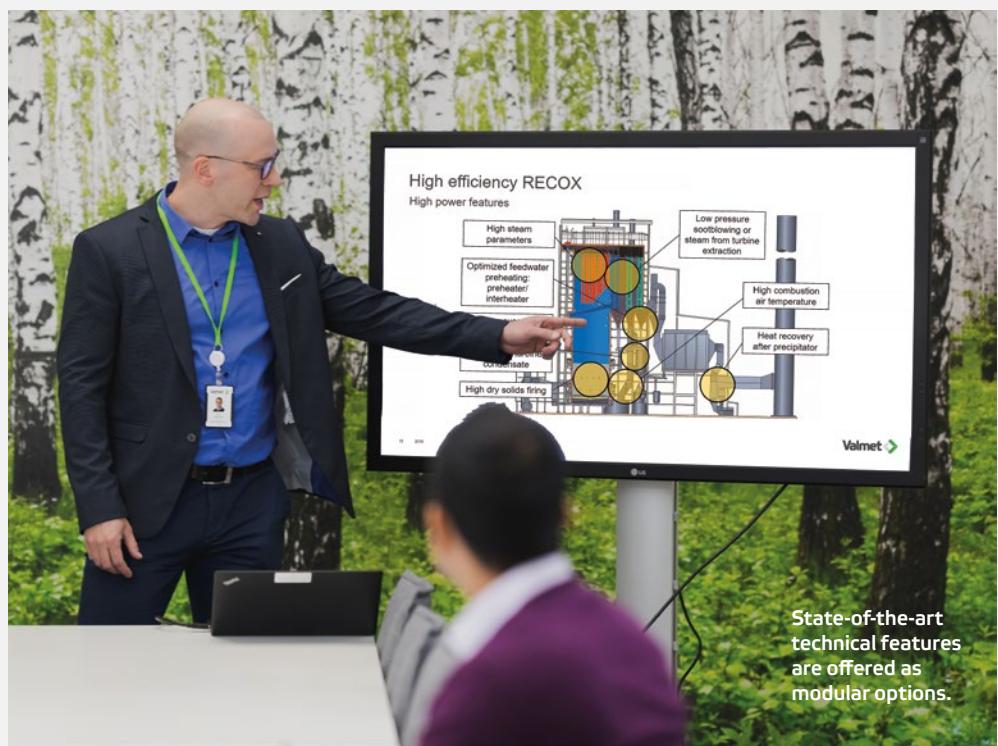
An optimized recovery boiler has a high reduction rate and is energy efficient. It makes operation easy and safe, and it is built to last: the robust design and superior

“We work together with our customers to tailor solutions to their needs.”

material choices mean less maintenance and minimized risk of corrosion.

“Our recovery boilers can go as long as 18 months without a cleaning shutdown. This is made possible by good design, expertise in materials, combustion know-how and optimization, reduction control optimization – and naturally by the professional operators running the boiler. Our technology and automation teams have developed many of these features together,” says Rikkinen.

“It is important to maximize chemical recovery and thermal output. Our Recovery Boiler Optimization solutions are designed for high reduction efficiency, steady smelt flow, high total titratable alkali (TTA) concentration, maximizing superheated steam temperatures, minimizing flue gas losses, efficient sootblowing and cleanability,” explains **Timo Laurila**, Business Manager for Recovery Analyzers and APCat Valmet.



↑ Recovery Boiler Optimization solutions improve performance and reliability of operations.

↑↑ Every recovery boiler is tailored to meet customer needs.

Partnering for operations and maintenance

Earlier, recovery boilers were often shut down for cleaning and maintenance one or two times a year, and the shutdown from liquor to liquor took at least a week. Now the shutdown is only once every year or two, and the pressure part working time can be as little as 48 hours. Naturally, this requires excellent shutdown management.

"The best results in executing maintenance shutdowns are achieved when we pre-plan them thoroughly together with the customers. The preplanning covers not only the work and schedules, but also the planning for safety and cooperation between the different companies operating on-site. This way, even really challenging shutdowns can be executed in a tight schedule," explains **Olli Talaslahti**, Sales Manager for Valmet's Services.

"Our experience in chemical recovery stems from deep process technology knowledge and a large installed base of boilers of every size. For each project, we assign a team of experts that works together to tailor a solution for the customer's needs, and we have a network of service professionals to support operations throughout the lifetime of the boiler. Our expert services include various process changes to remove bottlenecks, increase efficiency and reduce emissions," says **Jussi Mäntyniemi**, VP for Valmet's Recovery Business Unit. ■

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Results:

Unified and easy operation

Getting a complete solution from one provider ensures that all the technical details work seamlessly together, allowing for the safest solution on the market.

Maintenance friendly

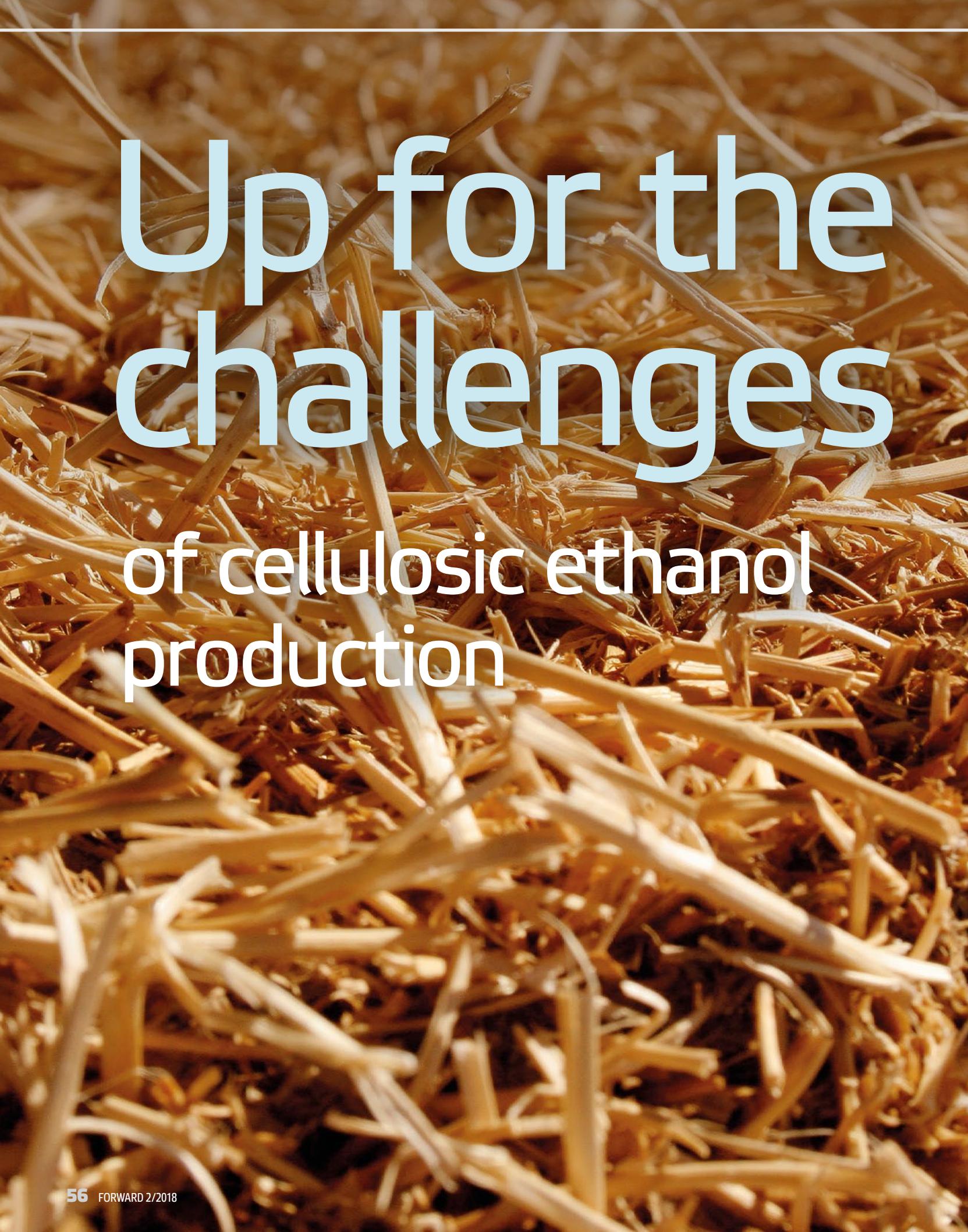
Due to its sturdy design, the RECOX+ is easy to maintain. A regularly maintained recovery boiler keeps running smoothly and maintains the same, high quality levels in performance in the long run as well.

High performance

RECOX+ is the most cost-effective recovery boiler to operate, maximizing chemical recovery and optimizing energy production. Due to its reliable and efficient operation, there is less downtime.

Meets strict safety and environmental standards

Safety and environmental performance have guided the development of RECOX+ technology, with features for lower emissions to ensure that it will continue to meet stricter environmental regulations in the future as well.



Up for the
challenges
of cellulosic ethanol
production



Pretreatment is one of the most critical and challenging areas in the cellulosic ethanol production process. Valmet's BioTrac system, part of the front end in a biorefinery and used for prehydrolysis, contributes to both the quality and quantity of the ethanol produced.

TEXT Kerstin Eriksson

Pretreatment makes the cellulose accessible in the following biotechnological stage by transforming the material, both physically and chemically. With a process solution designed for a specific raw material, the pretreatment stage can be very efficient, increase yield, and maximize the amount of ethanol produced. Equipment plays a critical part in the pretreatment area and is vital in achieving a fully implemented process solution.

Achieving balance in pretreatment

There are several challenges in the pretreatment area, and most plants have experienced them. They include feeding bulky, heterogeneous material into the system, together with contaminants such as silica and sand, which can lead

Patrik Pettersson,
Process Engineer,
and Francois
Lambert, Manager
of Biofuels
Technology, from
Valmet.



to wear problems. Bulky material is difficult to handle when feeding into a high-pressure reactor: The material must act as a steam-tight plug, to minimize blowback, but at the same time the energy input must be minimized to reduce wear on the feeding system. To achieve this balance, Valmet has a very flexible system to optimize the feeding of bulky material.

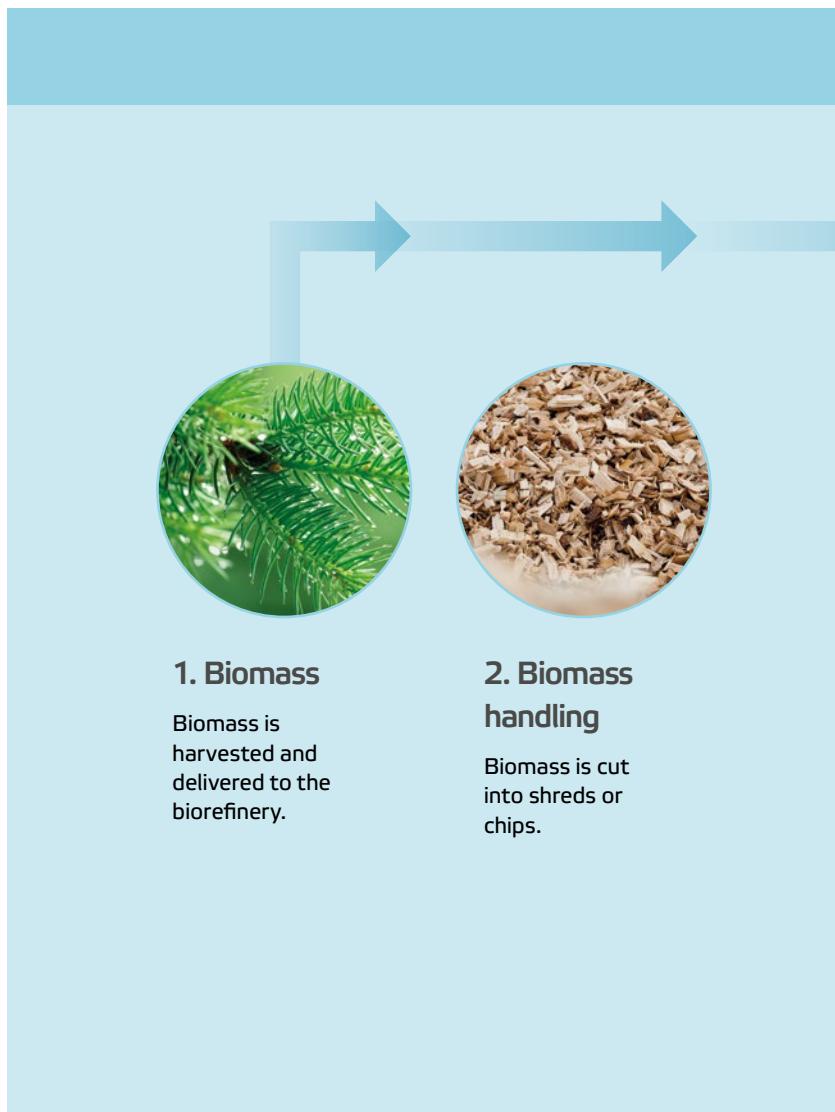
Other challenges include the physical behavior of the material as it passes through the system, and then discharging it.

"You need to manage all these challenges, otherwise you will get unnecessary sugar losses and formation of inhibitors, which will affect the subsequent process steps. It will also be a problem to obtain consistent production. Raw material in the cellulosic ethanol process is more challenging than in traditional biomass-based industries, with feeding and wear being the two main challenges," says **Francois Lambert**, Manager of Biofuels Technology at Valmet.

High availability with BioTrac

Based on knowledge gained in the non-wood pulp-
ing and panelboard industry, Valmet has managed to
minimize wear on the discharge line and has successfully
developed a solution to feed non-wood materials under
high pressure in a safe way. When dealing with high
temperatures and high pressure, it is extremely important
to reduce risks in order to improve safety. In the BioTrac
system, the biomass is pre-compressed to accomplish a
steady feed into the reactor while improving safety and
providing high availability.

The BioTrac system for prehydrolysis of biomass is
flexible in terms of both raw material and process. It can
easily be adapted to downstream process steps. The layout
of the system varies according to the application, but it of-
ten consists of either one or two reactors, although more
may be used if required. The patented feeding system



combines a force-feed screw and a plug screw feeder. Valmet's impregnation system has been developed to achieve even impregnation in a very short time and to prevent chemicals from remaining on the surface of the material.

"Basic research has been going on for many years, creating a knowledge bank that covers different raw materials and their behavior. We have been building pilot and demonstration plants since the 1990s, which we have used to further develop our knowledge about non-wood together with our customers and partners. Continuously serving and supporting our customers, we have followed them in their successes and transferred knowledge acquired from those plants into our full-scope offering," says **Patrik Pettersson**, Process Engineer at Valmet.

Proven, safe equipment

Valmet's technology originates from the traditional pulp, paper and fiberboard industries – where Valmet has extensive experience – and has been further developed to meet the new challenges of biorefining. Valmet's extensive

Cellulosic ethanol production process

Process automation systems for the whole process and for the supply chain



3. Prehydrolysis

The biomass is pre-treated with heat and/or chemicals under high pressure to make cellulose accessible to enzymes.

The BioTrac system for hydrolysis of biomass is flexible in terms of both raw material and process. It can easily be adapted to the desired end product.

4. Enzymatic hydrolysis

Enzymes break down cellulose chains into sugars.

5. Fermentation

Yeasts ferment sugars into ethanol.

Further refinement can range from producing second-generation bioethanol to bio-based chemicals and biomaterials, such as bioplastics. Or it may be black pellets to replace fossil coal as an energy source in heat and power generation.

6. Distillation

Ethanol is distilled and prepared for distribution.

7. Bioethanol

experience in non-wood pulping and feeding of non-wood materials has been highly valuable when applying this technology in the pretreatment stage. Non-wood materials are not a homogeneous category, and each material needs to be assessed separately to get the right feeding solution.

In the bioethanol industry, the main focus has been on the downstream stages of the cellulosic ethanol production process, so the design of the equipment has not

received as much attention. To better utilize the valuable raw material and prepare the material for further processing, the pretreatment stage needs to be reviewed.

Proven, safe equipment is vital to meet the challenges and increase production of cellulosic ethanol. Valmet is a reliable partner and up for the challenges of cellulosic ethanol production, from pilot plants to full-scale production. ■

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Valmet has developed a solution to optimize feeding bulky material under high pressure in a safe way.

What is cellulosic ethanol?

Cellulosic ethanol is ethanol produced from cellulose, the stringy fiber of a plant. It is a biofuel produced from renewable raw materials, such as grass, wood, algae, or other plants.



Biodryer belt, what is it?

Biodryer technology is used for drying of biomass, such as bark, forest residue, sawdust, bagasse etc. Dried biomass can be utilized as an energy source in gasification processes, pelletizing and power boilers. The dryer belt is designed to remove water efficiently by evaporating moisture from wet biomass.

Valmet Biodryer Belt
installed and ready to
carry the biomass.

Newcomer challenges the biodryer belt market

A few years ago, Valmet decided to combine its expertise in biodryer manufacturing with its industrial fabric experience and started producing biodryer belts. Today, Valmet has delivered several biodryer belts with good experiences and is ready to enter the global market with its new product.

TEXT Marianne Valta

Biodryers are used for drying biomass, such as bark, forest residue and sawdust. Dried biomass can be utilized as a valuable energy source in gasification processes, pelletizing and power boilers. Valmet's reliable dryer belt technology ensures that the end material is highly dry, as well as easy to maintain and handle. The dryer utilizes secondary heat – no primary energy is needed.

"It was a natural step to start producing belts for biodryers. With our existing machinery, we can offer our customers belts up to ten meters wide. In developing dryer belts, we utilize our know-how from paper machine clothing and advanced seaming techniques.

For example, zipper-aided seaming makes it easier to install belts weighing as much as 1,400 kilos – which also means it's safer and faster," explains **Tapio Salminen**, Product Sales Manager at Valmet.

Biodryer belts for power plants

Examples of Valmet's biodryer belt deliveries so far include a combined heat and power plant in Vaskiluoto, Finland, and several plants in China. Vaskiluoto was, in fact, the first plant to use a Valmet biodryer belt, and Valmet also handled the installation.

"We have been using Valmet's biodryer belt for almost two years, and

our experiences are very positive. The belt has carried fuel used to produce 750 GWh of energy. When we were looking into the belt change in 2016, Valmet's experts demonstrated their good understanding of our operating conditions and material requirements. The co-operation has been very smooth at every stage," says **Janne Österback**, Technical Manager at Vaskiluodon Voima.

Last year, Valmet delivered a start-up biodryer belt 7.2 meters wide and 125.7 meters long for Metsä Group's next-generation bioproduct mill in Äänekoski. In addition to high-quality pulp, the mill produces a broad range of other bioproducts, such as tall oil, turpentine, bioelectricity and wood fuel.

All power plants that use bark, sawdust or woodchips as an energy source for either gasification, pelletizing or power boilers can benefit from Valmet's biodryer belts.

"We believe that companies will invest in sustainable production in the future, and the demand for biomass handling to serve different purposes will grow. In addition to a durable and high-quality product, we are able to offer delivery times of just three weeks even to our European customers – I think it's a huge benefit in a market where products are normally shipped from Asia," says Salminen. ■

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EXPERT'S VOICE

Food for thought



Mika Karaila, Research
Director in Automation
R&D at Valmet.

Shaping the industrial world virtually

Virtual technology and applications familiar to computer gamers are beginning to make their mark in the industrial world. Mika Karaila from Valmet highlights the benefits of integrating virtual tools in mill planning and maintenance processes. TEXT Vesa Puoskari PHOTOS Tomi Aho

“**V**irtual reality is an excellent tool for visualizing complex industrial environments and machines in production plants. It can help to streamline maintenance and decrease costs through the use of intelligent products, tools and services at mills,” explains **Mika Karaila**, Research Director in Automation R&D at Valmet.

Valmet has been developing and testing intelligent maintenance applications and augmented reality equipment for visualizing and facilitating repairs at mills since 2016. Virtual Reality (VR) is an artificial 3D environment that users can immersively interact with.

For the first-timer, navigating in virtual surroundings might feel a bit awkward, but after getting used to the

headset and control stick, the journey starts to feel fun and fascinating.

“We have demonstrated our VR tools at several exhibitions. People queue up at our demos, and they always give enthusiastic feedback. We have managed to overcome the major technological challenges and we are currently developing tools together with our customers. Now we are able to truly focus on issues that are relevant to them.”

Saving maintenance costs with augmented reality

Valmet is using the most modern technology available to protect production lines from costly downtime – and even to decrease the environmental impacts of production.

Karaila emphasizes that augmented reality (AR) is a valuable maintenance tool. Maintenance can be very costly and challenging in a complex mill environment. Virtual technology can optimize and enhance operational work processes, security and asset performance to enable productivity enhancements.

The control room is the nerve center of the mill or plant, where screens display thousands of measurements from different parts of the process stages drawn in piping and instrumentation diagrams. With the help of AR, this process information can be displayed virtually in a headset, and mechanics can take the information they need with them when they are working on a machine.

Unlike VR, which creates a totally artificial environment, AR uses the real-world environment and overlays new digital information and images on top of it in real time.

"For example, we have created virtual solutions to visualize process measurements at pulp and paper mills. With the help of mobile devices and modern wearables, technicians can easily access the maintenance instructions and process measurements for mechanical components, valves and other equipment. This makes the whole operation more safe and manageable," Karaila explains.

Technicians can also shoot 360-degree video when tackling a task for the first time together with a more experienced worker. "When executing the task alone, they can verify the different stages of the work through AR devices. This is one way to ensure consistently good results in maintenance work, while also taking safety issues into account," he says.

Valmet has developed a Valmet DNA ecosystem that serves as an automation and information platform for process control. It combines all controls in a single platform: process, machine, quality, supervision, drive, as well as optimizations and mechanical condition monitoring.

"If the Valmet DNA tag is connected to the 3D world, then we can configure all the information in 3D surroundings. We have several applications for our energy, pulp and paper customers. The same programs can be configured to fit any of our customers."

Design platform for mill construction

Virtual tools can be integrated into the design process for power plants or paper mills and their machinery. "We can collaborate with our customers by creating and sharing virtual surroundings with several users, demonstrating and solving problems even if they are located in another part of the world," Karaila says.

"For example, we can manage VR mill planning processes to discuss with our customers and architects about whether certain pipelines are in the correct place, if there is enough space for maintenance operations, or whether some doors and windows need to be installed somewhere else," he adds.

"This is a quick way to proceed and solve issues



"Virtual reality can help to visualize complex industrial environments, streamline maintenance, and decrease costs at mills."

already in the design phase. During the planning and construction phase, we don't always have to travel to the site, which is often in a remote location. This saves time and costs."

Future industrial standard

With the key technological challenges now solved, Karaila believes that virtual tools will soon make a breakthrough in real-world applications.

"The technical properties of software and equipment are becoming more accessible in terms of price. In industrial environments, we can use equipment that is already familiar from consumer markets. Younger generations familiar with computer gaming seem to be especially enthusiastic about experimenting with and applying VR



and AR in their work.”

One example of a useful VR application is a gamified training tool for factory environments. Virtual training can prepare workers to react correctly in hazardous situations, for instance.

Also, the gesture and speech controls familiar from video game consoles are perfectly suited for industrial control rooms when the next-generation software for virtual control systems is ready.

“We are aiming to develop Valmet’s virtual expertise through assistive artificial intelligence at the predictive level in surroundings where extended reality can suggest the service routines that should be performed for executing simple tasks like changing a filter.”

Extended reality (XR) encompasses a wide spectrum

of hardware and software, including sensory interfaces, applications, and infrastructure that enables content creation for VR and AR.

Karaila adds that AR and VR equipment also work offline. “On industrial premises, network connections are not always reliable, so maintenance workers can get to know the problem by taking photos of the issue first, and then go online in a different office environment to solve the problem.”

He predicts that VR will gradually become an industrial standard.

“We are entering a stage where we can sit down with our customers and discuss what kind of applications they are interested in and what kind of problems they have had using devices. The more concrete the feedback we get from our partners, the better we can improve our tools.” ■

Around the world

Cooking plant rebuild to Smurfit Kappa in Sweden

Valmet will supply Smurfit Kappa with a cooking plant rebuild into CompactCooking G2 and brown stock washing equipment for its mill in Piteå, Sweden. "The rebuilt cooking plant will utilize the wood raw material more efficiently and lower the use of additive chemicals in the process. In addition, the cooking rebuild will lower the energy consumption within the process area which is in line with our sustainability goals," says Bo Johansson, Technical Manager at Smurfit Kappa Piteå.

Upgrading automation on Royal Caribbean's Mariner of the Seas

Valmet will upgrade the Dmatic XDi automation system to a Valmet DNA system onboard the Mariner of the Seas cruise ship owned by Royal Caribbean International.

Rebuild delivering top results at Alas Doradas, El Salvador

Valmet has successfully delivered and started up a Valmet Advantage ViscoNip and ReDry rebuild of Alas Doradas' PM4 tissue machine, close to San Salvador, El Salvador. "We are very satisfied with the results of the rebuild project. The combination of Advantage ViscoNip and ReDry have exceeded our highest expectations. The results show capacity increase by 20 percent and drying energy savings of 20-25 percent," says Carlos Jerez, Engineering Director at Alas Doradas.

Valmet and Saica Paper UK continue the shared journey

Valmet and Saica Paper UK have signed a new performance agreement for 2018–2020 regarding the Valmet-supplied OptiConcept board machine PM 11 in Partington, England, that started running in 2012. Since the start-up, performance optimization has been the core of cooperation. "We are very pleased with the support that the agreement provides us, as it has delivered the results we wanted. The agreement allows us to focus on our quality, and production bottlenecks can be solved with Valmet's experts quicker than we could on our own. It's important to be able to trust the support team, and agree long-term targets and actions to achieve them," says Pasi Häyrynen, Mill Manager at Saica Paper UK.

12-year automation service agreement with RÜTGERS Resins B.V.

RÜTGERS Resins B.V. in the Netherlands and Valmet have signed a 12-year service agreement covering maintenance and support for Valmet DNA automation system. The new long-term service agreement includes on-call, preventive and corrective maintenance, server audits, software and hardware upgrades.

Flue gas condensation system to Pori Energia in Finland

Pori Energia has chosen Valmet to supply flue gas condensing and heat recovery equipment to its Aittaluoto biomass power plant. The flue gas condensation system will improve the energy efficiency of the power plant and increase the district heat production capacity.

Warp control system to Stora Enso Packaging in Poland

Stora Enso Packaging has chosen Valmet to supply a warp control system to its corrugated board plant in Ostroleka, Poland. The system will reduce warp of the final product and improve the corrugated board plant's overall performance.

Containerboard making line for Hamburger Rieger in Germany

Hamburger Rieger GmbH has chosen Valmet to supply a containerboard making line for its Spremberg Mill in Germany. The new production line (PM 2) including Valmet's automation solutions will be designed to produce high-quality testliner grades based on 100 percent recycled paper.

Multifuel boiler to Kipas Holding in Turkey

Kipas Holding has ordered Valmet's multifuel power boiler and auxiliary process equipment to its greenfield paper mill in Söke, Aydin, Turkey. The boiler plant will provide steam for a paper machine currently under construction and additionally produce electricity. Its steam production capacity will be sufficient for a possible second paper machine. The start-up of the boiler plant is scheduled for March 2020.

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.

Replacing the first-ever Damatic Classic at Pankaboard in Finland

Valmet will replace the first-ever Damatic Classic automation system, operating since 1979, with a Valmet DNA automation system at Pankaboard's board mill in Lieksa, Eastern Finland. Additionally, the mill's existing Valmet Damatic XD automation system will be upgraded to Valmet DNA. "The new system will enable us to develop our customer need-based and flexible operating model more cost efficiently," says Lauri Junnila, Managing Director, Pankaboard Oyj.

New baling line to Metsä Board's Kaskinen pulp mill in Finland

Metsä Board's pulp mill in Kaskinen, Finland, has ordered a baling line from Valmet. The new line will handle the increased capacity at the mill and is scheduled to start up in the end of 2018. "We are waiting for Valmet's newest technology to give us easier living and to help us to reach our goals," says Timo Rissanen, Mill manager at Metsä Board Kaskinen.

Seventh Valmet supplied tissue line started up at Hengan's mill in China

Hengan and Valmet joined forces in January 2018 to successfully start a Valmet Advantage DCT 200 tissue line at Hengan's mill in Weifang, China. PM21 is the third of four Advantage DCT 200 lines recently ordered by Hengan. When the startup of PM22 takes place at the same mill in Weifang later this year, Hengan will have a total of eight Valmet supplied tissue production lines in operation.

Repeat order of three winders for Shanying International in China

Shanying International Holdings Co., Ltd., in Jingzhou, China, has ordered three winders from Valmet. The order is following the delivery of the Valmet OptiConcept M board machine (PM 21) announced in December 2017 and earlier winder deliveries to company's Ma'anshan site.

Long-term service co-operation at Ittihad Paper Mill, Abu Dhabi

Ittihad Paper Mill LLC and Valmet have signed an agreement on a long-term service co-operation at the new Ittihad Paper Mill in Abu Dhabi, United Arab Emirates. "Valmet as the main supplier and technology partner of choice, combined with their expertise in maintenance management provides the best platform for the successful start-up and operation for this state-of-the-art project, the largest of its kind in the region," states Mr. Abdullah Al Khateeb, Ittihad Paper Mill General Manager.

Three Valmet IQ quality control systems for E.I.L in EMEA

"These three new orders are a step forward in our partnership with Valmet. We established this partnership in 2012 with the aim of integrating Valmet's quality control systems in our tissue machine projects. Valmet's IQ quality control system has proven to be highly appreciated in many end-user's installations for the accuracy and reliability of its quality measurements and controls," says Andrea Poleschi, Sales Manager, Italian system integrator E.I.L.

Automation technology to PT. Buana Megah in Indonesia

Valmet will supply automation technology to PT. Buana Megah's PM3 board machine in Pasuruan, East Java, Indonesia. Valmet's delivery includes Valmet DNA automation system, Valmet IQ quality control system and consistency transmitters.

Successful startups at Lee & Man in China

Two successful Advantage DCT 200 tissue line startups were made at Lee & Man's tissue mill at Chongqing, China in January and March 2018.

About Valmet

Enabling circular economy

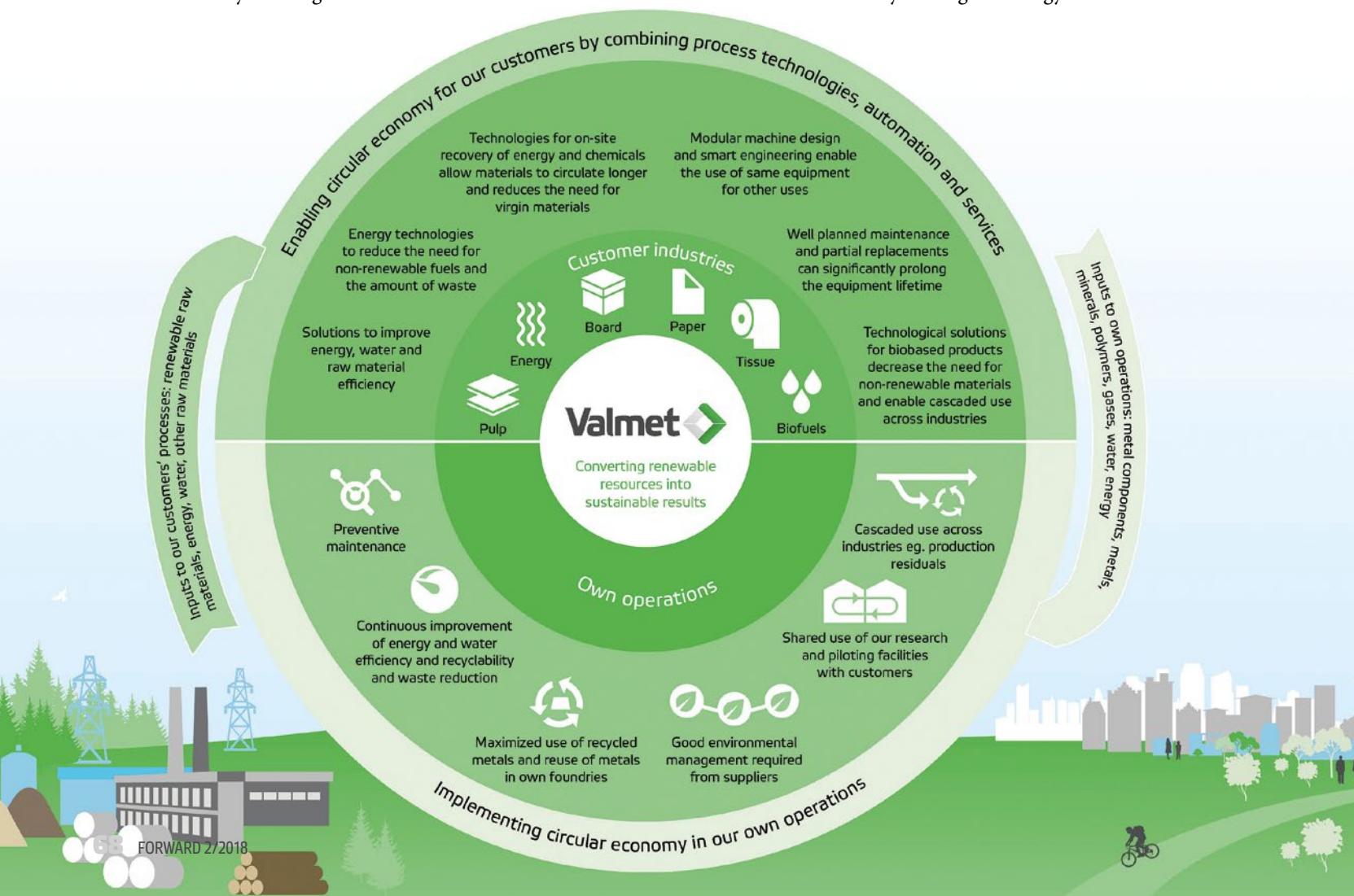
By combining process technologies, automation and services and through constant development, Valmet enables circular economy for its customers. TEXT Anna Niemi

In the circular economy, products, components and materials stay in a continuous cycle instead of being thrown away. The key idea is to use new materials as little as possible, use existing material flows as long as possible and to minimize the amount of waste. This can be achieved by reducing the initial

need for raw materials, by circulating the materials longer in the process, by recycling used materials, and by extending the lifetime of production equipment with well-planned maintenance. This very idea is built into Valmet's solutions for customers.

Converting renewable resources into sustainable products

Demand for a more resource-efficient and clean world is driving the need for more sustainable solutions. Valmet wants to enable circular economy for its customers by offering technology and services



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.

for converting renewable resources into sustainable products.

Valmet enables circular economy in many ways through combinations of process technologies, automation and services, and is constantly developing new technologies and services to support the circular economy. Valmet works with customers to utilize its research and pilot facilities to develop solutions that meet their needs. Valmet has identified six key areas where its solutions can help customers to achieve more sustainable business.

Solutions for circular economy

1. Improvement and optimization of resource efficiency

Resource efficiency can be improved through technology, automation and maintenance. Significant savings can be achieved in energy, water and raw materials with technologies such as Valmet's OptiConcept M paper and board machines, as well as Advantage DCT and Advantage NTT tissue machines. Valmet's Industrial Internet solutions enable data analytics to detect production inefficiencies and optimize material use. Performance agreements provide a comprehensive approach to improving mill-wide production efficiency.

2. Flexible energy production

Valmet's technologies for flexible energy production reduce the need for non-renewable fuels and the amount of waste. Waste-to-energy solutions using fluidized bed boiler and gasification technologies enable efficient energy recovery. Multi-fuel boilers enhance fuel flexibility and can operate on fuel mixtures ranging from 100-percent coal to 100-percent biomass. Fluidized bed boilers enable wider use of fuel sources, utilizing fuels with varying energy values and moisture content.

3. Chemical and energy recovery

On-site recovery of energy and chemicals allows materials to circulate for longer and reduces the need for virgin materials. Recovery islands enable efficient recovery of chemicals and energy in pulp mills. Condensate water recycling and recovery of paper pigments are examples of internal recovery and recycling solutions.

4. Design enabling reuse and conversion

Modular design and smart engineering enable same equipment to be used in other applications. Paper machines can be converted to produce board or other paper grades, and machines can be disassembled and rebuilt in another location. Flexible design enables changes based on market

needs. Modular I/O cards (input/output cards) enable system updates without the need to update the core system.

5. Maintenance and modernization of production technology

Well-planned maintenance and partial replacements can extend the lifetime of equipment. Preventive maintenance can be planned by utilizing big data analytics, e.g. in roll maintenance. Refiner segments, rolls and certain wear parts can be refurbished and reused. Individual process parts – or even complete mills and power plants – can be modernized to extend their lifetime. Boilers can be modified to use different fuels, e.g. switching from coal to biomass.

6. New bio-based products

Solutions for new bio-based products decrease the need for non-renewable materials. LignoBoost technology makes it possible to extract lignin from pulping process side streams, and lignin can be used as a raw material for bio-based materials and chemicals. Technologies for bioethanol, biocoal and bio-oil production are helping to replace non-renewable fuels and materials.

Forward

VALMET'S CUSTOMER MAGAZINE

FORWARD

Valmet's customer magazine

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