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ANDRITZ

ÄÄNEKOSKI

A Mill for the 21st Century

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A MILL FOR THE 21ST CENTURY

Äänekoski

Metsä Group's Äänekoski bioproduct mill has been the talk of the global pulp and paper industry for some time now with its outstanding environmental efficiencies and ambitions for new products derived from wood. Starting up in August 2017, ANDRITZ supplied crucial technology to help make the bioproduct mill a showcase production site for the 21st century.

Aerial view of the Äänekoski mill.

The environmental and sustainability statistics coming from Metsä Group's new bioproduct mill at Äänekoski in Finland are truly impressive: the mill will produce 1.3 million tonnes of pulp a year from 6.5 million cubic meters of wood with zero use of fossil fuels at the same time as using only 10 m³ of water per tonne of pulp.

Timo Merikallio, Project Director, has been leading the charge at Äänekoski as the 1.2 BEUR project went from planning to fruition at start-up on August 15, 2017. Merikallio says, "The decision to call Äänekoski a 'bioproduct mill' was almost a natural occurrence. At the outset of this project, we started looking at a wider scope and looking deeply into what other products could be made, in addition to, of course, our leading bioproduct, which is pulp.

"But this was not just about other products; we also wanted the mill to become a leader when it comes to environmental performance, a target which we are proud to have achieved. We have worked hard with ANDRITZ – as with all suppliers to this project – to maximize efficiency and reduce or reuse side streams in every area of the mill."

ANDRITZ was chosen to supply major, critical technology at the mill to ensure that the Metsä Group's sustainability and environmental demands were met across the board. The order included the very latest, world-class technology for the woodyard, fiberline, evaporation plant, and recausticizing plant. The core equipment supplied by ANDRITZ originated largely from Finland – domestic content was nearly 80% – and thus had a significant positive employment impact on ANDRITZ's engineering staff located in Kotka, Lahti, and Varkaus as well as on the ANDRITZ workshop in Savonlinna where a big part of the core equipment was fabricated.

MAXIMUM ENERGY EFFICIENCY – RIGHT ACROSS THE MILL

Metsä Group was adamant that it wanted the very best and most efficient equipment when it came to energy savings for this mill. Johan Engström, Chief Technology Officer, ANDRITZ PULP & PAPER, says, "A major source of revenue for the bioproduct mill is bioenergy production, so any energy saved in the process means extra revenue directly onto the bottom line.

"We accepted this challenge and looked very closely at every area where energy savings could be made; for instance, for the first time, we integrated a separate evaporator unit – Digester Evaporator (DeVap) – into the fiberline. This makes a big difference to energy efficiency, as 100% of the direct steam to the digester top is replaced by secondary vapor from the DeVap. The DeVap increases dry solid content of the black liquor and therefore less evaporation capacity is needed in the evaporation plant."

ANDRITZ also installed a new type of bark press – the HQ-Press – which increases the dry solid content of the bark. Engström says, "What the new, highly efficient bark press does, mechanically saves a lot of energy in the subsequent processes."

ANDRITZ latest technology for water management is also implemented into the mill, which has resulted in emission reductions but also increased energy savings. Engström adds, "To deal with emissions, it makes sense to reuse the condensates and filtrates we already have in the loop. This not only minimizes the emission problems, but is also great for energy savings as there is no fresh water that needs to be heated up."

The woodyard order consisted of a complete wood processing plant with three debarking and chipping lines, chip handling systems with three stacker reclaimer-type chip piles, and complete bark handling and storage. Each debarking line processes both hardwood and softwood and is designed for world record capacities using pine, spruce, or birch.

The softwood and hardwood fiberline comprises a TurboFeed chip feeding system, a two-vessel Lo-Solids cooking plant and brownstock and bleaching plant based on DD-Washers. The softwood capacity of the line is the highest in the world at 3,900 tonnes per day.

ANDRITZ delivery included the world's most energy-efficient black liquor evaporation plant. The evaporation plant has the highest capacity in Europe, at 1,650 tonnes per hour and is one of the world's largest single line recausticizing plants with a white liquor production of 16,000 m³ per day.

LIKE AN OPEN BOOK

For the first time, the Open Book project management method was used during the mill development stage. ANDRITZ Project Director for the bioproduct mill, Mika Mäkelä says, "We received the order from Metsä Group in April 2015 and it was a major order for us – in addition to the complete woodyard, the recausticizing plant, fiberline, and evaporation plant as core orders, defined scope came as part of the Open Book concept."

Open Book is a project management method in which the target price of the specified part of the "standard" equipment is

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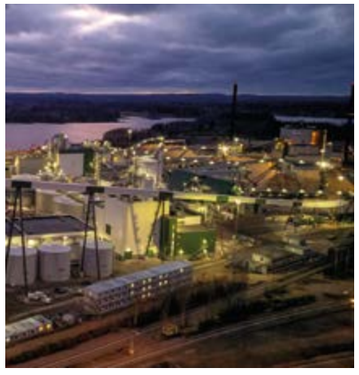
>
> **TIMO MERIKALLIO**
> Project Director,
> Bioproduct mill project



ANDRITZ supplied the Decision Support Wall (DSW) at the woodyard control room, which aids operators and maintenance groups in their daily work. It also acts as a common online remote meeting place for ANDRITZ and the operators.

One of the special features of the fiberline and evaporation plant connection is a new evaporation system for liquor extraction, digester evaporator DeVap, which enables the evaporation process to start first at the cooking plant.

agreed between supplier and customer. The purchasing preparations are made in open cooperation with the customer, taking advantage of all the know-how that participants have. Mäkelä explains how it works in practice, “The Open Book orders are placed in the customer’s name. Afterwards, when the plant is started up, the actual Open Book costs are checked and compared with the target price. If savings were made during the project, they are split between the supplier and the customer, and any cost overruns are divided up in a similar way. So, the risk and opportunity are divided between supplier and customer. The Open Book management went extremely well in cooperation with a very professional and experienced customer in Metsä Group.”

Merikallio says, “The Open Book concept for this project was great from the very beginning – it alleviates the risk to both the customer and supplier, but it also means you get the best resources at the best price.”

The project was organized according to ANDRITZ’s proven global management system, whereby a detailed organizational structure is developed for multi-divisional operations such as the bioproduct mill. “The objective with our global management system is to ensure that all those involved know who is responsible for what, where, and when,” says Mäkelä.

One of the factors that Mäkelä was impressed with during the project, was the collaboration with the customer, which was very smooth and efficient. He says,“The Metsä Group has a very professional approach, with experienced teams put together from several of its mills.

“Another factor that must be emphasized is the importance of the well-planned, logistical program as the project commenced. It was a really tight space that we were working on at the the bioproduct mill site and the just-in-time scheduling of deliveries and erection worked really well.”

THE VERY LATEST IN INDUSTRIAL IOT AND VISUAL TECHNOLOGY

The mill started up on August 15, seven minutes before schedule, and is using the very latest technology for monitoring and managing the whole mill process. Merikallio says, “This is a huge plant; as an example, the woodyard consists of three debarking lines and three chip piles, and we are using the best available technology for the overall management of the production.”

“The start-up went pretty much as planned and now we are operating right on the start-up curve. We are running both softwood and hardwood here – we tend to run softwood for five days, and then switch over to hardwood for two days so, as you can imagine, there is quite a lot of optimization to manage with two types of wood and three debarking lines.”

> “The Open Book management went extremely well in cooperation with a very professional and experienced customer in Metsä Group.”

MIKA MÄKELÄ
ANDRITZ Project Director for the bioproduct mill

The central heart of the mill operation is conducted from an ultramodern mission control room with vast banks of large video screens and monitors, showing almost every part of the mill operation.

“We monitor all operations from our central control room where we have five or six experts looking at all areas of the mill’s production,” says Camilla Wikström, Mill Manager (until 31.12.2017) at the bioproduct mill. “And for the first time, when we are doing our daily checks around the mill, we are using an iPad to check on individual pieces of equipment, for instance, pumps, checking on performance, and making sure everything is running to optimum levels. If there is a problem, we can pretty much get instant feedback and get a correction plan immediately into action.”

For the first time during a major start-up, ANDRITZ brought in extra skills and knowledge in real time remotely via its recently opened Customer Support Center, located in Kotka, Finland. Engström says, “The Customer Support Center is a key new addition for us to assist our customers throughout the world. The remote access showing the actual DCS screens enables real-time support and helps the communication between people on site and our experts in Finland.

“This means both mill personnel and ANDRITZ engineers can collaborate with experts based in the center while looking at

CAMILLA WIKSTRÖM
Mill Manager (until 31.12.2017)
Bioproduct mill

> “I am quite sure we will see a lot more innovation in bioproducts around the bioproduct mill in the future.”

One of the new, key technologies introduced to the woodyard is the new generation bark press, ANDRITZ HQ-Press, which targets to deliver around 5%-unit higher dry solids content of bark than any other press on the market.

(L to R): Mika Mäkelä, ANDRITZ Project Director for the bioproduct mill; Camilla Wikström, Mill Manager (until 31.12.2017); and Timo Merikallio, Project Director from the bioproduct mill.

exactly the same information from the mill operation on screen via the DSW. Essentially, it is as efficient as our experts being at the mill operation itself.

One of the IoT solutions ANDRITZ has supplied to the bioproduct mill is the Decision Support Wall (DSW) for the woodyard control room, which aids operators and maintenance groups in their daily work.

The DSW comprises live videos from processes and equipment, data recording facilities, and equipment diagnostics such as ChipperEKG and CrusherEKG.

ANDRITZ will also be introducing an advanced alarm triggering and process diagnostics display with a Traffic Light system where process status is indicated with colors that are controlled by ANDRITZ Metris tool rule base. "The Traffic Light system is an excellent new addition to help monitor and maintain the efficient running of the woodyard," says Engström. "Obviously when a green light is being displayed on the system, all is running well. However, when a yellow light appears, it means the operator needs to do something, for example, when monitoring the condition of knives in the chipper.

"Essentially, the Traffic Light system alerts an operator to a problem before it becomes a major issue and, therefore, gives the opportunity for early action to take place. It is an excellent tool to assist in preventative maintenance."

PAYING OFF, WITH BENEFITS

The hard work that has gone into the technology and equipment has paid off with benefits all around; as well as the 240% electricity self-sufficiency, the mill is well on its way to dramatically reducing effluent flows. Merikallio says, "There will be a lot of ongoing work to maximize all efficiency and streams around the mill. For instance, a normal pulp mill effluent flow is around 20 m³ per tonne; we have managed to squeeze that down to 10 m³ per tonne. Those types of improvements will continue mill-wide in all processes in the future."

"We are proud to say that the Äänekoski mill is using the same environmental permit that was granted for the original mill it replaced – even though the mill is two and a half times bigger," adds Wikström.

Metsä Group is also encouraging other bioproduct companies to join the mill, forming a cluster of biotechnology expertise that can make use of the side streams, as well as take advantage of the onsite energy and water management facilities. Wikström concludes, "EcoEnergy SF Oy is using our sludge as a raw material to make biogas for use as fuel for cars, as well as solid fuels that are produced in the form of pellets. I am quite sure we will see a lot more innovation in bioproducts around the Äänekoski mill in the future."

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