
BUSINESS
FINLAND
FOREST BIOECONOMY
TECHNOLOGIES
AND SERVICES
FROM FINLAND
#FINLANDWORKS

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BUSINESS
**FINLAND**

# KICK START YOUR BIO-BASED BUSINESS – **INVEST IN FINLAND**

Finland is at the epicenter of the global growth of the bioeconomy. The strong, renewing industry cluster, world class competence, and abundant feedstock backed by governmental facilitation offer huge growth potential with platforms and projects worth close to five billion euros.

**MOST HEAVILY FORESTED COUNTRY IN EUROPE: 86% OF LAND AREA IS FOREST**

**ANNUAL GROWTH OF 100M M3**

**90% OF THE FINNISH FORESTS ARE PEFC-CERTIFIED**

# KICK START YOUR BIO-BASED BUSINESS – **INVEST IN FINLAND**

BUSINESS **FINLAND**

## UNIQUE PLATFORM FOR BIO-BASED GROWTH

- Strong industry cluster
- World-class competence
- Growth partnering potential
- Abundant feedstock
- Government support

## HIGH POTENTIAL ECOSYSTEMS

- Expand Fibre
- Cliq Innovation
- FinnCeres
- Telaketju (textiles)
- Seed (digital transformation)

## PRODUCTS CLOSE TO COMMERCIALIZATION

- Wood-based textiles
- Next generation bio-based packaging
- Bio-composites
- Lignin applications
- Bio-based chemicals

## NEW COMMERCIAL ADVANCED PRODUCTS

- 100% renewable diesel
- Microfibrillated cellulose
- Pyrolysis oil
- High quality barrier board
- Kraft lignin
- Cross laminated timber

# FINLAND – BASE FOR INTERNATIONAL **BIOPRODUCTS MANUFACTURERS**

BUSINESS FINLAND

















# THE WORLD'S LEADING **FOREST BIOECONOMY TECHNOLOGY CLUSTER**

BUSINESS **FINLAND**

## COMPREHENSIVE WORLD CLASS OFFERING

Finnish companies deliver large scale EPC projects to all continents. Project deliveries over decades have enabled creation competitive solutions. Finnish companies can offer state-of-the art solutions for pulp and paper mills in

- Consulting and Engineering
- Pulp and Paper Process Equipment
- Energy, warehousing, and logistics
- Water, wastewater, and Environmental products
- Chemical and consumables
- Automation and instrumentation
- Data analysis and management systems
- Services for maintenance and production.

## NEW BIO PRODUCTS AND DIGITALIZATION

Leading technology in Biomass conversion and heavy investment in RDI has resulted in the creation of new bioproducts such as biomaterials, biochemicals, textile fibers and bio-based packaging. New Digital solutions have improved the productivity and sustainability of manufacturing processes.

Governmental Bioeconomy strategy and RDI funding speeds up the development.

## OPEN ECOSYSTEM

The Finnish Bioeconomy Ecosystem is open to international companies and research actors.

Many international companies have established RDI and production sites in Finland to take advantage of the leading knowhow and competitive business environment.

# STRONG RESEARCH AND INNOVATION ECOSYSTEM

BUSINESS FINLAND

## STRONG TRADITION IN FOREST INDUSTRIES AND INNOVATION

Finland has world-leading R&D capabilities to serve the existing and future forest bio-economy value chains. Research expertise covers the whole value-chain from forestry to products and services, including the following themes:

- Sustainable biomass production
- Forest resources and operations
- Sustainable bioenergy and biofuels
- Improvement of existing products and processes
- Novel bio-products and their production processes

## STRONG KNOWLEDGE – AND INNOVATION ECOSYSTEMS

Finnish ecosystems are open to international players. They provide access to an extensive network of research organizations and companies working on future forest bioeconomy solutions.

Finnish R&D actors are well connected internationally and can help in building international partnerships and research collaboration.

# AALTO UNIVERSITY

## THE NEW ERA OF SUSTAINABLE TEXTILE PRODUCTION

Aalto University's innovative Ioncell® technology turns used textiles, pulp or even old newspapers into textile fibers – sustainably and without harmful chemicals. The process converts cellulose into fibers which can be made into long-lasting fabrics. In our pilot plant, textiles can be produced and tested by customers.

https://www.aalto.fi/en/department-of-bioproducts-and-biosystems/ioncell-f

## REDEFINING BIOECONOMY WITH ADVANCED BIO-BASED MATERIALS

FinnCERES is a global competence center in the area of material bioeconomy, formed jointly by Aalto University and VTT Technical Research Centre of Finland. FinnCERES uncovers answers to fundamental questions about lignocellulose disassembly and re-assembly to create bio-based materials for a sustainable future.

https://www.finnceres.fi/

## TOWARDS CIRCULAR AND BIOECONOMY

The Bioinnovation Center is a multidisciplinary research and learning center accelerating the transition to a circular bioeconomy and creating opportunities for sustainable economic growth in Finland.

https://www.aalto.fi/en/school-of-chemical-engineering

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BUSINESS FINLAND

Aalto University
School of Chemical Engineering

# ÅBO AKADEMI UNIVERSITY

## ANALYTICAL SERVICES TO THE FOREST INDUSTRIES

Composition and chemical structure characterization – Role and fate of extractives in biomass, process waters, and products. Troubleshooting, mass balances, reactions, method development, etc.

## FRACTIONATION OF BIOMASS AND WASTES

Green approach fractionation for biomass processing, such as hot-water extraction. Novel solvent systems and processes –Innovative solutions of valorization ofwastes include, but are not limited to, sawdust, bark, process waste from forest industries and end product waste – e.g.,Lignin chemistry and valorization.

## NOVEL PRODUCTS FROM BIOMASS AND WASTE STREAMS

Renewable materials chemistry – Hemicelluloses, cellulose, lignin, extractives. Nanocellulose, biocomposites and new materials, e.g., to be used in 3D-printing for health related and/or technical applications.

## CONTACT

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BUSINESS
**FINLAND**

Åbo Akademi
University

# CLIC INNOVATION

CLIC Innovation Ltd is a non-profit company based on a public-private-partnership model.

## FACILITATING SUSTAINABLE GROWTH IN BIOECONOMY ECOSYSTEMS

We manage research and innovation collaboration between companies and academia. Our projects address systemic challenges that arise from the scarcity of natural resources. CLIC creates additional value by building, coordinating, and managing collaborative R&D&I projects to construct systemic solutions, which are beyond the resources of individual operators.

## ADDED VALUE MATERIALS AND CHEMICALS FROM WOOD FIBERS

In the theme of the bioeconomy, CLIC's main focus is in developing novel added-value materials and chemicals from wood fibers. The following application areas are at the heart of our activities due to their industry relevance:

- High-performance fibers cover a wide range of technologies and processes which transform raw materials from forest into high-added-value fibers for different end applications.
- Packaging material boosts the increased use of bio-based raw materials and aims at innovative packaging materials with new properties.
- Biocomposites aim at enabling biocomposites (especially wood-polymer composites) to become a compelling material alternative in the markets currently dominated by plastics and glass fiber-based composites, by developing new, highly performing natural fiber composites.
- Bio-based chemicals target a reduced dependency on fossil-based raw materials by developing high-performance, sustainable wood-based biopolymers, and biochemicals.

## CONTACT

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BUSINESS
**FINLAND**

# NATURAL RESOURCES INSTITUTE FINLAND LUKE

## RISK MANAGEMENT AND DAMAGE CONTROL OF FORESTS

Luke's expertise provides accurate estimates about forest resources, the status of forest health, and the impact of pests on forests and their future growth. Remote sensing tools focus on all the relevant damage agents of forests: fungi, insects or abiotic detect insect- and snow-damage and assess fire-loads or drought-stress of forests.

## FOREST BIODIVERSITY MANAGEMENT SERVICE

Luke provides an expert service for increasing and maintaining biodiversity in managed forests and measuring biodiversity to support responsibility in forestry. Our knowledge is based on long-term intensive forest monitoring programs and scientific research on the relationship between biodiversity and forest management.

## CARBON SMARTNESS SERVICES IN FOREST BIOECONOMY CYCLES

Luke's services provide various scenarios, building up low carbon actions, enhancing carbon neutrality and low-carbon roadmaps. Luke also provides decision support information to reach climate targets and to evaluate carbon impacts. Luke also provides estimates both on the development of forests carbon reservoirs and capacities as carbon sinks.

## CONTACT

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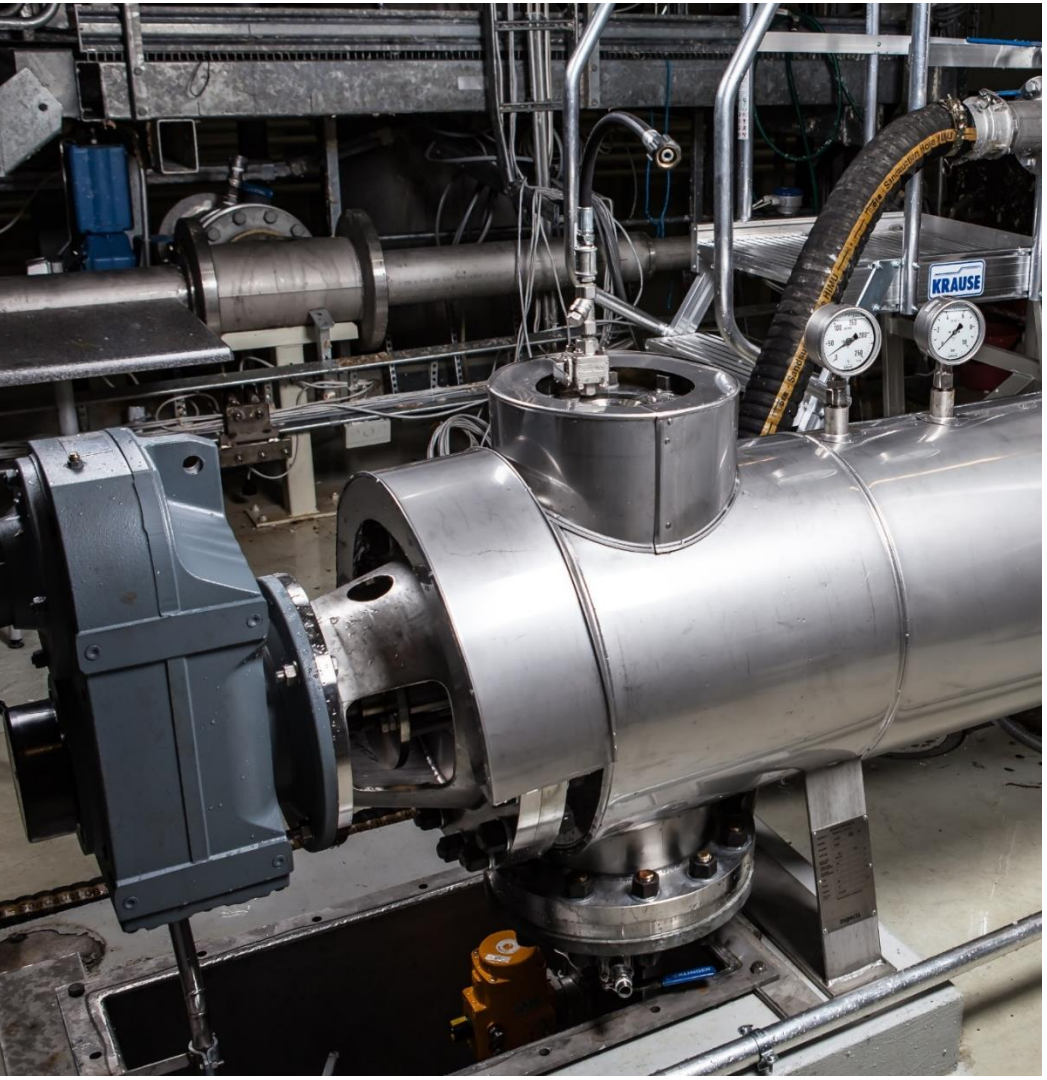
BUSINESS
**FINLAND**

Luke
NATURAL RESOURCES
INSTITUTE FINLAND




# SOUTH-EASTERN FINLAND UNIVERSITY OF APPLIED SCIENCES, FIBERLABORATORY

## FIBERLABORATORY – DEVELOPING FUTURE BIOPRODUCT PROCESSES

FiberLaboratory at Xamk – a bioproduct technology innovation center located in Savonlinna: Research and development of an international level; Piloting equipment that can be scaled up to production scale; Portable piloting equipment for mill experiments; Fiber, water and sludge laboratories; Bioproduct technology education; A networked operating environment.
https://www.xamk.fi/en/rdi/fiberlaboratory/

## FIBERLABORATORY – OFFERING AN EXTENSIVE RANGE OF RESEARCH AND DEVELOPMENT SERVICES TO INDUSTRY

Long experience of pulp and board mill processes, especially in mixing technologies and processes in LC and MC consistencies, pulp bleaching, washing and filtrates, imaging and camera technologies, and water and sludge treatment for the process research and analytical services. Implementing new ideas and solving process technology problems.
https://www.xamk.fi/en/rdi/fiberlaboratory/

## WOOD FIBER AND CELLULOSE TECHNOLOGY – NOVEL BIOMATERIAL AND PROCESS SOLUTIONS

One of our cornerstones is wood fiber and cellulose technology research with our dedicated pilot scale operating environment for new bioproduct innovations. For example, a unique continuous flow screw reactor for novel biomaterials, e.g., cellulose modifications Total volume 220 liters, pressurized max. 10 bar, feed 100–300 dm3/h (15–30 kg dry/h).
https://www.xamk.fi/en/rdi/fiberlaboratory/

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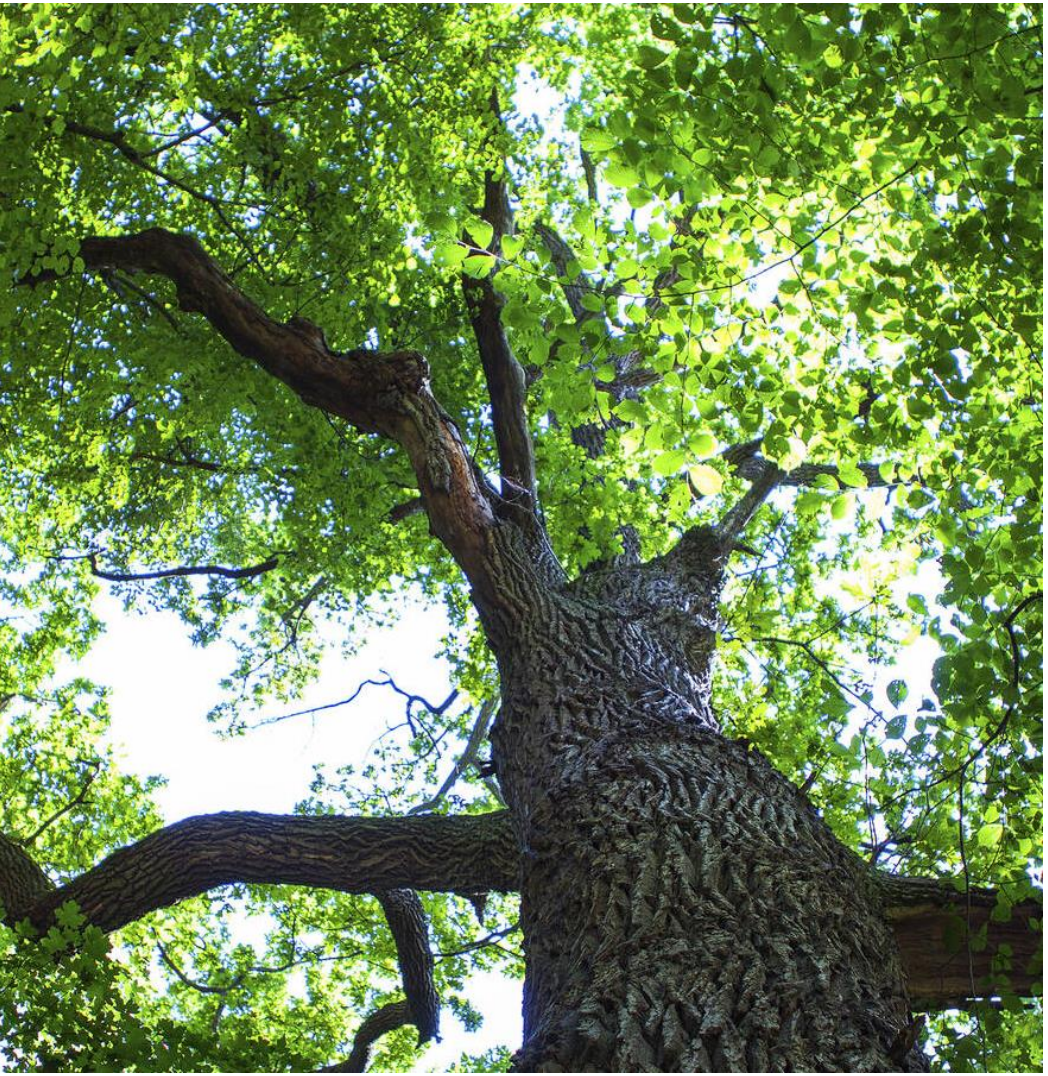
BUSINESS FINLAND

XAMK FiberLaboratory



# VTT TECHNICAL RESEARCH CENTRE OF FINLAND

## ALTERNATIVES TO FOSSIL-BASED RAW MATERIALS OR ENERGY

Discovering alternatives to fossil-based raw materials and energy are at the core of VTT's high impact renewable materials research and development. We help businesses transform through co-working on most demanding material development, testing, piloting and up-scaling projects.

Recyclable and renewable materials, Piloting infrastructure

## NEW PRODUCTS WITH FOAM FORMING TECHNOLOGY

One of the most potential technologies beyond paper and board manufacturing is foam forming technology, where water is replaced with aqueous foam. This technology expands the range of raw materials that can be used in the manufacturing process and enables the production of new, value-added and high-performing structures, e.g., for hygiene and health-care products.

https://www.vttresearch.com/en/ourservices/foam-forming-platform

## PLASTIC-LIKE PACKAGING FROM RENEWABLE RAW MATERIALS

VTT has developed a material made of cellulose and fatty acids which, due to its thermoformable properties, can be used in food packaging in a similar manner to plastic. This Thermocell material can be refined into films and build commodities and processed in conventional plastic treatment processes.

## CONTACT

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BUSINESS FINLAND

VTT

# HIGH-QUALITY **EDUCATION**

BUSINESS **FINLAND**

In Finland, companies, research and innovation players as well as universities work in close cooperation and form a solid ecosystem. Top level education produces a skilled workforce, which is one of Finland's key competitiveness factors in the forest-based bioeconomy. Universities provide bachelor and master's degrees in several programs, while world-class doctoral educational programs contribute the latest cutting-edge knowledge.

## UNIVERSITY PROGRAMS

- Forest products and bioproducts technology
- Biochemical and process engineering
- Wood and fiber material engineering
- Biorefining, bioenergy, and sustainable energy solutions
- Environmental management
- Forest economy and forestry

## UNIVERSITIES

Aalto University
LUT University
Tampere University
University of Eastern Finland
University of Helsinki
University of Jyväskylä
University of Oulu
University of Turku
Åbo Akademi University

## UNIVERSITIES OF APPLIED SCIENCES

Centria
Häme (HAMK)
Karelia
Lapland
Novia
South-Eastern Finland (XAMK)
Tampere
Turku

2020
**OVER 500 STUDENTS**
started in the programs

# FINNVERA – ENABLING AND STRENGTHENING **FINNISH EXPORT FINANCING**

BUSINESS **FINLAND**

Finnvera strengthens the operating potential and competitiveness of Finnish enterprises by offering loans, domestic guarantees, export credit guarantees, and other services associated with the financing of exports.

Finnvera provides comprehensive export credit guarantees against political and commercial risks associated with export financing. Finnvera's clientele comprises both companies, projects, as well as domestic and international banks, financial institutions and public buyers. Finnvera enables Finnish exports also by providing financing for the companies' foreign customers. Read more at www.finnvera.fi/eng

## EXTENSIVE EXPERIENCE ON FOREST SECTOR

Pulp and paper industry is one of Finnvera's biggest financing sectors. Due to the prominent position of Finnish machinery suppliers, Finnvera acts as a provider of financing in nearly all major pulp projects in the world. More than 70% of Finnvera's pulp and paper related exposure is in Latin America.

## BENEFITS OF EXPORT CREDIT GUARANTEES

- To exporters: payment is received on cash terms, protects against credit risks
- To borrowers: enables the availability of long-term financing
- To lenders: protects against credit risks

FINNVERA

# FOREST BIOECONOMY
# TECHNOLOGIES AND SERVICES FROM FINLAND

BUSINESS FINLAND

#FINLANDWORKS

# FOREST BIOECONOMY TECHNOLOGIES AND SERVICES FROM FINLAND

BUSINESS FINLAND

EPC, EPCM

PULP, PAPER, AND BOARD

PRODUCTION TEHCNOLOGIES FOR NEW PRODUCTS

- Consulting and Engineering
- Process Equipment
- Warehousing and Logistics
- Automation, quality control, ERP, digital solutions, etc.
- Consumable and Chemicals
- Production and Maintenance
- Water Treatment and Management
- Environmental Technologies
- Energy Solutions

- Recycled Fiber
- Mechanical Pulping
- Chemical Pulping
- Paper and Board Manufacturing
- Key Components

**FIBERLINE**

- Wood handling
- Cooking
- Delignification
- Bleaching
- Washing, screening and cleaning
- Drying of pulp and baling

**CHEMICAL RECOVERY**

- Evaporation
- Recovery boiler
- Lime kiln and causticizing
- Power boiler
- Traditional by-products

- Consulting and engineering
- Solutions based on biomass incl. biofuels
- Solutions based on pulp mill side streams
- Solutions for Power-to-X

- Stock and water systems
- Web forming and wet pressing
- Drying of paper and board
- Sizing and coating
- Finishing (e.g., calendering, reeling and winding)
- Wrapping and handling

# LARGE SCALE PROJECTS
# **EPC AND EPCM**

BUSINESS
**FINLAND**

1. PROJECT DEVELOPMENT
2. SUPPLIERS – EPC AND EPCM

# PROJECT LIFECYCLE

BUSINESS FINLAND

**BUSINESS IDEA**

**INVESTMENT DECISION**

**FINAL GO-AHEAD**

**TAKE-OVER DATE**

## DEVELOPMENT

- Product and market analysis
- Feasibility study
- Pre-engineering
- Basic engineering

## IMPLEMENTATION

- Engineering
- Procurement
- Construction
- Commissioning

**START-UP**

- Preparation for production

## PRODUCTION

- Operational improvements

AFRY ÅF PÖYRY

# STEPWISE PROJECT APPROACH

BUSINESS FINLAND


AFRY
ÅF PÖYRY

# CONTENTS OF THE **DEVELOPMENT PHASES**

BUSINESS **FINLAND**

| CONCEPT & SITE STUDY | PRE-FEASIBILITY STUDY | FEASIBILITY STUDY PRE-ENGINEERING |
|---|---|---|
| **RAW MATERIAL** | • Raw material supply and availability | • DD of raw materials availability<br>• Logistics (inbound)<br>• Cost of raw materials |
| **MARKETS** | • Demand and competition<br>• Products<br>• Sales prices | • Demand by end-use and volume<br>• Market shares & sales volumes<br>• Sales strategy<br>• Distribution channels/logistics |
| **INFRASTRUCTURE** | • Mill Location<br>• Transport connections<br>• Supplies and facilities | • Site & community development<br>• Water, power & fuel supply<br>• Materials & chemicals supply |
| **MILL CONCEPT** | • Process concept description<br>• Environmental protection<br>• General layouts | • Process flow diagrams<br>• Material balance sheets<br>• Buildings & structures<br>• Description of main equipment |
| **HUMAN RESOURCES** | • Manpower survey<br>• Manpower requirements<br>• Manpower costs | • Organisation structure<br>• Recruitment and training plan<br>• Personnel costs<br>• Know-how transfer |
| **ECONOMIC ASPECTS** | • Manufacturing. & investment cost<br>• Economic and financial evaluation<br>• Financing<br>• Institutional and legal aspects | • Manufacturing & investment cost estimates<br>• Financing & construction schedules<br>• Commercial profitability |
| **PERMITTING** | • Contacts to authorities<br>• Estimates on emissions | • Technical documentation<br>• Permit Applications |

| IMPLEMENTATION PREPARATIONS |
|---|
| **TECHNICAL CONCEPT**<br>• Process solutions<br>• Main machinery & equipment<br>• Layouts<br>• Construction materials<br>• Process control principles<br>• Electrification |
| **FINANCIAL ASPECTS**<br>• Investment budget<br>• Financing decisions |
| **PROJECT RULES**<br>• Information & communication systems<br>• Project procedures & instructions<br>• Technical standards |
| **PREPARATION OF CONTRACTS**<br>• Main machinery & equipment<br>• Site preparation & foundations<br>• Temporary site facilities |
| **TIME SCHEDULES**<br>• Master time schedule<br>• Procurement time schedule<br>• Contract control schedules<br>• Suppliers' data exchange program |

AFRY
ÅF PÖYRY

# LARGE SCALE PROJECTS
# EPC AND EPCM

BUSINESS FINLAND

## AFRY

AFRY is a European leader in engineering, design, and advisory services, with a global reach. We are 16,000 devoted experts in infrastructure, industry, energy, and digitalization, creating sustainable solutions for generations to come.

AFRY is ranked global #1 in Pulp and Paper in International Top Design Firms (ENR). AFRY has contributed to more than 90% of the world's largest pulp mill projects and has been involved in 80% of the mills with the world's fastest running paper machines.

## ANDRITZ

ANDRITZ is a leading global supplier of technologies and services for the pulp and paper industry , including power boilers and gasification plants  FINAL text: ANDRITZ Oy is a leading global supplier of systems, equipment and services for the pulp and paper industry including wood processing, fiber processing, chemical recovery, and stock preparation. In addition, ANDRITZ Oy offers biomass boilers and gasification plants for energy production. State-of-the-art IIoT technologies as part of Metris digitalization solutions complete the comprehensive product offering.

## VALMET

VALMET is the leading global developer and supplier of process technologies, automation, and services for the pulp, paper, and energy industries. Valmet's strong technology offering includes pulp mills, tissue, board and paper production lines, as well as power plants for bioenergy production.

VALMET's advanced services and automation solutions improve the reliability and performance of our customers' processes and enhance the effective utilization of raw materials and energy.

# SERVICES SPANNING THE ENTIRE PROJECT LIFECYCLE

## FROM PRE-FEASIBILITY TO IMPLEMENTATION, REINFORCED BY DECADES-LONG PROJECT EXECUTION KNOW-HOW

A large industrial investment is a time-consuming, complex and capital-intensive process, that involves many phases and several partners. Choosing the right project implementation method and an experienced engineering partner is a key to reaching a successful outcome. All delays during the implementation phase mean delays in the start-up and consequently the project is not delivering expected payback on the investment.

AFRY has broad experience of executing complex process industry EPCM projects in all conditions around the world. Experience from varying site conditions and locations is also one of our assets. As an example, the manpower at peak construction time of a large pulpmill project can exceed 10,000 people, involving hundreds of sub-contractors. Having hands-on experience of site management and implementation of hundreds of large scale EPCM investments, AFRY ensures that the projects are kept on track even in the most demanding conditions.

## ONE-STOP-SHOP PROVIDES ALL PROJECT SERVICES UNDER ONE ROOF

The main characteristics of EPCM (Engineering, Procurement and Construction Management) is that the project owner remains fully in charge and has full control of the project. The EPCM contractor, executes the project on behalf of the owner and provides services supporting the owner in all phases of the project, including project management and controlling, procurement, and supervision of the sub-contractors.

The EPCM model is clearly more risk-free than many other implementation models, and, as a whole, is less expensive.  Being a flexible and 'open' implementation method, the owner has full visibility of the costs and progress throughout the project. Decisions and contracts are made as the project progresses, making it easier to select the best techno-economical solutions. While the key guidelines for the investment project are decided in the project's development phase, in practice, refinements, and unexpected situations always occur during the project. As the owner is not legally tied into one EPC agreement, the investor can always make appropriate changes during the process.

## DIGITALISATION AND SUSTAINABILITY ARE THE KEY DRIVERS IN ALL PROJECTS

Digitalization brings in new dimensions and lifecycle advantage to any large engineering project. At AFRY we continuously improve the utilization of data and digital technologies to optimize project execution and to ensure that the engineering data (ET) is available in one single source from the early project phases to the operational phase enriched with operational data (OT).

Sustainability aspects are taken into account in all project phases. We are helping to modernize and adapt industry to increased sustainability and economic productivity through improved energy efficiency, effective and circular resource use, diversification, technological upgrading and innovation, environmentally-friendly technologies and industrial processes, as well as improved health and safety.

# PASSION AND INNOVATION – THE CORNER-STONES OF DELIVERING THE LATEST IN COMPLETE PULP MILLS

With a proven track record of impressive EPC (Engineering, Procurement, Construction) deliveries in the pulp industry, ANDRITZ is the market leader in the field having constructed and delivered eight complete chemical pulp mills around the world.

This successful track record comes from many years experience in the pulp industry globally combined with a deep understanding of the complete pulp production process – from woodyard to baling including the complete chemical recovery island.

ANDRITZ is fully aware that the major target for pulp producers is to achieve an environmentally sound, safe and steady operation that produces the best uniform quality pulp. Highly qualified ANDRITZ experts and skilled employees provide committed performance to ensure global market leadership and customer satisfaction. The quality of products and services are key factors in ensuring customers maintain reliable and efficient services.

ANDRITZ customers benefit from this vast experience and expertise, as well as the proven quality, reliability and safety of products wherever they are located in the world. Qualified project management resources are able to operate smoothly in all cultures worldwide.

At the center of all ANDRITZ operations is its health and safety mission – ensuring best industry practice both in terms of results and effectiveness, always ensuring the health, safety and security of all employees and stakeholders, as well as the protection of the environment and communities wherever it is operating.

# FULL-SERVICE SUPPORT THROUGHOUT THE LIFECYCLE OF THE PLANT

This array of experience, expertise and top technology and products may be exported around the world, but their home is in Finland. Some of the key equipment is manufactured at ANDRITZ Savonlinna Works and at ANDRITZ Warkaus Works.

ANDRITZ service expertise – from replacement parts to comprehensive maintenance programs – helps protect and extend the life of equipment and lower life cycle costs. Dedicated service specialists' know-how extracts maximum performance and safety out of all equipment over its complete life cycle. ANDRITZ offers a broad range of services to increase the reliability, overall production efficiency, and availability across all processes and equipment. The right tools, and the right people – with local support and global experience.

## SHOWCASE – ARAUCO MAPA INCLUDING SYNERGY CONTRACT

ANDRITZ recently supplied energy-efficient and environmentally-friendly pulp production technologies and key process equipment for the modernization and extension of Celulosa Arauco y Constitución's ARAUCO pulp mill in Chile.

The ANDRITZ scope of supply included the full EPS including a complete wood processing plant with Autonomous Wood Processing Solutions, fiberline with Lo-Solids continuous cooking, and DD-washing technology; a white liquor plant including two lime kilns; and an energy-efficient black liquor evaporation plant equipped with the latest of ANDRITZ's innovations in secondary condensate quality enhancement for 100% reuse in other departments of the mill.

ANDRITZ is also the maintenance and service partner for the mill. The long-term ANDRITZ SYNERGY™ service agreement covers the entire mill, including all pre-engineering, commissioning, start-up and integral maintenance, as well as the supply of spare and wear parts and an after-sales service.

The scope also includes a complete operator training system with an exact model of the plant areas to train the operators in customer-specific operating scenarios.

pulpandpaper.fi@andritz.com

Kraft pulp (andritz.com)

# LARGE PROJECTS

Valmet delivers dozens of large-scale projects every year. Typically, these projects include Valmet's world-leading technologies for paper, board, pulp, and energy production with advanced automation systems as well as services.

Today, Valmet's Industrial Internet solutions, together with Performance Center services, are becoming a key part of Valmet's deliveries. It is vital for Valmet's customers that their large investments are completed on-time with world-class quality and that their new production units quickly give high-performance after start-up.

Valmet has nearly 500 experienced project managers and altogether around 4,000 valmeteers working on the projects worldwide to ensure the success of the customer's investment.

The backbone of Valmet's project management is a well-defined project execution model that divides large projects into nine internal checkpoints called gates to ensure that a project is proceeding according to the plans and will reach its objectives. There are many topics that are controlled in each gate, but the most important ones are:

- Health, safety, and environment
- Project schedule and progress
- Quality assurance
- Risk and opportunity management
- Change management
- Financial control of the project


# EXAMPLES OF RECENT LARGE-SCALE PROJECTS

## KLABIN – PUMA II PULP AND PAPER MILL PROJECT, BRAZIL

Brazil's largest paper producer, Klabin, has made significant investment in its Ortigueira pulp and paper mill, called Puma II.

Valmet has delivered most of the equipment for the project including an OptiConcept M kraftliner machine, a complete new fiberline including a new Continuous Cooking G3, and a pulp dryer rebuild. Valmet has also supplied the automation system and quality management solution, as well as Valmet's Industrial Internet solutions.

"Our choice is not only based on machinery or cost, but also on our previous good cooperation, combined with Valmet's solid reputation for technology and its global team with local service support here in Brazil," says **Francisco Razzolini**, Director for Industrial Technology, Innovation, Sustainability and Projects at Klabin. Successful co-operation between Klabin and Valmet is now continuing with a delivery of a new OptiConcept board machine. .

Read more at valmet.com/klabin

BUSINESS FINLAND

Valmet


# EXAMPLES OF RECENT LARGE-SCALE PROJECTS

## SHANYING INTERNATIONAL, CHINA

Shanying International is the third-largest producer of containerboard in China. Shanying International and Valmet have been collaborating for over 15 years. During the past few years, Valmet has delivered several OptiConcept M board making lines and a waste-to-energy boiler to Shanying International.

"We are happy about the earlier references of Huazhong PM 21 and PM 23. It was really nice to see how well and seamlessly everybody worked together when optimizing PM 21 and starting up PM 23. Our people and Valmet's experts were in Jingzhou and Valmet's experts in Europe supported us via a remote connection", says **Wu Ming Wu**, Chairman and CEO of Shanying International.

Read more at valmet.com/media/articles/board-and-paper/quick-turnaround-to-remote-mode

## METSÄ GROUP'S KEMI BIOPRODUCT MILL PROJECT, FINLAND

Metsä Fibre, which is part of Metsä Group, is building a new bioproduct mill in Kemi, Finland. The new mill will have an annual pulp production capacity of 1.5 million tons.

Valmet will deliver the full production process, from wood handling to baling, as well as a mill-wide automation system. The delivery also includes integrated industrial internet applications to help optimize the mill's production efficiency.

"We want the best professionals in their field to partner with us to build a modern bioproduct mill in Kemi. We expect our partners to commit to the goals of the project in terms of safety, schedule, and quality", says **Jari-Pekka Johansson**, Director of the bioproduct mill project at Metsä Fibre.

Read more at valmet.com/kemi



Valmet

# PULP, PAPER, AND BOARD

BUSINESS FINLAND

1. CONSULTING AND ENGINEERING
2. PROCESS EQUIPMENT
3. WAREHOUSING AND LOGISTICS
4. AUTOMATION, MEASUREMENTS, QUALITY CONTROL, AND NEW DIGITAL SOLUTIONS
5. CONSUMABLES AND CHEMICALS
6. PRODUCTION AND MAINTENANCE SERVICES
7. WATER TREATMENT AND MANAGEMENT (incl. raw water and effluents)
8. ENVIRONMENTAL TECHNOLOGIES
9. ENERGY SOLUTIONS

# CONSULTING AND ENGINEERING

BUSINESS FINLAND

AFRY

Cadmatic

Elomatic

Finnish Forest Products Engineers' Association

Indufor

Vision Hunters

# A STRATEGIC ADVISORY, CONSULTING, ENGINEERING AND PROJECT IMPLEMENTATION PARTNER

AFRY's offering covers the whole bio-based industry value chain and lifecycle, from advisory services, engineering and projects, to operational phase support, and digital and sustainability solutions.

We serve our clients from early strategic development phases to big CAPEX implementation projects and to smaller operational phase support assignments. Our Management Consulting offerings from corporate strategy and market insights to investment strategies and M&As ensure outstanding performance of our clients.

Forest Industry is part of our DNA, and we are the advisor and engineering partner of choice for many of the leading pulp and paper companies globally. We are actively working with clients to capture the opportunities in the growing bio-based products markets.

## VALUE CHAIN UNDERSTANDING FROM RAW MATERIALS TO END PRODUCT MARKETS – AND EVERYTHING IN BETWEEN

Based on deep strategic insight and technology expertise, AFRY is excellently positioned to support clients in implementing sustainable and profitable forest industry investments. We offer unique sector specific advisory services, proven process technology specialism, multidisciplinary engineering expertise, and strong project implementation capabilities.

## A STRATEGIC PARTNER ENSURING THE HIGHEST LEVELS OF TECHNOLOGY, SAFETY, AND QUALITY

Our Forest Industry expertise has its roots in Finland. Today, our track-record spans across the globe, and includes the design of 90% of the world´s largest pulp mills and more than 400 major mill design projects. Our office network uses common practices and tools as well as advanced digital technologies, ensuring efficient project execution.

## COMPANY

AFRY is a European leader in engineering, design, and advisory services with a global reach. We are 16,000 devoted experts in infrastructure, industry, energy, and digitalization, creating sustainable solutions for generations to come.

**Marika Hahtala**
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https://afry.com/en/offerings/process-industries



AFRY
ÅF PÖYRY

# CADMATIC DESIGN AND INFORMATION MANAGEMENT SOFTWARE SOLUTIONS

## OUR SOLUTION

CADMATIC provides a complete software solution for the design, engineering, and information management needs of industrial plant owners and operators, EPCs, design and engineering companies, and their contractors. CADMATIC's high-performance tools for the design of process-intensive industrial plants cover all design phases. It also includes tools and solutions for engineering project review and communication, as well as digital twins for asset lifecycle management. Our data-driven solutions enable close collaboration between all disciplines, integrates processes, and assures end-to-end continuity by sharing the same source of real-time information.

## BENEFIT FOR THE CUSTOMER

CADMATIC empowers its customers to raise the efficiency and profitability of their operations and design and engineering projects to totally new levels. Our solutions do the following:
1. Shorten project lead times;
2. Minimize manual data handling and errors;
3. Raise work efficiency;
4. Enhance information accessibility;
5. Drive digital transformation

## COMPETITIVE ADVANTAGE

CADMATIC is the biggest CAD software company in Finland with a long history of providing solutions, among others, to the pulp, paper, and board industry. We implement our solutions flexibly with different licensing options backed up with the best support services in the business. Our open solutions are easy to integrate with other systems.

## COMPANY

CADMATIC is a leading developer of digital and intelligent 3D-based design, engineering, and information management software solutions. We support advanced digitalization in all project phases with data-driven plant construction and operation.

**References:** www.cadmatic.com

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BUSINESS FINLAND

CADMATIC


# EFFICIENCY OPTIMIZATION AND INVESTMENT IMPLEMENTATION FOR PRODUCTION FACILITIES

## OUR SOLUTION

Efficiency optimization services. Make your processes more efficient with data. The visualization of complex processes in real time delivers a powerful optimization tool to boost your production. Use the help of flexible and intelligent data analysis to operate your production more efficient, making profound decisions in every situation. Investment implementation services utilize the full scope of key engineering disciplines. We take good care of your project with our management and engineering experience.

- Process and Energy
- Plant and Mechanical
- EIA & IT
- Value Services
- Technical Analyses
- Laser scanning
- Visualizations and VR-environments

## BENEFIT FOR THE CUSTOMER

Gives your team the tools to make decisions based on data and quickly makes the right decisions and optimizes production resources with the correct data. In the end, you save time and money by avoiding setting up your own project engineering organization.

## COMPETITIVE ADVANTAGE

Transfer your identified saving potentials to improved profit and increased sustainability. Flexible resource allocation allows you to focus on core businesses.

## COMPANY

Elomatic: founded in 1970; a privately-owned company; 1,000 engineering professionals. Areas of expertise: Consulting, engineering, project management services and CADMATIC software applications.

**Customers:** Technology Suppliers, Process and Energy, Machinery and Equipment Builders.

**References:** Efficiency Analyzing System development and implementation for Metsä Board. Preliminary study and design to the start-up of the plant for Spinnova.

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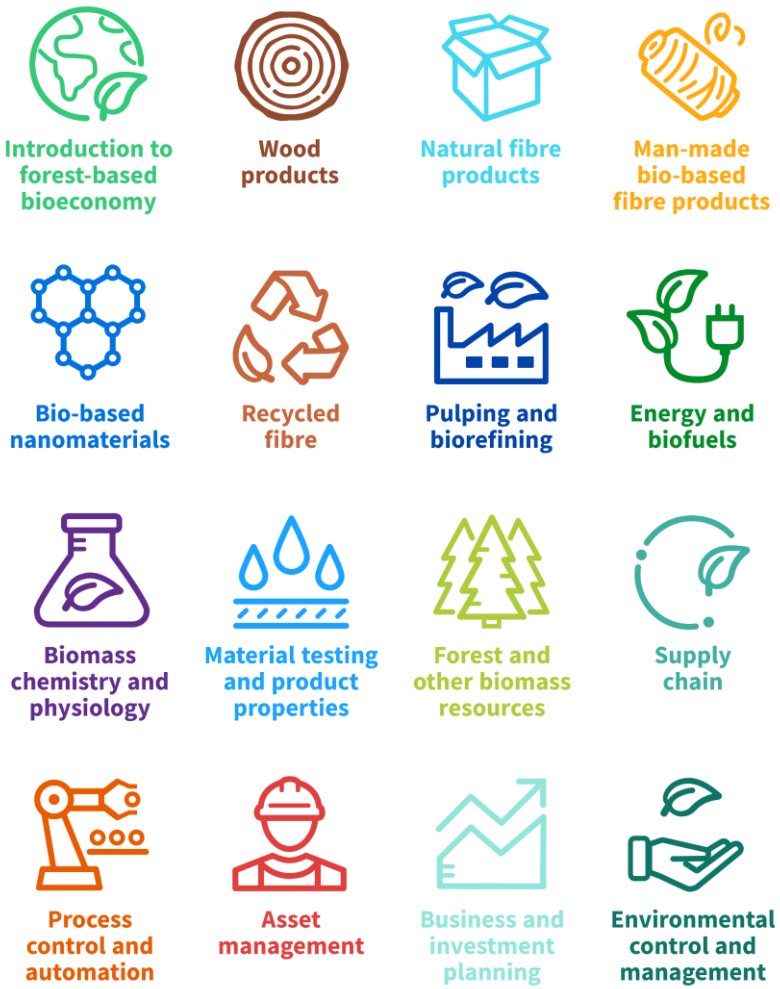
ELOMATIC
CONSULTING & ENGINEERING




# FORESTBIOFACTS - DIGITAL TREASURE TROVE OF FOREST-BASED BIOECONOMY

## OUR SOLUTION

Finnish Forest Products Engineers' Association, a network for professionals and companies in the forest industry, has built a new digital learning environment in collaboration with universities and leading companies in the field. The extensive material in the ForestBioFacts learning environment is a true treasure trove, useful for students and professionals alike. Forest industry managers and researchers can also utilize the material, e.g., as an introduction for new employees.

The learning environment is continuously developed further on the basis of feedback collected from users. ForestBioFacts has been licensed already to over 40 education providers and companies in the field worldwide.

## BENEFIT FOR THE CUSTOMER

ForestBioFacts is an abundant information package. Over 150 experts in the forest-based bioeconomy sector have contributed to the content production. The entity includes:

- 16 themes throughout the value chain of the forest bioeconomy.
- 1500 articles, 300 videos, dictionary of 6,000 terms in six languages and comprehensive glossary
- Access to the 21-volume strong Papermaking Science and Technology book series
- Free introduction to forest-based bioeconomy, suitable for lower and upper secondary schools.

## COMPANY

Finnish Forest Products Engineers' Association (PI) is a modern network of around 2 700 forest industry professionals and 50 companies and a modern developer of our members' expertise. We believe that together we can create a wood-based future.

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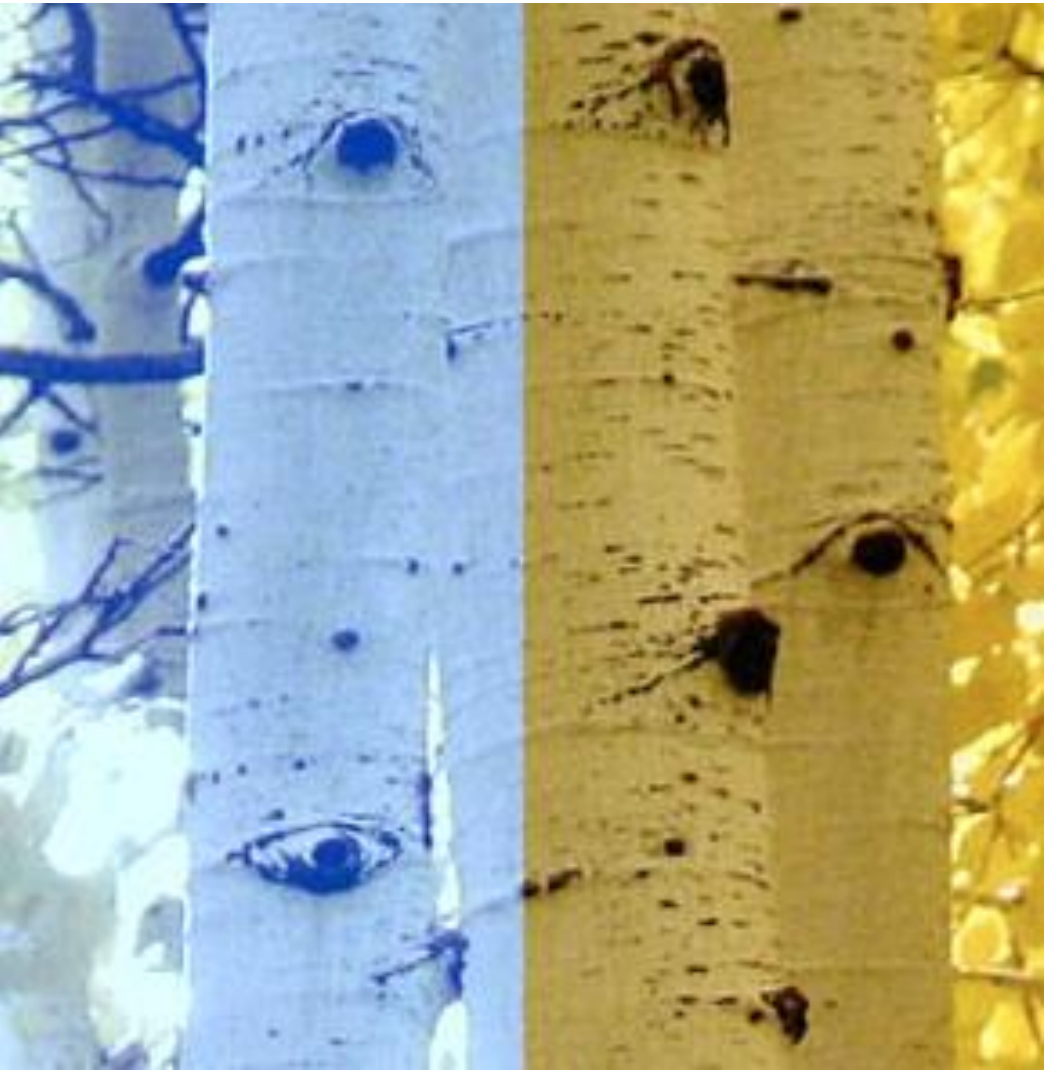
BUSINESS FINLAND

forest bio facts



# LEADING EXPERTISE IN FORESTRY, WOOD INDUSTRY AND SUSTAINABLE LANDSCAPES

## OUR SERVICES

Indufor is a global leader in Natural Resources Management, Investment Advisory, and Strategic Industrial Development consulting. We support our customers to compete and sustainably grow in international markets. Indufor Group has offices in Finland, New Zealand, Australia, the United States, and China. We have over 40 years of experience in more than 100 countries. The Indufor Group is one of the world's leading foresty and forest industry consulting service providers. We provide high-quality knowledge and services for our clients over the forest and bioeconomy value chains, adding value to our clients and to all the affected communities.

## BENEFIT FOR THE CUSTOMER

We serve both public and private clients with our holistic view of the forestry sector. Our services also support our clients in reaching their ESG objectives.

## COMPETITIVE ADVANTAGE

Indufor is an independent forestry and wood industry consulting company. We have strong experience of both the private sector and the public sector funding mechanisms and understand the needs of private companies, investors, and development financiers.

## COMPANY

Indufor Oy was established in 1980 in Helsinki. The company has a global network of partner companies and consultants which allows us to support forest and forest industry investment opportunities in the Americas, Asia-Pacific, Africa, and Europe.

**Our clients:** Our clients are private/public forest companies, investors, financial institutions, international development banks and organizations, and governments.

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Indufor

# MANAGEMENT CONSULTING FOR PULP, PAPER, AND PACKAGING

## OUR SOLUTION

Vision Hunters provides management consulting services throughout the value chain supporting clients in their strategic decision-making process, to improve their operations, to identify and implement new business opportunities including feasibilities within bioindustry and develop future strategies and support in M&A process. We serve our clients within bio-based industry by providing a detailed analysis of business and growth strategies, new opportunity assessments, sustainability, technical support, conceptual development, investment feasibility, and assets. We have a strong track record in the pulp, paper, paperboard, and packaging industries throughout their lifecycle and value chains.

## BENEFIT FOR THE CUSTOMER

Vision Hunters offers a full scope of services to the pulp, paper, and packaging sectors. Understanding the fundamentally changing business landscape, we help our clients in making sustainable business decisions for sustainable value-creating growth. Our diligent and flexible teams are committed to achieving the best results in the set time frame.

## COMPETITIVE ADVANTAGE

Fundamental knowledge of the bioindustry sector. Through us, clients gain access to leading global pulp and paper expertise, strategic advisory, and practical business experience. Underpinned by a detailed sectoral knowledge and bioindustry foresight, we provide tailor-made solutions to unique business needs.

## COMPANY

Vision Hunters is a leading Finnish management consulting company for bioindustry providing strategic advisory services in: Fiber and Pulp, Paper, Board & Packaging, Tissue and Hygiene, Energy, Bioproducts, Biochemicals, Forest Assets, and Wood Products.

**References:** Vision Hunters serves forest and bio-industry clients globally. We are a strategic partner for many of the leading companies in this sector.

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# PROCESS EQUIPMENT

BUSINESS
**FINLAND**

RECYCLED FIBER
MECHANICAL PULPING
CHEMICAL PULPING
- Fiberline
- Chemical recovery

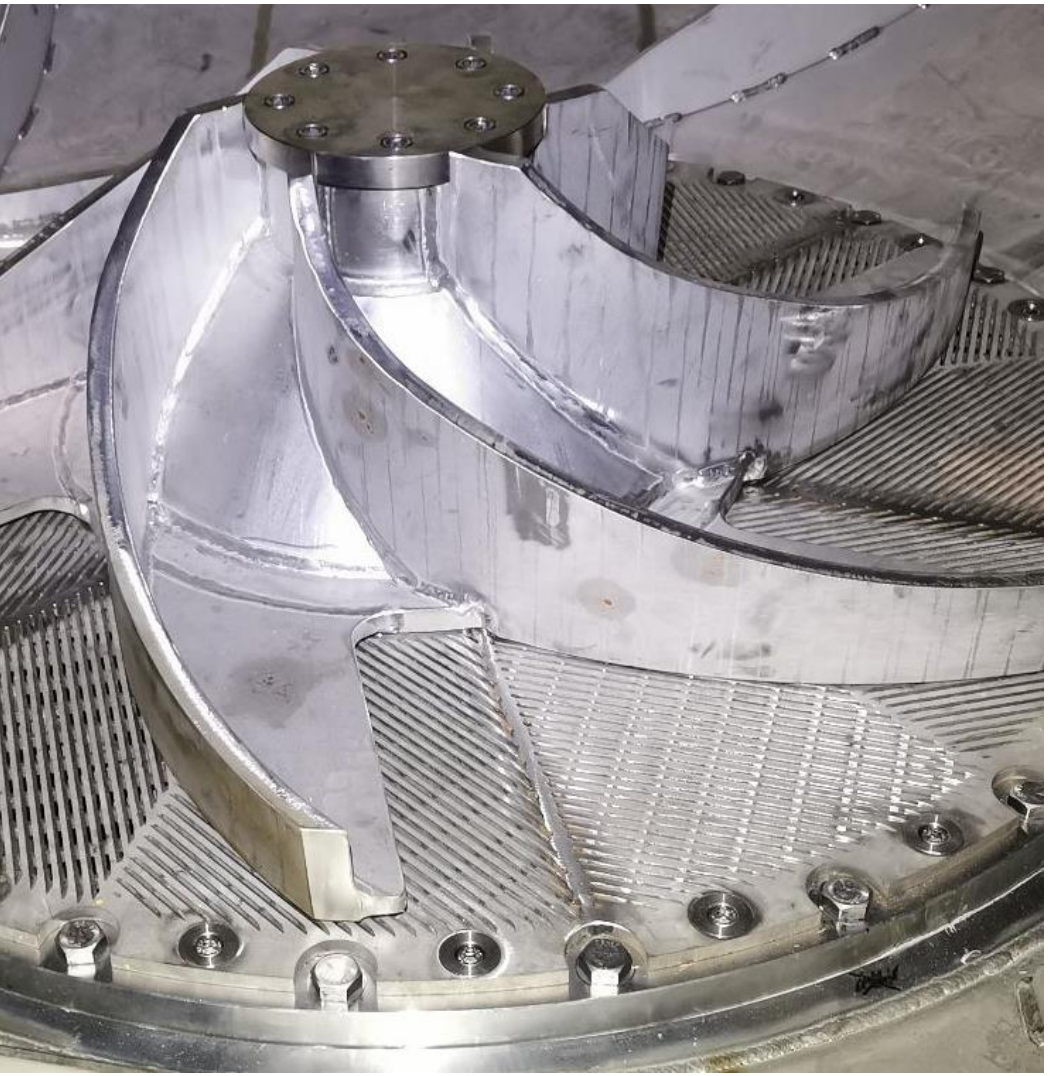
PAPER AND BOARD MANUFACTURING
PUMPING, MIXING AND AERATION
ELECTRICAL AND MECHANICAL KEY COMPONENTS

# PROCESS EQUIPMENT

BUSINESS
FINLAND

RECYCLED FIBER

PR Pulping
Valmet



# NEWEST PULPING TECHNOLOGY FOR RECYCLED PAPER

## OUR SOLUTION

So far, the OCC stock preparation processes have included several items of equipment, a large amount of pumps, complicated piping, several vats with agitators and cleaners. The process is complicated and there are a lot of wearing parts. PR Pulping's mission is to simplify processes and get rid of all equipment which do not give any added value to production process. Following this principle, we developed SimplyOne® Compact for the pulping and cleaning of recycled paper and bio masses.
It is a complete double pulper system with coarse screening, reject washing, and heavy reject removal build in one horizontal vat. Now, one device can handle many tasks instead of the old principle where one device has one task.

## BENEFIT FOR THE CUSTOMER

- Simple compact design eliminates all unnecessary equipment
- Low machinery wearing due to minimized internal recycling
- Highest fiber yield thanks to active fiber washing recovering fibers and giving clean reject out
- Automatic continuous process is simple to start, simple to run, simple to stop and easy to clean

## COMPETITIVE ADVANTAGE

PR Pulping invests in the development of new innovations that result in significant savings in investment, operating and maintenance costs in the pulp handling of the paper industry throughout the plant's life cycle. We will tailor a solution to the various customer's needs on a case-by-case basis.

## COMPANY

PR Pulping is a privately-owned Finnish company with long experience in the Pulp and Paper Industry. We offer stock preparation equipment and processes, equipment rebuilds, modifications and capacity expansions, as well as spare and wear parts worldwide.

**References:** https://www.prpulping.com/

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Pulping

# OPTIMAL SOLUTIONS FOR RECYCLED FIBER NEEDS

Producing high-quality board and paper grades with recycled raw material, such as Old Corrugated Containers (OCC) and Mixed Waste (MW), places high demands on recycled fiber processes. The solution to this is an end-to-end supplier of energy-efficient recycled fiber lines for board and paper mills.

Through customized process design, Valmet delivers optimized final pulp quality, cleanliness, and process yield both with partial rebuilds and new recycled fiber lines. The result is a process that gets the most out of each and every fiber, again and again.

## EFFICIENT AND STABLE PRODUCTION PROCESS

Recycled fiber lines help board and paper makers reduce their energy consumption and minimize raw material costs, while delivering a quality product. Integrated automation solutions further increase production efficiency and stability through accurate online measurements, controls, and operator tools.

## BRINGING TOGETHER TECHNOLOGY AND OPTIMIZATION EXPERTISE

Recycled fiber line process optimization begins ith the specification of the end product's desired properties. This, in turn, guides the selection of a stock preparation concept, which must be robust, flexible, and meet all the productivity and environmental demands. Valmet's expertise, including a full-scale pilot testing facility, supports customers in enhancing the entire recycled fiber line to produce more stable quality pulp while also improving efficiency.

## ABOUT VALMET

Valmet is the leading global developer and supplier of process technologies, automation, and services for the pulp, paper, and energy industries. Valmet is a full-scope supplier of customized, energy-efficient recycled fiber lines that ensure the targeted end-product quality.

Read more at valmet.com/pulp/recycled-fiber



Valmet

# PROCESS EQUIPMENT

BUSINESS FINLAND

MECHANICAL PULPING

Valmet

# ENERGY-EFFICIENT PRODUCTION OF HIGH-YIELD PULP GRADES

Valmet is a full-scope supplier for mechanical pulping, including CTMP (Chemi-ThermoMechanical Pulp), HT-CTMP (High-Temperature - Chemi-ThermoMechanical Pulp), TMP (ThermoMechanical Pulp), NSSC (Neutral Sulfite Semi Chemical) pulping, and PGW (Pressurized GroundWood) systems.

Valmet's technical know-how provides intelligent, integrated, and complete processes for mechanical pulping. Our portfolio is built on strong R&D to guarantee high end-product quality.

## CTMP

The CTMP process provides a pulp with excellent bulk properties at a high production capacity. The key sub-processes in CTMP pulping range from chip preparation, high-consistency refining, steam recovery, low-consistency refining, screening/ fractionation, cleaning, bleaching, and dewatering to pulp storage prior to board/paper production or drying and baling for market pulp. The use of CTMP pulp is continuously spreading to new end-use applications and combinations. High-temperature CTMP (HT-CTMP) is a further development of the traditional CTMP production process.

## SUSTAINABLE AND COST-EFFICIENT

The CTMP process gives a high yield, resulting in high raw material efficiency. Applying Valmet's CTMP in the middle layer of carton board leads to a lighter weight.

Applying high temperature, CTMP will extend the operating window and make it possible to increase raw material efficiency and reduce CO2 emissions. It is a perfect solution for producing high freeness pulp with high to extremely high bulk and low shive content while keeping energy consumption low.

Valmet's CTMP and mechanical pulping technologies support the production of end products that are even more sustainable and cost efficient.

## ABOUT VALMET

Valmet is the leading global developer and supplier of process technologies, automation, and services for the pulp, paper, and energy industries. Valmet's CTMP is a reliable and proven technology that enables the production of high-yield pulp at high capacity with low energy and chemical consumption.

Read more at valmet.com/mechanicalpulp

# PROCESS EQUIPMENT

BUSINESS FINLAND

FIBERLINE

| Company | Wood handling | Cooking | Delignifi-cation | Bleaching | Washing, screening and cleaning | Drying of pulp and baling |
|---|---|---|---|---|---|---|
| ANDRITZ | ● | ● | ● | ● | ● | ● |
| VALMET | ● | ● | ● | ● | ● | ● |

World's highest capacity single line hardwood fiberline including complete woodyard and two pulp drying lines at Suzano's Três Lagoas pulp mill

# LEADERSHIP ACHIEVED IN THE WORLD'S MOST PRODUCTIVE MILLS

## OUR SOLUTION

ANDRITZ's process expertise includes the very latest in complete fiberline technology and equipment design, including completely integrated, customized wood processing solutions in all climates and for all species, and innovative turnkey high-performance market pulp drying lines.

As part of its offering, ANDRITZ's A-ConFlex™ flexible continuous kraft and dissolving pulping technology enables flexibility in the production between high-quality dissolving pulp and paper grade pulp. ANDRITZ High-Kappa pulping is suitable for any board application resulting in strong and sustainable high-Kappa pulp.

ANDRITZ offers full service support throughout the lifecycle of the plant.

## BENEFIT FOR THE CUSTOMER

ANDRITZ's modern wood processing plants produce high-quality chips and minimize labor and energy costs, wood losses, the environmental load, and maintenance requirements. ANDRITZ fiberline processes and machines are developed to have a positive impact on pulp production: high quality, high availability, high throughput, and excellent energy conservation. The EvoDry™ Pulp Drying System provides higher operational runability and reduced operating costs.

## COMPETITIVE ADVANTAGE

ANDRITZ offers cost-effective, economical logyard cranes for woodyard, and fiberline technology, including unique Lo-Solids continuous cooking and DD-Washers which ensure excellent pulp quality with the lowest chemical consumption and high runability.

Furthermore, ANDRITZ is the only supplier with solid references and experience in the continuous cooking of dissolving pulp with A-ConFlex™ technology, enabling flexibility between dissolving and kraft pulp.

## COMPANY

ANDRITZ Oy is a leading global supplier of technologies and services for the pulp and paper industry, including power boilers and gasification plants.

**Contact:** fiberline@andritz.com
Pulp (andritz.com)


# OPTIMIZED PRODUCTION FROM CHIP TO END PRODUCT

Valmet is a full-scope supplier of fiberlines, including wood handling, cooking, screening, washing, oxygen delignification, bleaching, and of pulp drying and baling, as well as board and paper machines for integrated mills. Advanced process technologies, automation, and services are the three pillars that make Valmet's offering unique.

Valmet's wood handling concept results in high-quality chips and enables cost savings in the production process. It provides leading solutions for both batch and continuous cooking.

The TwinRoll press technology offers excellent washing efficiency, high availability, and high outlet consistency, resulting in low environmental impact.

The Valmet Airborne Dryer is setting the new market standard for pulp drying technology, delivering the best production efficiency, reliability, and energy consumption. The dryer is designed for safe and easy operation and maintenance.

## LOWER COSTS AND IMPROVED QUALITY

Chip quality is the first parameter that has a direct effect on the final quality of paper and board. With Valmet ImpBin, chip impregnation is done in a more homogenous way than with any other concept available on the market. It combines the benefit of a lower wood cost with improved pulp quality, resulting in a much stronger virgin pulp.

## TAILORED PRODUCTION PROCESS

Valmet tailors the whole process – from chip to end-product. It is possible to adjust the cooking process (impregnation, yield, strength properties) and tailor the fiber properties for the final product. This tailoring covers technologies in all departments as well as the automation system to control both quality and costs.

## ABOUT VALMET

Valmet is the leading global developer and supplier of process technologies, automation, and services for the pulp, paper, and energy industries. Valmet's fiberline solutions cover the whole process – from wood handling to cooking and to ready pulp bales or paper.

Read more at valmet.com/chemicalpulp

# PROCESS EQUIPMENT

BUSINESS FINLAND

## CHEMICAL RECOVERY

| Company | Evaporation | Recovery boiler | Lime kiln and causticizing | Power boiler | Traditional by-products |
|---|---|---|---|---|---|
| ANDRITZ | ● | ● | ● | ● | ● |
| VALMET | ● | ● | ● | ● | ● |

Recovery Island at Suzano's Três Lagoas pulp mill in Brazil

# A CIRCULAR BIOECONOMY FOR PULP MILLS

## OUR SOLUTION

The recovery island from ANDRITZ incorporates state-of-the-art technologies and services, thus ensuring the highest energy efficiency and optimum environmental protection.

The latest technology for evaporation plants guarantees the maximum reuse of condensates with minimum energy consumption. ANDRITZ HERB recovery boilers maximize the use of thermal energy while efficiently recovering cooking chemicals. ANDRITZ LimeLine white liquor plants (WLP) recycle and reuse the mills' process streams inside the mill in order to produce pure white liquor for the cooking process while minimizing energy consumption. ANDRITZ also provides power boilers and gasification plants for the mills' energy production.

## BENEFIT FOR THE CUSTOMER

A unique process design combined with lamella technology ensures the best achievable steam economy at all times for the evaporation plant. Maximum electric power generation is achieved with ANDRITZ HERB recovery boilers, which have high steam parameters and customized preheating systems. Knowledge of the whole white liquor plant means products and expertise cover the complete white liquor preparation process, providing fully integrated systems.

## COMPETITIVE ADVANTAGE

ANDRITZ is a pioneer in high dry solids evaporation with the best possible energy efficiency to maximize recovery boiler steam and power generation. Evaporators with more than seven effects and effective heat recovery from black liquor results in minimum energy consumption. An improved combustion process means that HERB minimizes emissions, optimizes smelt reduction degree, and creates an odorous free pulp mill. HERB ensures the optimum operation of WLP.

## COMPANY

ANDRITZ Oy is a leading global supplier of technologies and services for the pulp and paper industry including power boilers and gasification plants.

**References:** ANDRITZ recently supplied large recovery island deliveries in greenfield pulp mills globally. ANDRITZ has the biggest fleet of magnum size recovery boilers worldwide.

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Pulp (andritz.com)



ANDRITZ

# COMPREHENSIVE CHEMICAL RECOVERY SOLUTIONS

Valmet is a full-scope supplier of pulp mills, including chemical recovery, offering advanced technology for recovering and preparing cooking chemicals and for producing energy.

Valmet has commissioned recovery islands integrating recausticizing, lime kilns, evaporation plants, ash treatment, and recovery boilers with outstanding performance in energy efficiency, chemical recovery, and sustainability.

## MAKING PULP MILLS FOSSIL FUEL-FREE

For pulp mills aiming to be 100% fossil fuel-free, Valmet has solutions to utilize biomass-based fuels in lime kilns. Valmet offers two main alternatives: wood powder firing and biomass gasification. In biomass gasification, the bark is dried with belt dryers and gasified with CFB gasification technology.

Modern energy-efficient mills have excess biomass, e.g., bark, which can be used to make product gas for lime kilns.

Using gasified biomass in lime kilns eliminates the need to use fossil fuel at the mill, enabling CO2 emission-free pulp production. This has also proven to be economically beneficial and has become the standard for modern mills.

## COMBINING TECHNOLOGY AND AUTOMATION KNOWHOW

Valmet has delivered several biomass-based solutions for lime kilns for customers in Europe, Asia, and South America. Designing the correct solution requires an understanding of the whole chemical pulping process.

Valmet's comprehensive offering includes several advanced process analyzers and mill optimization tools, translating into lower costs and an overall improved performance of the mill.

## ABOUT VALMET

Valmet is the leading global developer and supplier of process technologies, automation, and services for the pulp, paper, and energy industries. Valmet's solutions for chemical recovery cover all technology areas advanced automation systems, including analyzers and optimizers, and comprehensive services for the whole life cycle of the mill.

Read more at valmet.com/recovery

# PROCESS EQUIPMENT

BUSINESS FINLAND

## PAPER AND BOARD MANUFACTURING

| Company | Stock and water systems | Web forming and wet pressing | Drying of paper and board | Sizing and coating | Finishing (calendering, reeling, and winding, etc.) | Wrapping and handling |
|---|---|---|---|---|---|---|
| AIKAWA | ● | | | | | |
| ANPAP | ● | ● | ● | ● | ● | ● |
| DB SANTASALO | ● | | | | | |
| FLOW CONTROL | ● | | | | | |
| KONECRANES | | | | | | ● |
| PESMEL | | | | | | ● |
| TEVO | | | | ● | | |
| UPROVAL | | | | | | ● |
| VALMET | ● | ● | ● | ● | ● | ● |

# REAL-WORLD, PROVEN SOLUTIONS FOR YOUR MOST CHALLENGING FIBER PROCESSING ISSUES

## OUR SOLUTION

We offer innovative fiber processing solutions tailored to customers' furnish, application, and end-product needs. Screening, refining, stock preparation and paper machine approach flow – we cover it all.

## BENEFIT FOR THE CUSTOMER

Our people, knowledge, and skills. Our focus on product development and continuous improvement. Fiber processing is our primary business, so we strive to do this the best way possible through customized solutions.

## COMPETITIVE ADVANTAGE

AFT takes an upgrading approach to improve mill operations, working with existing equipment to reach a high level of performance. With a focus on sustainability, we help mills produce more while using less energy, water, and fewer chemicals.

## COMPANY

With over a century of expert knowledge and equipment development, AFT is a global leader in stock preparation and wet end systems with production in five countries.

**References:** www.aft-global.com

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# AIRLAID PRODUCTION LINE AND MACHINERY MANUFACTURER

## OUR SOLUTION

With Anpap equipment, our customers can produce a wide range of different types of airlaid products. The Airlaid (also called dry paper) process is a way to form a continuous web of fibers using air as a medium. Airlaid is a fabric-like material which belongs to nonwoven materials. Nonwovens are commonly referred to as a web or sheet where fibers are bonded with each other with binders, mechanically or with thermal energy. The main raw material used in Airlaid nonwovens is fluff pulp. Airlaid products are soft and strong, even when wet. Good moisture absorbency is also one of their advantages. Typical products are, e.g., wet and dry wipes, napkins, diverse hygiene and hospital applications, and food pads.

## BENEFIT FOR THE CUSTOMER

The recycling economy is growing and the processing of renewable raw materials with the machines we build is cost-effective. We can meet the increased market need to use renewable raw materials as substitutes for plastics. Our equipment is suitable for use also in other nonwoven (i.e., wet- and foamlaid) processes.

## COMPETITIVE ADVANTAGE

Delivered machines are always tailor made to meet and exceed end-user expectations for airlaid products. Easy maintenance and high yield means cost savings and less waste during the machine lifetime. Our services also include process and production auditions, process improvements, cost evaluations, as well as mechanical and automation engineering.

## COMPANY

Anpap has been working with airlaid since the 1970s and we continuously develop our products to meet customer and market demands. Machines and components are manufactured and designed in Finland. The number of our employees has increased due to more projects.

**References:** Anpap has delivered several full turn-key airlaid production lines and numerous machine sections and machineries around the world.

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anpap
Ahead in airlaid.

# BOTTOM SCRAPER / PULPER

## OUR SOLUTION

Gearunit for running the pulper / bottom scraper.

## COMPETITIVE ADVANTAGE

Efficiency and avalaibility of operations.

## BENEFIT FOR THE CUSTOMER

Durability and availability.

## COMPANY

David Brown Santasalo

**References:**

Several hundred units running worldwide

**Leo Suuronen**

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https://dbsantasalo.com/industries/fibre-paper-tissue


# SEAL SUPPLY SYSTEMS AND THERMOSIPHON SYSTEMS

## OUR SOLUTION

Variable area and pressure-different flow meter applications and non-clogged thermosiphon systems.

## BENEFIT FOR THE CUSTOMER

Over 50 years of development and experience. Flexible and fast deliveries all over the world.

## COMPETITIVE ADVANTAGE

Savings in total investment, service, maintenance costs, and seal water consumption throughout the life-cycle of the systems.

## COMPANY

Flow Control is a Finnish company that manufactures oil circulation lubrication systems, flow meters, and seal supply systems for the purposes of the pulp-, paper- and board industry.

**References:** Deliveries and references to the world's leading equipment manufacturers.

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# STREAMLINE YOUR STORAGE HANDLING

## OUR SOLUTION

Konecranes has been involved in pulp, paper, and wood since the 1920s, and our customers have got to know us as a partner with a clear vision that helps them to succeed. As we continue to develop our equipment and services, we produce new product enhancements such as the Automated Storage and Retrieval System (ASRS). Specially designed for paper storage facilities, this fully automated system uses cranes to help speed up work cycles, reduce roll damage and track inventory. Utilizing vertical stacking and without the need for forklifts or open aisles, it is particularly suited for mills with limited space. ASRS brings cranes and an operating system to increase your productivity and improve safety.

## BENEFIT FOR THE CUSTOMER

- Over 100 years' experience of manufacturing, delivering, and servicing the pulp and paper industries.
- Wide range of overhead cranes, and workstation lifting portfolio for highest lifecycle value.
- Core components are manufactured inhouse with strict quality control.
- Automation technology for end-to-end process optimization.
- Advanced Service offering.

## COMPETITIVE ADVANTAGE

- Faster load cycles and safer roll handling with automation and efficient cranes.
- Automated, safe, and fast inventory management with programmable storage.
- Lower overall energy costs and reduced environmental impact.
- Enhanced safety and serviceability with remote monitoring.
- Automated and expandable.
- Roll tracking by Storage management software.

## COMPANY

Konecranes is a world-leading group of Lifting Businesses™, serving a broad range of customers, including manufacturing and process industries, shipyards and terminals. Konecranes provides lifting solutions and services for lifting equipment of all makes.

**References:** Konecreanes has a proven track record of supplying advanced solutions and equipment for pulp, paper, and board mills across the globe for more than 100 years.

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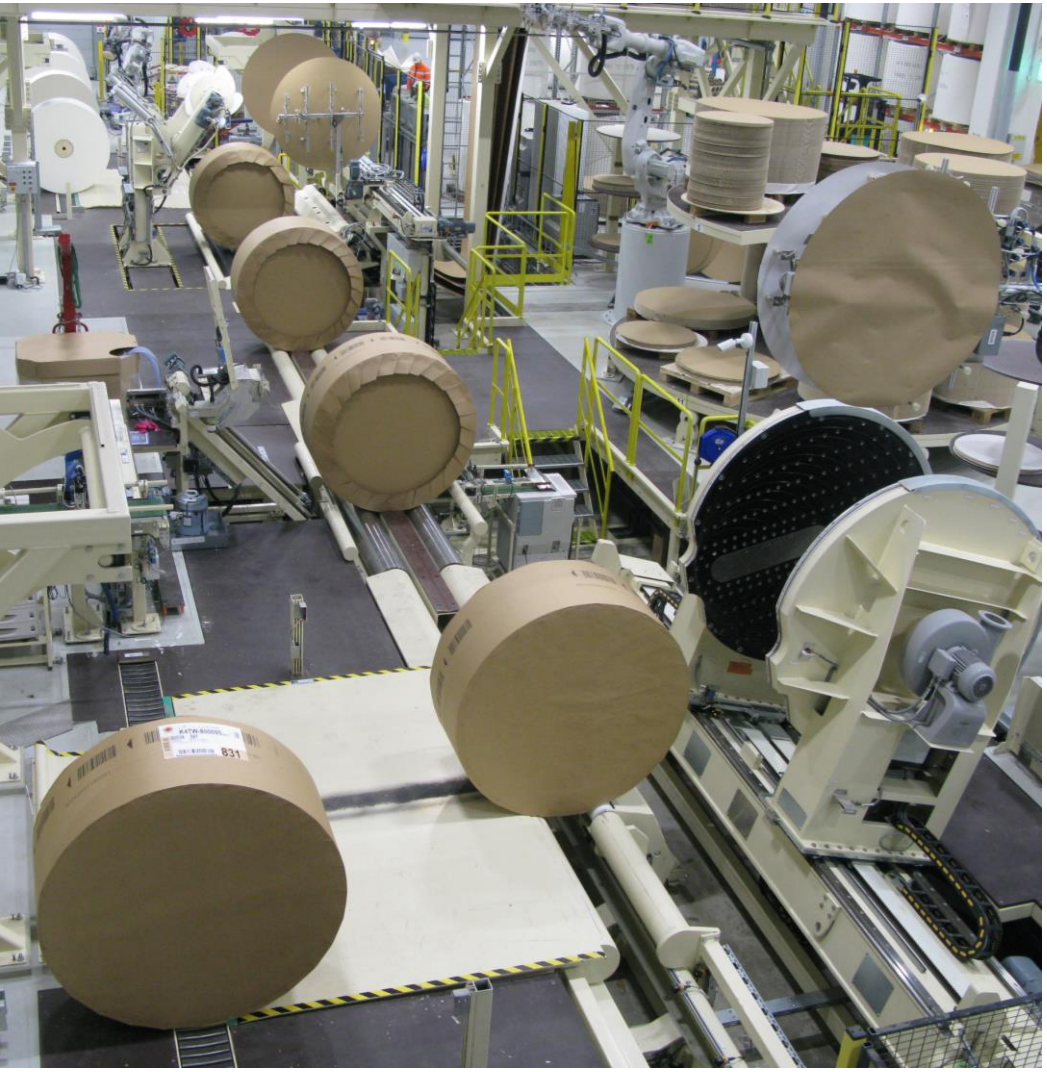
BUSINESS FINLAND

KONECRANES® Lifting Businesses™



# AUTOMATED HANDLING OF PAPER ROLLS AND PULP BALES

## OUR SOLUTION

Pesmel conveying solutions manage all transportation within the mill. Engineered and tailored according to an understanding of how the products, whether paper rolls or pulp bales, need to be handled, automated operation ensures smooth and damage-free material flow between production, wrapping and shipping.
Our range of material handling includes conveyors and systems for wrapping, sorting and loading. Our packaging lines are modular in design making them adjustable to meet prevailing requirements. Each customer's needs, such as space considerations, capacity and packing code requirements are taken into consideration. Pesmel packing systems all have fully automated functions with high capacities.

## BENEFIT FOR THE CUSTOMER

Pesmel's packing lines are designed to provide immaculate protection against the elements and damages in handling and transportation while at the same time optimizing usage of packaging materials. A high degree of automation provides capacities up to 180 rolls an hour and reduces the need for manual labour and the risk of human error in operation.

## COMPETITIVE ADVANTAGE

Each customer situation is different and requires in-depth understanding of material flow and related, design, automation, machine building and software. Pesmel's Material Flow How© concept meets with these requisites, containing a combination of industry insights with inhouse advanced engineering, material flow optimization and software development, setting Pesmel ahead of its competitors.

## COMPANY

Pesmel is a Finland-based integrated solution provider of automated logistics, storing and packing systems for the pulp and paper manufacturing industry globally. We are a specialist in innovative material flow and logistic solutions.

**References:** Material Flow How© knowledge and industrial applications have made us a global benchmark with over 600 deliveries to world-leading corporations.

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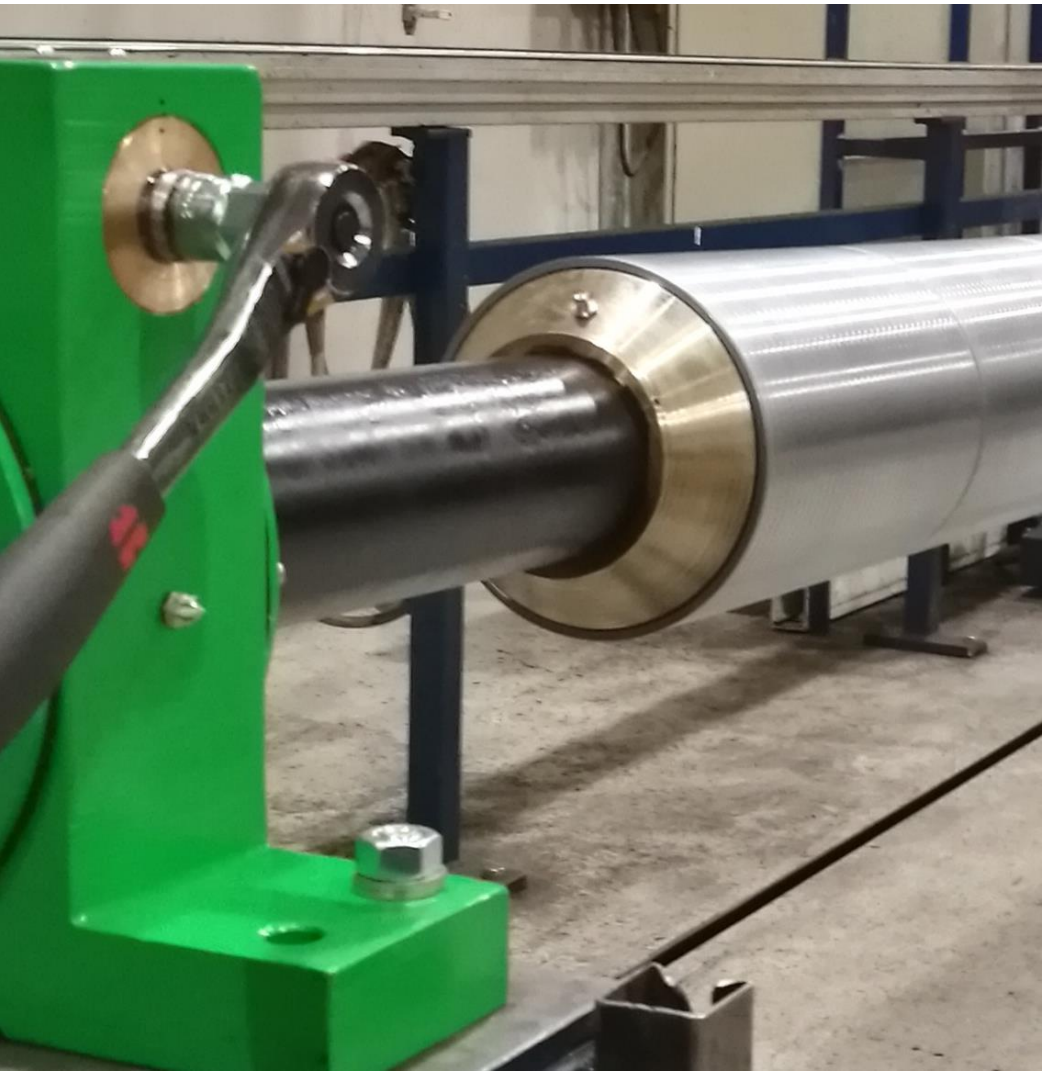
PESMEL



# EXCELLENCE IN SPREADING TECHNOLOGIES

## OUR SOLUTION

TEVO's high performance spreader rolls provide a comprehensive technical solution for web spreading in paper machines. For Size Press and Coater applications, TEVO's vibration-free and smoothly running spreader rolls can be equipped, for example, with the following auxiliary equipment: the TEVO Direct Drive keeps the operating speed exactly the same as that of the web; a Hydraulically Adjustable Bow Height to handle different product runs; Air-Cooling of the roll shell at extreme temperatures; Anti-Sticking roll covers with good release properties; Monitoring systems of vibration and temperature levels, and roll contact angle  Furthermore, TEVO's On-Site Service Team is always ready to support you.

## BENEFIT FOR THE CUSTOMER

TEVO Spreader Rolls are designed and fabricated individually for their specific application and operating conditions. Only high-quality raw-materials and components are used, which ensures a long lifespan and easy maintenance. There are over a thousand TEVO Spreader Rolls supplied to leading pulp, paper, and board mills throughout the world.

## COMPETITIVE ADVANTAGE

TEVO Spreader Rolls contribute to the increase in paper production output thanks to their effective spreading properties. Moreover, the quality of the paper end product will be improved due to an even paper surface which has no wrinkles, markings or other distortions. A long service interval of TEVO's bowed rolls brings savings in maintenance costs.

## COMPANY

TEVO Oy is a Finnish machine engineering export-oriented private company supplying products worldwide to pulp and paper, steel, offshore, shipbuilding, and nuclear industries. TEVO Group incorporates over 100 professionals in three locations in Finland.

**References:** Delivery of roll products to renowned OEM companies and direct customers in nearly 40 different countries. References will be supplied upon request.

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# ROBOWRAP ROLL WRAPPING AND ROLL HANDLING SYSTEMS

## OUR SOLUTION

Uproval offers highly automated roll handling and roll wrapping solutions for paper and board industries world wide. Our solutions are based on the renowned Saimatec Optima and Robowrap technologies. An increase of the automation level with the use of robots and automatic manipulators, an increased safety level and an increased production level are typical targets in our projects. Key technologies are also available as a modernization of existing equipment. Spare parts and service for present Saimatec and other roll wrapping / roll handling equipment are an important part of our supply.

## BENEFIT FOR THE CUSTOMER

We work with a compact core team and involve a network of trusted co-operation partners with whom we will deliver complete roll handling projects to our customers.

## COMPETITIVE ADVANTAGE

Uproval systems are highly flexible and tailored to each customer's specific needs and layout. Highly integrated and distributed automation solutions are key elements of our products, making installation and startup possible in a very compact time frame.

## COMPANY

Uproval Oy was founded in 2018 to continue the roll handling business of Saimatec Engineering Oy, which operated from 1981 on the international market. A structural arrangement and generational changeover were key drivers in founding the company.

**References:** Major international paper and board manufacturers use Uproval / Saimatec systems. Reference information available upon request.

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uproval

# SUSTAINABLE PAPERMAKING PROCESS WITH INNOVATIVE TECHNOLOGIES

Valmet has been collaborating with its customers in more than 700 board machine and 900 paper machine deliveries worldwide. This means that 40% of the paper and board in the world is produced with Valmet's paper and board machines.

Valmet's offering includes everything for profitable board and paper production: innovative technologies, reliability, and high performance, as well as advanced automation solutions to guarantee that every paper machine runs smoothly and energy-efficiently, and uses raw materials economically.
We work closely with our customers to continuously develop new products and papermaking processes that meet customers' varying needs.

## MAXIMUM EFFICIENCY WITH MINIMUM OPERATING COSTS

Defining the right production capacity is the key to ensuring the highest possible return on a paper machine investment. Valmet's focus is on supplying properly scaled papermaking lines and sustainable solutions to serve local and global markets. Valmet's board and paper machines are designed for cost-efficient and flexible production, safe and easy operation, excellent end-product quality, and a low environmental load.

## COMPREHENSIVE EXPERTISE FOR SECURED INVESTMENTS

Valmet has the expertise and technology to understand papermakers' production-specific processes, from furnish preparation to paper and baseboard making, sizing, coating, drying, calendering, reeling, winding, and wrapping. Valmet's experts provide support and guidance – from initial planning to the project phase, through commissioning and start-up to continuous production – throughout the entire life cycle of the paper machine.

## ABOUT VALMET

Valmet is the leading global developer and supplier of process technologies, automation, and services for the pulp, paper, and energy industries. Valmet's high-efficiency solutions for board and paper making cover new production lines and equipment, and machine rebuilds.

Read more at valmet.com/board-and-paper

# PROCESS EQUIPMENT

BUSINESS FINLAND

PUMPING, MIXING AND AERATION

Sulzer Pumps Finland


# INDUSTRY LEADER OFFERS ENERGY-EFFICIENT PUMPING, MIXING AND AERATION SOLUTIONS

## OUR SOLUTION

Wherever fluids are pumped, mixed or controlled – Sulzer is there. Our full-line pump, agitator and compressor portfolio provides unique application coverage. We are the trusted partner for achieving our customers' performance, reliability, and sustainability goals in the pulp, paper, and board industry. Intensive research and development in fluid dynamics, process-oriented applications, reliable products, intelligent service, and performance-improving solutions support our forerunner position. We serve our customers through a worldwide network of front-end experts, production sites, and service centers that provide qualified services for the entire product life cycle. https://bit.ly/2YWZCun

## BENEFIT FOR THE CUSTOMER

With our full-line product portfolio, we offer our customers energy-efficient and sustainable solutions, including complete water and effluent treatment. We strive for exceptional customer experience when providing innovative pumping, mixing, and aeration equipment – also for new applications. Our expertise can lower the operating costs of a plant.

## COMPETITIVE ADVANTAGE

Sulzer's extensive product portfolio is designed to meet the most demanding requirements for all types of liquids and capacities, making it ideal for challenging pumping and mixing operations. Our deep process and application knowledge, understanding of the market needs, and commitment to R&D keeps us at the leading edge of technical innovations. Read more.

## COMPANY

Sulzer is a global leader in fluid engineering. We specialize in pumping, mixing, aeration, and separation technologies for fluids of all types. Our customers benefit from our sustainable solutions and comprehensive factory and service center network.

**References:** Sulzer has a proven track record of energy-efficient solutions and is the key equipment supplier for many recent pulp, paper, and board mill projects.

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SULZER

BUSINESS
FINLAND

# PROCESS EQUIPMENT

BUSINESS
**FINLAND**

## ELECTRICAL AND MECHANICAL KEY COMPONENTS

**ABB** – electrical motors and AC drives
**Danfoss** – AD drives
**Kumera Drives** – mechanical drives
**Premekon** – walkways and stair towers

# WE KEEP THE WORLD TURNING WHILE SAVING ENERGY EVERY DAY

## OUR SOLUTION

ABB's Motion business is the largest supplier of drives and motors, globally. We provide customers with the complete range of electrical motors, generators, drives, and services, as well as integrated digital powertrain solutions.

## BENEFIT FOR THE CUSTOMER

Our offering is industry and application specific, and it provides the right performance to meet the diverse needs of our global customer base. We are close to our customers with our products and services in different parts of the world.

## COMPETITIVE ADVANTAGE

We enable a low-carbon society by carbon neutrality in our own operations. We also support our customers in reducing annual $CO^2$ emissions by > 100 Mt. We take care of our supply chain emission reduction. As 45% of the world's electricity is used to power electric motors in building and industrial applications, investing to upgrade the equipment used in these systems will yield significant rewards in terms of efficiency and sustainability.

## COMPANY

ABB (ABBN: SIX Swiss Ex) is a leading global technology company that energizes the transformation of society and industry to achieve a more productive, sustainable future. By connecting software to its electrification, robotics, automation and motion portfolio, ABB pushes the boundaries of technology to drive performance to new levels. With a history of excellence stretching back more than 130 years, ABB's success is driven by about 105,000 talented employees in over 100 countries.
www.abb.com

**References:** ABB is actively present worldwide in the pulp and paper industry.

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BUSINESS
**FINLAND**


# VACON® – DRIVEN BY DRIVES

## OUR SOLUTION

From small wall-mounted drives to large, enclosed drives – there are a wide selection of VACON® branded drives available from Danfoss Drives. VACON® drives can be tailored according to our customers' specific needs, also when it comes to special motor control requirements. A variety of our drives under the Finnish VACON® brand are well-suited for use in heavy industries and demanding applications. Besides our wide selection of drives, we also offer a variety of aftermarket services which can help you optimize your operations even further.

## BENEFIT FOR THE CUSTOMER

Drives play an important role when it comes to energy saving, optimizing operations, and minimizing mechanical damage. VACON® drives have versatile connection possibilities, making process optimization at pulp and paper mills even more convenient and accessible.

## COMPETITIVE ADVANTAGE

Our VACON® branded products are always tested before they are sent out from our factory to ensure the highest quality possible. In addition to excellent products, we offer an on-call replacement device service which ensures fast delivery when you need it.

## COMPANY

Vacon was established in Vaasa, Finland, in 1993 and became a part of the Danfoss Group in 2014. VACON® branded products are still sold worldwide under Danfoss Drives. Most VACON® products are manufactured in the city of Vaasa, in Western Finland.

**References:** VACON® drives are trusted by many customers and partners globally. Additionally, our drives are commonly used in heavy industry sectors in Finland.

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# KUMERA – GLOBAL PLAYER IN PULP AND PAPER

## OUR SOLUTION

Kumera is a prominent manufacturer and service provider of mechanical power transmissions. The experience gathered over decades guarantees high expertise and innovative quality products and services for the pulp, paper, and board industry. Depending on customers' needs, we can offer a product from our standard gear range as well as tailor-made solutions.

We are working on constant improvements in close collaboration with our customers, equipment manufacturers, research institutes and end-users. This enables us to adapt the latest technology and new demands set for power transmissions equipment.

## BENEFIT FOR THE CUSTOMER

Low vibration levels of gear units are achieved by studying industry processes. Preventive maintenance and a global service network secures operational reliability, minimizing shutdowns. A customer benefits from our high-quality products, complete gear service and application expertise.

## COMPETITIVE ADVANTAGE

In pulp and paper processes, essential requirements for power transmissions are reliability and usability to keep production running. Design engineering, drive systems, tailor made replacement gears, and modernization projects are our core expertise in power transmissions. Our Power-Plaza enables for customers to select gearboxes, to have drawings and quotations and being served with spare parts deliveries.

## COMPANY

Kumera Corporation is a private, family-owned company, operating in four divisions. The company is a global player in power transmission, process technology, and marine propulsion.

**References:** Kumera is a trusted partner of major plant supplier and end-customers. Read more: https://kumera.com/industrial-gearboxes-drives/

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KUMERA

# PREMEKON OY

## OUR SOLUTION

Premekon Oy designs and manufactures industrial walkways, stair towers as well as various other types of metal structures. Stairs, ladders, handrails and other walkway components can also be delivered separately. Premekon Oy has 14 3D-designers, a manufacturing unit and our own assembly group. Our core competence is to be a reliable partner who knows several different walkway, machinery and safety standards very well.

## BENEFIT FOR THE CUSTOMER

Premekon offers a convenient and cost-effective turnkey solution, including design, manufacturing, and installation. Premekon has several alternative models and structures to suit customers requirements. Our products can be installed outdoors, indoors, around the process unit or in very corrosive areas.

## COMPETITIVE ADVANTAGE

Premekon walkways and stairs are pre-assembled structures which are easy to install with bolt joints. Our experienced designers use 3D software and parametrical models, which prevents possible collisions with pipes and other structures in the installation site.

## COMPANY

Premekon Ltd is a privately-owned metal company with specialization in the manufacturing of industrial service platforms and stair towers. We specialize in turnkey deliveries of service platforms, from custom-made 3D design to installation.

**References:** Metsä Fibre Äänekoski MFBTT, Metsä Group, Valmet, Andritz, Stora Enso.

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PREMEKON

# WAREHOUSING AND LOGISTICS

BUSINESS FINLAND

JTA Connection

Kalmar

Mantsinen Group

Mitsubishi Logisnext Europe

Movella

MoveRoll

Pesmel

Stevenel

# TAKING ON CHALLENGES THAT OTHERS AREN'T READY FOR

## OUR SOLUTION

JTA Connection is a well-known provider of tailor-made, complete turnkey solutions for the paper and pulp industry; Basically, we can handle everything before pulper and after slitter. We have developed various improvements for the long production chains of making paper. We have strong experience, for example, in automated indoor logistics, pulp bale warehousing and handling, robotic dewiring and wire removal of pulp bales, robotic roll core plug puller, and complete paper roll packaging solutions.

## BENEFIT FOR THE CUSTOMER

The core of creating our solutions lies in the needs of our customer. Everything is made for the customer's special needs and no shortcuts are taken. Our processes are very flexible so there are opportunities for changes and improvements to the final solution throughout the designing and engineering phase.

## COMPETITIVE ADVANTAGE

Our engineering team consists of highly skilled experts with various backgrounds in different fields.

We are not dependent on other companies' products but assemble our own conveyors, elevators, and other major components in our factories. You name it: we've got the know-how.

## COMPANY

JTA Connection has over 20 years of experience in factory automation, robotics and automated material handling. We have a strong reputation in helping our clients boost their productivity with innovative, high-quality solutions.

**References:** The biggest pulp and paper companies in Finland, such as Stora Enso and UPM, the Tire manufacturer Nokian Renkaat, and the Oil and Gas company Exxon.

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JTA CONNECTION

# PULP NON-FICTION

## OUR SOLUTION

Södra, the Swedish forest-owners' cooperative, has gone from being a buyer of oil to a net producer of electricity. By 2030, their aim is to be fossil-free. Kalmar's electric forklift trucks are helping them to reach that target.

## BENEFIT FOR THE CUSTOMER

Södra is a net producer of electricity and can use the electricity it produces at its facilities to power, for example, forklifts inside it. "We've gone from being a big buyer of oil to being a seller of electricity. That would have been unthinkable just a few years ago, but now it's a reality."

## COMPETITIVE ADVANTAGE

In Sweden, this makes Södra a pioneer in the field, although the trend is similar in the rest of Europe. The transition is easier for companies such as Södra, partly because it's a cooperative and doesn't have to deliver quarterly results to its shareholders, and partly because it is Europe's leading manufacturer of pulp – not paper or cardboard.

## COMPANY

Kalmar offers the widest range of cargo handling solutions and services to ports, terminals, distribution centers, and to heavy industry. One in four container movements around the globe are handled by a Kalmar solution.

**References:**
https://www.kalmarglobal.com/news--insights/articles/2019/20190509_pulp-non-fiction/

https://www.kalmarglobal.com/our-story/kalmar-in-brief/

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# THE MASTER OF ROUNDWOOD HANDLING

## OUR SOLUTION

We manufacture material handling machines, grapples, and auxiliary products for roundwood handling at woodyards, ports, and terminals. Our world-class manufacturing is combined with our practical contractor know-how at woodyards, making us a unique company on the market capable of designing, optimizing and delivering solutions to improve your operations. Our physical products are complemented with a full range of services from assembly and training to locally available spare parts and technical support. We are the frontrunner and global market leader in professional roundwood handling solutions.

## BENEFIT FOR THE CUSTOMER

Our tailored solutions minimize your total cost of handled roundwood and emissions produced, while making your operations run at very high availability, predictability, safety, and operator comfort. We offer you a long-term partnership with constant improvement and readily available local support.

## COMPETITIVE ADVANTAGE

We are the only manufacturer in the business that also operates woodyards. We can help you to make correct choices regarding layout, dimensioning and logistics flows, and provide you with the most robust, productive, energy efficient and safe solutions – optimized for your specific operation.

## COMPANY

Mantsinen has +55 years and +500,000,000m$^3$ of experience in woodyards. We both manufacture material handling machines and operate at wood-yards ourselves, making us a unique company in the business with unparalleled knowhow and solutions.

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MANTSINEN

# INTRALOGISTICS AUTOMATION INTELLIGENCE SINCE 1983

## OUR SOLUTION

Mitsubishi Logisnext Europe has a long history and strong expertise in offering high-quality solutions specifically designed for the needs of the paper industry. The in-house transportation and ware-housing of paper rolls, pallets of sheet products and pulp bales are 24/7 operations, where automated logistics technology can offer great opportunities to increase efficiency and safety. The Automated Guided Vehicle (AGV) is a key tool in a modern automatic warehouse to maximize benefits of higher throughput and precision. The modern AGV is more flexible and versatile than ever before and offers scalable solutions for automated logistics deployment at enterprises of all sizes.

## BENEFIT FOR THE CUSTOMER

Implementation of an AGV fleet can have immediate bottom line advantages: increased control through real-time monitoring, reductions in waste and product damage, increased safety through collision avoidance capabilities, better predictability in total costs of ownership, and highly optimized operations with energy savings.

## COMPETITIVE ADVANTAGE

Rocla AGV Solutions for paper and board manufacturing offer a combination of the best industry practices, including technology, maintenance, and expert skills. Thanks to our 35+ years of history and solution customizability, our solutions cover a wide range of requirements for pulp bale, paper reel, and sheeted product transportation applications.

## COMPANY

Mitsubishi Logisnext Europe Oy is a technology-driven designer and manufacturer of a wide range of logistic solutions and services. MLE's AGV operations are based in Järvenpää, Finland, and operate globally, benefiting from 35+ years of experience. **References:** SK Parenco, Kabel Premium Pulp & Paper, Green Bay Packaging, Ricoh, The Navigator Company, L' Imprimerie, V-TAB, Agfa, Sappi Alfeld

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Logisnext
MITSUBISHI LOGISNEXT EUROPE


# BETTER TRANSPORTS OF PULP AND PAPER

## OUR SOLUTION

Movella Oy provides the best possible transport system for paper and pulp products in ports and factory areas. The transport system consists of a Movella translifter which is operated by a standard terminal tractor and Movella cassettes.

## BENEFIT FOR THE CUSTOMER

Movella translifters are safe to use and they have very high transport efficiency, which results in very low operation costs and also low CO2 emissions.

## COMPETITIVE ADVANTAGE

To guarantee a safe and effective operation, Movella has dedicated products for paper rolls, pulp bales, logs, and other forest-based products.

## COMPANY

Movella Oy is a Finnish company which is specialized in transport equipment for ports and heavy industry. Over 80% of the products are exported to Europe and all over the world.

**References:**
References in the pulp and paper segment: Gothenburg RoRo Terminal, Hangö Stevedoring, Lübecker Hafengesellschaft, Port of Kiel, and Cuypers Vorkliften.

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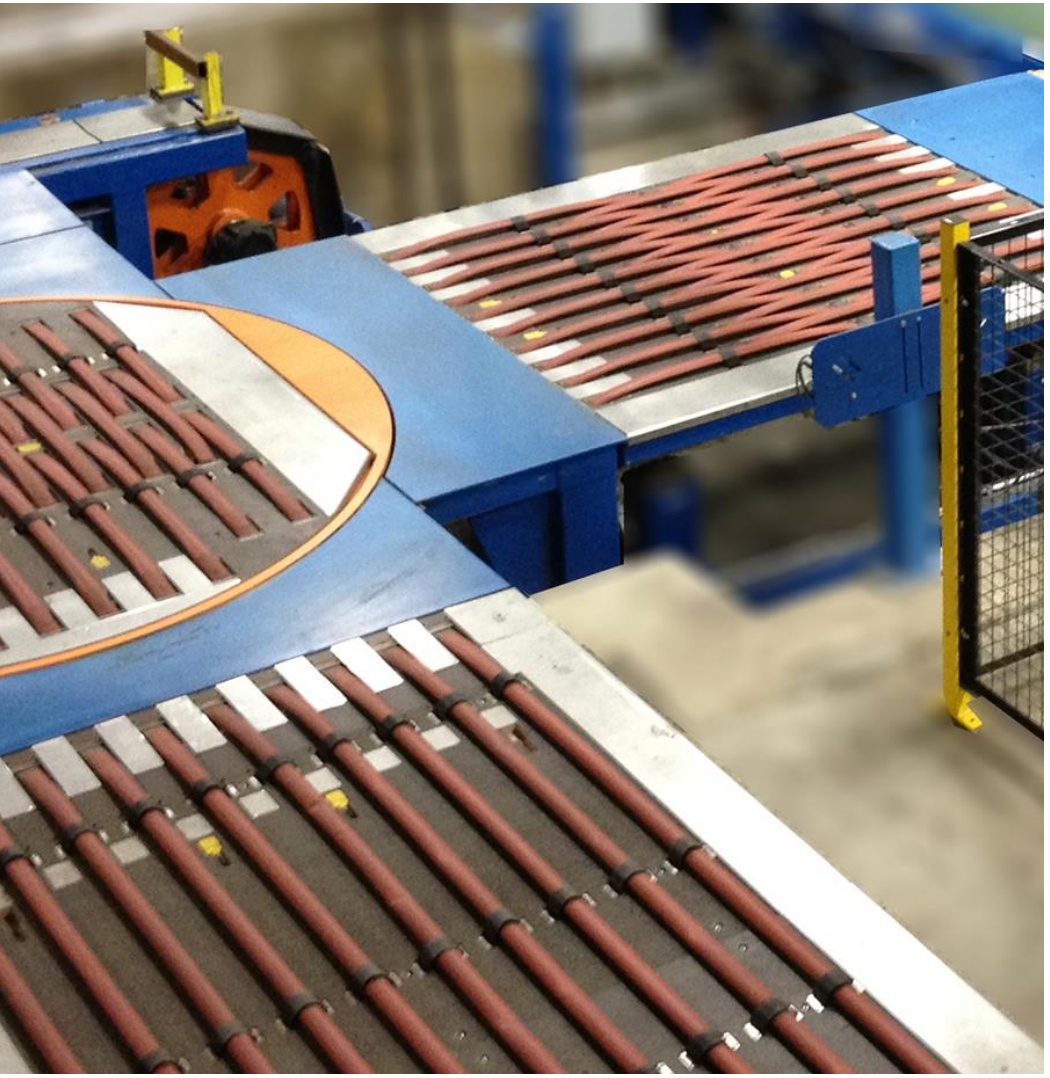
MOVELLA



# ROLL HANDLING EQUIPEMENT

## OUR SOLUTION

MoveRoll Oy, a paper roll handling equipment supplier from Finland, has been developing innovative roll handling solutions for paper mills since early 2008. MoveRoll products include a wide category of horizontal pressure conveyors, Kicker, Zero Energy Receiver and Braking Pads. All product MoveRoll categories are innovative and patented. These products have, for example, successfully been installed in paper mills in Finland, Sweden, the USA, Brazil, China, Thailand, the Middle East, France, Italy, Austria, the UK, Chile, and South Africa. To make MoveRoll products globally available, we cooperate with internationally renowned partners who use MoveRoll innovations as their primary end customer choice.

## BENEFIT FOR THE CUSTOMER

MoveRoll roll handling products are unique and innovative. They can easily be integrated into roll handling systems and offer a simple and innovative way to gently convey or receive paper rolls. The benefits of our roll handling products are: increased safety, energy saving, easy installation and maintenance, ease of use, and product reliability.

## COMPETITIVE ADVANTAGE

MoveRoll solutions are supplied mainly to existing OEM´s and roll handling equipment suppliers. The products MoveRoll offers are superior to the conventional solutions in terms of safety, energy savings, low installation cost, low maintenance, and higher productivity. All products MoveRoll offers are unique and patented.

## COMPANY

MoveRoll Oy is based in Porvoo, Finland, and supplies innovative and patented paper roll handling equipment to the global paper industry. We have expertise and experience in compressed air systems and have innovated paper roll handling since 2008.

**References:**
Our solutions are supplied globally and installation of MoveRoll products is found in all major groups in over 100 mills in the USA, Asia, Europe, and Africa.

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# MATERIAL FLOW HOW® FOR PAPER ROLLS AND PULP BALES

## OUR SOLUTION

Pesmel is a global high-tech company that designs and supplies highly automated and integrated handling, storing and packing systems for the pulp and paper industry. Our focus is on improving our customers' mill efficiency and capacity utilization. As a specialist in innovative material flow solutions, we help industrial customers to rethink and renew their logistic chain. Our competitive edge lies in the capability of automatically handle heavy and complex objects as part of industrial logistics systems and solutions. .

## BENEFIT FOR THE CUSTOMER

Key benefits of Material Flow How® concept reported include: Increased efficiency and flexibility in mill's storing and shipping functions; Over 50% better storing density compared to other storing methods; 100% better handling capability compared to overhead crane storages; Shortened gate-to-gate times, e.g., train: 1 400 tons in 3 hours, truck: under 20 minutes".

## COMPETITIVE ADVANTAGE

Pesmel's demanding systems and solutions require in-depth knowledge in material flow optimization, design, engineering, automation, machine building, and software development. The combination of advanced software capabilities, inhouse engineering, and material flow knowhow sets Pesmel ahead of its competitors.

## COMPANY

Pesmel is a Finland-based integrated solution provider of automated logistics, storing, and packing systems for the pulp and paper manufacturing industry globally. We are a specialist in innovative material flow and logistic solutions.

**References:**
Material Flow How® knowledge and industrial applications have made us a global benchmark with over 600 installations to world-leading corporations.

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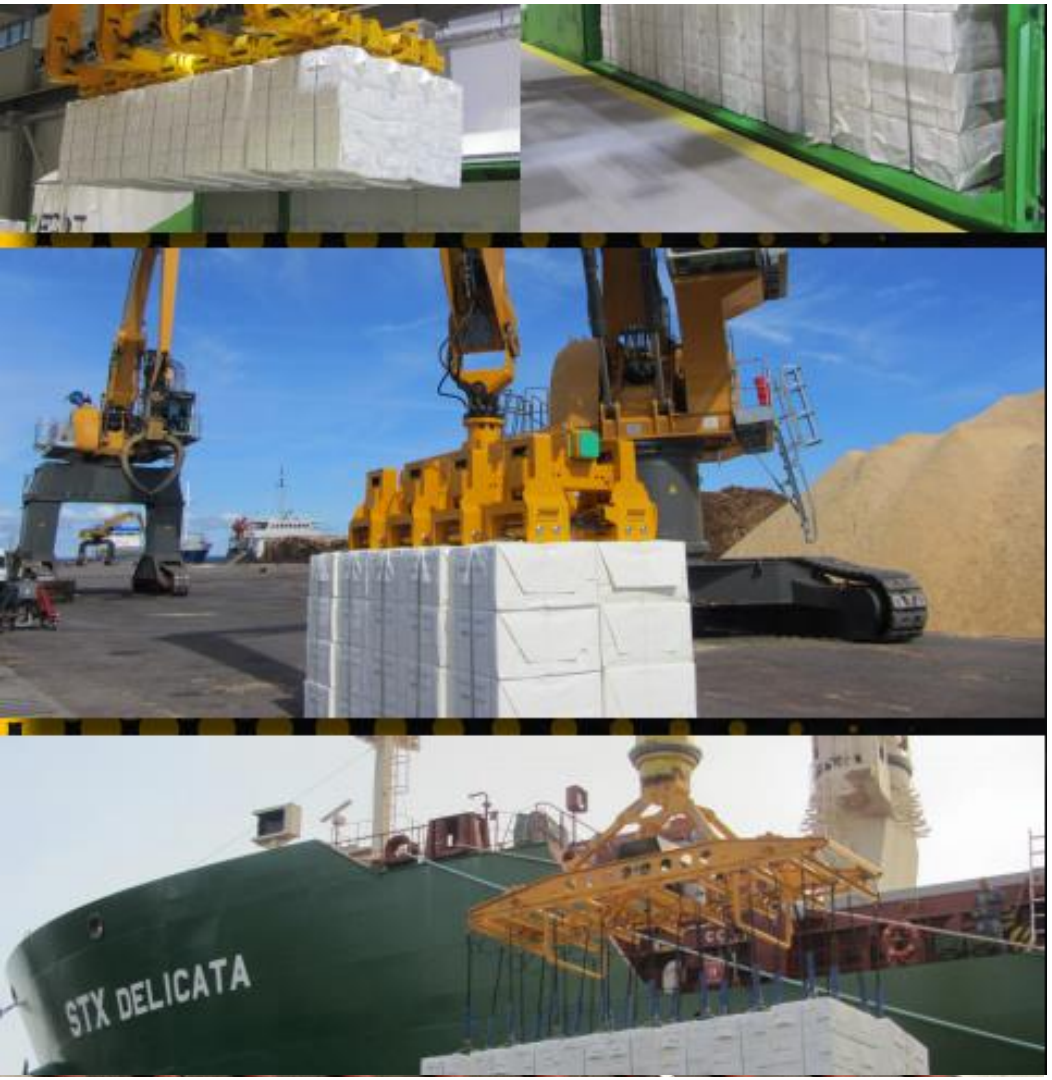
PESMEL




# AUTOMATED PULP UNIT HANDLING IN LOGISTIC PROCESSES

## OUR SOLUTION

Stevenel Ltd offers solutions for logistic chains: Pulp Mill storages; Factory/river ports; Truck/train wagon transportations; Port/Industry terminals; Vessel sizes 2,500-60,000 tons; Semi-and fully automated pulp spreaders for material handling cranes and cable/overhead cranes.

## BENEFIT FOR THE CUSTOMER

Increase productivity 50–100% compared to traditional methods; Minimized turnaround time of the vessels at the ports; Improved working safety; Improved loading and unloading efficiency; Minimized cargo damages; Improved loading and unloading cost efficiency; Total economy and improved competitiveness of the customer.

## COMPETITIVE ADVANTAGE

Product features are patented, thus offering unique solutions for customers. Stevenel Ltd has more than 30 years experience in pulp handling.

## COMPANY

Stevenel Ltd is a Finnish company, located in Tampere. Established in 1998. The product portfolio focuses on various Pulp attachments to mechanize traditional, labor intensive logistic processes.

**References:**

PULP Mills: Metsä Fibre – automated train wagon loading.

CMPC; Brazil – automated river barge loading;
Pulp Ports – numerous refs.

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Stevenel
Pro-Loading

# AUTOMATION
# MEASUREMENTS
# QUALITY CONTROL
# NEW DIGITAL SOLUTIONS

BUSINESS
FINLAND

ACA Systems
Ambertec
ANDRITZ
Finnos
Fluid Intelligence
GloCell
Insta
Kytölä
Procemex
Process Genius
Semantum
Tamtron
TietoEvry
Trimble
Valmet
Vincit
Visilab Signal Technologies


# ADVANCED AND CLEVER ANALYZERS TO SECURE YOUR COMPETITIVE EDGE

## OUR SOLUTION

ACA Permi is an online porosity measurement that controls the base substrate quality in real time. Even small process or raw material variations are visible in the online porosity trend. The ACA AX-100 (high shear viscosity) and ACA Flow (water retention) are modern instruments used to control coating color rheology in process conditions. Especially new water-based barrier coatings may be very challenging in terms of rheology and thus proper instrumentation is required for quality control. ACA ROQ is a revolutionary CD profiler for ready made rolls. It can predict roll problems based on a high resolution hardness profile. ACA Permi Lab is an air permeability based quick barrier property test.

## BENEFIT FOR THE CUSTOMER

We are specialized in advanced instrumentations that connects the raw material fluctuations with process parameters. This gives us the possibility to optimize the runability and to achieve the highest efficiency with maximized end product quality. Data management leads to significant cost savings.

## COMPETITIVE ADVANTAGE

Today, we offer manufacturers and finishing converters comprehensive services, high quality measuring equipment solutions as well as modern data handling platforms. Our heritage has been always
to provide information that can lead to more stable processes and better product quality as well as production cost reduction.

## COMPANY

ACA Systems Oy, a privately-owned technology company founded 1986 in Polvijärvi, Finland, is specialized in developing, manufacturing, and selling high technology instrumentation for the paper, board, and other industries globally.

**References:**
Our customer base includes all leading fiber material companies such as UPM, Stora Enso, SAPPI, Ahlstrom-Munksjö, IP, Delfort, BillerudKorsnäs, etc.

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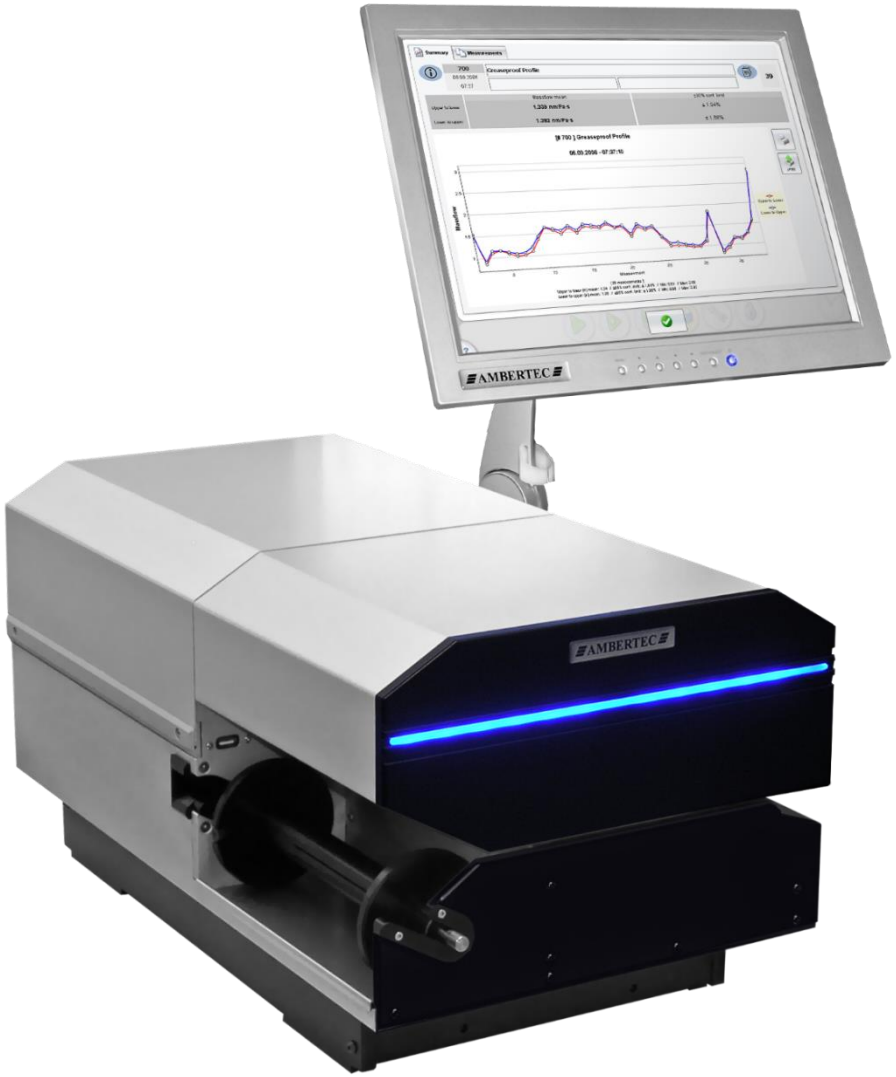
ACA SYSTEMS

PULP, PAPER AND BOARD:
Automation, measurements, quality control & new digital solutions




# QUALITY CONTROL AND PROCESS OPTIMIZATION

## OUR SOLUTION

Our approach is to assist our customers in their development and optimization tasks, adding special measurements and know-how to the portfolio. AMBERTEC specializes in the analysis of non-uniformity in basis-weight (raw material distribution) and porosity properties of web type materials with high accuracy and resolution.

## BENEFIT FOR THE CUSTOMER

AMBERTEC has successfully been used, in addition to routine quality control, e.g., for process enhancement and quality improvement projects, research and development of new products, process components, additives, etc., as well as for guarantee verification purposes. + Fewer quality problems, less waste, better runability, energy savings.

## COMPETITIVE ADVANTAGE

Formation: + Obtain and visualize true local (millimeter-scale) basis weight variations + Measure all web type products – also coated and printed materials + Know impact, e.g., to absorption, porosity, coating and printing quality.

## COMPANY

Since 1986, AMBERTEC has been supplying innovative instruments and services for reliable quality control, troubleshooting, and process optimization. The company is based in Espoo, Finland.

**References:**
Over 250 paper and paperboard mills, paper mill machinery and chemical suppliers, and research institutes worldwide.

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BUSINESS FINLAND

AMBERTEC

ANDRITZ has delivered smart pulp mill solutions: autonomous cranes, Metris FOX and recovery boiler Metris AVA tools for bioproduct mills in Finland.

# ANDRITZ AUTOMATION – TOWARDS AN AUTONOMOUS PULP MILL

## OUR SOLUTION

As a technology leader with extensive, long-term experience in supplying industrial measurement, control and optimization solutions for various applications, ANDRITZ has combined its process and equipment expertise with the latest advancements in the digital era. The result is Metris: ANDRITZ Digital Solutions. Metris offers tools, smart services, and AI solutions for connecting and visualizing data as required in real time. It represents the most comprehensive areas of a pulp mill, including functions from data acquisition to optimization with the aim of enabling autonomous operation. Cyber security – a must in the age of digitalization – is a major feature embedded within the Metris platform.

## BENEFIT FOR THE CUSTOMER

The integrated platform offers many advantages; it can be used as a system control with advanced diagnostics, integrated into applications such as condition monitoring, process analysis, AI operational support as well as e-learning and training. The Metris platform can be used for setting up specific KPIs and forecasting models for customer processes. Cyber security comprises holistic risk-management concepts of customers production processes.

## COMPETITIVE ADVANTAGE

ANDRITZ combines digital technologies and processes know-how, aiming towards a completely autonomous pulp mill. ANDRITZ is improving the safety, environmental load and operating costs of pulp mills with innovative products, such as autonomous cranes. Metris AVA (Advanced Visual Analysis), is a fast, reliable and cybersecured measurement system for all processes and environments, providing a visual view as numbers.

## COMPANY

Pulp, paper, and power mill automation in ANDRITZ Finland has combined its process and equipment expertise with the latest advancements in the digital era.

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PULP, PAPER AND BOARD:
Automation, measurements, quality control & new digital solutions


# X-RAY LOG SCANNERS

## OUR SOLUTION

Finnos' solutions measure logs with high accuracy, enabling efficient usage of raw material. With accurate measurement, optimization and decision making based on data, we increase the efficiency of your production. We consult, manufacture, and develop. Our guiding principle is to transform the structures of the global sawing industry and generate unbelievable business growth for you.

## BENEFIT FOR THE CUSTOMER

Higher yield and better overall control of the process due to accurate measurement.

## COMPETITIVE ADVANTAGE

Finnos has the most advanced technology combined with deep know-how of the forest industry.

## COMPANY

Finnos is a private Finnish high-tech company providing solutions to the global forest industry.

**References:**
Some of Finnos' references include the world's leading forest companies such as Metsä Group, Stora Enso, UPM, Vida Ab, Group Lebel, etc.

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# FLUID EYE® – MACHINE HEALTH ADVISORY SERVICE FOR PLANT PRODUCTIVITY

## OUR SOLUTION

Fluid Eye® is an Automated Machine Health Doctor service that detects the emergence of any important machine or process health phenomena by analyzing industrial fluids in real-time. Online data is connected with other context data such as lab, standards, and industry benchmarks. With industry specific AI, Fluid Eye® provides automatically Actionable Advice to your staff and connected systems in the form of work orders and direct machine commands of those actions that need to be taken now. Fluid Eye® provides assurance through industrial fluids' management so that critical machines can be 1) Optimally maintained to maximize Production Performance, and 2) Continuously available to maximize Production Quality.

## BENEFIT FOR THE CUSTOMER

Fluid Eye® delivers plant level production efficiency:
1) Increased uptime and machine availability;
2) Increased product and production quality;
3) Reduced OPEX and CAPEX costs via resources efficiency and reduced machine failures;
4) Increased sustainability via reduced waste streams.

## COMPETITIVE ADVANTAGE

Fluid Eye® combines online industrial fluids' diagnostics, cross-industry operational machine, and fluid health expertise to relevant contextual data. This automated analytics process delivers operational teams' actionable advice to factories. It gives them an unbeatable advantage to act extremely early so that potential problems won't even escalate.

## COMPANY

Fluid Intelligence Oy is a Finnish based online diagnostics and professional services company. The company serves its customers in key industrial sectors such as pulp and paper, energy, chemical, mining, and logistics. It has distributors in the EU and the Americas. **References:** Adven energy, Woikoski gases, Nordzucker food producer, Sibelco minerals, confidential pulp and paper customers.
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Fluid Intelligence

# SOFTACELL PAPER FURNISH OPTIMIZATION SOFTWARE

## OUR SOLUTION

SoftaCell is a software product that helps paper makers to choose the best available pulps for a certain paper, board, or tissue products. The solution is based on an extensive understanding of fiber physics, mathematical modelling, and a broad knowledge of the pulp and paper industry, but is still easy to use. Input data to SoftaCell are pulp quality laboratory measurements. Pulp is refined by a laboratory refiner comparable with an industrial refiner and pulp samples are taken from certain refining levels and measured. Mathematical models are created based on the data. Finally, a digital twin of the produced (or planned to be produced) paper product is created, and the fiber mix and refining energy are optimized.

## BENEFIT FOR THE CUSTOMER

There are two main users for SoftaCell; pulp producers and paper / board / tissue producers. A pulp producer can offer the most suitable fiber from its selection to a customer. A paper product producer can select the most suitable fiber (market pulp) for its purposes. In both cases, the selection of the fiber can be done without a physical mill trial.

## COMPETITIVE ADVANTAGE

A pulp producer can better serve its customers by a consultative sales approach. Clear benefits can be reached when pulps of certain qualities can be directed to the right places. A paper product producer can reach remarkable benefits, both quality- and cost-wise, by using most suitable pulps. Savings can be tens of euros / ton production.

## COMPANY

GloCell Oy was founded in 2004 as a pulp fiber consulting company. Since 2010, GloCell has provided the fiber furnish optimization software SoftaCell. Currently, GloCell is widening its business to man-made cellulosic textile fibers.

**References:**
SoftaCell is used by leading pulp and paper companies. About 20% of globally produced market pulp is steered with the help of SoftaCell.

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GloCell IN

BUSINESS
FINLAND

PULP, PAPER AND BOARD:
Automation, measurements, quality control & new digital solutions

# INSTA – WORTH YOUR TRUST

## OUR SOLUTION

As a comprehensive supplier of process automation and electrification, we offer optimal, device-independent automation technology, in addition to our extensive expertise. We know and understand our customers' production processes. We have particularly strong expertise in technologies related to the forest industry and the process industry, energy production, and distribution. Utilizing digitalization in manufacturing processes and end products provides a head start in the competition between forest industry companies. Insta is a specialist in the application of automation and digitalization and a reliable global turnkey supplier.

## BENEFIT FOR THE CUSTOMER

We combine opportunities created by designing, implementing, manufacturing, installing, and maintaining industrial automation systems and solutions, as well as machine learning – helping our customers stay at the forefront of development today and tomorrow.

## COMPETITIVE ADVANTAGE

Our strengths include our highly competent employees, reliability, and flexibility. We manage both smaller subprojects and more extensive investment projects with agility and suitable resources. The high quality of our services and solutions is an integral part of our customer promise.

## COMPANY

Insta is a trusted Finnish family-owned business and a partner for its customers in intelligent industry, defense, and cyber security. We improve our customers' performance and productivity in an increasingly rapidly evolving and digitalizing world.

**References:**
Insta is a trusted partner of many notable plant suppliers and end customers. Read more:
insta.fi/en/references/tag/automation-and-electrification

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BUSINESS
FINLAND

INSTA

PULP, PAPER AND BOARD:
Automation, measurements, quality control & new digital solutions


# FLOW MEASUREMENT AND MONITORING EXPERTISE SINCE 1945

## OUR SOLUTION

Customized and tailor-made flow measurement and oil lubrication monitoring devices ensure a smooth and uninterrupted operation of industrial process equipment. A multitude of flow meter applications cover most needs even in the most demanding of operational.

## BENEFIT FOR THE CUSTOMER

Kytola Instruments has a proven track record as a forerunner. Our customers value our agility, promptness, and precision. Each product is made to order to accommodate specific customer needs. We take pride in durable, accurate, and high-quality products that are manufactured in accordance with the latest ISO 9001 and ISO 14001 standards.

## COMPETITIVE ADVANTAGE

Kytola offers solutions that stand the test of time. With more than 75 years in the business, we know our customers and their needs. Products are customized to meet customer's application requirements and provide optimized performance. We are agile and flexible. Our customers range from small one-man businesses to huge international corporations.

## COMPANY

Kytola Instruments' products are designed and manufactured at our own premises in Finland using the latest machine-tool technology. Our subsidiaries and a comprehensive international distributor network bring Kytola products to a location near you.

**References:**
Hundreds of paper, board, and pulp mills around the world.

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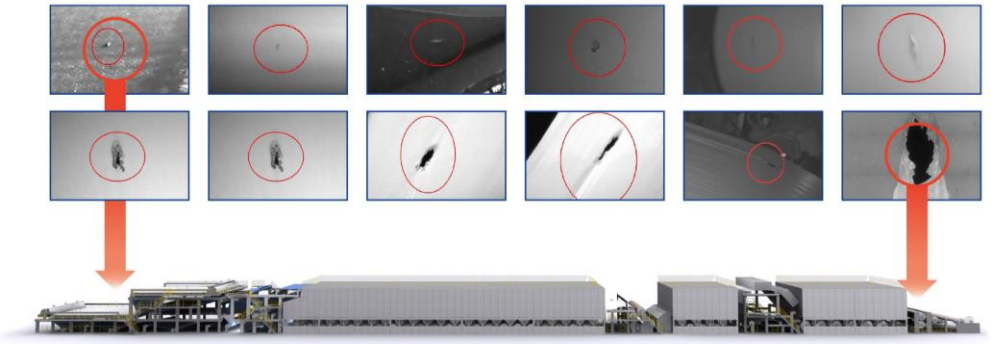
BUSINESS
**FINLAND**

Kytola INSTRUMENTS



# IMPROVING PAPER QUALITY AND PRODUCTION EFFICIENCY

## OUR SOLUTION

Procemex designs, manufactures and provides life cycle services for web break monitoring and web inspection systems for pulp and paper mills, globally. Procemex One Platform is an intelligent camera-based system that helps to reduce paper web breaks, detect paper defects and provide visual root cause analysis.

## BENEFIT FOR THE CUSTOMER

By finding the root causes in paper web breaks easily and fast, Procemex OnePlatform helps to secure product quality and minimize expensive production downtime. Procemex has the capability to provide paper mills with machine vision applications to ensure adequate product quality, improved manu-facturing efficiency, and increased operator safety.

## COMPETITIVE ADVANTAGE

Procemex One Platform integrates web break monitoring, paper defect detection and post processing machine vision applications under one roof. With One Platform, these systems – typically separate – are integrated, and work seamlessly together. The system is based on Procemex Smart. Camera technology, which enables data processing and analysis inside each camera shell. Tens or hundreds of cameras located along the production line are synchronized with each other and provide visual answers for papermakers in case of problems

## COMPANY

Procemex is the global leader in delivering fast and accurate smart camera-based solutions to eliminate web breaks, minimize process downtime and secure product quality.For over 20 years, the company has led the industry with the help of extensive R&D activities.

**References:**
With over 1000 project experience**,** Procemex has acquired a unique understanding of production processes: core excellence lies in mastering optical imaging and image processing.

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# PAPER WEB MONITORING, WEB INSPECTION, AND MACHINE VISION SOLUTIONS

## OUR SOLUTION

Our 3D Digital Twin application is an identical copy of the physical real world that collects and visualizes information about existing devices and systems. The application has a single-pane multi-layered view that provides a lot of information in a clear format. This creates compelete situation awareness of your functions 24/7 from any device.

## BENEFIT FOR THE CUSTOMER

Our solution will take your day-to-day managament to a whole new level. You are able to react on time and optimize the operation of your factory. Factory, guest and occupational safety can be taken to a better level. Maintenance and service functions are visualized in one source. Thanks to a common cloud platform for digital twins, if you have more than one factory, individual plants can be connected to the platform, making new features immediately available in multiple plants when needed.

## COMPETITIVE ADVANTAGE

We create an unfair competitive advantage. With complete situational awareness, you lead effectively and in a timely manner. As a result of the measures, productivity will improve.

## COMPANY

Process Genius's team has a strong industrial or software background and years of experience in building Digital Twins for industrial use. It has been operative since 2012 in Joensuu and Helsinki, Finland.

**References:**
We act as a partner for clients in the global process industry. References on request.

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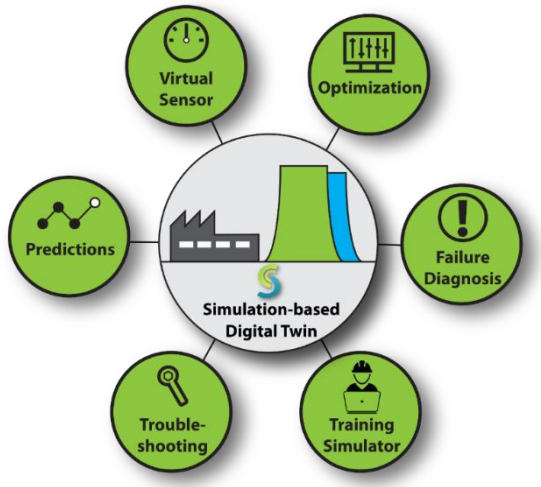
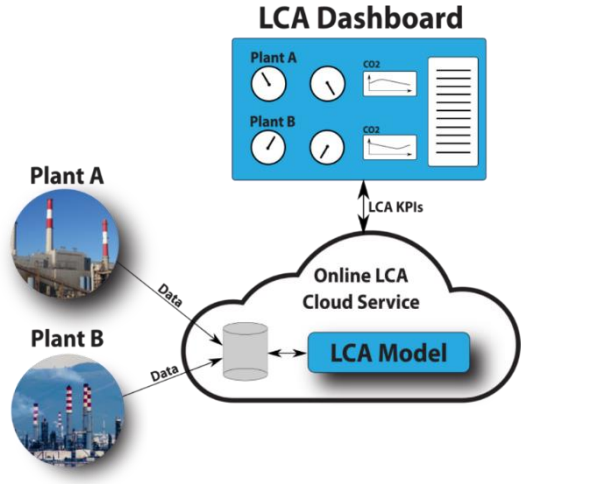
BUSINESS
FINLAND

Process Genius




Simulation-based Digital Twin for operation support




LCA Dashboard for improved environmental impact awareness

# SIMULATION-BASED DIGITAL TWIN AND LCA DASHBOARD FOR OPERATION SUPPORT

## OUR SOLUTION

A simulation-based Digital Twin is a digital replica comprised of a simulation model of the targeted process that is running in parallel with the plant while it is continuously adjusted to synchronize the model results with the process state. Potential applications are, for example, virtual sensors, process operation optimization, and assessment of what-if scenarios. The LCA Dashboard is a cloud-based solution for the calculation and visualization of LCA KPIs based on up-to-date information of production processes. This is achieved through the connection of the LCA model with the process monitoring systems. LCA results and other sustainability-related KPIs are displayed using a dashboard-like interface.

## BENEFIT FOR THE CUSTOMER

Simulation-Based Digital Twins are a powerful solution for applications such as optimization, predictions, and a virtual sensor. They reduce operation costs and provide an improved monitoring of the process. LCA solutions can be used to better assess and communicate the environmental impact of production, resulting in a reduction of your carbon footprint.

## COMPETITIVE ADVANTAGE

Our solutions are based on a unique combination of modeling, simulation, and software development methods targeted to improve the design and the operation of industrial facilities. Our unique approach results in holistic applications that can reduce design costs, support commissioning, and increase efficiency during the plant operation.

## COMPANY

Semantum is a software development company founded in 2007. We offer industrial software solutions for modeling, simulation, and engineering automation. Semantum offices are located in Espoo, Finland.

**References:**
Please see our website.

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Semantum


# WEIGHING SOLUTIONS AND EFFICIENT WEIGHING DATA MANAGEMENT

## OUR SOLUTION

Tamtron's offering includes a wide range of type-approved, robust, accurate, high-quality truck scales, wheel loader scales, material handler scales, forklift truck scales, and timber crane scales that can be installed to different applications regardless of the make, as well as data transfer solutions that enable you to utilize the weighing data in all operations. While advanced and easy-to-use scales weigh during normal operations without interrupting or slowing down the workflow, Tamtron's weighing information management systems ensure real-time access to the weighing information, reports, and operations.

## BENEFIT FOR THE CUSTOMER

The control and management of material flows is a crucial part of everyday operations. With Tamtron's solutions, the weighing information can be connected from all scales at the site and utilized simultaneously in all company's processes and tools. With the information, operations can be optimized to be as fluent and efficient as possible.

## COMPETITIVE ADVANTAGE

Tamtron's professional weighing solutions with solid connectivity and data management will help operators to meet the demands for transparency, traceability, and ever-growing reporting liabilities. Reporting between co-operation partners becomes easier when the required information is available on one system, easily and reliably.

## COMPANY

Tamtron Group, established in 1972, is an international manufacturer of scales and weighing information management systems. Tamtron has 170 employees and an annual turnover in 2021 over 22 M€. Tamtron is represented worldwide in over 50 countries.

**References:**
Äänekoski, Metsä Group
Kumeko Forest

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TAMTRON
WEIGH TO KNOW

PULP, PAPER AND BOARD:
Automation, measurements, quality control & new digital solutions

# ENABLE BUSINESS TRANSFORMATION WITH TIETOEVRY TIPS SOLUTIONS AND SERVICES

## OUR SOLUTION

TietoEVRY's TIPS Industry Solutions and Services are designed to improve the efficiency and profitability of pulp, paper, board, packaging, tissue, and nonwoven business. It is the leading industry-specific ERP (Enterprise Resource Planning) and MES (Manufacturing Execution System), and has already been installed in over 300 locations worldwide.

Meeting today's business challenges is one thing, but, in addition, you need to be prepared for tomorrow's challenges. TietoEVRY helps companies navigate the disruption through digitalization, focusing on agile production control and optimized operational excellence.

## BENEFIT FOR THE CUSTOMER

TIPS users have online access to all business processes and mill departments, so you will have information for correct decisions more quickly than ever before. You can adapt to the ever-changing workflows in a mill as business, production, processes, and quality information are all integrated and configured to help you develop optimal business processes.

## COMPETITIVE ADVANTAGE

You can achieve more sales with less waste, and an increased profit margin. Better OTIF (On Time In Full) delivery rates and shorter lead times will result in higher customer loyalty, thus providing you with an opportunity to improve your standing in a volatile market.

## COMPANY

TietoEVRY creates a digital advantage for businesses and society. The company serves thousands of enterprise and public sector customers in more than 90 countries and employs around 24,000 experts globally. www.tietoevry.com

**References:**
For further information, please visit tietoevry.com/tips and contact Jarmo Ropponen, Head of Sales and Marketing, Pulp, Paper and Fiber.

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BUSINESS
**FINLAND**

tieto EVRY


# WEDGE: FAST ONLINE INDUSTRIAL DATA ANALYTICS

## OUR SOLUTION

Wedge is powerful data-mining software that enables you to improve industrial plant efficiency with ease. Wedge digests all of the process data from multiple sources. It uncovers and suggests possible root causes and consequences of process events before they escalate into problems. With Wedge, you can: VISUALIZE process and quality data; CLEANSE and focus the data, compensate process delays; ANALYZE data with a versatile set of tools; DIAGNOSE dependencies and root causes; FEED THIRD PARTY SYSTEM by automated data refining and analysis.

## BENEFIT FOR THE CUSTOMER

- Make data analysis fast and easy: Do a week's data-analysis work in 10 minutes
- Save costs and energy: Address issues rapidly and thus minimize loss of production and reduce waste
- Improve productivity: Ensure the end-product quality with a smooth production process
- Enable collaboration: Share data and knowledge with colleagues and partner

## COMPETITIVE ADVANTAGE

Wedge is the fruit of more than 25 years of industrial cooperation. Praised for its exceptional user experience and smart data-handling, Wedge also offers unique advanced analysis and diagnostics tools that truly set it apart

## COMPANY

Trimble is an Industrial Technology company that provides the best system for process analytics. Trimble has 11,000+ employees globally and is listed in Nasdaq (TRMB).

**References:**
Wedge is used globally by thousands of professionals. Here are some of our customers: Stora Enso, Metsä Group, Holmen, UPM, Progroup, Klabin, and Orora.

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Trimble®

PULP, PAPER AND BOARD:
Automation, measurements, quality control & new digital solutions

# FUTURE-PROOF AUTOMATION SOLUTIONS

Valmet's future-proof automation solutions are designed to maximize the profitability and sustainability of customers' businesses by improving production performance, raw-material and energy efficiency, and cost-effectiveness. Valmet's automation offering, ranging from single measurements to mill-wide process automation systems, optimization, and automation services, is the widest available on the market and supports pulp and paper maker customers throughout the life cycle.

## A SOLID FOUNDATION FOR MILL-WIDE OPTIMIZATION

The Valmet DNA Automation system provides a solid foundation for increasing the efficiency of pulp and paper making. It is a single, scalable automation platform that integrates process and machine controls, quality management, analyzers and measurements, condition monitoring, and advanced process control and optimization applications – all accessible through one operator interface. The secure web-based Valmet DNA User Interface enables centralized control, providing secure access to the system and expert support when and where needed.

## ONGOING SUPPORT AND OPTIMIZATION

Designed and delivered with expertise, Valmet's solutions come with lifetime systems compatibility and ongoing support: optimization, systems maintenance and development services for the customer's evolving needs.

To date, Valmet has delivered close to 5,000 automation systems and more than 100,000 analyzers and measurements. Valmet continuously support its customers – both on site and remotely – on five continents.

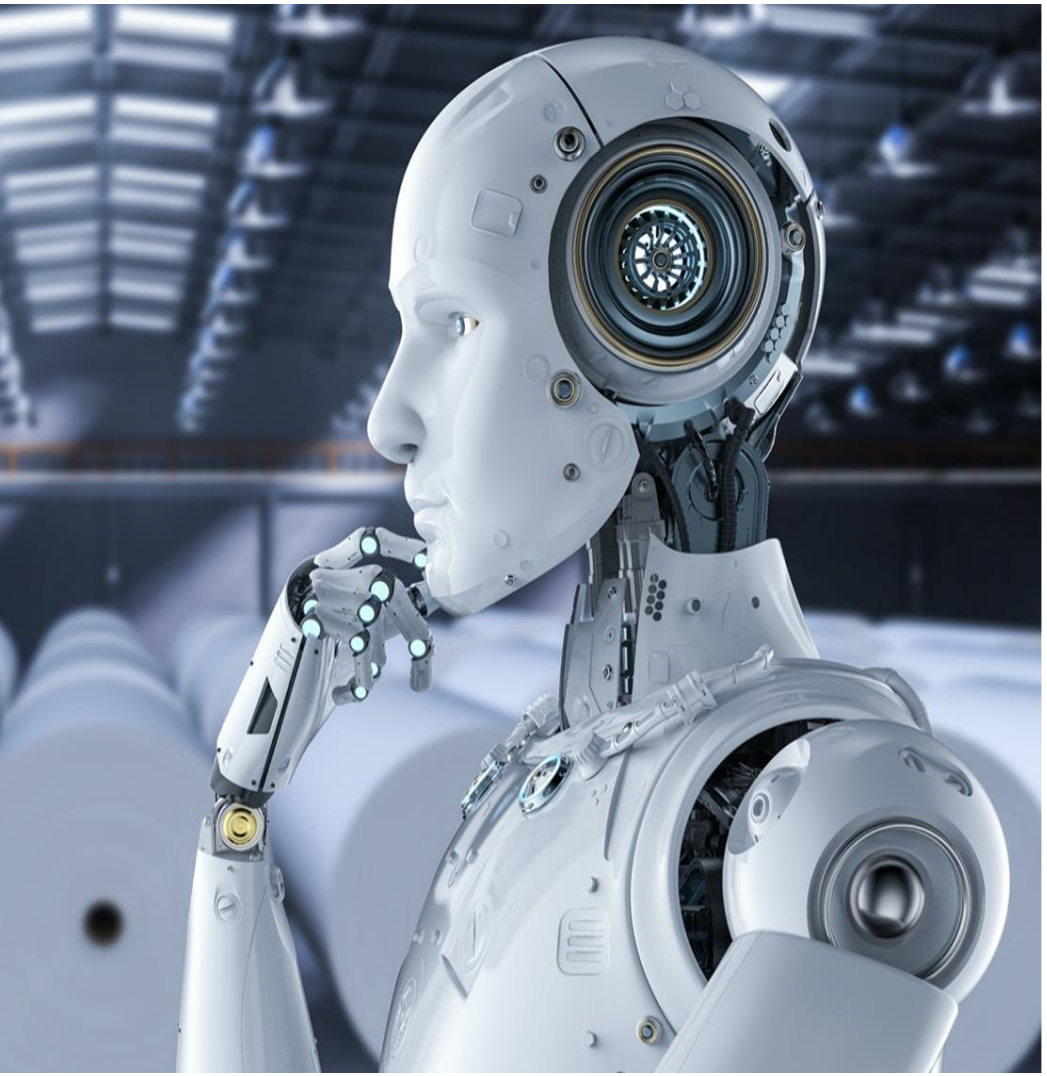
## ABOUT VALMET

Valmet is the leading global developer and supplier of process technologies, automation, and services for the pulp, paper, and energy industries. Valmet provides future-proof automation solutions for the pulp, board, paper, tissue, energy, marine, and process industries with lifetime system compatibility and ongoing support.

Read more at valmet.com/automation

BUSINESS
FINLAND

Valmet



# OUR SOLUTION VINCITEAM POWERED BY M-FILES

## OUR SOLUTION

Intelligent service, maintenance, and material management to meet all needs. VincitEAM is a modern service, maintenance, and material resource planning system that brings together human activity, documents, and data content. It lets you lead data, property, and operations effectively with a single solution. Get the information you need at the right time and on all devices.

## BENEFIT FOR THE CUSTOMER

Company maintenance costs adjustable according to the company's strategy, more efficient production and better resource management. Enables full transition to mobile lifecycle management. System available with Azure SaaS cloud service. Very extensive EAM and ECM functions in the same system.

## COMPETITIVE ADVANTAGE

VincitEAM is the only service, maintenance, and asset management tool on the market that combines all data contents, documents, and daily EAM activities into one seamless software that we configure to your needs. You get to manage almost all of your processes, equipment life cycles, and safe work-flows with one totally mobile system. You get all the functionalities that you, your employees, and your collaborators need – and only as many features as you need at any given time.

The modern VincitEAM system includes all data and documentation for maintenance management with user-friendly desktop, mobile, and web user interfaces.

## COMPANY

Vincit is a top expert in software development. Our customers are mainly large and medium-sized enterprises, along with start-up companies and public sector organizations. Vincit serves more than 300 customers in a variety of sectors. In 2020, the company's turnover amounted to EUR 52.4 million.

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VINCIT eam


# MICROWAVE PORTABLE MOISTURE METER FOR PULP, PAPER, AND BOARD

## OUR SOLUTION

The MK30 model is an independent portable unit for measuring pulp moisture manually. It can be used similarly for measuring stacks and reels of paper and other fiber products. It is made for deep penetration to the material. Manual on-line measurement of a running web is a possibility in many cases. We also have on-line models for such an application. PC programs are available with lots of features at no cost. The MK30 is capable of measuring from very dry to very high moisture levels over a wide range of basis weights of pulp and paper products.

## BENEFIT FOR THE CUSTOMER

This meter is very handy and easy to carry around. It is able to measure to a 30 mm depth in pulp and paper products. The data is shown and can be saved for later downloading to a PC for archival and reporting. The MK30 has a wealth of features for advanced users but a simple straightforward use is just as possible. Wireless communication is a standard.

## COMPETITIVE ADVANTAGE

This is a unique meter having practically no competition. It will give an immediate moisture reading averaging a thick layer of material. Production machines can be adjusted to save energy in drying and to maintain quality. Customer complaints can be resolved with MK30 quickly.

## COMPANY

Visilab Signal Technologies has been making instruments for the pulp and paper industry since 1985. The technologies mainly used are microwave and near infrared for measuring moisture. We have several portable and on-line meter models in this range.

**References:**
Visilab has sold portable moisture meters since 1994 to most European countries and all over the world. Many mills have purchased more than one meter.

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VISILAB
SIGNAL TECHNOLOGIES

# CONSUMABLES AND CHEMICALS

BUSINESS FINLAND

CH-Polymers

Lapua-Ketjut


# CHP BAR – WATER-BASED BARRIER COATINGS FOR SUSTAINABLE PACKAGING

## OUR SOLUTION

CHP BAR water-based barrier coatings provide sustainable and environmentally-friendly solutions for the packaging industry. CHP BAR is used in paper and board manufacturing, online and offline coating, as well as in converting. This biomaterial-containing product range gives exceptional barrier properties for multiple end uses in fast food packaging, cups, plates, straws, wrapping paper, etc. All products are ready formulated and are meant to be used as such. CHP BAR products are suitable for direct food contact, and comply with BfR XXXVI, FDA §176.170, GB 9685.

## BENEFIT FOR THE CUSTOMER

The CHP BAR product range is an excellent solution to replace PE films, fluorochemicals or waxes in paper and board coatings. The biomaterial-containing CHP BAR coatings can be applied with conventional coating equipment to make repulpable, recyclable, and compostable products while maintaining product properties and improving production efficiency.

## COMPETITIVE ADVANTAGE

The commercially available CHP BAR product range is an excellent option to achieve recyclable and biodegradable products with barrier functionality. Solutions containing biomaterial are in high demand within our customer segments and we are glad to be able to offer products for these markets.

## COMPANY

CH-Polymers develops and manufactures waterborne polymer dispersions for use in multiple industries, e.g.: paper & packaging, nonwoven & specialties, and paints and coatings. Our strategy is to create solutions using sustainable products and processes.

**References:**
CH-Polymers delivers CHP BAR barrier solutions to global paper & packaging companies in commercial volumes.

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BUSINESS FINLAND

CH POLYMERS

# CONVEYOR CHAINS

## OUR SOLUTION

Lapua Chains offers heavy conveyor chains for conveyors used in pulp and paper manufacturing. The most common application in the pulp process is wood handling, such as log tables, slasher and in-feed conveys for log chippers. Other common applications are lamella chains for paper roll and reel handling at packing and in the paper mill warehouse. The company cooperates with a number of machine manufacturers worldwide and therefore has a high level of know-how in chain conveyors.

## BENEFIT FOR THE CUSTOMER

Procuring chains directly from the original manufacturer customer gets the best know-how and service. Working without excessive dealers also keeps costs significantly lower.

## COMPETITIVE ADVANTAGE

Lapua conveyor chains are designed to last long and to give low life-cycle costs, as well as fewer unplanned production breaks, thus creating trouble free production. The long life time of chains is achieved by carefully selected materials and using Finnish manufacturing

## COMPANY

Lapua Chains Ltd. is a family-owned company operating worldwide directly and through carefully selected distributors. Our main customer groups are heavy forest industries such as the pulp and paper/board industry, saw mills, and the plywood industry.

**References:**
Andritz, Valmet, Metso, Raumaster, Jartek Invest, Heinola Sawmill Machinery, Hewsaw, Renholmen, Hekotek, Valonkone, Raute.

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LAPUA CHAINS
Conveying Power

# PRODUCTION AND MAINTENANCE SERVICES

BUSINESS FINLAND

Clean Steel International

Fincoat

PR Rolls

Suomi Teline

Valmet

# SMART BLASTING – PATENTED BOILER CLEANING SERVICE

## OUR SOLUTION

Modern, fast, effective, and environmentally-friendly technology to clean power plant boilers Grit blasting by well trained (Smart Blasting Certificate) and experienced staff. No negative downsides like other methods (harming tubes, dust, corrosion). The best possible cleaning result to maximize boiler performance and to provide better boiler availability.

## BENEFIT FOR THE CUSTOMER

Improved heat transfer; Better flue gas flow; Less soot blowing required; Time saving in annual outage; Makes boiler inspection easier and faster; No need for extra cleaning shutdowns.

## COMPETITIVE ADVANTAGE

Time and money saving; Improved boiler availability; Better efficiency ratio, lowering corrosion and the erosion level.

## COMPANY

Clean Steel is specialized in boiler efficiency and availability improvement. Established in Finland in 2011. The core of the company is innovative Smart Blasting technology. The market leader in Finland. Operating In Europe and Latin America.

**References:**
UPM, Stora Enso, Metsa Group, Klabin (Bra), Montes del Plata (Uruguay), SCA Muncksund (Sweden), Smurfit Kappa Biganos (France), Ence Navia (Spain).

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Clean Steel

# HARD COVER SOLUTIONS FOR PULP AND PAPERMAKERS

## OUR SOLUTION

Thermal sprayed coatings, diffusion coatings, grinding, and on-site services.

## BENEFIT FOR THE CUSTOMER

Longer lifetime for customer products, improved production capacity, and better efficiency.

## COMPETITIVE ADVANTAGE

Fincoat has over 20 years experience in hard cover coatings and uses the latest technology in spray coating with robots and automation. The company holds quality certificates 9001, 14001 and 45001.

## COMPANY

Fincoat operates globally and its production plants are located in Riihimäki Finland, and Freiberg Germany. The head office is located in Riihimäki and the company employs 16 people with a turnover of 4 M€.

**References:**
All major pulp and paper companies globally.

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# COATING AND MACHINING SPECIALIZING ON-SITE SERVICE

## OUR SOLUTION

PR Rolls is specialized in both on-site and in house services to improve the runability, quality and production of paper machines by offering: ThermalSpray Coatings, Machining, Dynamic Balancing, Repairing of grooves and damages, Grinding, and Alignments.

Coatings: Our product selection for coatings include TecnoClean – Non-stick and good release coatings; TecnoClean Coating in combination with special grinding works; TecnoCleanCera Hybrid – Excellent Nonstick/Release Coating; TecnoGuide – Corrosion resistance coatings; TecnoGuide HT – Non-stick and corrosion resistance coatings; TecnoGrip – Friction/anti slip coatings; TecnoDiamond –Hard and Mirror Finished Surface Coatings; TecnoMicro – PTFE coating of Headboxes.

## BENEFIT FOR THE CUSTOMER

Short delivery time. The service we provide on-site is carefully planned down to the last minute; Better paper quality; Excellent non-stick; Good release; Excellent wear resistance; Corrosion free; Better runability at high speeds; and fewer paper brakes.

## COMPETITIVE ADVANTAGE

Fast delivery time onsite; Quality of the products.

## COMPANY

PR Rolls Oy.

**References:**
UPM, Stora Enso, Metsä Fiber, Metsä Board, Mondi, Sappi, Palm Paper, Koehler, International Paper.

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# FULL-SERVICE SCAFFOLDING SOLUTIONS THAT ARE HIGH QUALITY, SAFE AND COST-EFFECTIVE

## OUR SOLUTION

Full-service scaffolding solutions including everything from safety courses a structural designing to contracting and material sales –
Full service contracting including: Contracting // Occupational safety courses // Scaffolder training // Structural planning // Designing and Safety solutions // Long time partner & representative of ALFIX GmbH – German scaffolding manufacturer // Material rental // Material sales // Assembly and dismantling service. Acknowledged for safety and liability.

## BENEFIT FOR THE CUSTOMER

Safe and cost-effective solutions // Reliability to scheduling and time management // Save time and money

## COMPETITIVE ADVANTAGE

Demonstrated experience from several industries such as Oil and Gas (on- and off-shore) // Energy sector // Pulp and Paper // Traditional building sites.

Ability to offer accurate unit-based prices and contracting. High level of working safety. Long-term partner and representative of ALFIX GmbH

## COMPANY

Suomi Teline is a Finnish company providing everything you need when it comes to scaffolding and weather protection. Experience in sales and full-service contracting in various countries in different industries. A real Turnkey partner for your project.

**References:**
Helsinki Shipyard, Contracting and sales// Olkiluoto Nuclear plant, Contracting Oil and Gas // Sakhalin island, Contracting // Pulp and Paper, Uruguay and Brazil, Contracting and sales.

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SUOMI TELINE


# RIGHT COMBINATION OF SERVICES FOR EVERY NEED

Valmet's service offering is designed to match the customer's specific needs, whether it is reduced energy and raw material costs, reduced process variability, optimized quality and production, or enhanced environmental performance.

Depending on the need, the service solution can be provided as a one-time delivery or as a longer-term partnership through service agreements. Services are offered globally – both remotely and on site – through Valmet's approximately 100 service centers, eight Valmet Performance Centers, and more than 6,000 service professionals.

## TANGIBLE BENEFITS THROUGHOUT THE PROCESS LIFE CYCLE

Valmet can offer the right combination of services and capabilities to match the customer needs in each phase of the production process life cycle. When planning the investment, the foundation for optimized operational results for the production process to come can be set. Services can help to accelerate the start-up curve when ramping up the production. Working together in maintenance and operations ensures maximized reliability and optimized performance of the production process.

## REMOTE MAINTENANCE SERVICES AVAILABLE AT ANY TIME

With advanced remote connections and tools, Valmet can offer its customers maintenance services that are independent of time and place. The remote services option has proven very valuable for many customers, ensuring the continuity of their operations.

## ABOUT VALMET

Valmet is the leading global developer and supplier of process technologies, automation, and services for the pulp, paper, and energy industries. Valmet's service offering covers spare and process parts, workshop and roll services, fabrics, maintenance development and outsourcing, field services, process upgrades, Industrial Internet solutions, and Learning Services.

Read more at www.valmet.com/service



Valmet

# WATER TREATMENT AND MANAGEMENT

BUSINESS FINLAND

Optoseven

Teollisuuden Vesi – Industrial Water

Toihan

WatMan Engineering

W-Rix


# LIQUID ANALYZER

## OUR SOLUTION

On-line UV-COD and Turbidity analyzers for control and monitoring purposes. A new innovative product segment in between optical sensors and chemical analyzers. With the extractive sampling method service, free operation and reliable online analysis is equally possible at even the harshest conditions and at potable water. Service highlights: Effluent water analysis from different process points for online process control; Treated wastewater quality assurance; Raw and potable water analysis.
The analyzer can be equipped with a multipoint measurement unit to analyze waters from different processes or process points with a single analyzer unit.

## BENEFIT FOR THE CUSTOMER

Continuous analysis fills the gaps in laboratory analysis results, which enables online process control, a better understanding of the process, and a faster response to process failures. Optimized process control cuts the operation costs and helps to meet the environmental requirements.

## COMPETITIVE ADVANTAGE

Low Cost of Ownership: no expensive wearing parts, manual cleaning or other maintenance required; Reliable reagent free analysis with non-drifting design: an optical measurement method with automatic cleaning, zero calibration adjustment and self-diagnostics; Wide measuring range: a measuring range all the way from deionized water to influent wastewater.

## COMPANY

Optoseven is a Finnish company that was founded in 2014 by seven professionals. Each founder has their own profession in terms of research, development, manufacturing, service, sales, etc., with an experience of more than 15 years working in the industry.

**References:**
Optoseven has a wide range of customers in the forest industry, at wastewater- and potable water treatment plants, and has connections to system providers.

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Optoseven

PULP, PAPER AND BOARD:
Water treatment and management

# WE MAKE CLEAN WATER

## OUR SOLUTION

Teollisuuden Vesi provides comprehensive, multidisciplinary expert services for water treatment from raw water to boiler water, process waters, and waste waters. Our profound knowledge for pulp and paper processes serves you in the design of new facilities, in updating your water systems, and in moving towards closed circulation systems. We carry out piloting novel solutions from laboratory tests to full scale operations. We also apply culture-independent microbial analytics to manage process hygiene and to guarantee product safety. We control pipeline corrosion and the fouling of membrane systems. Furthermore, efficient operation and maintenance represent our core competence.

## BENEFIT FOR THE CUSTOMER

We act for the client mill from the owner's engineering perspective to select and implement the best possible solutions for each need. Our extensive experience and latest scientific and technological advances cover all relevant alternative approaches. We support you to concentrate on process efficiency and the development of renewable, sustainable products.

## COMPETITIVE ADVANTAGE

Teollisuuden Vesi possesses a unique tool kit of leading-edge techniques for pulp and paper companies emphasizing the sustainability and recirculation economy. Our capabilities range from the regeneration of ion exchange resins and raw water biocide optimization to the comprehensive management of process water chemistry and end product quality.

## COMPANY

Teollisuuden Vesi represents an independent expert service provider emphasizing the relevance of the work in a global context. We are proud of our technological capabilities, but also of our scientific perspective and systematic approach.

**References:** Finnish pulp and paper companies via Finnish Forest Industries and the Finnish Recovery Boiler Committee. Co-operation with Stora Enso, Kemira and Solenis.

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BUSINESS
FINLAND

Teollisuuden Vesi


# PAULA-WWTP®

## OUR SOLUTION

PAULA-WWTP® is a cloud-based advisory technology for improving wastewater treatment process performance. The core of PAULA-WWTP® technology is built on predictive algorithms that convert raw data into actionable insights automatically. The main objective is to empower mill users with the benefits of predictive and prescriptive data analytics, which help improve the accuracy and timing for process adjustments. Mill process data and adjustment recommendations quality are validated before sending the recommendations to the mill. Toihan experts follow the wastewater treatment process performance via a remote connection and are ready to provide additional support for mill operators.

## BENEFIT FOR THE CUSTOMER

Since more information to support decision making is available, mills spend less time on wastewater treatment process disturbances and troubleshooting. Increased process control has also improved the final effluent quality significantly. In addition, savings created by the optimized process control typically cover the costs of utilizing PAULA-WWTP®.

## COMPETITIVE ADVANTAGE

In PAULA-WWTP®, Toihan has combined the niche expertise in wastewater treatment process optimization to modern cloud-based data analytics. The support technology is scalable and it can be integrated into existing operational mill systems.

## COMPANY

Toihan produces mill-specific diagnostics services and cloud-based technologies to improve pulp and paper industry wastewater treatment process performance. Our experts have delivered assistance for over 40 pulp and paper mills globally.

**References:**
Public references for PAULA-WWTP® users:
Stora Enso, Holmen Paper Hallsta, Kotkamills.

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TOIHAN

# CUSTOMIZED WATER TREATMENT EQUIPMENT

## OUR SOLUTION

Customized water treatment engineering and equipment for challenging waters. Our main focus is in desalination and clean water applications. Designed and manufactured under one roof in Lahti, Finland.

## BENEFIT FOR THE CUSTOMER

Our designers and production work closely together. Close communication between the customer, designers, and production enables the production of a water purification system that meets the customer's needs. It also enables rapid response to change and the delivery of sustainable, reliable, and high-quality systems.

## COMPETITIVE ADVANTAGE

Processes are designed and customized for each specific case individually. This ensures the most energy efficient and sustainable systems.

## COMPANY

WatMan is a Finnish manufacturer of customized water treatment systems. Since our establishment, our primary focus has been to design, manufacture, and supply innovative water treatment equipment of the highest quality, for customers who demand more.

**References:**
Almost 1,000 water treatment projects delivered worldwide over 50 countries since 1995.

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WatMan
WATER ENGINEERING

# CLEANER WATER WITH LESS ENERGY

## OUR SOLUTION

Waterix key products are COOLIT coolers, AIRIT floating aerators, and MIXIT mixers for water and wastewater treatment. COOLIT is a floating cooler designed for hot industrial process water. It can manage industrial wastewater, process liquids or power plant condensed water. Based on the evaporation of water into the air, COOLIT spray coolers have been developed to effectively cool hot industrial water and liquids. This is a real option for industrial cooling towers with a higher initial cost as they are more expensive to maintain and usually require chemicals for the prevention and removal of scaling. Our floating spray cooler is a premium product on the market.

## BENEFIT FOR THE CUSTOMER

Due to careful R&D, Waterix products have many benefits. They are characterized by lower energy consumption than competing technologies; installation and servicing is easy; the structure is virtually maintenance-free; and it is affordable as overall costs through the product's entire lifecycle also bring genuine benefits to clients.

## COMPETITIVE ADVANTAGE

The wide intake pipe prevents clogging, enabling the effective circulation of water through the device and reducing the need for maintenance. Other advantages are that there is no need for a complex infrastructure and it is easy to add capacity to the basin later. Also, our technologies are used for retrofitting, replacement and the upgrading of existing aeration and cooling systems.

## COMPANY

Waterix, a product brand of W-Rix Ltd, has devices and services for the treatment of industrial wastewater and process water cooling with an eye to the overall costs for the entire lifecycle and the efficiency of the products.

**References:**
Waterix applications are successfully in use in several pulp and paper mills, for example, at UPM-Kymmene, Stora Enso, and International paper.

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waterix®
Cleaner water with less energy®

# ENVIRONMENTAL TECHNOLOGIES

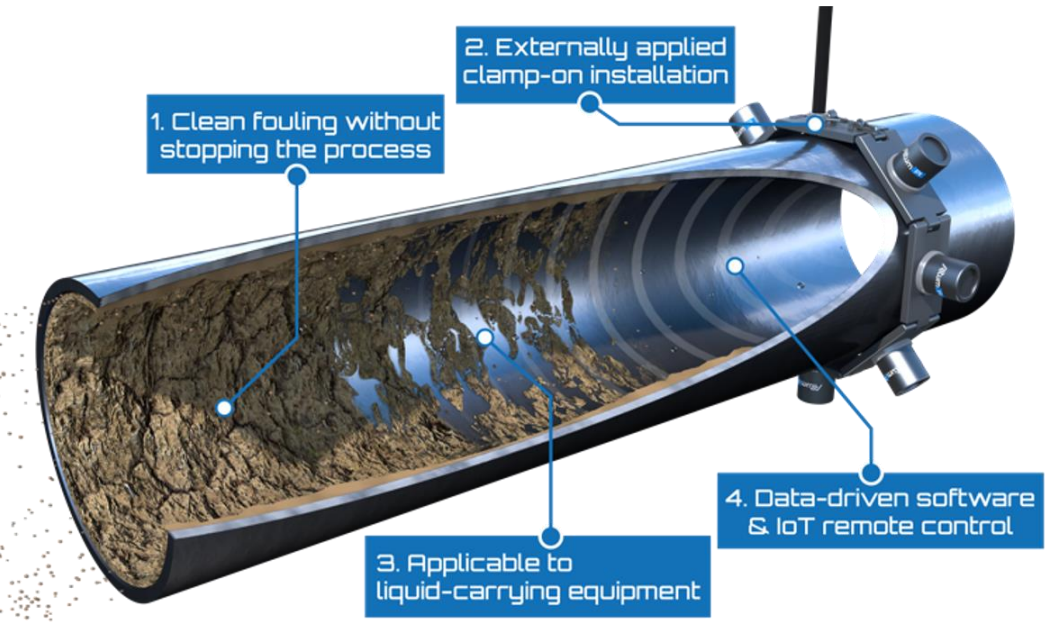
BUSINESS FINLAND

Altum Technologies

EHP Environment

Valmet

# INCREASE PROCESS UPTIME AND ENERGY EFFICIENCY WITH ALTUM'S ZPD ULTRASOUND SOLUTION




## OUR SOLUTION

AltumTechnologies' ZPD (Zero-Process-Downtime) solution enables the customer to clean or prevent fouling in the production processes without any changes to the equipment or disrupting the production. By increasing energy efficiency and reducing the use of chemicals, Altum helps you to reduce your environmental footprint significantly and, at the same time, increase production. Altum's solution is based on utilizing software-guided power ultrasound technology. This is the ultimate approach to help pulp and paper mills gain process uptime, increase capacity, and help to meet the sustainability goals.

## BENEFIT FOR THE CUSTOMER

Big gains in your process uptime by removing and preventing fouling, for example, in black liquor evaporators (i.e., 3t/h increase in evaporation rate), heat exchangers, valves, and pipelines. Reduction of environmental impact by reducing CO2 emissions, usage of chemicals and water. Production and financial gains with better energy efficiency, lower maintenance costs, and fewer headaches.

## COMPETITIVE ADVANTAGE

The uniqueness of our solution is that the system can be attached externally to any existing production environment without making changes to the production process or the equipment nor stopping the production process. The same solution can be used to clean several different types of equipment within one plant, for example, pipelines and valves.

## COMPANY

Altum Technologies was founded in 2016 in Helsinki, Finland, to radically increase the production and energy efficiency of process industries, and to make industrial processes more environmentally-friendly. We have done +70 installations worldwide.

**References:**
Stora Enso, Sappi and two leading companies in Japan –fouling prevention in evaporators; Metsä Fibre and UPM –multiple applications, i.e., in pipelines.

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Altum TECHNOLOGIES

# REAL-TIME ENVIRONMENTAL MONITORING

## OUR SOLUTION

We design, manufacture, install, and operate online monitoring stations in remote and harsh environments to bring valuable data for our customers. Our offering includes comprehensive monitoring solutions for water quantity and quality, weather, ground and structures. Monitoring data is transferred from the stations in real time to the EHP-Data service for easy data analysis and reporting. Data service features include remote support, automatic alerts, data back-ups, and visualized dashboards.

## BENEFIT FOR THE CUSTOMER

With EHP's solutions, our customers can review and evaluate the state of the surrounding environment in real time, thus improving the environmental safety, resource effectiveness, and regulation compliance of their operations. Our early warning systems enable a more sustainable and environmentally-friendly pulp and paper production.

## COMPETITIVE ADVANTAGE

We provide turn-key solutions and high quality services for various monitoring needs. EHP is a forerunner of real-time environmental monitoring with extensive references of different customer segments, monitoring sites, installation types, and parameters.

## COMPANY

EHP Environment is a Finnish company providing advanced environmental monitoring solutions for a better tomorrow.

**References:**
EHP Environment has supplied over 1,400 online monitoring stations around Northern Europe, Russia, and North America.

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ehp environmental solutions.
Part of Mitta Group

# MINIMIZING AIR EMISSIONS

Reducing environmental impacts and striving for long-term sustainability are key considerations for any production plant. Valmet's solutions for emissions control include primary solutions to minimize emissions, various cleaning technologies, and advanced emissions monitoring and reporting applications.

Valmet's offering for flue-gas cleaning includes dry flue-gas cleaning, wet flue-gas cleaning and heat recovery, flue-gas desulfurization, and NOx reduction. To meet the demands of tightening emission regulations, Valmet has introduced new solutions, for example, NOx scrubbers for lime kiln flue gases. With comprehensive NCG collection and handling, it is possible to make pulp mills practically odorless.

## TAILORING THE SOLUTIONS FOR CUSTOMER NEEDS

Valmet's emissions monitoring and reporting solutions help to assess the adequacy and improve the functioning of the environmental monitoring systems to ensure a minimal environmental footprint and production that is compliant with environmental legislation.

To control emissions in the best possible way, both technically and economically, it is important that the solution is tailored and optimized for the entire mill. The right solutions can help Valmet's customers reduce their environmental footprint, maximize production efficiency, minimize disruptions to production, and secure compliance.

## COMBINING PROCESS AND AUTOMATION KNOWLEDGE

Valmet's unique offering combines production process knowledge, emissions control technology expertise, as well as automation and analyzer technologies. Valmet has hundreds of successful air emissions control references worldwide.

## ABOUT VALMET

Valmet is the leading global developer and supplier of process technologies, automation, and services for the pulp, paper, and energy industries. Valmet's solutions for mill emissions control include various emission reduction technologies, flue-gas cleaning solutions, as well as reporting and monitoring solutions.

Read more at valmet.com/emissioncontrol



Valmet

# ENERGY SOLUTIONS

BUSINESS FINLAND

ANDRITZ

Runtech Systems

Saalasti

SyncronTech

Valmet


ANDRITZ fluidized bed boilers: more than 110 references worldwide for variety of different fuels. Several references in the pulp and paper industry.

# POWER GENERATION SYSTEMS FOR THE CIRCULAR BIOECONOMY

## OUR SOLUTION

ANDRITZ provides the complete range of power generation technologies and services, from the latest technology in boilers to complete power islands. Technology provided by ANDRITZ includes power generation systems for the efficient use of biomass, sludges, rejects, process gases, black liquor, and refuse-derived fuels. The company's power generation portfolio comprises well-proven equipment such as PowerFluid CFB boilers, EcoFluid BFB boilers, and recovery boilers.

ANDRITZ also delivers gasification plants for pulp mill solutions. It also supplies advanced industrial burner solutions for energy production and environmental protection.

## BENEFIT FOR THE CUSTOMER

Biomass is an abundant resource and to use it as a fuel to replace fossil fuels will help industries reduce their emissions. Reducing emissions of fossil carbon dioxide goes toward increasing a plant's environmental sustainability. ANDRITZ power generation technologies demonstrate unmatched fuel flexibility and high efficiency with the lowest emissions.

## COMPETITIVE ADVANTAGE

ANDRITZ fluidized bed technologies are characterized by excellent fuel flexibility, including fuels which are difficult to burn when using other technologies. The fluidized bed systems produce exceptional combustion with the lowest emissions and the highest efficiency. Solutions provided are designed to reduce CO2 emissions by utilizing different types of biomass, sludge, and waste fuels to generate energy as a replacement for fossil fuels.

## COMPANY

ANDRITZ Oy is a leading global supplier of technologies and services including and power boilers and gasification plants for energy production.

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Power boilers (andritz.com)

# RUNECO PAPER MACHINE VACUUM BLOWER SYSTEMS

## OUR SOLUTION

The environmentally-friendly and energy efficient RunEco provides a reliable, completely water-free vacuum solution with significant heat recovery potential ideal for the paper industry applications. It consists of an EP Turbo Blower, an EcoDrop water separator and an EcoFlow dewatering measurement. EP Turbo Blowers are modern blowers with a integrated high-speed motor controlled by a frequency converter: the rotation speed and vacuum level can be adjusted according to the process requirements. The EcoFlow dewatering measurement provides accurate real-time feedback about the dewatering performance along the paper machine which can be used to optimize dewatering and vacuum levels in the forming and press sections.

## BENEFIT FOR THE CUSTOMER

The RunEco vacuum system saves 30–70% energy compared to traditional vacuum systems. Less energy and no water contribute to lower CO2 emissions and a smaller carbon footprint. EP Turbo Blowers always have a variable speed and capacity, which allows the vacuum system to be optimized quickly without bleed air and with minimal throttling and expansion losses.

## COMPETITIVE ADVANTAGE

Runtech Systems has a unique dewatering and vacuum system offering and expertise to help our customers get the most out of their equipment, improving their papermaking process. For more than 20 years, Runtech has optimized dewatering and vacuum systems globally.

## COMPANY

Runtech Systems is a global provider of engineered systems tailored to the pulp and paper industries. Runtech works with customers to better understand and control their operational conditions to maximize efficiency and cost effectiveness.

**References:** Over 800 Turbo Blowers supplied to papermakers globally, e.g., Domtar, DS Smith, ICT, Lee & Man, Metsä Group, Mondi, Sappi, Smurfit Kappa, and Stora Enso.

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Runtech Systems

BUSINESS FINLAND

# SAALASTI BIOENERGY SYSTEMS

## OUR SOLUTION

Saalasti has pioneering and innovative solutions for the crushing, milling, pressing, drying, grinding, and screening of biomass. Making boiler fuel is in our blood. Saalasti has over 70 years' experience in heavy machinery and over 40 years in converting forest-based biomass into power plant fuel. Typical materials are logs, wood from thinning, loose or bundled slash, treetops, stumps, and wood waste. Our solutions are used in paper and pulp mill wood rooms, sawmills, biomass terminals, and power plants. We supply both individual machines and entire processing systems along with our after-sales services ranging from equipment inspections to contractual maintenance.

## BENEFIT FOR THE CUSTOMER

Possibility to use different biofuel materials becomes more important all the time. Versatility to increase capacity, change material and particle size is vital to ensure full lifetime of the investment. Saalasti design answers this with the Multitool™ rotor design. It is most adjustable device on the market, enabling usage of a wide range of biofuel materials.

## COMPETITIVE ADVANTAGE

Saalasti solutions have proven to have the lowest lifetime cost. Equipment is designed to be robust and has a wide rebuild ability over the plant's lifetime. Equipment needs simple type of civil works and has a fast erection time. The service life of our equipment is measured in decades and Saalasti's after-sales service ensures trouble free operation over the years.

## COMPANY

For more than 40 years, Saalasti has been a recognized expert in the supply of innovative bioenergy systems. Our main products are different types of biomass chippers, crushers and dewatering presses, along with a lifetime after-sales service.

**References:**
Saalasti has delivered more than 350 Saalasti Bioenergy Systems around the world.

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# SYNCPOWER® EMS (ENERGY MANAGEMENT SYSTEM)

## OUR SOLUTION

SyncPower® EMS has been developed for energy-intensive industries. It minimizes energy costs per production unit. SyncPower® EMS supports energy production, purchase and integrated production planning where cost of energy affects profitability. Forecasting the use of electricity and natural gas as well as short term procurement planning and participation in various energy marketplaces are core functions. Real-time monitoring of electricity supply and balance management in mill and corporate level. Interfacing to various automation-, business- and marketplace systems are supported. System is available as SaaS service or local installation. In both cases security is uncompromised.

## BENEFIT FOR THE CUSTOMER

A mill or corporate can plan the production of their goods and at the same time benefit possibilities in various energy marketplaces, including CO2 markets. Routine energy forecasting and reporting tasks are automated, saving time. Ensure that during busy moments like production breaks, the energy forecasts are correctly managed.

## COMPETITIVE ADVANTAGE

SyncPower® EMS supports holistic view to energy consumption, purchase and planning. SyncPower® EMS minimizes the total cost of electricity and gas usage by controlling the timing of consumption and potential production. SyncPower® EMS enables taking advantage of events in energy markets, e.g. selling extra capacity to the market.

## COMPANY

Syncron Tech develops and delivers software solutions to boost production in industries and the energy sector. Huge amounts of data and fearless utilizing of it is typical in our customer applications. We have a strong IIoT technology background.

**References:**
One of the major forest companies uses SyncPower® EMS for corporate energy management in Finland.

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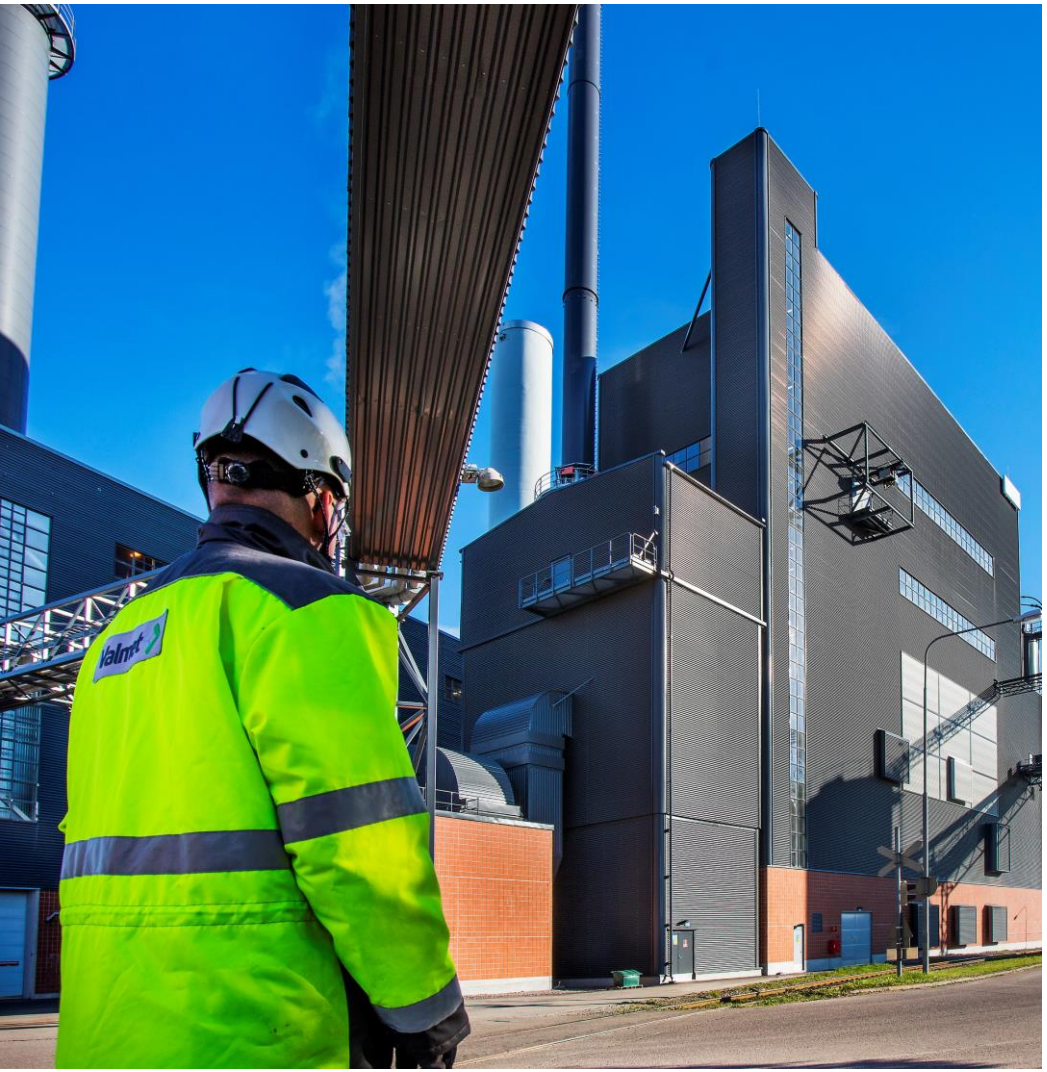
SYNCRONTECH
In sync. In control.



# UNIQUE ENERGY OFFERING

Valmet is a reliable technology partner in the ever-changing energy markets. With decades of experience, Valmet has the know-how to deliver energy solutions based on biomass, waste streams, or a mixture of different fuels. Valmet offers innovative, tailored solutions from its wide technology, automation, and services offering.

Customers can count on Valmet's Circulating Fluidized Bed (CFB) and Bubbling Fluidized Bed (BFB) technologies to provide wide fuel flexibility, high combustion efficiency, high reliability, excellent controllability, and low emissions. We supply complete cleaning solutions for extensive air emissions control, tailored and optimized for the entire power plant.

Valmet's solutions for advanced power plant automation are based on the Valmet DNA automation and information platform. Valmet has a global network of service professionals.

## ENERGY FOR PAPER MILLS

Valmet has delivered several waste-fired boiler plants to paper mills in China. A waste-to-energy boiler plant supplies electricity to the paper mill and enables the mill to utilize all of its mill waste in energy production. Valmet's boiler technology offers the highest steam parameters and overall plant efficiency.

## STRONG GLOBAL PRESENCE

To date, Valmet has delivered more than 300 fluidized bed boilers and over 1,200 power plants worldwide utilize Valmet's process automation system. The company also has a strong global presence with 100 service centers.

## ABOUT VALMET

Valmet is the leading global developer and supplier of process technologies, automation, and services for the pulp, paper, and energy industries. For energy production, Valmet is an experienced provider of fluidized bed boilers, gasifiers, power plants, integrated pyrolysis, equipment for environmental protection, automation solutions, and a wide selection of services.

Read more at valmet.com/energy



Valmet

# PRODUCTION TECHNOLOGIES FOR NEW PRODUCTS

BUSINESS FINLAND

1. NEW BUSINESS DEVELOPMENT
2. CONSULTING AND ENGINEERING
3. SOLUTIONS BASED ON BIOMASS AND SIDE STREAMS
4. SOLUTIONS FOR POWER-TO-X

# EVERYTHING CAN BE MADE OF WOOD

BUSINESS FINLAND

- BIOPLASTICS
- BIOCHEMICALS
- BIOFUELS
- TEXTILE FIBERS
- SOLID WOOD
- PULP

- PHARMACEUTICAL PRODUCTS
- INTERIOR DESIGN SURFACES
- FOOD ADDITIVES
- PAPER
- BIOENERGY

# NEW BUSINESS DEVELOPMENT

BUSINESS FINLAND

**FEASIBILITY STUDY** – products and markets

## DEVELOPMENT

- Resource base valuations and development
- Technology mapping
- R&D portfolio strategies
- Technology options evaluation
- Technology benchmarking
- Technology strategies

## IMPLEMENTATION

- Strategy development
- Market entry strategy
- Price projections
- Technology acquisitions
- Market scenarios

## OPERATIONS

- Market forecast
- Market analysis
- Operational excellence

**During all levels of technology development**:

- Technology novelty assessment
- Technology development roadmaps
- Technical, economical analysis
- Feasibility studies

**Pilot plants, commercial production plants, continuous improvement**:

- Basic engineering
- Project implementation:
  - All engineering disciplines
  - Project management services
  - Site services
  - Operational improvement

**TECHNOLOGY READINESS** (DOE levels):

**Idea & basic technology research** → **Prove feasibility Poc** → **Lab-scale testing** → **Pilot-scale plant** → **Full-scale demo plant** → **Commercial production** → **Continuous improvement**

AFRY ÅF PÖYRY

# OVERALL FROM PILOT TO COMMERCIAL PROJECT APPROACH

BUSINESS FINLAND

| PHASE 1 | PHASE 2 | PHASE 3 | PHASE 4 | PHASE 5 | PHASE 6 |
|---|---|---|---|---|---|
| **Technology review** | **Pilot plant engineering** | **Test runs** | **Prefeasibility of the overall concept** | **Detailed engineering of the commercial plant** | **Commercial plant** |
| Phase 1 to select the most attractive process technology concept | **Step 1 – Pre-engineering**:<br>A technical concept for a pilot scale plant will be carried out based on the most attractive technology identified in Phase 1<br><br>The scope of the phase includes:<br>• The plant and its integration to the existing facilities and processes<br>• Line diagram, layouts<br>• Investment cost estimate for an pilot line in selected site<br><br>**Step 2 – Delivery model EPS** (or some other):<br>• Engineering<br>• Procurement<br>• Supply | After the pilot plant has been constructed, test runs would be conducted | A prefeasibility study for a commercial scale plant will be carried out based on the technical concept developed in Phase 2 | If the prefeasibility study (Phase 4) of the project indicates that the project is attractive, the next step is to carry out detailed engineering for the plant<br><br>The plant will be engineered taking into consideration its potential future scaling up to full commercial scale system | Construction and start-up of the commercial MFC production |

AFRY ÅF PÖYRY

# SOFTWOOD PULP MILL BIO-BASED BY-PRODUCTS

BUSINESS FINLAND

Sludge

Effluent treatment

Biosludge gasification

Dewatering

Raw turpentine

Turpentine separation

Pyrolysis

Pyrolysis oil

Granilation

Distillation

Fertilizer

Turpentine

Fuels

Phenols

Bleached pulp

Nanocellulose plant

MFC

NCC

Paper / board / textile applic.

Composite materials

Rhelogy modifier

Films/barriers

Absorbents

Functional additives, etc.

Dry bark

Coke, sand

Methanol purification

Methanol

Methanol

Hydrotreatment

Distillation

Biodiesel

Heads

Fatty acids

Distilled tall oil

Resin acids (Rosin)

Pitch

Crude Tall oil

Black liquor

CNCG Incinerator

Soap

H2SO4 plant

Sulfuric acid

H2SO4

Lignin

Fuels

Phenols

Carbon fibers

Activated carbon

Black pellets

Bark drying

Bark gasifier

Steam explosion

Lignin separation & drying

Tall oil plant (HDS®)

Bark

Gas

Drying

AFRY ÅF PÖYRY

# HARDWOOD PULP MILL BIO-BASED BY-PRODUCTS

BUSINESS FINLAND

Sludge

**Effluent treatment**

**Biosludge gasification**

Biogas

**Dewatering**

Dry wood

**Pyrolysis**

Polyaccharides

Granilation

Hemicellulose refinery

Pyrolysis oil

Coke, sand

Bleached pulp

Nanocellulose plant

MFC

NCC

**Methanol purification**

Methanol

Black liquor

CNCG Incinerator

**H2SO4 plant**

H2SO4

Lignin

**Bark drying**

**Bark gasifier**

**Steam explosion**

**Lignin separation & drying**

Bark

Gas

**Drying**

**Fertilizer**
**Sugar**
**Biochemicals**
**Biofuels**
**Biomaterials**
**Fuels**
**Paper / board / textile applic.**
**Composite materials**
**Rhelogy modifier**
**Films/barriers**
**Absorbents**
**Functional additives, etc.**
**Methanol**
**Sulfuric acid**
**Fuels**
**Phenols**
**Carbon fibers**
**Activated carbon**
**Black pellets**

AFRY ÅF PÖYRY

# CONSULTING AND ENGINEERING

BUSINESS FINLAND

AFRY

Ambertec

ANDRITZ

Elomatic

GloCell

SciTech

Sulzer Pumps Finland

Vision Hunters

VTT

# BIO TRANSITION LEADS THE WAY TOWARDS MORE SUSTAINABLE INDUSTRIES

AFRY has a deep knowledge and expertise in both wood- and agro-based feedstock, plastics, graphene and other old and new materials and their end uses. We are a trusted and technology independent partner for delivering sustainable bio-based solutions for future generations.

Our clients include all bio-based industry business participants: industrial manufacturers, suppliers, technology developers, investors and financiers and other interest groups who are seeking strategic advice and implementation solutions for bioproducts. We have a track record in bio-based industries and of biorefining processes and projects that spans over six decades.

## EXPERTISE IN THE FULL LIFECYCLE OF THE BIOREFINING VALUE CHAIN

AFRY's offering spans the whole bio-based industry value chains, from strategic advice in evaluating novel products, to understanding biomass availability and assessing technical feasibility to taking the investment from the conceptual stage to implementation of full-scale commercial production units.

## HUNDREDS OF POSSIBILITIES TO CREATE VALUE IN THE BIO-BASED MARKETS

Based on our deep sectoral insight and process technology competence, we help clients assess bioproducts and applications with near- and medium-term potential. Our clients range from industrial manufacturers, suppliers, technology developers, investors and financiers to start-ups.

AFRY can help businesses to identify, design and implement the most profitable ideas in terms of cost, product functionality, regulation, and market demand.

## COMPANY

AFRY is a European leader in engineering, design, and advisory services, with a global reach. We are 16,000 devoted experts in infrastructure, industry, energy and digitalization, creating sustainable solutions for generations to come.

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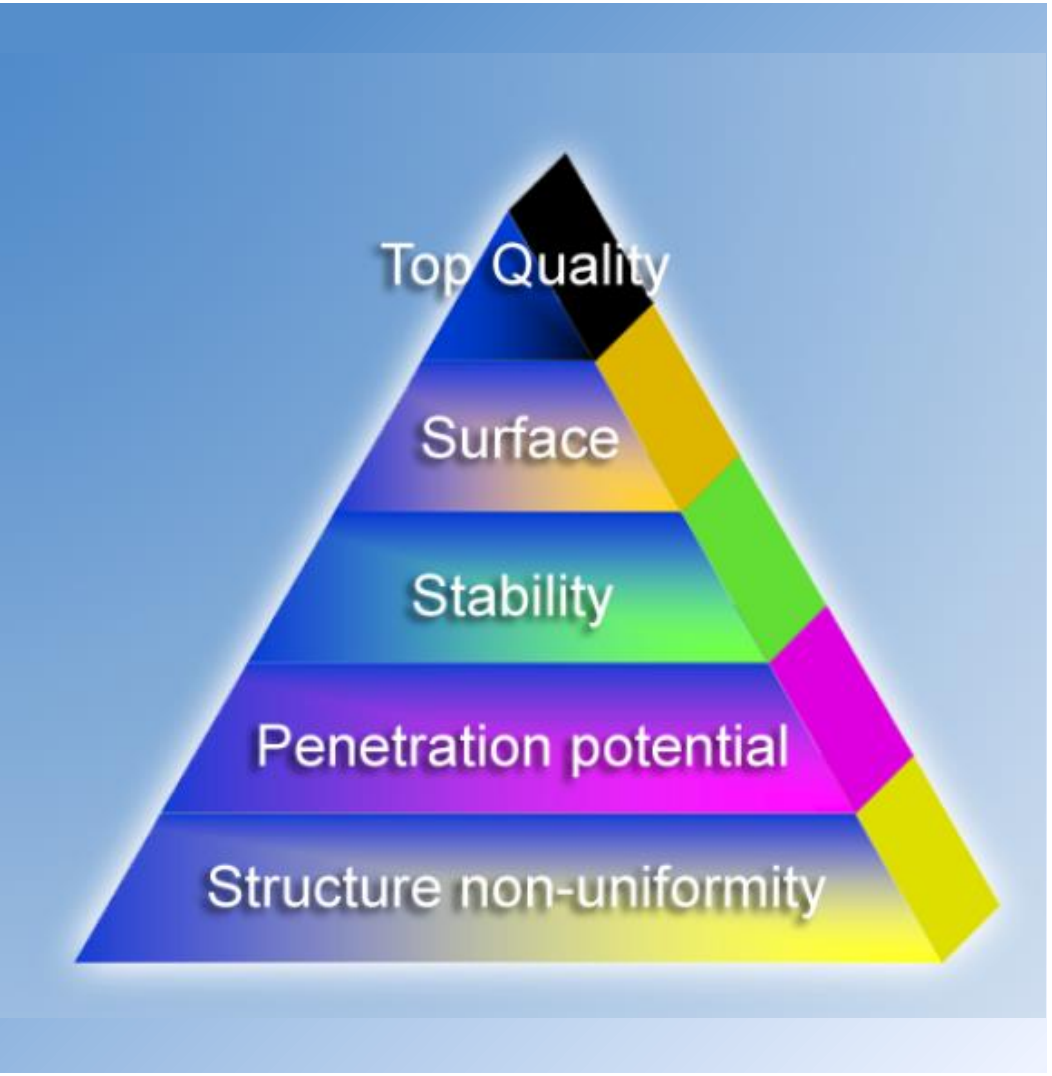


# AMBERTEC PRODUCTS AND SERVICES FOR QUALITY CONTROL AND PROCESS OPTIMIZATION

## OUR SOLUTION

AMBERTEC specializes in the analysis of non-uniformity in basis-weight (raw material distribution) and porosity properties of web type materials with high accuracy and resolution.

## BENEFIT FOR THE CUSTOMER

AMBERTEC has successfully been used, in addition to routine quality control, e.g., for process enhancement and quality improvement projects, research, and the development of new products, process components, additives, etc., as well as for guarantee verification purposes.

## COMPETITIVE ADVANTAGE

Formation:

- Obtain and visualize true local (millimeter-scale) basis weight variations.
- Measure all web type products – also coated and printed materials,
- Know impact, e.g., to absorption, porosity, coating and printing quality.

## COMPANY

Since 1986, AMBERTEC has been supplying innovative instruments and services for reliable quality control, troubleshooting, and process optimization for industry. The company is based in Espoo, Finland.

**References:**
Over 250 paper and paperboard mills, paper mill machinery and chemical suppliers, and research institutes worldwide.

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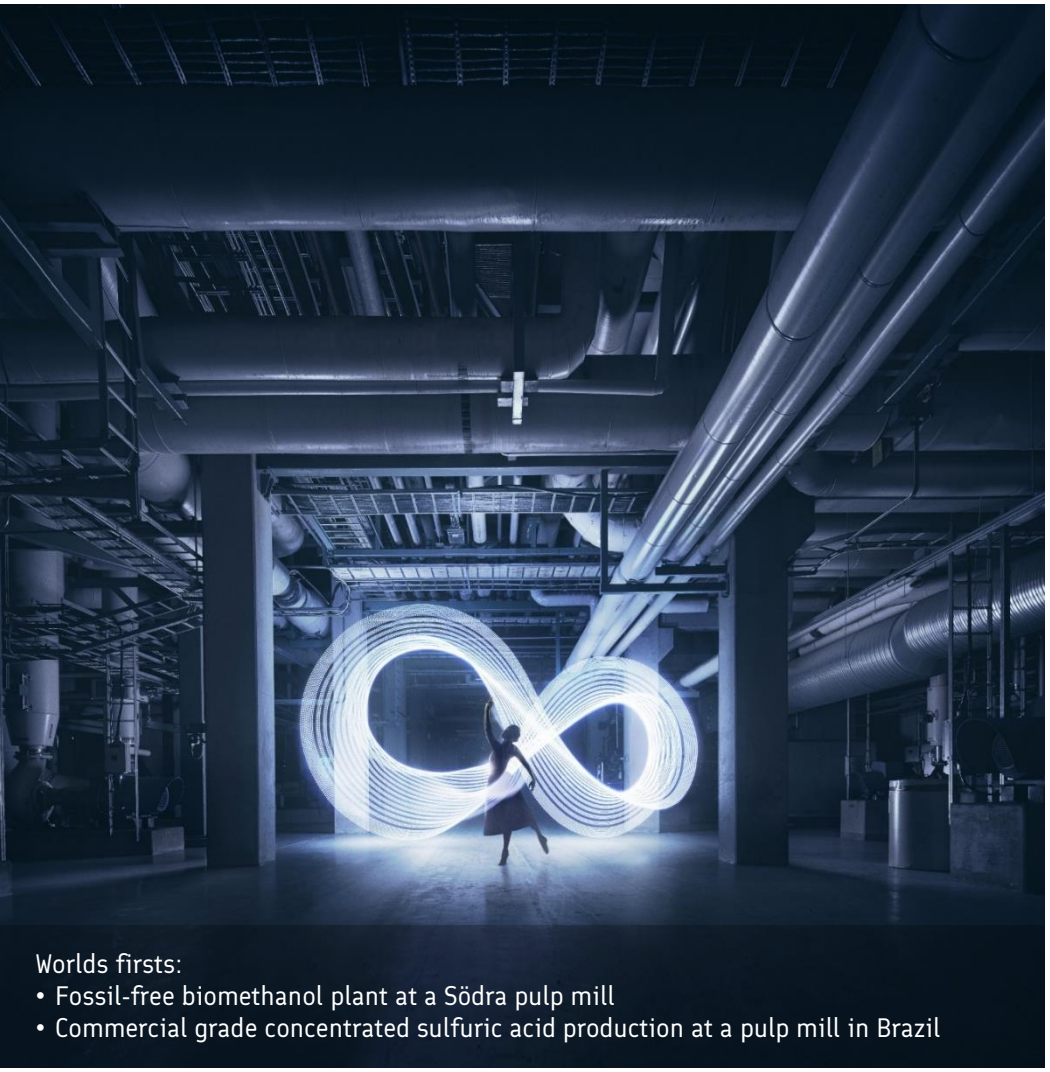

Worlds firsts:
- Fossil-free biomethanol plant at a Södra pulp mill
- Commercial grade concentrated sulfuric acid production at a pulp mill in Brazil

# BIOPRODUCTS PRODUCTION FOR INCREASED REVENUE AT PULP MILLS

## OUR SOLUTION

Pulp mills are increasingly being referred to as bio-refineries as the products recovered from side streams are renewable and are therefore gaining attention for their environmental benefits. These high-value products obtained from side streams include, e.g., biomethanol and lignin. Pulp mills can also produce other products from wood fiber, such as MCC and raw material for textile fibers.

ANDRITZ has introduced A-Recovery+, a concept that transforms the chemical island at a pulp mill into a profit center. Key areas have been identified within the chemical island where big cost savings can be made, as well as providing additional opportunities for revenue from the expanding market for bioproducts.

## BENEFIT FOR THE CUSTOMER

A-Recovery+ is a tailored chemical recovery solution that makes it possible to optimize the chemical balance in a mill to increase the revenue generated and/or reduce costs significantly. For example, optimizing the sodium/sulfur (Na/S) balance when a mill produces its own sulfuric acid leads to chemical savings in both sodium hydroxide and sulfuric acid. This means a two-pronged approach is achieved, both environmental and commercial.

## COMPETITIVE ADVANTAGE

A-Recovery+ provides new opportunities for the expanding bioproduct market. The systems in the A-Recovery+ solution generate economic value from the side streams in a kraft pulp by creating additional chemical cycles that add value, such as purifying raw methanol to commercial quality biomethanol, producing commercial quality sulfuric acid on-site from concentrated non-condensable gases, or recovering high-quality lignin from black liquor.

## COMPANY

ANDRITZ Oy is a leading global supplier of technologies and services for the pulp and paper industry, including technology for renewable energy production.

pulpandpaper.fi@andritz.com
A-Recovery+ chemical recovery concept for kraft mills (andritz.com)



ANDRITZ

# BIOPRODUCTS PRODUCTION FOR INCREASED REVENUE AT PULP MILLS

## OUR SOLUTION

Investment Evaluations Know your Capex and Opex. Defining your Investment and lifecycle costs supports your decision making since early-stage. Recognizing and managing risks in pre-engineering, applying best available technology, finding the matching suppliers guides you to making the right decisions. Development: Utilize the engineering to develop your vision to reality. Our motivated experts, using up-to-date tools, deliver a 100% detailed and structured documentation package to build up your investment. EPCM: Let us take care of your Engineering, Procurement and Construction Management in your project. We create, manage, and follow up the project plan. Our systematic way brings your investment to life.

## BENEFIT FOR THE CUSTOMER

- Benefit from our expert network to reduce unknown factors.
- Enable your stakeholders to make fact-based decisions.
- Get professional project implementation and engineering by experts when you need it.

## COMPETITIVE ADVANTAGE

Transfer your identified saving potentials to improved profit and increased sustainability. Flexible resource allocation allows you to focus on your core business.

## COMPANY

**Elomatic:** founded in 1970; a privately-owned company with 1,000 engineering professionals. Areas of focus: Consulting, engineering, project management services and CADMATIC software applications.

**Customers:** Technology Suppliers, Process and Energy, Machinery and Equipment Builders.

**References:** Efficiency Analyzing System development and implementation for Metsä Board. Preliminary study and design, to the start-up of the plant for Spinnova.

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ELOMATIC
Visions of Tomorrow, Engineered Today

# TEXTILE FIBER BLEND OPTIMIZATION

## OUR SOLUTION

This product is in a precommercial phase.
Novel textile fiber manufacturing technologies, the imperative of textile recycling and the move towards more sustainable fashion emphasize the need for a more comprehensive understanding of the relationship between fiber properties and their processability in yarn spinning. Our idea is to create an AI tool that will help its user to select the most suitable staple fibers for the cost efficient manufacture of yarns and textiles of a targeted performance. Development of this new tool is performed in co-operation with a partner company that has in-depth textile fiber knowledge. We are now searching for industrial partners from the textile industry.

## BENEFIT FOR THE CUSTOMER

As previously mentioned, a yarn and textile manufacturer can select the most suitable staple fibers for its purpose. The solution will also help the supplier of a novel kind of stable fiber to find the most suitable role for its product in the evolving value chain of fashion and textile products. The solution will also help to tackle the recycling imperative.

## COMPETITIVE ADVANTAGE

This kind of solution does not exist, but based on our studies on artificial intelligence solutions and textile fiber data, we are convinced that our idea is feasible. Those players who are the first to use this solution gain a remarkable advantage against their competitors. The textile production value chain and end-product quality can be optimized.

## COMPANY

GloCell Oy has extensive experience in fiber blend optimization in the paper pulp > paper / board / tissue value chain. This experience is valuable when creating a corresponding tool for the textile value chain. The concept has been tested successfully.

**References:**
Together with our partner company we have all the required competencies from data processing and the textile industry to create a well-functioning solution.

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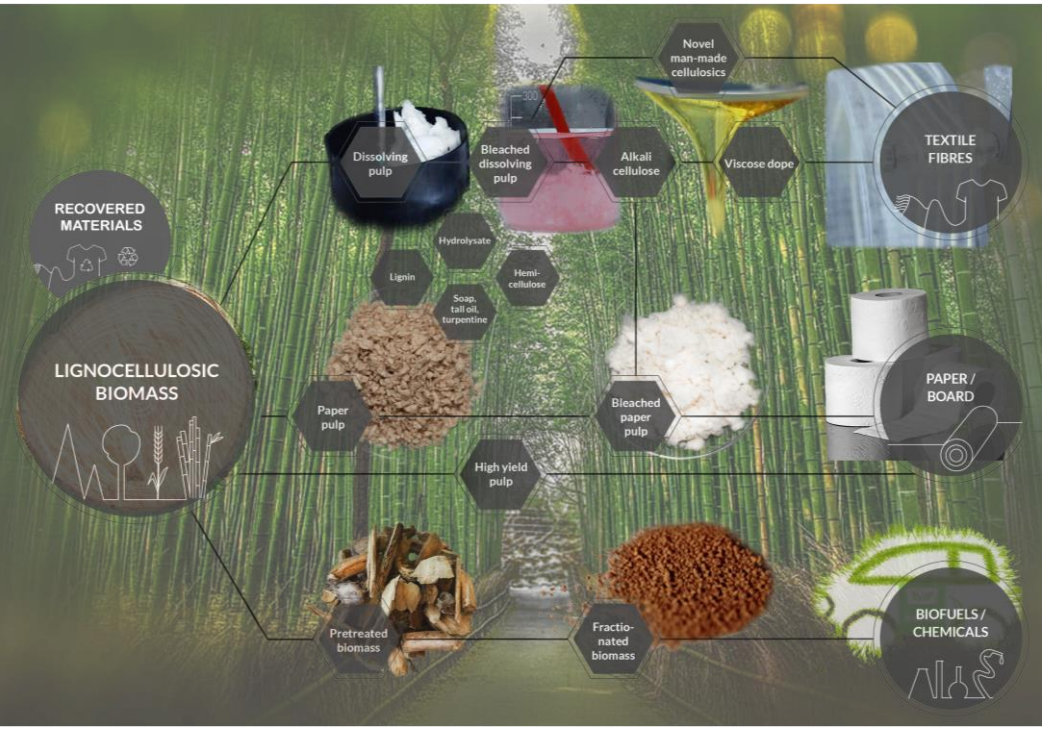
GloCell IN

PRODUCTION TECHNOLOGIES FOR NEW PRODUCTS:
Consulting and engineering




# PROVIDING TECHNOLOGY DEVELOPMENT FOR A GREEN FUTURE

## OUR SOLUTION

We provide laboratory supported expert services for bio-based industries. We specifically focus on biomass fractionation technologies to help customers find alternative production processes. Our typical product is a process concept which shows the process flows together with proposals for equipment types to be used. With the concept document in hand, the customer can approach machinery vendors to initiate detailed planning. We work as a complementary resource to the customer's own organization, thus helping leverage the knowhow within the organization.

## BENEFIT FOR THE CUSTOMER

The customer gets access to top level expertise and pulping, bleaching and a regenerated cellulose laboratory with trained staff without the customer's own investment. The complementary approach develops customer in-house knowledge. Confidentiality is a central part of the service, enabling efficient IP development.

## COMPETITIVE ADVANTAGE

We have a long track record in the field and top-level experts in the organization. By combining unique state of the art facilities with the ability to innovate and reinvent established methods, our highly qualified professionals help our customers' ideas become a reality.

## COMPANY

Founded in 1983, privately-owned. SciTech provides services in biomass processing in the areas of pulp manufacture, viscose production and other regenerated cellulose products, as well as bio-based chemicals, lignin and hemicellulose separation.

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SciTech Service

BUSINESS FINLAND

PRODUCTION TECHNOLOGIES FOR NEW PRODUCTS:
Consulting and engineering

# COMMITTED PARTNERSHIPS AND BREAKTHROUGH SOLUTIONS FOR FUTURE TECHNOLOGIES

## OUR SOLUTION

Sulzer is the world leader in innovative, reliable, and proven pumping, mixing, and aeration solutions for the pulp, paper, and board industry. Forest companies, research institutes and industry partners are developing processes for virgin and recycled fiber-based products to replace cotton and oil-based synthetic fibers and to produce higher-value carbon products. Modified cellulose materials for packaging and coatings are also high on the list. Our intensive R&D activities and partnerships with key players in the industry boost our development of new and innovative process equipment. We are excited to be supporting the great potential of the future forest-based industry. https://bit.ly/39827f2

## BENEFIT FOR THE CUSTOMER

Sulzer's competence center with the world's biggest full-scale research facility for the pulp, paper, and board segment and for new process applications based on wood raw materials is located in Kotka, Finland. This is where the main product platforms for new applications are developed. Our customers benefit from our commitment to innovation.

## COMPETITIVE ADVANTAGE

Our knowhow and product offering are based on close cooperation with the world's leading pulp, paper, and board producers, machinery suppliers, engineering companies, and research institutes. We are an innovation partner who can provide solutions where none yet exist. Our full-scale testing facilities in Kotka, Finland, are key for this competence.

## COMPANY

Sulzer is a global leader in fluid engineering. We specialize in pumping, mixing, aeration and separation technologies for fluids of all types. Our customers benefit from our sustainable solutions and comprehensive factory, and service center network. **References:** Our energy-efficient solutions make a difference for the mill performance. Recent bioproduct projects have chosen our equipment for the key processes.

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SULZER

BUSINESS
FINLAND

# MANAGEMENT CONSULTING IN BIOECONOMY BUSINESS

## OUR SOLUTION

Vision Hunters provides strategic advisory and strategic management consulting services for forest and bioindustry related sectors. Our consulting expertise for bioproducts covers traditional biorefinery side stream products as well as new bioproduct segments ranging from bioplastics, biofuels, biomedicals, lignin, hemicellulose to cellulose derivatives. We have conducted research on over 60 markets globally and have become one of the leading consulting companies within the forest and bioindustry sectors, helping our clients with sustainable business targets. Through our network of senior-level consultants and associates, we have the capability to manage even the most complex global assignments.

## BENEFIT FOR THE CUSTOMER

The bioeconomy is one of the most rapidly growing economic sectors in the world and we help our clients to capture new opportunities, generating higher value. Our services for the forest Industry bio-based sector include, e.g.: strategic analyses of bio-based business opportunities, new product and market entry strategies, and by-product businesses.

## COMPETITIVE ADVANTAGE

Vision Hunters has a strong track record and expertise in helping clients to navigate and analyze the opportunities in bio-based businesses. We are a network of highly experienced and result-oriented, independent thinkers. We draw from the deep, decades-long experience of our global team, and have a passion to turn great ideas into reality.

## COMPANY

Vision Hunters is a leading Finnish management consulting company for bioindustry providing strategic advisory services for bioproducts, bio-chemicals, bioenergy, biorefinery, and traditional forest product businesses.

**References:** Vision Hunters serves forest and bioindustry clients globally. We are a strategic partner for many of the leading companies in bioeconomy sector.

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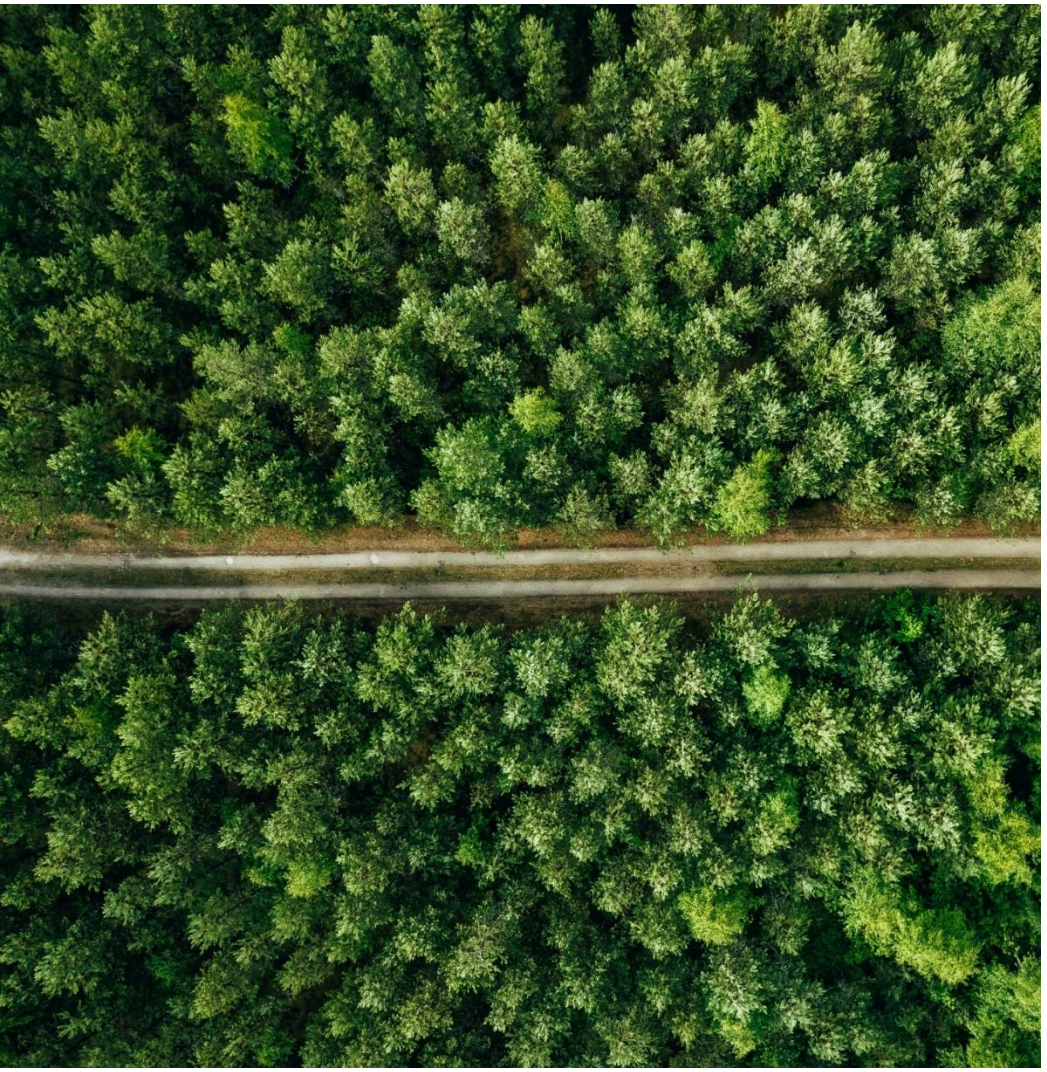

# ARE ALTERNATIVES TO FOSSIL-BASED RAW MATERIALS OR ENERGY ON YOUR TO-DO LIST?

## OUR SOLUTION

Discovering alternatives to fossil-based raw materials and energy are at the core of VTT's high impact renewable materials research and development. We help businesses transform through co-working on the most demanding material development, testing, piloting and up-scaling projects. Our research services are used by a variety of different industries to find new material solutions for consumer goods, health and hygiene products, packaging, and construction materials to name a few. We also work closely with energy and chemical companies on bio-fuels and chemicals development.

## BENEFIT FOR THE CUSTOMER

- Early validation of technical and economic feasibility of new products.
- Gain critical data on the technical and financial feasibility while ensuring the product matches your requirements.
- Demonstration of the production process and product consistency with extended piloting, generating process design data for further scale-up.

## COMPETITIVE ADVANTAGE

Partnering with us allows you to harness the full potential of your technology and innovation initiatives and speed up your innovation process. You can minimize any economic risk by experimenting in a safe environment and make decisions based on scientific facts through our creative interdisciplinary possibilities.

## COMPANY

VTT is a visionary research, development and innovation partner. We have been bringing together people, business, science and technology to solve the biggest challenges of our time since 1994.

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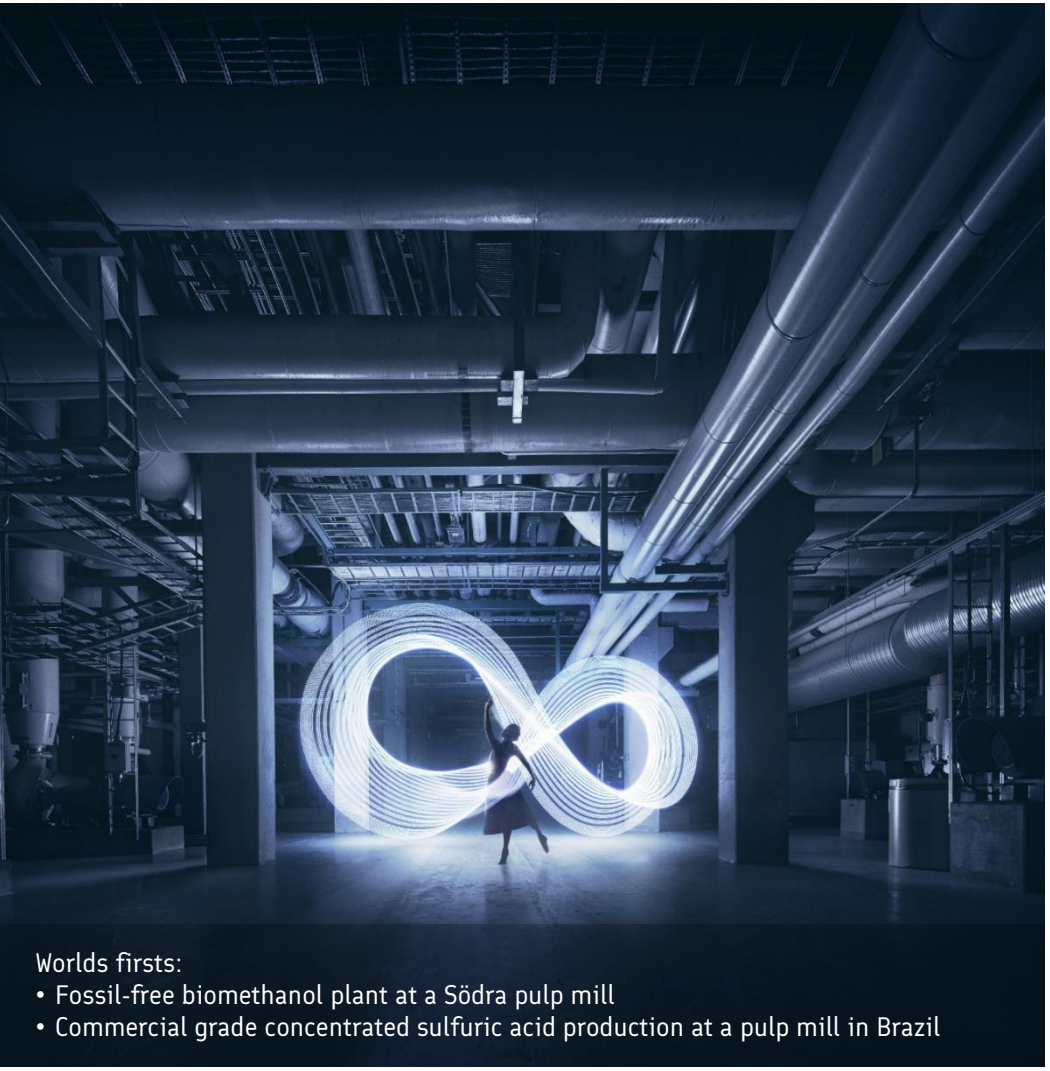
BUSINESS
FINLAND

VTT

# SOLUTIONS BASED ON BIOMASS AND SIDE STREAMS

BUSINESS FINLAND

**ANDRITZ** – new products from pulp mills
**CH-Bioforce** – separating cellulose, hemicllulose and lignin
**Chempolis** – biofuels, textile fibers, etc.
**CH-Polymers** – binders and barriers
**Dolea** – recyclable drinking straw
**Elastopoli** – biocomposites
**EniferBio** – sustainable aquafeed
**Esbottle** – paper bottle
**Fortum** – Bio2X textiles and biocomposites, etc.
**Lumir** – indoor acustics
**Paptic** – replacing plastic in packaking
**Saalasti Finland** – biomass mechanical pretreatment
**Soilfood** – fertilizers and soil improvers
**SPINNOVA** – sustainable textile material
**St1** – Power2X and advanced biofuels
**Sulzer Pump Finland** – pumping and mixing
**Valmet** – commercial lignin extraction



Worlds firsts:
- Fossil-free biomethanol plant at a Södra pulp mill
- Commercial grade concentrated sulfuric acid production at a pulp mill in Brazil

# BIOPRODUCTS PRODUCTION FOR INCREASED REVENUE AT PULP MILLS

## OUR SOLUTION

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## BENEFIT FOR THE CUSTOMER

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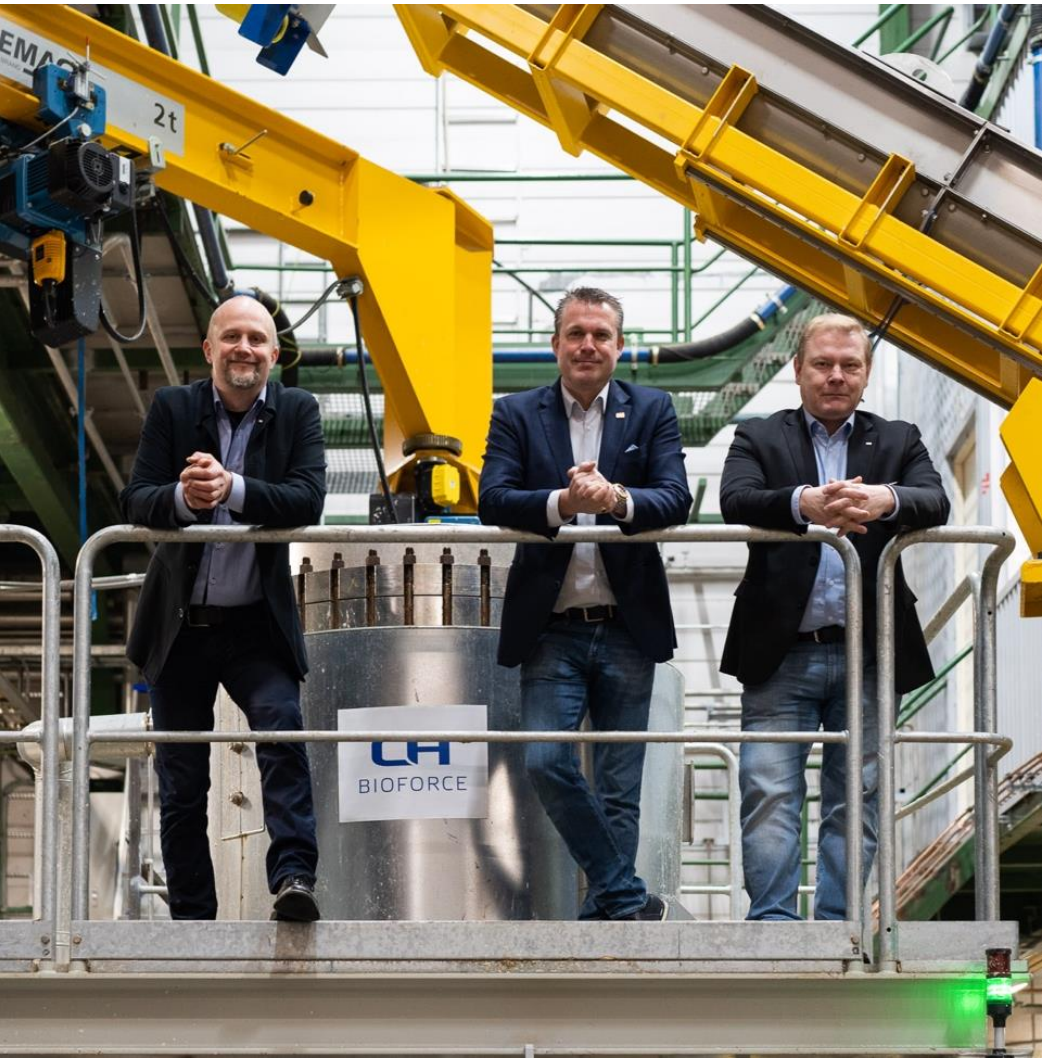
## COMPETITIVE ADVANTAGE

A-Recovery+ provides new opportunities for the expanding bioproduct market. The systems in the A-Recovery+ solution generate economic value from the side streams in a kraft pulp by creating additional chemical cycles that add value such as purifying raw methanol to commercial quality biomethanol, producing commercial quality sulfuric acid on-site from concentrated non-condensable gases, or recovering high-quality lignin from black liquor.

## COMPANY

ANDRITZ Oy is a leading global supplier of technologies and services for the pulp and paper industry including technology for renewable energy production.

pulpandpaper.fi@andritz.com
A-Recovery+ chemical recovery concept for kraft mills (andritz.com)




# ADVANCED BIOMASS CHEMISTRY – NEXT GENERATION BIOREFINERY

## OUR SOLUTION

CH-Bioforce offers the only technology available globally which can produce biopolymers in their polymeric and native form on an industrial scale..

## BENEFIT FOR THE CUSTOMER

Our technology fractionates all biomass main components in one process while raising material efficiency from less than 50% to over 90%. The resulting biopolymers – cellulose, hemicellulose, and lignin – are all extremely pure. All three constituents can be extracted with high purity, which allows our partners to develop their own products with 100% trust in the quality of raw materials. While viable investments in current pulping technologies go into the billions, CH-Bioforce is flexible in size and profitable also on a smaller scale.

## COMPETITIVE ADVANTAGE

- Our technology can utilize practically any kind of biomass as feedstock, typically industrial and agricultural side streams such as straw. Our technology can replace fossil and food-based raw materials in areas such as textiles and packaging applications.
- Protected by several patent families with international coverage. The technology has been thoroughly evaluated in the pilot plant and it is safe to say the business case is attractive.
- Superior material efficiency and excellent cost competitiveness. Our biopolymers are as flexible a feedstock as fossil based.

## COMPANY

CH-Bioforce's carbon-neutral biopolymers provide a truly sustainable alternative to oil-based materials in multiple industries. In addition to economical profitability, our technology is also environmentally sound and sustainable. A recent environmental impact assessment confirms even the process itself is completely carbon neutral.

**References:** Currently operating on a pilot scale. A vast number of evaluations executed for different applications and numerous LOIs with potential customers signed.

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CH BIOFORCE


# FORMICO BIOREFINERY ENABLING A SUSTAINABLE GREEN ECONOMY

## OUR SOLUTION

Global challenges, such as transport fossil fuels emitting CO2, air pollution due to burning agricultural residues, unsustainable forestry and deforestation, and textile industry emissions can all be solved with Chempolis' formico biorefinery platforms. Chempolis formico biorefinery technology can turn any lignocellulosic raw material, whether they are energy crops such as bamboo, agricultural residues such as straw and bagasse, or woody biomass such as softwoods and hardwoods, into sustainable cellulose products such as textile fibers or biofuels, hemicellulose products such as biochemicals and lignin, and products such as biochemicals and bioaromatics replacing fossil-based chemicals.

## BENEFIT FOR THE CUSTOMER

High revenue and profitability potential; long-term flexibility towards higher value products; high resource efficiency and yield of co-produced biochemical; efficient energy integration; lower steam pressure; smaller plant size footprint; based on well-known machinery solutions; low discharges thanks to closed-loop process and integrated recovery.

## COMPETITIVE ADVANTAGE

Chempolis sustainable technology enables refining biomasses economically into high-quality products while minimizing environmental impacts and maximizing social benefits. Chempolis is capable of delivering know-how services for engineering and the execution of a biorefinery project. Our solution is ready-to-market and offers better long-term potential.

## COMPANY

Chempolis Oy Ltd is a technology developer and licensor of next generation formico(R) biorefinery technologies with in-house engineering capability and patent portfolio, employing 42 people. Fortum Oyj is our main industrial partner and shareholder.
**References:** Chempolis is building a first-of-its-kind biorefinery in India, producing bioethanol and biochemicals from bamboo, coming on stream at the end of 2022.

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chempolis
pure future

BUSINESS
FINLAND


# BIOMATERIAL-CONTAINING BINDERS AND BARRIER COATINGS

## OUR SOLUTION

Biomaterial-containing binders for paints and coatings and nonwoven & specialties industries are already available, while biomaterial-containing binders for paper and packaging are under development in a precommercial phase. CHP BAR biomaterial-containing barrier coatings are available.

## BENEFIT FOR THE CUSTOMER

Solutions containing biomaterial are in high demand across our customer segments because of increasing attention towards sustainability and the environment. This trend is driven simultaneously by consumers, brand owners and legislation.

## COMPETITIVE ADVANTAGE

CH-Polymers long history in binder production and development, coupled with our team of experienced experts and our vision for a green future creates an ideal environment for developing bio-based solutions for tomorrow.

## COMPANY

CH-Polymers develops and manufactures waterborne polymer dispersions for use in multiple industries, e.g.: paper and packaging, nonwoven and specialties, and paints and coatings. Our strategy is to create solutions using sustainable products and processes.

**References:**
We are working together with our customers, Finnish universities and our co-operation companies CH-Bioforce, FP-Pigments, and Chemec.

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CH
POLYMERS

# DOLEA STRAW

## OUR SOLUTION

Dolea contributes to the circular economy on a global scale by producing fully recyclable drinking straws out of paperboard. Dolea also manufactures patented machines for drinking straw production.

## BENEFIT FOR THE CUSTOMER

Dolea straws are sturdy, safe, and user-friendly, and suitable for all drinks. Recyclable Dolea straws contain zero glue, and are therefore recyclable as paper according to the PAP21 standard. Sustainable local production, global effects.

## COMPETITIVE ADVANTAGE

User-friendly and safe Compliant to European Union framework regulations on materials for food contact. The disintegration in liquid is minimal for the whole duration of use. Zero glue means no glue or other chemicals get in the mouth of a customer. Unique feature Dolea straws are custom printable – no other media gets in the mouth of a consumer.

## COMPANY

Dolea Ltd. is an award-winning Finnish cleantech company, rated one of the hottest start-ups. Dolea contributes to the circular economy on a global scale using patented technology to manufacture recyclable drinking straws and straw machines.

**References:**
Kasvu Open winner 2019. Distribution through multiple channels within the food service wholesale in Finland and Sweden.

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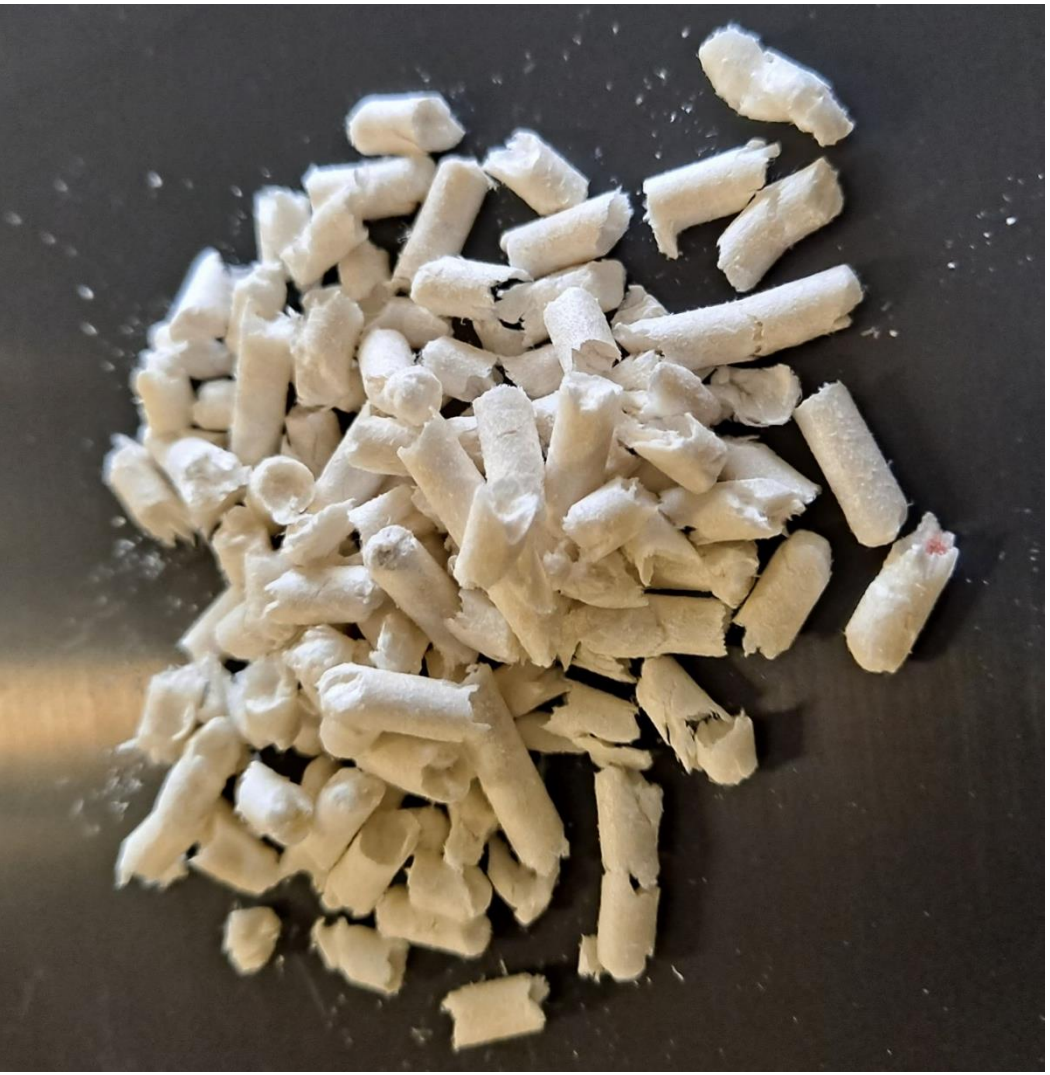
dolea



# ELASTOPOLI WET WEB BIOCOMPOSITES

## OUR SOLUTION

Elastopoli has created and patented a unique biocomposite manufacturing technology that utilizes cellulose fibers in a wet process to preserve their best mechanical performance in biocomposites when compared to dry mixing methods. Fibers can be used directly from a pulping process, dry pulp or recycled pulp/paper that is introduced into Elastopoli Wet Web Process. The biocomposite products are a fiber masterbatch that material compounders in plastic industry uses as a bio reinforcing mechanism in various plastics to replace glass fibers and minerals to gain an improved carbon footprint in their products especially when reinforcing recycled plastics with our bio-reinforcement technology.

## BENEFIT FOR THE CUSTOMER

Technically, cellulose-based composites are lighter than their fossil-based competitors Economically, the process temperatures are lower, resulting in energy savings, and production is 30–50% faster compared to fossil-based plastics. The carbon footprint of the produced fiber masterbatch
is carbon negative due to carbon stored in the cellulose fibers.

## COMPETITIVE ADVANTAGE

Elastopoli technology is based on never dried/wet fibers and can be integrated directly to a pulp mill or other source of fibers. The large scale production is both competitive and profitable compared to conventional plastics and it meets the recycling and low carbon footprint regulations the industry is facing.

## COMPANY

Elastopoli is a development company for the plastics industry and was founded in 2002. Biocomposite development started in 2007. We manufacture fiber masterbatch, biocomposites, and provide laboratory and testing technology services for industry.

**References:**
Elastopoli has created biocomposite solutions, for example, for LG soundbars (Korea), Fiskars recycled scissors, and Isku student chairs.

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Elastopoli Oy

# SUSTAINABLE AQUAFEED FROM BIOREFINING SIDE STREAMS

## OUR SOLUTION

EniferBio is a start-up reinventing a pioneering Finnish solution – the Pekilo process. Originally developed by the pulp and paper industry in Finland in the 1970s, the process allows the conversion of dilute side streams into value-added protein feed, while simultaneously purifying the water by removing COD. The improved Pekilo process by EniferBio uses streams such as pre-hydrolysis liquor, or ethanol industry vinasse/stillage to produce a high-protein product suitable for the high-value aquafeed market. With more than 15 years of industrial scale operations, the Pekilo process has an unrivaled track-record among alternative protein production technologies.

## BENEFIT FOR THE CUSTOMER

The continuous Pekilo bioprocess is unique in capturing value from the most difficult to valorize streams, e.g., diluted, chemically complex, and inhibitory side streams. Biorefineries such as ethanol and dissolving pulp plants can generate a novel stream of revenue while improving water recycling.

## COMPETITIVE ADVANTAGE

The alternative protein market is undergoing tremendous growth. The Pekilo process is the only credible solution for producing local, renewable, and sustainable aquafeed protein, while also being cost competitive with the current industry standard protein ingredient – soy protein concentrate. The industrial history significantly de-risks scale-up.

## COMPANY

EniferBio was founded in 2020 by a team of five biorefining experts as a spin-off company from the Technical Research Centre of Finland VTT. Besides VTT, it counts Nordic FoodTech VC and Voima Ventures as its financial backers in a 1M € seed round. **References:** As the first alternative protein company ever, EniferBio was crowned the winner of the Feed Tech Challenge hosted by the leading feed company Nutreco.

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eniferBio
VALUE EVERYTHING

# PAPER BOTTLE

## OUR SOLUTION

ESBOTTLE presents a unique paper bottle for any liquid, semi-liquid, and tablets/powder. Made only from renewable materials, all parts of the bottle are made of completely organic cardboard. Any size and different shapes are possible. Production starts with a cardboard roll from which stripe blanks for bottles and bottoms are cut. The machine folds the bottle from cardboard strips. After the cap is installed, the bottle is sterilized, and pressure tested. Then the bottom will be installed, and a digital printer gives the bottle a photo quality design. The machine is fully automated and has an environmentally-friendly production process. The first products are expected to be launched on the market in 2022.

## BENEFIT FOR THE CUSTOMER

The bottle can be made pressure resistant for CSD or other carbonated beverages. The bottle construction makes it light and economical. Customers can design their own bottle shape and bottles of different sizes can be produced on the same line. The machine has an integrated filling station and a group packing machine can be installed at the end of the line.

## COMPETITIVE ADVANTAGE

The paperboard bottle is made from renewable materials, does not contain toxins, and can be safely recycled. As the machine forms bottles from rolls, there will be significant savings in transport. The machine is flexible and can fill bottles with different sizes and with the digital printer the product change will be easy and short.

## COMPANY

Esbottle has kept a low profile on market as our resources have been limited. But we are now moving into next phase both in respect of projects with customers and as we are broadening company structure and will secure the growth with help of investors.

**References:** We are developing paper bottles for different applications to four customers at the moment. The first bottle forming unit will be ready by January 2022.

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Esbottle

# FORTUM BIO2X: TRANSFORMING BIOMASS FOR A CLEANER WORLD

## OUR SOLUTION

Bio2X aims to fractionate biomass in biorefineries to its main components for further processing to high-value products. The fractionation technologies as well as using agricultural residues, such as wheat straw, as feedstock are at the core of Bio2X. In fractionation, the biomass is separated into lignin, cellulose, and hemicellulose with a high yield and purity. This allows for high material efficiency, since up to 90% of the feedstock is converted into valuable products, such as textile fibers and biocomposites, leaving only 5–10% for energy use. The fraction properties can be adjusted in a flexible manner and used to replace fossil-derived raw materials in many industrial and consumer sectors.

## BENEFIT FOR THE CUSTOMER

Currently, there are no advanced straw-based materials on the market. Bio2X uses straw as raw material for sustainable materials while the grain is used for food. The straw fractions have numerous applications globally, such as textiles, biocomposites, packaging materials, cosmetics and resins with clearly beneficial LCA in terms of climate change.

## COMPETITIVE ADVANTAGE

The technology converts up to 90% of the feedstock into non-energy products and is flexible with raw materials. The fraction quality can be tailored to serve the end applications. For example, the cellulose pulp quality is suitable for both textile and paper grade use and the sulfur-free lignin is attractive towards many material applications.

## COMPANY

Fortum's purpose is to drive the change for a cleaner world. We are securing a fast and reliable transition to a carbon-neutral economy by providing customers and societies with clean energy and sustainable solutions.

**References:**
1. Straw-based garment collection debuted in March 2021 by award-winning designer Rolf Ekroth, featured in Vogue USA. 2. ExpandFibre Veturi program.

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Fortum Bio2X

BUSINESS FINLAND

# LUMIR BIO-BASED ACOUSTIC SOLUTIONS

## OUR SOLUTION

Lumir provides sustainable and seamless acoustic solutions for walls and ceilings. These bio-based acoustic solutions give you limitless freedom to integrate acoustic materials into any architectural vision. We use over 80% wood-based materials in our products, which makes them sustainable and safe for users. Lumir acoustic solutions have been installed already in over 300 buildings. Lumir has recently developed an industrially upscalable process for production of bio-based acoustic panels, Lumir Bioboard. Lumir Bioboard can be used in same way as conventional acoustic panels. Lumir is currently planning a pilot factory based on the process.

## BENEFIT FOR THE CUSTOMER

Lumir acoustic solutions provide an effective reduction of reverberation for homes, public spaces, schools, offices, and shops. They are suitable for new construction and renovations. Lumir acoustic solutions can be customized to spaces without compromising the architectural vision and they act as carbon sink reducing a building's carbon footprint.

## COMPETITIVE ADVANTAGE

Lumir has developed visually and acoustically high quality products from bio-based raw materials. Performance of the products have been scientifically proven. Production process is easily upscalable and exportable. Lumir is also developing new bio- and circular economy-based products for the construction industry.

## COMPANY

Lumir was established in 2009 and has 12 employees. Lumir has highly educated staff from different fields, ranging from acoustics and materials sciences to construction.

**References:**
Lumir acoustic solutions have been used in over 300 buildings in Finland, ranging from private homes to the Finnish Parliament.

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Lumir


# PAPTIC® – A SUSTAINABLE ALTERNATIVE TO REPLACE PLASTIC FILM IN PACKAGING

## OUR SOLUTION

Paptic® is the new bio-based, recyclable, reusable, next-generation packaging material made of renewable raw materials. Forging a category of its own, Paptic® combines the best features of existing materials, for instance, printability, durability, and versatility. The unique touch and feel properties make the material stand out from the conventional materials. In numerous flexible packaging applications, plastic can be replaced with soft and durable Paptic®, e.g., in carrier bags, e-commerce mailers, product packaging, dry food packaging, and hygiene packaging.

## BENEFIT FOR THE CUSTOMER

With Paptic®, a brand can easily switch to use a more sustainable alternative in packaging and achieve its sustainability targets faster. By choosing Paptic® for its packaging, a brand can differentiate from its competitors, strengthen its sustainability forerunner image, and help consumers act responsibly.

## COMPETITIVE ADVANTAGE

Paptic® is the only material offering a combination of the versatility of plastic and sustainability of paper. Paptic® enables the fastest route for brands to switch from oil-based packaging to renewable and recyclable materials in packaging.

## COMPANY

Paptic Ltd is a high-growth company established in 2015. The company has developed Paptic®, a fiber-based material, to replace plastics in packaging. Today, the company employs 30 professionals and delivers its material to over 40 countries.

**References:** Stockmann, Sokos, and Decathlon Singapore use Paptic®, to name a few. 2020: WorldStar Award winner and Jury's Special Prize in Luxepack in Green.

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PAPTIC®

# SAALASTI BIOENERGY SYSTEMS

## OUR SOLUTION

Saalasti has pioneering and innovative solutions for the crushing, milling, pressing, drying, grinding, and screening of biomass. Making boiler fuel is in our blood. Saalasti has over 70 years' experience in heavy machinery and over 40 years in converting forest-based biomass into power plant fuel. Typical materials are logs, wood from thinning, loose or bundled slash, treetops, stumps, and wood waste. Our solutions are used in paper and pulp mill wood rooms, sawmills, biomass terminals, and power plants. We supply both individual machines and entire processing systems along with our after-sales services ranging from equipment inspections to contractual maintenance.

## BENEFIT FOR THE CUSTOMER

The possibility to use different biofuel materials becomes more important all the time. Versatility to increase capacity, change material and particle size is vital to ensure the full lifetime of the investment. The Saalasti mechanical dewatering system doubles the existing thermal drying capacity without extra investment in heating power.

## COMPETITIVE ADVANTAGE

Saalasti solutions have proven to have the lowest lifetime cost. Equipment is designed to be robust and has a wide rebuild ability over the plant's lifetime. Equipment needs simple types of civil works and has a fast erection time. The service life of our equipment is measured in decades and the Saalasti after-sales service ensures trouble free operation over the years.

## COMPANY

For more than 40 years, Saalasti has been a recognized expert in the supplying of innovative bioenergy systems.. Our main products are different types of biomass chippers, crushers, and dewatering presses, along with a lifetime after-sales service.

**References:**
Saalasti has delivered more than 350 Saalasti Bioenergy Systems around the world.

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# SOILFOOD – THE BEST SOLUTIONS FOR THE LAND

## OUR SOLUTION

We offer side stream processing services, which help companies achieve their emissions and recycling targets. Our customers include leading paper and pulp, bioenergy, and food industry companies. Our full service includes the whole lifecycle of the side stream, from the industrial plant to the end user in agriculture. Our service allows the industrial client to focus on core business instead of side stream handling. Soilfood takes care of refining, warehousing, quality control and use of the fertilizer product in agriculture. When we find suitable side streams and refine them to products, we can create a reliable, sustainable and mutually profitable value chain.

## BENEFIT FOR THE CUSTOMER

We offer the most sustainable way to improve the profitability of farms and industry plants. Our promise to industry includes:

- Optimal lifecycle profits or minimal lifecycle costs;
- The most responsible and sustainable utilization of side stream;
- The most reliable and safest comprehensive service.

## COMPETITIVE ADVANTAGE

Utilization of sludges as soil improvers in agriculture is an ecological option for side-stream handling. As sludges contain nutrients and organic carbon, they are valuable resources. Our solution is cost and material efficient. $CO^2$ emissions are reduced as carbon is stored into soil and chemical fertilizers are replaced by recycled nutrients.

## COMPANY

Soilfood is a circular economy company, whose goal is to replace virgin raw materials with recycled materials in large volumes and quickly. We create a sustainable food chain by processing industry side streams for agriculture.

**References:**
Our customers include leading paper and pulp, bioenergy, and food industry companies in the Nordics.

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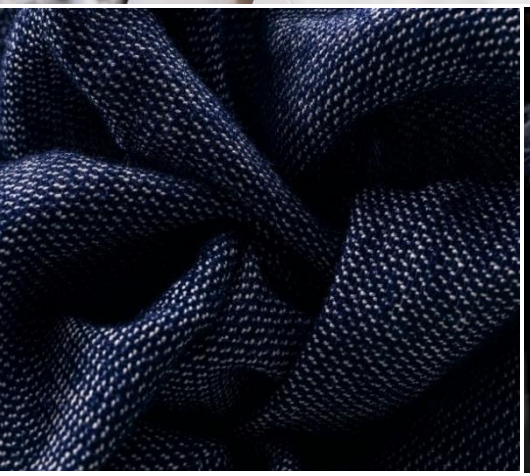
SOIL FOOD



# THE SUSTAINABLE TEXTILE MATERIAL COMPANY

## OUR SOLUTION

SPINNOVA believes the textile world as we know it has reached a turning point. Companies around the globe are struggling to find ways to leave the linear models behind and ensure a more circular and sustainable tomorrow – a tomorrow with less waste, lower $CO^2$ emissions and no harmful chemicals or excessive water use. It's easy to talk about change, but a different thing to make it happen. That's where we come in. SPINNOVA, a Finnish textile material innovation company, is speeding up the long-awaited fundamental shift in industry practices.
We create the next generation textile fiber with minimal water use, lower emissions and zero waste, without dissolving or the use of harmful chemicals.

## BENEFIT FOR THE CUSTOMER

SPINNOVA® is a 100% natural fiber made of wood or waste stream cellulose. Over its lifecycle, this cotton-like fiber is produced with 99% less water and significantly lower $CO^2$ emissions compared to cotton. SPINNOVA® 's unique sustainability aspects also include zero harmful chemicals, zero microplastics, 100% recyclability and fast biodegradability.

## COMPETITIVE ADVANTAGE

Our highly scalable technology allows feedstocks from wood to agricultural and cotton waste. This unique fiber can be recycled in the same clean process back to fiber of the same quality, enabling disruptive circularity for textile products. The patented technology is fully modular, which allows for the gradual scaling of production according to demand

## COMPANY

We are now scaling up our wood-based SPINNOVA® fiber production with our partner Suzano, the world's largest pulp producer, expanding to waste-based fibers in the future. Spinnova is publically listed, and we employed some 55 people in August 2021. **References:** Our partners include Adidas, H&M Group, The North Face, and BESTSELLER. Spinnova has recently received awards, e.g., from the Fast Company, ISPO, and ANDAM.

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BUSINESS
**FINLAND**

SPINNOVA®


# ENERGY TRANSITION TROUGH P2X AND ADVANCED FUELS BIOREFINING

## OUR SOLUTION

St1 is a forerunner and partner in Energy Transition by integration of power conversion to replace fossil fuels (P2X) and solutions to convert side streams to advanced biofuels. $CO^2$ utilization and integration to ecosystems, producing hydrogen and synthetic fuels including synthetic methane for the traffic sector and industrial users with our technology partners. Sawmill and biorefinery streams to produce bio-ethanol and biogas.

## BENEFIT FOR THE CUSTOMER

St1 provides a top of the range professional team and preselected partners to participate global energy transition with a secure outlet to all produced renewable energy.

## COMPETITIVE ADVANTAGE

An experienced highly professional team and company who knows where to focus in complex energy systems. A secure outlet for renewable energy to maximize value.

## COMPANY

St1 Oy.

**References:** Kajaani Cellunolix(r) Biorefinery.

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# COMMITTED PARTNERSHIPS AND BREAKTHROUGH SOLUTIONS FOR FUTURE TECHNOLOGIES

## OUR SOLUTION

Sulzer is the world leader in innovative, reliable, and proven pumping, mixing and aeration solutions for the pulp, paper, and board industry. Forest companies, research institutes and industry partners are developing processes for virgin and recycled fiber-based products to replace cotton and oil-based synthetic fibers, and to produce higher-value carbon products. Also modified cellulose materials for packaging and coatings are high on the list. Our intensive R&D activities and partnerships with key players in the industry boost our development of new and innovative process equipment. We are excited to be supporting the great potential of the future forest-based industry. https://bit.ly/39827f2

## BENEFIT FOR THE CUSTOMER

Sulzer's competence center with the world's biggest full-scale research facility for the pulp, paper, and board segment and for new process applications based on wood raw materials is located in Kotka, Finland. This is where the main product platforms for new applications are developed. Our customers benefit from our commitment to innovation.

## COMPETITIVE ADVANTAGE

Our knowhow and product offering are based on close cooperation with the world's leading pulp, paper, and board producers, machinery suppliers, engineering companies, and research institutes. We are an innovation partner who can provide solutions where none yet exist. Our full-scale testing facilities in Kotka, Finland, are key for this competence.

## COMPANY

Sulzer is a global leader in fluid engineering. We specialize in pumping, mixing, aeration, and separation technologies for fluids of all types. Our customers benefit from our sustainable solutions and comprehensive factory and service center network. **References:** Our energy-efficient solutions make a difference to mill performance. Recent bioproduct projects have chosen our equipment for their key processes.

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SULZER

# LIGNIN EXTRACTION WITH VALMET LIGNOBOOST

Valmet's mission is to develop technologies to convert renewable raw materials into sustainable results. Valmet LignoBoost is a technology that enables lignin, the natural glue that keeps wood fibers together, to be extracted in the kraft pulping process.

There are four LignoBoost plants in operation today: the commercial-scale LignoBoost plants operated by Stora Enso in Finland and Domtar in the USA have design capacities of 50,000 and 25,000 tpa, respectively. Valmet has recently delivered a demonstration-scale LignoBoost XS plant to Klabin in Brazil. The world's first LignoBoost plant with a capacity of 8,000 tpa is operated by RISE in Sweden.

## BIO-BASED ALTERNATIVE FOR VARIOUS END USES

Lignin is a renewable material made of much the same chemical building blocks as those found in petroleum-based materials. This means that lignin offers numerous opportunities to replace fossil materials in various applications, including carbon fiber, plastics, and adhesives. Alternatively, lignin can be used to improve product characteristics in, e.g., carton board and plywood.

## PROVEN SOLUTION – FROM STUDIES TO COMMERCIAL PRODUCTION

Valmet LignoBoost is proven and reliable technology. LignoBoost kraft lignin has a high purity and can be tailored for multiple different applications.

Valmet can support the development of its customers' lignin business from the very outset – from feasibility studies and the production of lignin samples to demonstration and commercial-scale LignoBoost plants.

## ABOUT VALMET

Valmet is the leading global developer and supplier of process technologies, automation, and services for the pulp, paper, and energy industries. Valmet is actively developing solutions to produce new value adding products from biomass or pulp and paper mill side streams.

Read more at valmet.com/lignin



Valmet

# SOLUTIONS FOR POWER-TO-X

BUSINESS FINLAND

Clic Innovation

St1

# GREENE2 DECARBONATES ENERGY SECTOR AND INDUSTRIES

Green Electrification (GreenE2) is an open innovation ecosystem orchestrated by CLIC Innovation. Its +200 members pursue the vision of decarbonizing the energy infrastructure and industries through green electrification and sector coupling. As an innovation ecosystem, it brings together companies and research institutions with authorities, to develop the solutions needed in the future energy markets.

## FIVE FOCUS AREAS

GreenE2 focus areas include;
1) optimal sector coupling value chains,
2) production and transport of green hydrogen,
3) deploying P2X and CCU technologies,
4) superior system level efficiency and
5) boosting pioneering business.

## GROWING COMPETENCE THROUGH PROJECT BUILDING

The ecosystem was established in 2020. In 2021, the ecosystem is growing its members' competences in the above mentioned focus areas through project building. For example, a domestic co-innovation project is planned that has to do with a strategic resource of the Nordic countries, namely capture and use of biogenetic carbon (bio-CCU).

Another project under preparation is called Carbon Negative Living as a Service. This ambitious aim incorporates the whole vision of the ecosystem: how to transform our energy infrastructure so that our daily living doesn't cause emissions any more, but rather captures the extra carbon in the atmosphere. A third theme under preparation is the sustainability of value chains in hydrogen economy.

## JOIN US TO IMPROVE THE DIALOGUE WITH YOUR PERSPECTIVE

The ecosystem is open for all and free of charge up to the serious application writing phase. Dedicated project partners pay a modest preparation fee once the application is submitted – or become associate partners through a yearly membership fee.

Bring along your solutions to phase out fossil fuels and raw materials through green electrification!

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# ENERGY TRANSITION TROUGH P2X AND ADVANCED FUELS BIOREFINING

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**References:** Kajaani Cellunolix(r) Biorefinery.

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