



BioCircleToZero

**Doubling the value of wood without
harvesting more trees**

ANDRITZ



New R&D program unites companies, research institutes, and universities for technological breakthroughs in Finland

ANDRITZ continues to innovate new ways of increasing the value of wood at pulp mills, ultimately aiming to create biorefineries. With the BioCircleToZero program, funded by Business Finland, the company aims to take a giant leap forward in efforts to double the value of wood.

It is said that “necessity is the mother of invention” and this certainly applies to wood use in Finland. The situation in Europe in recent years has led to rising costs of raw material while wood harvesting in Finland is approaching sustainable limits. As a result, the focus is shifting toward maximizing the value extracted from each stream without increasing forest use.

Johan Engström, Chief Technology Officer, ANDRITZ Finland says, “We simply have to get more value out of the wood being used at pulp mills. One of the most straightforward ways to address this challenge is to burn less wood-based material in the process, increase the pulp yield, utilize side streams, such as lignin and biomethanol, or increase the value by high-value products like man-made textile fibers. In reality, biomass will always be burnt to some stage, but technologies for the biogenic CO₂ together with

green hydrogen can be converted to, for example, e-fuels. To meet these challenges, we have launched the BioCircleToZero program and with a lot of intense, combined innovation and effort, we can realistically see doubling the value of wood in the future.”

BUILDING A STRONG PARTNER ECOSYSTEM FOR TECHNOLOGICAL BREAKTHROUGHS

Doubling the value of wood sounds like a highly ambitious task; however, there is a lot of interest and support for the program. The five-year BioCircleToZero program was launched in early 2025 by ANDRITZ and supported by Business Finland, the country’s agency for trade and promotion, with a grant of 10 MEUR. Led by ANDRITZ, the initiative has been set up to encourage cooperation and R&D efforts with companies, research institutes, and universities working in the field of forest product industries, energy, climate, and

environmental sectors. Expecting some 100 members, the initiative has already secured big-name supporters in the forest products industry as partners, including companies, research institutes, and universities. Business Finland has also provided an additional 20 MEUR to partners contributing to the program.

Kari Tuominen, CEO of ANDRITZ Finland, says of the program, “This is an extremely important initiative. At ANDRITZ we have always been known for developing innovative new technology that is well received by our customers. Although we have had many successes in joint developments for the forest product industries in the past, with the BioCircleToZero program we are building a large ecosystem where it is not only us bringing new technology to market.



“One of the clear directions ahead is that we must utilize all waste at pulp mills and make as many products out of the wood as we possibly can before burning it.”

JOHAN ENGSTRÖM
Chief Technology Officer, ANDRITZ Finland

We are leading the initiative, but our partners are also key in any new development that enables the creation of added value from wood."

PIONEERING INTO ALL AREAS TO BENEFIT THE COMPLETE WOOD VALUE CHAIN

One of the examples of innovation as part of the program is the better use of wood at chemical pulp mills. Currently, approximately half of the wood going into a chemical pulp mill ends up being burned for energy as process residues. Engström says, "This can, and must, be reduced. Burning such a valuable raw material should be minimized as much as possible, especially if a commodity product is being made. There is so much more that can be done to add value to the wood instead of simply burning it."

To address this, the program focuses on developing added-value products from the process side streams that would otherwise be used for energy. Engström continues, "We have already developed successful solutions for making new products out of the side streams from pulp mills and, in some cases, we have

created solutions that seemed impossible to begin with. This is what the BioCircleToZero program has been designed for; building ecosystems that will enhance and optimize the utilization of all areas of pulp mills, innovating and proving the feasibility of pioneering new products."

TARGETING FOR MORE RESOURCE-EFFICIENT INDUSTRIES

The BioCircleToZero initiative focuses on four main streams with each stream having its own set of tasks and goals:

Stream 1: Biorefinery supercharged – Concentration on biorefinery process improvements and connections to enable emission-free production processes.

Stream 2: Biorefinery interconnected – Focusing on enabling the ecosystem growth around biorefinery processes by opening the materials, services, and side streams flows to third parties. This stream will also evaluate and develop new business models for biorefinery ecosystems, for instance, business models that

enable growth creation from negative emissions.

Stream 3: Process solutions with zero emissions – This stream focuses on turning biogenic carbon flows into high-value renewable fuels and products by combining green hydrogen and Power-to-X (P2X) technologies with biorefinery processes.

Stream 4: High-value products – This stream develops new processes and high-value products to create more value from pulp, such as man-made cellulosic fibers (MMCF) for the textile industry and chemicals from biobased feedstocks. Moreover, the streams encompass ANDRITZ's key capabilities in biorefinery technologies and P2X.

"One of the clear directions ahead is that we must utilize all waste at pulp mills and make as many products out of the wood as we possibly can before burning it," says Engström. "From the burnt biomass, we can collect biogenic CO₂ emissions to enable even more products to be made, for instance, fossil-free fuels for aviation or marine applications."

Engström continues, "We at ANDRITZ lead the BioCircleToZero program, and our valued partners in the ecosystem are the contributors that follow along on our journey towards doubling the value from wood without harvesting more trees. In the initiative, we set goals for the journey. Our task is to build a complete, effective ecosystem, which develops pioneering solutions to achieve our ambitious and exciting aim of doubling the value of our precious wood supply."

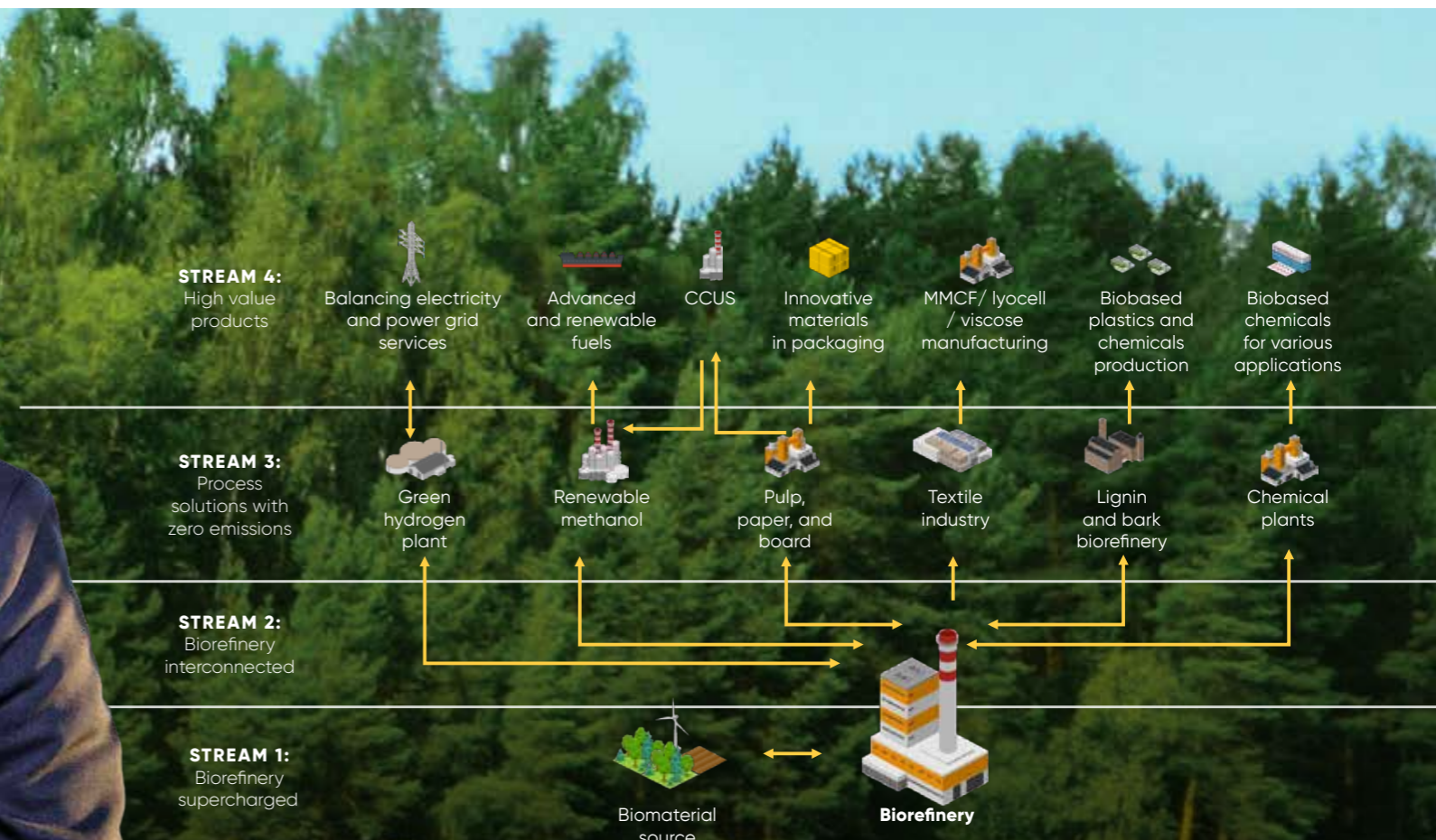
Tuominen concludes, "This is not only about pulp and paper, but we are also pioneering into all areas of how value can be added to wood, including the production of textiles, biochemicals, biofuels and e-fuels, recycling and reusing materials and energy, and the environment. As a technology supplier to the pulp, paper, and bioproducts industries, the program is exciting for us as this initiative will benefit the complete wood value chain and therefore many different industries around the globe."

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KARI TUOMINEN
CEO ANDRITZ Finland



**SAUNA –
SUSTAINABLE
PULPING INNOVATION
ACHIEVING ZERO
POLLUTION THROUGH
EFFICIENT WOOD
RESIDUE FEEDSTOCK
UTILIZATION**

The **SAUNA** project is part of the Horizon Europe program that aims to strengthen the European green economy with a focus on achieving zero waste and zero pollution biorefinery operations. SAUNA is an EU-funded project aiming to develop an innovative pulping method that increases product yields and cuts emissions.

The project addresses enhanced environmental performance of pulp production by developing a novel wood fractionation concept where chemical recovery, environmental lifecycle & sustainability, unit operations and energy sources are reevaluated by 11 expert partners including five companies, which represent a wide range of expertise from production level to end user companies, four research institutes and two universities.

“The targeted outcome is a scalable technical solution for sustainable biorefinery with integrated pollution prevention and monitoring strategies covering air, noise, water, and soil.” Dr. Markus Paananen, Manager, Fiberline Technology R&D.

H₂ELP is a research and innovation project aimed at reducing the levelized cost of hydrogen and methanol production by improving system performance, lifetime and operational practices under dynamic Nordic conditions. The project is carried out together with the VTT Technical Research Centre of Finland and industrial partners including Vaisala and Fortum, combining research expertise with real pilot and laboratory environments. Through hands-on collaboration across the hydrogen value chain, H₂ELP supports faster deployment of commercially viable hydrogen and P2X -solutions. The project is part of the Veturi Co-Innovation initiative funded by Business Finland.

„Lowering the levelized cost of product is a critical enabler for accelerating the large-scale deployment of green hydrogen and its derivatives, strengthening their competitiveness and enabling wider, faster market adoption.”
Dr. Thomas Kohl, Technology Director Renewable Fuels, ANDRITZ.

Future development toward pulp mill autonomy

Automation and digitalization play a vital role in the development work of the BioCircleToZero program.

Capturing data on processes and equipment, including those currently under development, is essential for process analytics, control, and optimization, asset performance management, mill-wide optimization and plant information management. Thus, the development further paves the way toward mill autonomy and enables the BioCircleToZero program to achieve its objectives of utilizing raw materials in full and reducing waste.

Within BioCircleToZero, the Smart Biorefinery area has its own development work packages, under the Biorefinery supercharged and the Biorefinery interconnected streams. The development of automation and digitalization is also closely integrated with other work packages across the entire program.

ANDRITZ has already made strong progress in advanced measurements, vision systems,

analyzers, condition monitoring solutions and robotics and mechatronics. ANDRITZ is also well established in digital solutions such as Advanced Process Control and Optimization, operator training systems, asset performance management, digital twins, mill-wide optimization and simulation. The development in the BioCircleToZero program will broaden and deepen the automation and digitalization capabilities even further.

“We are thrilled to participate in the exciting Veturi program, and our development efforts there are well underway. We are eager to join forces with new ecosystem partners to advance sustainable, data-driven biorefinery solutions” – Johanna Newcomb, Vice President, Smart Solutions, Pulp & Paper Automation and Digitalization.

JOIN US!

Are you interested in the opportunity to collaborate with us in Finland?

Let us know and we will contact you directly.

Contact us:
BioCircleToZero@andritz.com



H₂ELP – H₂ PRODUCTION LIFETIME & PERFORMANCE EXTENSION

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