Cepi
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RE INVEST 2050

ADVANCING LOW-CARBON INNOVATION IN THE FOREST FIBRE AND PAPER INDUSTRY

Executive summary

For the fifth time, the forest fibre and paper industry reaffirms its dedication to lowering carbon emissions and offering bio-based alternatives to carbon-intensive products through REINVEST 2050. This edition highlights 28 cases from 8 European countries, showcasing initiatives from 18 companies. These projects, undertaken and successfully launched over the past two years, demonstrate resilience and innovation despite regulatory uncertainty, rising carbon prices, and soaring raw material and energy costs.

The transition to a low-carbon economy is no longer a distant goal, it is happening now. Companies in our sector are making bold investments and implementing innovative solutions to reduce emissions, enhance energy efficiency, and drive sustainable production. This publication showcases a series of forward-thinking projects that exemplify that commitment, highlighting real-world actions taken by companies to accelerate decarbonisation.

From replacing fossil fuels with renewable electricity to deploying advanced energy storage, electrification with heat pumps, and cutting-edge biomass solutions, these projects demonstrate the tangible steps industries are taking to reduce their environmental impact. They not only contribute to significant reductions in CO_2 emissions but set new benchmarks for efficiency, innovation, and resilience.

Collaboration has been key. Many of these initiatives involve partnerships with technology providers, energy stakeholders, and policymakers to overcome technical and regulatory challenges. The lessons learned and successes achieved offer a roadmap for others looking to embark on similar transformations.

However, in order to ensure the long-term success of industrial decarbonisation, certain critical measures must be upheld. Further erosion of carbon leakage protection must be prevented as free allocation and indirect carbon cost compensation remain essential tools in facilitating a fair industrial transition. Additionally, secure access to abundant, affordable fossil-free energy is crucial to maintaining our industry's global competitiveness and ensuring its continued viability in Europe.

Recognising the vital role of industry in providing voluntary demand-side response services is also imperative. By contributing to grid stability, ensuring reliable electricity supply, and supporting district heating networks, our sector plays a key role in bolstering energy security. On top of that, unlocking financing instruments to de-risk investments in new installations or substantial refurbishments aimed at improving energy efficiency, CO_2 avoidance, and the transition to fossil-free energy is essential.

Encouraging innovation in energy efficiency and renewable energy integration within industrial processes must remain a priority. This includes supporting the combination of emerging technologies and expanding access to research and development funding for demonstration projects that address the unique challenges faced by our sector.

As Cepi's members look ahead, the urgency to act remains high. These case studies serve as inspiration and proof that industrial decarbonisation is achievable through strategic investments, innovative technologies, and a shared commitment to a more sustainable future. Let these initiatives be a call to action for industries, policymakers, and society to continue pushing boundaries, fostering innovation, and driving meaningful change to strengthen Europe's competitiveness in a low-carbon world.

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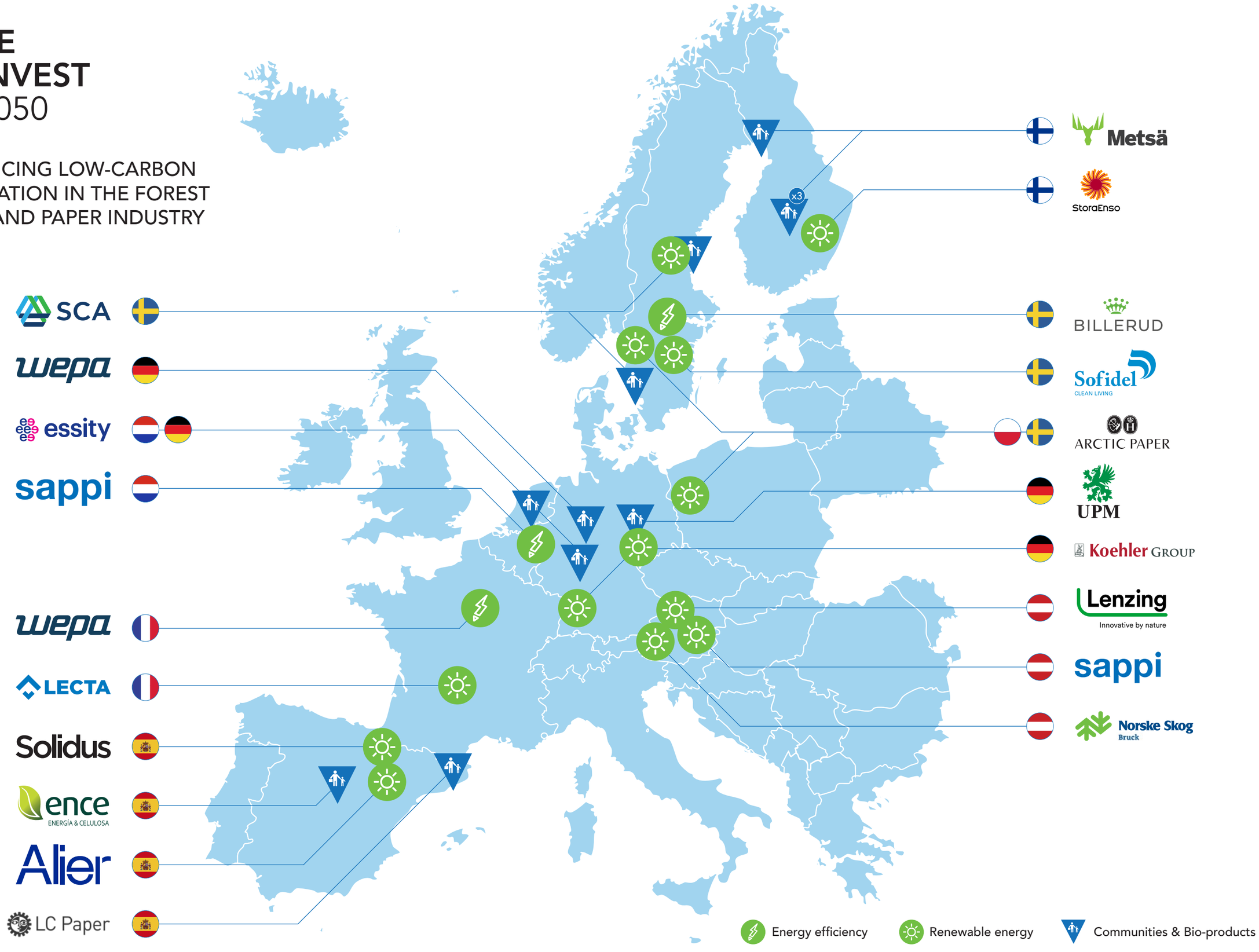

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INVESTMENT MAP:
ADVANCING LOW-CARBON INNOVATION IN THE FOREST FIBRE AND PAPER INDUSTRY

Biomass plant for self-consumption of thermal energy

Alier

Project description

ALIER's commitment to industrial decarbonisation has driven the development of this project, which aims to integrate renewable thermal energy into the recycled paper manufacturing process, reducing the carbon footprint of both the company and its products. For this purpose, ALIER reoriented its thermal energy supply strategy by replacing its cogeneration plant, previously reliant on natural gas, with a biomass boiler powered by 100% renewable, CO_2-neutral forest biomass. Additionally, this boiler is supplemented with biogas derived from waste generated during paper production.

The new installation is among the three most significant in Spain. By decarbonising its production process and drastically reducing its dependence on fossil fuels, ALIER can accelerate its progress to achieve net-zero emissions in 2030.

The implemented solution

The new biomass plant was installed at ALIER's factory in Rosselló (Catalonia) and inaugurated in October 2024. With a capacity of 36 MWt (50 tph), it meets 97% of the factory´s steam demand. As a result, it will prevent the emission of more than 91.000 tonnes of CO_2 per year and reduce natural gas consumption by 98%, effectively lowering the direct carbon footprint (scope 1 emissions) by the same percentage.

The production plant is located in an area rich with agricultural biomass and nearby forest biomass, minimising logistical costs and CO_2 emissions associated with transportation. A forest resource availability analysis of the surrounding area indicates that the project utilises 2,5% of the total harvestable biomass (67.000 tonnes per year).

The key hurdles solved

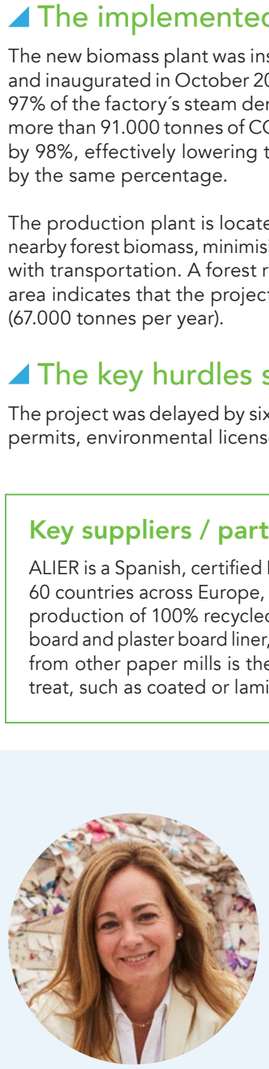
The project was delayed by six months due to hindrance in obtaining building permits, environmental licenses and an activity license.

Key suppliers / partners

ALIER is a Spanish, certified B Corporation company present in more than 60 countries across Europe, America, Africa and Asia. It specialises in the production of 100% recycled paper mainly for the manufacture of plaster board and plaster board liner, kraft bags and sacks. A different characteristic from other paper mills is the capacity to recycle paper that is difficult to treat, such as coated or laminated papers and used beverage cartons.

The Project's Achievements:

- **Investment**
  28 million euros, including a 6.2 million euro grant from the Ministry for Ecological Transition and the Demographic Challenge of the Government of Spain. This funding was provided by the Recovery, Transformation and Resilience Plan.
- **CO_2 emissions saved**
  Potential of 91.000 tonnes CO_2 per year.
- **Any other sustainable benefits**
  Bioenergy production not only generates renewable energy but delivers significant benefits to society and the local economy. It serves as a driver for employment and economic development, particularly in rural areas, where it creates job opportunities, helping to curb rural exodus. Additionally, it supports the transformation of resources into energy and innovative products, fostering bioeconomic growth that strengthens society and protects the environment.



Elisabet Alier
President, ALIER

"The implementation of the biomass plant is part of a set of initiatives carried out by ALIER in recent years that aim to achieve climate neutrality before 2030.

Thanks to major investments such as the new biomass plant, by 2025 we will have reduced our scope 1 CO_2 emissions by 98% and all our scope 2 energy will be renewable. This is just the beginning: we are already working with our value chain to reduce scope 3 emissions.

We hope that our new biomass plant will serve as a success story that will enable other paper companies to implement this type of technology in their industries."

Solar farm provides renewable power

ARCTIC PAPER

Project description

As part of Arctic Paper Group's 4P strategy for 2030, the energy part has taken centre stage. Investments in renewable energy, including solar power, are important for ensuring sustainable energy self-sufficiency and enabling Arctic Paper to produce and trade energy surplus.

At Arctic Paper Kostrzyn, solar expansion is ongoing. In 2021, the mill launched a 0.9 MW pilot photovoltaic (PV) farm, generating 0.2 GWh of green energy. Its success paved the way for further expansion to a larger and more efficient solar farm. By early 2025, the Kostrzyn mill's solar capacity reached 18 MW, with an additional 10 MW planned by mid-2025.

The implemented solution

- Climatic factors such as sunshine and cloud cover (panels generate electricity even under diffuse radiation) were analysed between 2018 and 2022 to account for yearly variations,
- Economic and financial comparison of alternative solutions, considering annual renewable electricity (MWh), investment costs, operating expenses, revenue, and Dynamic Generation Cost (DGC) analysis,
- Sensitivity analysis assessing the impact of risk factors (for example, investment costs, natural gas price, CO_2 ETS allowance price, and electricity price) on project performance and the company's financial sustainability.

The key hurdles solved

MAZEL SA prepared all required documentation and obtained the necessary permits for constructing a photovoltaic installation. During project preparation, component costs, such as panels, were carefully considered.

Key suppliers / partners

MAZEL SA, provider of renewable energy solutions.

The Project's Achievements:

- **Investment**
  11 million euros financed by own funds.
- **CO_2 emissions saved**
  Reduction of CO_2 emissions: 619.585 tonnes CO_2 per year, both directly and indirectly, when installation produces energy nominal capacity.
- **Any other sustainable benefits**
  The amount of electricity generated from renewable sources is 16.009 MWh per year.

Michał Jarczyński
CEO, Arctic Paper Group

"The project will significantly reduce gas fuel costs for electricity generation and lower CO_2 emission rights expenses. We obtain revenues due to increased electricity sales from the surplus generated by the PV farm. Furthermore, we are well prepared in the event of an energy crisis.

We navigated the changing regulations and government uncertainty, which are critical when developing solar power businesses for internal use and energy sales. The complex and lengthy permit process added to these challenges."

Decarbonising paper production: Implementing the climate action strategy

Koehler GROUP

Project description

The Koehler Group previously consumed about 62.000 metric tonnes of coal annually, sourced from South Africa and Colombia. This fossil fuel had to be shipped halfway around the world, resulting in about 150.000 metric tonnes of direct CO_2 emissions per year. Since its founding in 1807, Koehler has relied on renewable energy (hydropower). Through Koehler Renewable Energy for biomass expertise and Koehler Innovation and Technology for engineering, the company is switching from fossil fuels to regional biomass. To support this, the Koehler Group has invested over 70 million euros in the Oberkirch mill.

The implemented solution

The existing power plant, built in 1986, underwent several significant conversions to accommodate the new fuel. This included the construction of two collection points for unloading trucks and corresponding silos. The fuel mix includes wood chips, biogenic waste, and residues from wood processing. One advantage of using such carbon-neutral biomass is its availability in the region.

By converting the power plant to biomass, Koehler will reduce direct emissions by over 150.000 metric tonnes of CO_2 per year at the Oberkirch site, advancing both its carbon-neutrality goal and Germany's national climate targets. The Koehler Group will continue to reduce its carbon footprint through efficiency improvement processes, one step at a time, as set out in its environmental and climate action strategy.

The key hurdles solved

Pre-project feasibility studies, permitting and ensuring a reliable regional biofuel supply were key steps in the construction and upgrade of the power plant.

Key suppliers / partners

- Koehler Innovation & Technology
- Valmet

The Project's Achievements:

- **Investment**
  More than 70 million euros.
- **CO_2 emissions saved**
  150.000 tonnes CO_2 per year of direct emissions.
- **Any other sustainable benefits**
  Reducing the impact of transport from overseas, reducing scope 3 emissions of the coal, contributing to regional value added.

Hartmut Felsch

Mill Director Koehler Paper Oberkirch mill

"In order to fulfil Koehler's promise to generate more renewable energy than required for paper production by 2030, it was already clear in 2016: 'The combined heat and power plant at the headquarters, at our Oberkirch mill had to be modernised,' says Hartmut Felsch, Mill Director at the Koehler paper mill in Oberkirch. 'Until recently, it had mainly been running on hard coal and substitute fuels and produced 150.000 tonnes direct fossil CO_2 emissions per annum.' In 2019, the decision was made to convert the power plant from hard coal to biomass. At the same time, two paper machines were equipped with shoe presses to reduce our energy needs. 'Coal combustion was stopped in June 2024, regular operation commenced in October 2024,' says Felsch."

Solid refuse-derived fuel (RDF) boiler

LECTA

Project description

Lecta has invested in a refuse-derived fuel (RDF) boiler at its Condat paper mill in France, operational since September 2024. This was a great energy transformation project offering multiple environmental and economic benefits, in line with Lecta's sustainability goals.

By using locally-sourced RDF solid fuel with high biogenic content, the Condat mill aims to achieve three main reduction goals:

- CO_2 emissions, improving its environmental impact,
- fossil fuel consumption, developing circular economy practices,
- and waste landfilling, improving local circumstances.

The RDF boiler will reduce CO_2 emissions by 16.000 tonnes annually. The circular initiative collects waste with high biogenic content from local sources that cannot currently be recovered, reducing the volume of waste that would otherwise end up in landfills.

The new boiler will meet the mill's steam needs. Local authorities, Lecta's staff, and key suppliers had the opportunity to visit the RDF boiler; the project had been promoted internally and externally.

This kind of project can be triplicated in other regions or countries as it relies on sorted waste as fuel.

The implemented solution

This RDF boiler is a bed fluidised boiler of 32 MW thermal.

The key hurdles solved

- Acceptance by the neighbourhood,
- New legislation without industrial experience, which required discussion and negotiation on certain aspects,
- Fuel supply: we developed and implemented a multi-supplier strategy.

Key suppliers / partners

Main suppliers are:

- VALMET Technologies: boiler, flue gas treatement.
- SERA Bois: unloading, conveying, fuel storage.
- E'NERGYS: engineering.

Main partners are:

- ADEME: subsidies and support.
- KYOTHERM: financing partner.
- DREAL: environmental authority.

The Project's Achievements:

- **Investment**
  56 million euros.
- **CO_2 emissions saved**
  16,000 tonnes CO_2 per year.
- **Any other sustainable benefits**
  This project allows the avoidance of 50,000 tonnes of ash going to landfill each year. One part of the ash will be used as materials for road construction (avoiding the utilisation of natural gravels).

Mathieu Introvigne

Project Manager Lecta

"The exceptional thing about this project is the simultaneous impact on several environmental and societal goals: CO_2 emissions reduction, development of circular and local economy, reduction of our dependency on fossil fuels, reduction of waste landfill.

This project could be a success model in the future if it is included in a global plan of decarbonisation. It requires good collaboration with local governments and a coordinated fuel supply plan.

The RDF boiler is a major step for LECTA on its path to achieve environmental goals."

Wind Energy through Power Purchase Agreement (PPA)

Lenzing
Innovative by nature

Project description

Driven by the need for sustainable energy and Lenzing Group's commitment to reducing carbon emissions, this project aims to secure a long-term, stable, and eco-friendly electricity supply while reducing fossil fuel dependency. The primary objective was to integrate renewable wind energy into Lenzing's operations as a part of its decarbonisation strategy. The project will provide approximately 13 MW of renewable wind power to the Upper Austrian site, meeting the annual electricity needs of 10.000 average Austrian households.

The project supports Lenzing's sustainability goals, enhancing operational resilience and environmental impact, and serving as a model for similar projects in other regions.

The implemented solution

This project is aligned with Lenzing's sustainability goals. The company signed a 15-year supply contract with WLK energy for 13 MW of wind power generated by the new wind farm in Engelhartstetten, which has 11 turbines and a total capacity of 45 MW. This integration of renewable wind power into Lenzing's energy mix reduces reliance on global energy markets and complements existing solar and biomass initiatives.

The key hurdles solved

Key non-technological challenges included securing permits, aligning with legislation, and ensuring infrastructure readiness. Close collaboration with authorities and partners during the preparation phase, including planning and permitting, led to a successful, groundbreaking start in November 2023. Addressing these challenges strengthened stakeholder relationships and improved project execution, offering insights for future renewable projects.

Key suppliers / partners

WLK energy (electricity supplier and wind farm operator).

The Project's Achievements:

- **Investment**
  The total cost of the wind farm in Engelhartstetten is approximately 90 million euros. A substantial share of this investment is financed by the European Investment Bank in collaboration with Erste Bank Austria. Lenzing will secure a Power Purchase Agreement (PPA) for 13 MW of the wind farm's total installed capacity of 45 MW.

- **CO_2 emissions saved**
  The project supports the transformation of energy production in Austria and promotes electricity generation from renewable energy sources.

- **Any other sustainable benefits**
  - Reduced dependency on fossil fuels.
  - Stable and diversified energy supply.
  - Long-term cost stability in energy procurement.

Christian Skilich
Member of the Management Board of Lenzing Group

"The Engelhartstetten wind farm represents a significant step towards decarbonising our operations. This project not only reduces our carbon footprint but enhances our energy independence. It perfectly complements our broader sustainability strategy and sets a benchmark for future renewable energy projects."

Recovering energy and upcycling of calcium carbonate from paper sludge

essity

Co-funded by the European Union

Project description

A new demonstration plant, designed, built and operated by Alucha and located next to Essity's paper mill, will convert paper sludge into Circular Calcium Carbonate (CCC), pyrolysis oil, and gas. The pyrolysis oil will be reused at the mill, and the pyrolysis gas will fuel the process itself. New value chains for using CCC will be created, driving a breakthrough in circularity across diverse European industries. Eventually, CCC can also be used in the paper industry, thus closing the loop.

The large-scale demonstration is crucial for scaling and replicating this approach across Europe and consists of:
- Mine2.1: 7.000 tonnes per year of CCC are obtained from treating 19.700 tonnes of paper sludge per year,
- Mine2.2: adding a 2nd line brings the total capacity to 14.000 tonnes of CCC per year from 39.4 kilotonnes per year of paper sludge.

The implemented solution

The pyrolysis oil will serve as a biofuel for both the plant itself and Essity's facilities. CCC has been successfully tested by companies such as AkzoNobel, Bostik and DYKA, which approved its use in paint, coatings, adhesives, sealants and plastics. Alucha won AkzoNobel's "Paint the Future Award" for circularity.

The key hurdles solved

The project has faced several regulatory barriers: compliance with environmental, waste management, product safety and standards, health and safety, and energy regulations.

The following progress has been made:
- CCC already has REACH status, minimising regulatory risks,
- All necessary permits for construction and operation are secured,
- Local power supply issue for the new facility resolved by Essity Cuijk and Alucha, in collaboration with the regulatory authorities,
- The project will continue to work closely with authorities to proactively ensure ongoing full compliance during development and implementation of waste-to-resource technology.

Key suppliers / partners

The consortium partners possess all areas of expertise to make this demonstration project and its future roll-out a success:
- Essity is the owner of the waste stream,
- Alucha owns and operates the technology to turn it into valuable circular products,
- Grolman Group has the contacts and infrastructure to market CCC internationally.

The Project's Achievements:

- **Investment**
  The applied subsidy project and activities have a budget of over 17.7 million euros with an EU contribution of almost 7 million euros from the EU LIFE environmental programme (circular economy related).

- **CO_2 emissions saved**
  4.300 tonnes of CO_2 per year.

- **Any other sustainable benefits**
  - 19.700 tonnes per year less paper sludge waste at Essity's paper mill in Cuijk,
  - 7.000 tonnes per year CCC recovery,
  - 2.000 tonnes per year pyrolysis oil production,
  - 5230 MWh less energy usage from fossil fuels at Essity's paper mill in Cuijk.

  Substantially improved environmental performance due to:
  - Upgrading waste into a valuable resource instead of incineration or landfill,
  - Higher energy recovery of pyrolysis oil vs incineration,
  - Less mining and landscape degradation in the EU,
  - Less transport of mined calcium carbonate (GCC) and paper sludge waste in the EU.

Ronald Knol
Plant Manager of Essity Cuijk

"Essity has many worldwide production locations and I am proud that we in Cuijk are part of these unique ones in collaboration with Alucha and Grolman Group. This project offers great potential to make our waste processing more sustainable and thus contribute to the sustainability goals of Essity worldwide."

Muoto™ packaging from wood

Metsä

Project description

Plastic is the most widely used material in food packaging, typically, based on fossil raw materials. Recycling plastic packaging, especially with its composite structure, is often challenging, resulting in only a small portion being recycled globally. The takeaway sector heavily relies on bagasse-based packaging, mainly imported from Asia to the EU. These factors create opportunities for new packaging solutions. This is why Metsä Group, in partnership with Valmet, started developing a new wood-based packaging solution. At the heart of the ongoing project is a demo plant in Äänekoski, Finland, which opened in May 2022.

The implemented solution

Muoto™ products are made from renewable wood fibres using an innovative manufacturing technology, allowing multi-layered, lightweight, yet sturdy packaging. The products are directly three-dimensional, free from harmful chemicals, such as PFAS, making them suitable for food packaging. The manufacturing method is resource-efficient, modular and fully automated. Muoto™ products are directly finished and do not require further processing down the supply chain, ready for delivery to the end-users. After use, they can be recycled alongside cardboard.

The drying method is efficient, and the products are of high quality and have a smooth surface. Production can be integrated to the unit producing the pulp(s).

The key hurdles solved

- Securing freedom-to-operate remains an ongoing task, including during the demo phase.
- An important area is finding a business model that is competitive on a global market, considering similar materials produced outside the EU and imported to the region.
- The project is still in the demo phase. Many non-technological hurdles, such as environmental permits, are not yet relevant.

Key suppliers / partners

Whereas Muoto™ is a Metsä Spring (Metsä Group) product, the ground-breaking manufacturing technology is an outcome of close collaboration between Metsä Spring and Valmet.

The Project's Achievements:

- **Investment**
  So far, Metsä Group and main partner Valmet have invested over 20 million euros in the project. Business Finland has supported the project with grant funding.

- **CO_2 emissions saved**
  Muoto™ products are made from pulp from Metsä Group's Äänekoski bioproduct mill. It has fossil CO_2-eq emissions per tonne, approx. 30% lower than the average European pulp mill. All chemicals and additives are assessed for suitability for food contact and compliance with the relevant regulations and recommendations (see Sustainability on muoto.io).

- **Any other sustainable benefits**
  The Muoto™ concept has other sustainability benefits:
  - Muoto™ is made for purpose. Our wood-based products can replace fossil-based or sugarcane-based packaging alternatives in selective applications, in align with our product development and product performance.
  - Uncoated Muoto™ products are easy to recycle and are biodegradable, if recycling them is not possible.

Jarkko Tuominen
Vice President, Projects, Metsä Spring

"Packaging of goods is a huge business area that continues to grow and evolve. A large proportion of consumer and food packaging is made of plastic, which typically relies on fossil raw materials and is often imported from outside the EU. Moulded fibre products offer an alternative to these, and we have further developed and improved this technology.

The production of Muoto™ packaging products is integrated in a pulp-producing mill, which offers many benefits: carbon dioxide emissions, per tonne of Muoto™ product, are low, Muoto™ can be recycled and is rigid but still lightweight, which improves raw material efficiency and reduces transport emissions.

Developing a new product is inspiring and, in doing so, we have found top professionals for our team and as our partners."

Reducing natural gas use with a new Waste to Energy Boiler

Norske Skog Bruck

Project description

Norske Skog operates two paper machines at the Bruck mill in Austria, producing publication and packaging paper. Two recent projects, completed between 2020 and 2023, are key for the mill's future production. Paper machine 3 was converted into the production of packaging paper, and the new Waste to Energy (WTE) boiler K9 reduces fossil fuel use.

The projects are closely connected. Paper rejects from recovered paper and biogas from anaerobic treatment fuel the WTE boiler. The WTE boiler is now the main steam source for the mill, reducing natural gas use in the combined cycle power plant by 75%.

The implemented solution

The 50 MW bubbling fluidised bed (BFB) boiler was chosen for its 40 years' experience in mill residues such as bark and sludge. It is the optimal solution for low-heating-value fuels such as paper rejects. The boiler is designed for the incineration of paper rejects, refuse derived fuels (RDF) and sludge. The full integration into the existing mill infrastructure (feedwater, steam turbine, power connection) helps to minimise the investment cost. However, it also added complexity to the project due to the limited space, with the installation being carried out during the mill's full operation.

A state-of-the-art flue gas cleaning system includes cyclones for ash removal, dry cleaning with activated carbon and hydrated lime, flue gas condensation for heat recovery and a catalyst for NOx-reduction, ensuring low emissions. The flue gas condensation provides up to 10 MW for process water heating and district heating applications.

The key hurdles solved

The permitting process, including an environmental impact study, took three years. Integrating the new project into an industrial site with a long history of production posed challenges, especially as the pandemic started just after the main boiler contract had been signed. Nevertheless, the project was completed on time and within budget.

Gas condensation provides up to 10 MW for process water heating and district heating applications.

Key suppliers / partners

- The mill itself – the project management.
- Valmet – the main supplier for the complete boiler delivery.
- Locally – the scope of the fuel storage, supply and the integration into the mill infrastructure.

The Project's Achievements:

- **Investment**
  75 million euros.

- **CO_2 emissions saved**
  150.000 tonnes of CO_2 per year.

- **Any other sustainable benefits**
  The project is a brown field installation at the existing industrial site, there is no new land use. The flue gas cleaning system has no wastewater. The boiler can use the biogas from the anaerobic treatment directly without further gas cleaning. All rejects from the paper mill can be used as fuel in the boiler. 50% of the boiler ash is recycled further.

Enzo Zadra
Managing Director

"The project reached all its goals and was carried out according to the time schedule and within the planned budget. We significantly reduced our carbon footprint and made a huge step towards becoming less dependent on fossil fuels and can now deliver more district heating to the local communities.

The project began at the start of the Covid-19 pandemic and the start-up was during the turmoil of the energy markets due to the war in Ukraine. The local project team managed all those difficulties in a perfect way."

BioFit project: adapting infrastructure to scale renewable energy

sappi | gratkorn mill

Project description

Sappi has made significant progress in decarbonisation and climate action, including the complete modernisation of Boiler 11 at its Gratkorn mill in 2022, transitioning from coal to multi-fuel (natural gas and biomass). The new investment at Gratkorn further reduces fossil fuel use and related carbon emissions by modernising infrastructure for efficient biomass use and large-scale logistics.

The BioFit project establishes the infrastructure for increased biomass delivery handling, sorting and processing. This includes decentralising intermediate storage terminals within the surrounding regions and improving the biomass handling system at the mill. BioFit aims to supply approximately 300.000 tonnes of biomass per year, with 50% being delivered by truck and 50% by rail.

The project will cut fossil emissions by an additional 100.000 tonnes per year which, combined with the boiler modernisation, will enable an estimated 55% reduction in emissions compared to 2020.

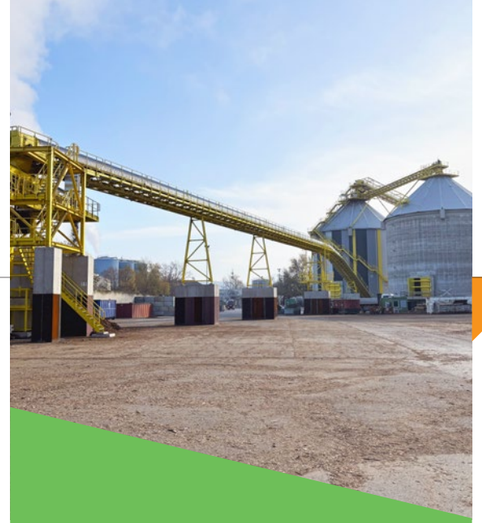
The project offers a scalable model for mills in other regions or countries transitioning from coal to biomass, focusing on:
- Adapting local infrastructure for biomass logistics,
- Partnering with regional storage and transport providers,
- Leveraging EU or local funding for decarbonisation projects.

The implemented solution

The BioFit project is split into two parts:
- **Step 1** focused on biomass handling at the plant, including the construction of two 10.000m³ storage silos (completed), an open storage area of 5.000m² (underway), and conveyor belts to move the biomass (underway).
- **Step 2** involves the development of railway infrastructure, reducing scope 3 transport emissions, to deliver the biomass to the plant (completed), unloading trucks, a terminal, a photovoltaic system and an additional silo for biomass storage (underway).

Key suppliers / partners

- FMW, a mechanical equipment supplier, helped in the development of a general technical solution.
- Granit, a local company, delivered civil construction.
- Elin and Siemens, long-term partners, delivered the electric and automation components and did the installation.
- Papierholz Austria PHA, thanks to a long-term cooperation, sourced the biomass on the market.



The Project's Achievements:

- **Investment**
  About 40 million euros, with partial EU funding from "Transform the Economy – shift to renewable energy/ away from fossil fuel".
- **CO_2 emissions saved**
  The BioFit project will deliver an estimated reduction of 100.000 tonnes of CO_2 per year. Combined with the emission reduction impacts of the modernised boiler in 2022, a total 230.000 tonnes CO_2 per year emission reduction (55% reduction in emissions compared to 2020) is anticipated once the projects are complete.
- **Any other sustainable benefits**
  Benefits also extend to the mill through improved energy sustainability and reduced long-term operational costs, and to the local communities through positive environmental impact and potential job creation in biomass logistics and infrastructure development.

Wolfgang Fuchs
Manager Pulp Mill & Utilities, Sappi Gratkorn Mill

"In my view, addressing the challenge of climate change requires a unique mix of commitment, innovation, and scale. This project plays a critical role in further scaling up the share of renewables powering our mill. It helps to achieve even more CO_2 savings thanks to our Boiler 11 modernisation, and strengthens the reliability and stability of our energy system for the future. It serves as a scalable model for industrial decarbonisation and is a critical step in Sappi's roadmap to achieve decarbonisation goals."

Demand-side flexibility with an e-boiler and CHP unit

sappi | maastricht mill

Project description

The novel combination of a new e-boiler and an existing highly flexible combined heat and power (CHP) allows the mill to switch between renewable electricity and natural gas to produce steam. The old gas-fired backup boiler was replaced by the e-boiler, which, alongside the CHP, provides the *automated frequency restoration reserve (aFRR)* balancing service to the transmission system operator (TSO).

The project is replicable. Many other e-boilers are being built in the Netherlands and beyond, and CHP units are being refurbished for greater flexibility. As a balancing service provider (BSP) for aFRR, Sappi Maastricht helps other companies valorise their flexibility and shares knowledge.

The project was promoted internally, winning the global Technical Innovation Award, and externally, with extensive media coverage. The case was also presented at several energy-related events.

The implemented solution

The initial goal was to achieve 40 MW of flexible capacity (20 MW from the e-boiler and 20 MW from the CHP). However, during the start-up year, the flexible capacity reached 68 MW thanks to the addition of the CHP steam turbine and enhancing the gas turbine's flexibility. This led to significant financial savings, CO_2 reduction, and a large contribution to the grid stability, supporting the Netherlands' energy transition. Later, the mill also started providing congestion management to the distribution system operator (DSO), securing a first-of-its-kind contract.

The start-up of a second e-boiler is scheduled at the end of 2025.

The key hurdles solved

- A national subsidy was acquired for the e-boiler (SDE++, a contract for difference - CFD).
- Permits obtained for e-boiler construction.
- Increased contracted transport capacity for grid connection.
- The mill became a BSP for the delivery of aFRR.
- Provides congestion management for the Dutch DSO with a first-of-its-kind contract (can be used for other flexible assets).
- Optimised bidding strategies, generating additional income and reducing CO_2 emissions.

Key suppliers / partners

- "Eco steam and heating" was a turnkey supplier of the e-boiler project.
- "Parat Halvorsen" is the supplier of the e-boiler.
- The grid is balanced for the TSO TenneT.
- Congestion management was delivered for the DSO Enexis.

The Project's Achievements:

- **Investment**
  6.5 million euros.
- **CO_2 emissions saved**
  22.000 tonnes CO_2 per year.
- **Any other sustainable benefits**
  Grid balancing and congestion management.

Joep Berghs
Coordinator Energy & Environment

"Sappi Maastricht plays a pioneering role in the energy transition as the first production company in the Netherlands to provide a specific balancing service (aFRR) to TenneT using an e-boiler. This e-boiler balances the electricity grid and electrifies our steam demand, significantly reducing natural gas use and enhancing our site's sustainability. We also utilise the e-boiler to manage grid congestion effectively, thereby freeing up local grid capacity to better serve households and businesses. By combining innovation with sustainability, Sappi Maastricht benefits both its operations and the wider community, driving progress in the energy transition."

Wind power investment increases access to renewable energy

SCA

Project description

Wind power, as a renewable and one of the most environmentally friendly choices, plays a key role in combatting climate change.

SCA is investing 1.7 billion SEK in the Fasikan wind farm, located on SCA's forest land in Bräcke municipality, Jämtland county. The wind farm will consist of 15 turbines, generating a total of 105 MW, with an estimated annual production of 333 GWh, enough to power approximately 15.000 average households.

As Europe's largest private forest owner, SCA has many areas of land with favorable wind conditions. SCA leases land for wind power development and also builds wind farms on its own forest land. Currently, about 20% of Sweden's total wind power production capacity is on SCA land.

Each TWh of new wind power in Sweden reduces greenhouse gas emissions by decreasing the need for electricity from sources such as coal and gas power in Central Europe. The European residual mix emits about 0.6 kilogrammes of CO_2 per kWh, meaning that the Fasikan wind farm will reduce CO_2 emissions by approximately 200.000 tonnes per year.

The implemented solution

Construction began in November 2023, the turbine foundations have been case, and the turbine components will be delivered in the spring. All roads and internal power grids are finished. The wind farm is expected to be operational by the end of 2025 or early 2026. This project will help SCA become self-sufficient in electricity.

The key hurdles solved

- **The social perspective** – people: Early local dialogue and formal consultations with residents, businesses, and associations.
- **The ecological perspective** – nature and wildlife: Multiple inventories and studies, with adjustments made before the application is submitted.
- **The economic perspective** – calculations: Measurements were carried out over two years, and production was calculated based on normalized average wind speeds over 30 years.

Key suppliers / partners

- Nordex
- Arise AB
- Stenger & Ibsen Construction Sverige AB
- Linjemontage
- Siemens Energy
- Kolektor

The Project's Achievements:

- **Investment**
  1.7 billion SEK.
- **CO_2 emissions saved**
  200.000 tonnes CO_2 per year.

Milan Kolar
Operations Manager Wind Power

"It takes significant amounts of new, fossil-free electricity to enable the green transition. By developing new wind farms on SCA land with favourable wind conditions, leasing the land to the wind farm owners and keeping selected wind farms to secure our own supply, SCA contributes to securing the energy supply needed for the green transition. To develop sufficient fossil-free electricity production, permitting processes must speed up and more projects must be granted approval. SCA believes local incentives for wind power are essential. Currently, there is no legal right to compensation for nearby residents but SCA engages with political decision makers and business associations to accomplish such legislation or voluntary business agreements."

Innovative bio-syngas generation plant

Sofidel
CLEAN LIVING

Project description

Sofidel, in collaboration with Meva Energy, has installed an innovative plant at its Kisa site in Sweden to directly supply two burners in tissue machines with renewable bio-syngas produced from biomass (wood residues). This project support's Sofidel's target to reduce emissions by 40% by 2030.

It also pioneers the use of a compact, efficient reactor for bio-syngas production, a simpler option for CO_2 reduction (scope 1) compared to other technologies. The project aims to demonstrate this potential to energy stakeholders, including governments.

Construction at the Kisa site was completed at the end of 2022, and commercial operation begun in Q3 of 2023.

The implemented solution

The gasification unit produces 32 GWh of renewable bio-syngas annually (at full speed), with a generation capacity of 4.2 MW, reducing CO_2 emissions by 8.500 tonnes per year, compared to the previous carbon footprint generated by the consumption of liquefied petroleum gas (LPG). The bio-syngas is supplied to the burners of two paper machines installed at the Kisa site.

The existing drying system was modified with new dual-fuel burners, capable of using both LPG and renewable syngas, ensuring stable gas supply with minimal variation. This on-site generation, combined with the need for no syngas refining, is the basis for reaching a high conversion efficiency as well as achieving high levels of CO_2 emission reductions.

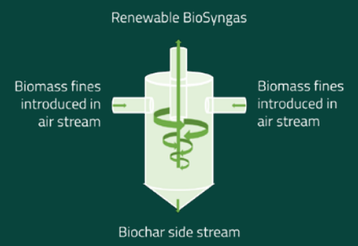
The system has been proven effective in drying tissue with renewable syngas without affecting the product quality, with seamless burner interaction between bio-syngas and LPG. The gasification system is currently being optimised through AI tools to further enhance productivity and efficiency.

The key hurdles solved

Due to the innovative nature of this plant, the permitting process took time to finalise, and some bottlenecks are still being addressed in order to automate the process.

Key suppliers / partners

- Meva Energy, a Swedish company, developed the gasification technology,
- Sofidel, Meva Energy along with the Department of Energy of University of Pisa (UniPi) carried out studies related to the utilisation of low-calorific renewable gas for tissue drying.



The Project's Achievements:

- **CO_2 emissions saved**
  8.500 tonnes CO_2 per year.
- **Any other sustainable benefits**
  Alongside bio-syngas, the Kisa plant is producing biochar (a residue, made of carbon and ashes, remaining after the pyrolysis of biomass) that can be used as a carbon sink, as well as having commercial value for use in soil improvement and animal feed.

Davide Mainardi
Chief Technical Officer, Sofidel Group

"At Sofidel we believe in building an inclusive and sustainable future and, in our commitment to minimise our impacts on natural capital and encourage the transition to a low-carbon economy, are increasingly focusing on renewable energy. The renewable gas supply agreement signed with Meva Energy will help Sofidel to achieve its 2030 emission reduction targets that have been approved by the Science Based Targets initiative (SBTi) as being consistent with the reductions needed to limit global warming to well below 2°C under the Paris Agreement."

Replacing diesel forklifts with electric forklifts

Solidus

Project description

As part of Solidus San Andrés' strong commitment to environmental sustainability, the company developed a decarbonisation plan aimed at reducing fossil fuel consumption. One of the first steps of this journey was to eliminate diesel usage within the mill.

After evaluating available technologies, Solidus San Andrés identified the feasibility of operating electric forklifts 24/7. Other factories within the Solidus Group and across the pulp and paper industry have already implemented electric forklifts successfully, providing a proven path ahead.

The implemented solution

Diesel forklifts with lithium battery electric forklifts. A key challenge was the mill's limited space, which made traditional battery-swap forklifts impractical. However, advances in fast-charging lithium battery technology provided an effective solution, allowing us to transition to electric forklifts without operational disruptions.

By adopting this innovative approach, the mill has taken a crucial step towards reducing emissions and enhancing sustainability within our operations.

The key hurdles solved

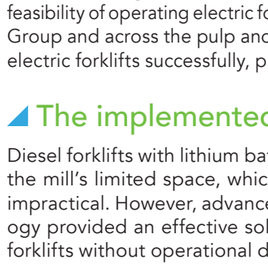
There were no obstacles. The extra electricity consumption is covered by the current contract. The proposal and supplier selection phase took us almost a year.

Key suppliers / partners

Reybesa

The Project's Achievements:

- **Investment**
  228.000 euros.
- **CO_2 emissions saved**
  154 tonnes CO_2 avoided per year.
- **Any other sustainable benefits**
  Noise reduction, improved air quality in the mill.



Rafael Lacasa Cebollero

Mill Manager

"We are strongly committed to improving the environment hence our decarbonisation plan. One of the first steps was to remove the mill's gasoil consumption. We studied the current technology and saw that it is possible to have electric forklifts running 24/7.

As diesel consumption is not a process aspect but an auxiliary one, we tried to eliminate it as soon as possible.

Other factories in the Solidus group and the pulp and paper sector already have this equipment in operation but we were faced with some challenges: Due to a lack of space in the mill the option of forklifts with the battery replaced was not viable. With the new fast-charging lithium battery technology we were able to solve this issue."

Replacing fossil fuels with renewable bioenergy

StoraEnso

Project description

Stora Enso is investing 30 million euros in the Heinola fluting mill to cut greenhouse gas emissions by over 90% (equivalent to 113,000 tonnes of CO_2 annually) by replacing fossil fuels with renewable bioenergy. The investment will be completed during the autumn 2025 shutdown.

The Heinola fluting mill produces high-quality fluting, which is the intermediate cardboard needed for corrugated board, mainly for export. Most of its wood is obtained from private forest owners in the surrounding area.

The investment supports the company's environmental goal to halve its operational greenhouse gas emissions by 2030. The Heinola fluting mill supplies 95% of Heinola's district heating required by the residents. Our investment supports Heinola's climate-positive goals.

The implemented solution

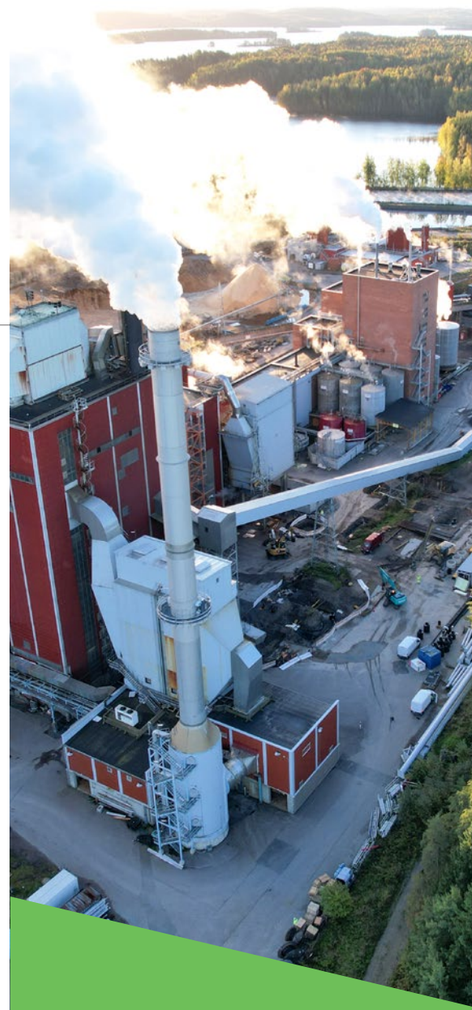
This investment modernises the bubbling fluidised bed (BFB) boiler, adjusting its operation to maximise biomass fuel use. Sumitomo will supply boiler pressure frame components, new blowers, and the bottom ash removal system. The investment will also improve the fuel reception, supplied by Raumaster, conveyor systems and silo.

Once completed, our Nordic Semi-Chemical Fluting will have the lowest carbon footprint on the market.

Key suppliers / partners

Sumitomo provides the parts for the boiler pressure frame and is responsible for the new blowers and the bottom ash removal system.

Raumaster supplied the fuel handling equipment.



The Project's Achievements:

- **Investment**
  30 million euros.
- **CO_2 emissions saved**
  113.000 tonnes CO_2 per year.
- **Any other sustainable benefits**
  Provides 95% of heating needed by Heinola district residents.

Eija Liikola

Project Manager

"The investment is one of the most significant in the mill's history, aiming at sustainable development and efficient biofuel utilisation. Once achieved, it will be possible to replace the remaining fossil fuels used for the mill's energy source with renewable bioenergy, reducing greenhouse gas emissions by over 90%.

This is my largest project and interesting to lead a project of this scale from procurement to implementation. The work is on schedule but there is still much to do. Equipment installations will begin in the spring and conclude during the autumn 2025 shutdown. Safety is the most important aspect and is upheld daily. Good collaboration among stakeholders is a prerequisite for a successful project."

SPAjax – New Recovery Boiler

BILLERUD

Project description

The SPAjax investment was made mainly because the existing recovery boiler had reached its technical lifetime and no longer met new environmental requirements.

The new recovery boiler commissioned in August 2023 also creates new opportunities for future capacity increases at the Frövi pulp mill.

All performance objectives were met:

- A recovery boiler with a maximum continuous dry solids flow of 1.670 tonnes per day.
- A black liquor concentrator achieving firing conditions with 81% dry solids.
- All process equipment is highly available and fulfils environmental demands.
- Collecting all weak gases from the fibre line and burning them in the new recovery boiler.
- No temperature increase of the effluent.
- Bio-oil as starting and support fuel.

The implemented solution

- To meet modern environmental standards, black liquor is burned at high concentration (81% dry solids) with well-staggered combustion and efficient flue gas cleaning.
- Strong gases, methanol and prioritised weak gases from the pulp mill are collected and burnt in the recovery boiler, improving the odour situation surrounding the mill.
- A steam centre with reduction stations producing at various pressure levels was installed, to prepare for a potential future turbine.
- The secondary heating system was upgraded, including a cooling tower with a capacity of 24 MW and air coolers for 65°C and 85°C water to meet discharge temperatures.
- Pitch oil and Hydrotreated Vegetable Oil (HVO) are used for start-up and back-up oil burners.

The key hurdles solved

Ground preparations and rock blasting were carried out according to a tight schedule to finish the concrete base plate and foundations.

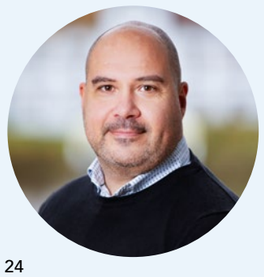
The recovery boiler building layout was largely defined before the contract was signed. This proved to be a success factor and of utmost importance, as Andritz had to start its design work immediately in order to provide the design weight for the concrete base plate.

Key suppliers / partners

Andritz

The Project's Achievements:

- **Investment**
  251 million euros.
- **CO_2 emissions saved**
  30.000 tonnes CO_2 per year.
- **Any other sustainable benefits**
  The modern technology of the new recovery boiler enables:
  - Reduced dust and SO_2 emissions,
  - Improved energy efficiency,
  - Improved flue gas purification,
  - Safer operational availability,
  - 65% reduction of smell,
  - Increased pulp production,
  - Zero-harm Occupational Health and Safety (OHS) governance.



Richard Morén
Mill Director

"The 2.6 billion SEK investment in a new recovery boiler in Frövi is strategic for Billerud but also for the Swedish industry and is part of the transition to a fossil-free and circular society where packaging is recyclable. The recovery boiler runs on fossil-free biofuel and will contribute to lower air emissions and improving resource and energy efficiency. Despite a challenging external environment, this important milestone has been achieved according to schedule. Collaboration and communication between the operations, the project, and suppliers have been crucial."

The new Biofibras de Galicia plant

ence
ENERGÍA & CELULOSA

Project description

Ence aims to meet the growing demand for tissue and packaging products in a sustainable, circular way. The new Biofibras de Galicia plant, located on the site of a former thermal power plant, will have a treatment capacity of 160.000 tonnes of recycled paper per year for the production of 100.000 tonnes per year of bleached recycled pulp with a high degree of whiteness, mainly used for the production of tissue paper.

This first plant in Europe to produce bleached recycled fibre from OCC offers multiple sustainability benefits, reducing greenhouse gas emissions, pressure on resources such as wood and water, and landfill waste.

The application of Ence's structured project management approach improves the quality, efficiency and overall success of the project.

The implemented solution

The project is based on three elements: innovation, the use of mature technologies and Ence's own know-how. The designed unit produces a high-quality bleached recycled fibre for any paper use, including the sanitary segment.

The shift from primary eucalyptus wood fibre to secondary OCC fibre involves a change from the Kraft process to a recycled fibre treatment including bleaching. The project also includes a pilot plant for the recycling of textile fibres through an innovative process.

The key hurdles solved

The project started in early 2023 and industrial activity will start in 2027. The Xunta de Galicia (regional government) declared the plant a strategic industrial project, as part of the philosophy of the Law of Administrative Simplification and Support for the Economic Reactivation of Galicia. This nomination cuts deadlines by half - except for applications and appeals - while maintaining technical, legal and environmental guarantees.

The challenges involved are not only technological, but include development of the required infrastructure for collecting and recovering the OCC raw material.

Key suppliers / partners

- Andritz, Valmet, Voith and Kadant
- Veolia
- AFRY

The Project's Achievements:

- **Investment**
  355 million euros.
- **CO_2 emissions saved**
  The project is estimated to reduce CO_2 emissions by up to 96% compared to a baseline scenario of 100.000 tonnes of virgin fibre production. This translates into a reduction of approximately 287.000 tonnes of CO_2 over the first 10 years of Biofibras' operations.
- **Any other sustainable benefits**
  Recovery of 180.000 tonnes per year of OCC currently destined for landfills or incinerators without energy recovery. Water consumption 15 times lower than in the virgin pulp manufacturing process.

Antonio Casal Lago
Cellulose Business Development Director

"The bioplant project in As Pontes is a clear example of transition and commitment to the circular economy. It not only allows us to enter the cardboard and paper recycling sector, but also to advance in the manufacture of innovative products such as bleached recycled pulp, a milestone in the market. Most notably, this project does not require new wood, and is sourced exclusively from recycled materials. Its focus on renewable energy and biofuels makes it a sustainable model, aligned with the objectives of decarbonisation and industrial revitalisation in Galicia."

Wheat straw factory in Mannheim

essity

Project description

Essity, a global leader in hygiene products, invested 40 million euros in a sustainable alternative fibre facility at its tissue manunfacturing plant in Mannheim, Germany, producing high quality hygiene tissue products from wheat straw. The new cellulose made from straw is as soft, tear-resistant and highly absorbent as conventional cellulose made from wood fibres. It is processed into hygiene products from the market-leading consumer brand Zewa. Water and energy use is reduced while the by-product is further refined into a substitute for oil-based chemicals. Globally, half of all straw goes unused. By using this agricultural by-product and making it into high-quality pulp, Essity becomes more circular and offers consumers a tissue product with less climate impact.

The implemented solution

The new straw pulp plant extends across several buildings, including a new 10,000 m^2 straw warehouse. Straw bales are sorted and cleaned before entering the plant. In the bleaching tower, the straw is split into component parts and then bleached. The pulp is cleaned in a historic building that has been creatively converted. From the pulp storage tower it is pumped in liquid form, through a supply pipe of up to 1 km, directly to the paper machine. The by-product lignin is concentrated in the evaporation plant.

The key hurdles solved

The construction of the new 'factory within a factory' required enormous efforts in terms of financesand personnel. A project team of 64 different companies and 1.300 employees worked on the construction/conversion of the existing premises. A total of 2.050 tonnes of steel and 15 km of pipelines were constructed. Many requirements for building permits and for the protection of historical monuments and fire protection had to be met. There was no 'blueprint' for the project because it was the first of its kind.

Key suppliers / partners

- Essity
- Andritz AG

The Project's Achievements:

- **Investment**
  40 million euros.
- **CO_2 emissions saved**
  20% compared to conventional paper production.
- **Any other sustainable benefits**
  Essity uses an exclusive technology to produce straw pulp which requires less energy and water than conventional pulp production. Essity's innovative straw pulp has a smaller environmental footprint of at least 20% than pulp made from wood or recycled fibres. Essity is the only tissue manufacturer in Europe able to reintroduce straw, a local agricultural by-product, into the material cycle.

Dr. Martin Wiens
Factory Manager

"The new plant for straw pulp strengthens the traditional Mannheim site and at the same time demonstrates a strong commitment to innovation. The company's long-standing expertise in pulp production has made it possible to start a completely new chapter: Essity is the first company in Europe to be able to produce an alternative pulp from straw. This pulp is just as soft, white and strong as the pulp made from pure wood fibres, which is used for hygiene products."

Hot Stuff: Decarbonisation of paper production at Koehler's Greiz mill

Koehler GROUP

Project description

In 2021, Koehler Group announced the ambitious decision to convert the power plant at Koehler Paper's Greiz mill from pulverised lignite to the more sustainable fuel wood fine dust. This conversion has significantly reduced the mill's CO_2 emissions and contributed to the climate action strategy. The rebuilt power plant has been operational since spring 2023.

The project's main goal was to save more than 24.000 tonnes of CO_2 emissions per year thanks to the conversion. The investment of around 8 million euros is part of the Koehler Group's sustainability strategy.

Greiz acted as a pilot, closing a gap in the market with an innovative process from Koehler Renewable Energy, where wood fine dust fraction is used as fuel in existing coal-fired power plants.

The conversion in Greiz was the first step to a more comprehensive decarbonisation strategy. Koehler intends to continue investing in the Thuringian mill in the future. In general, the Group has set itself the goal of generating more renewable energy with its own plants than is required for its own production by 2030.

The implemented solution

The expertise of our colleagues at Koehler Renewable Energy (also part of the Koehler Group) has successfully resulted in developing an innovative process that turns a normally rather unpopular waste material into a valuable fuel that can be used in existing coal-fired power plants. This is an innovation on the market.

The key hurdles solved

Technical hurdles included finding the best approach to process varying low-quality wood dust material into a more homogenous biofuel.

Key suppliers / partners

- Koehler Innovation & Technology
- Koehler Renewable Energy

The Project's Achievements:

- **Investment**
  About 8 million euros.
- **CO_2 emissions saved**
  24.000 tonnes of direct CO_2 emissions per year are expected.
- **Any other sustainable benefits**
  A reduction of sulphur emissions. A pilot of an innovative new process that can be carried out in other power plants.

Birgit Hagebölling
Corporate Director Technology & Operations at Koehler Renewable Energy

"Birgit Hagebölling reaches into the container labeled "Wood dust" and nods her head in satisfaction. Her gaze sweeps over the two new concrete silos that are connected to conveyor units. In the background you can hear the sound of the material being prepared in the cone mill, and there is a scent of freshly chopped wood in the air. The wood dust trickles through her fingers back into the container, fine as flour. It has taken the teams at Koehler Renewable Energy, Koehler Anlagentechnik, and Koehler Greiz seven years to work out how to replace lignite with a bio-based fuel at the power plant in Greiz. "We finally achieved our goal in 2024," reports the delighted engineer. "Since then, we have only been incinerating wood dust."

Making more with less: advanced recycled waste treatment for the next decades

LC Paper

Project description

LC Paper has a strategy to mitigate all impacts of papermaking, including energy supply, raw materials and logistics.

In 2017, it implemented a 4,6 megawatt peak on-site solar plant complemented with renewable electricity from the grid; a few years later biomass and biomethane boilers were installed to decarbonise low- and high-temperature process heat.

A special folding box board was developed to replace plastic shrink wrap for toilet roll retail packs. The virgin fibre raw materials originate exclusively from sustainably-managed forests with relevant certification.

The last big challenge was to recover high quality pulp from heterogeneous paper for recycling. LC Paper developed and implemented advanced processes to iteratively separate a variety of impurities (staples, clips, plastic windows in envelopes) and non-paper components (beverage cans, pieces of metal and plastic, organic waste). The very efficient and effective separation stages resulted in up to 18% more usable fibres for papermaking than the traditional processes.

The implemented solution

The process consists of several different advanced filters and material separators that iteratively classify the materials and sizes with a much higher degree of precision and fine tuning than equivalent classic processes, responding to the heterogeneous reality of recycled packaging versus the more homogeneous nature of copy and print paper, which was the main source of recycled paper some years ago.

The key hurdles solved

The lower consumption of post-consumer waste for the same amount of usable paper pulp is crucial considering the limited availability of paper for recycling. The advanced separation process facilitates further valorisation of the non-paper components, and increases their circularity. The project adapts to a changing social reality: we print less paper and we read less printed books and newspapers, but we use more cardboard packaging.

Key suppliers / partners

- Machinery: Hellenbrand (Germany), Parason (India)
- Engineering: in-house

The Project's Achievements:

- **Investment**
  5 million euros, co-funded by Next Generation European funds ("PERTE Circularidad" handled by the Ministry of Environmental Transition of Spain).
- **CO_2 emissions saved**
  610 kilotonnes CO_2 equivalent per year.
- **Any other sustainable benefits**
  Savings of raw material (less post-consumer recycled waste used for the same weight of produced paper) and better sorting of non-paper waste.

Sergi Alvarez
Technical Manager, LC Paper

"We achieve better sustainability practices on multiple fronts: firstly, a reduction of CO_2 emissions per tonne of paper due to the optimisation of the input weight to output weight ratio and the reduction in untreatable waste due to misclassifications. We also support an increased circularity: very degraded recycling mixes which could not be processed by any plant until now had to go to landfill, whereas now we will be able to raise that acceptance threshold thanks to the increased complexity of the technical solution we are implementing."

Kemi bioproduct mill

Metsä

Project description

Kemi bioproduct mill represents the highest energy, material and environmental performance in the world. It is a brownfield project located in Metsä Group's existing integrated mill (pulp and board operations) in the city of Kemi, Northern Finland.

The bioproduct mill produces pulp and other bioproducts. Its total annual capacity is 1,5 million tonnes of pulp replacing Metsä Fibre's old pulp mill which had a capacity of 610 000 t/y. The new and larger bioproduct mill enables a business ecosystem to be further developed.

The mill operates completely fossil free and has 250% electricity self-sufficiency.

The implemented solution

The core is based on a traditional but efficient pulp production process. It produces pulp (both softwood and hardwood), tall oil, turpentine, electricity and steam. In addition, it produces product gas out of bark, biopellets from effluent treatment sludge and sulphuric acid from strong odorous gases for the mill's own use. Any surplus bark and bio pellets are sold for external energy producers.

The low water consumption is achieved by efficient process water circulation and a closed cooling water system.

The key hurdles solved

During the pre-engineering phase, one of the main concerns of the local community was the impact of the heat load in the Bothnian Bay in front of the town of Kemi. This issue was solved by implementing a closed cooling water system with cooling towers.

During the COVID-19 epidemic, strict safety precaution measures were put into place at the construction site; at the peak, the headcount was 4.000 employees.

During and after the epidemic, the global cost inflation, constraints in supply chains and the war in Ukraine, had a major impact on the investment and availability of materials and workforce.

Key suppliers / partners

- Valmet Technologies
- ABB
- AFRY
- Fimpec

The Project's Achievements:

- **Investment**
  The total investment cost of the project was 2.02 million euros.
- **CO_2 emissions saved**
  Fossil CO_2 emissions saved 45 kilotonnes per year.
- **Any other sustainable benefits**
  Emission reductions to the watercourse:
  - Water use reduction 1735 000 m^3 per year,
  - COD reduction 4 610 tonnes per year,
  - BOD reduction 116 tonnes per year,
  - Phosphorous reduction 3 tonnes per year,
  - Nitrogen reduction 35 tonnes per year,
  - Suspended solids reduction 203 tonnes per year,
  - Reduction of waste to landfill 4.314 tonnes per year.

Pekka Kittilä
Kemi bioproduct mill manager

"Kemi bioproduct mill is the largest investment in the history of Finland's forest industry and the most efficient wood processing mill in the northern hemisphere. The environmentally-, energy- and material-efficient mill operates completely without fossil fuels. The mill produces 2.0 TWh of renewable electricity annually. The electricity self-sufficiency rate is 250% and the surplus electricity is delivered to the national grid.

The mill has been built using the best available technology (BAT), e.g. wastewater treatment has been improved with a three-stage purification process and even though production is 2,5 times larger compared to the old mill, water usage is at most the same or lower".

Kuura™ textile fibre from paper-grade pulp

Metsä

Project description

The aim of this project is to develop and demonstrate the feasibility of a new environmentally-friendly concept, in which paper-grade wood pulp is converted into a novel Kuura™ textile fibre (a lyocell staple fibre). The pulp is made by Metsä Group utilising Nordic spruce and pine, and the concept is based on integrating the textile fibre production to the entity making the pulp (i.e. to a bioproduct mill). The aim is to sustainably and efficiently increase the valorisation of pulp, and meet the growing demand for textile fibres by introducing to the market an alternative to, essentially, cotton fibres and other cellulosic fibres. The Kuura™ fibre is recyclable and Metsä Group can trace the main raw material all the way back to the original local forest.

At the heart of this ongoing project is a semi-industrial production plant (a demo plant) located in Äänekoski, Finland. The demo plant is integrated to Metsä Group's bioproduct mill and started up at the end of 2020.

The implemented solution

Kuura™ textile fibre has been researched and developed at the Äänekoski demo plant, among other places, since 2020. The technology used is essentially a modified direct dissolution method.

A pre-study (i.e. a conceptual design project) for a first possible commercial mill producing the Kuura™ textile fibre was completed at the end of 2024. In early 2025, the project moved into the so-called pre-engineering phase, which is estimated to last approx. 1.5 years.

The key hurdles solved

Our greenfield demo plant has enabled us to resolve several technological issues and led to a significant improvement in our market understanding.

Key suppliers / partners

The solution is a combination of many actors, including other companies, universities, research institutes and Metsä Group itself. Itochu Textile Company has been a main partner since 2014. Itochu is responsible for customer collaboration.

The Project's Achievements:

- **Investment**
  The demo phase investment is, so far, about 50 million euros. Part of the financing is a 16 million euro loan from Business Finland
- **CO_2 emissions saved**
  According to a Life Cycle Assessment completed in 2024, the CO_2 emissions of the new Kuura™ concept are significantly lower than those of cotton fibre or other man-made cellulosic fibres. The LCA work was published on metsaspring.com (see Portfolio and Textile fibre from paper-grade pulp) as of mid-February 2025.
- **Any other sustainable benefits**
  Kuura™ textile fibre is produced from softwood kraft pulp, that has a higher yield from wood than dissolving pulp, which is commonly used as raw material in the production of man-made cellulosic fibres such as lyocell and viscose fibres. The bioproduct mill in Äänekoski generates significant amounts of excess renewable energy, which is used to produce the Kuura™ fibre. This energy integration and circular symbiosis provides a product with a clear climate change mitigation potential compared to the use of existing commercial textile fibres.

Niklas von Weymarn
CEO Metsä Spring

"Metsä Group's innovation company Metsä Spring invests in and supports potential innovations and technologies that find new purposes and higher value for Nordic wood to replace fossil-based materials and chemicals in everyday products. We promote a culture of diversity, equality and inclusion.

To date, Metsä Spring has made six external start-up investments (Woodio, Innomost, Montinutra, Fiberwood, Adsorbi, and FineCell), and has launched three in-house development projects, Kuura™ textile fibre, Muoto packaging solutions and capture of biogenic CO_2."

40 years of progress in turning waste to value

SCA

Project description

For over 40 years, SCA and Adven have been turning waste into value through circular economy solutions. In Timrå, Sweden, SCA operates one of the world's largest production facilities for bleached softwood sulphate pulp, an energy-intensive process that generates significant amounts of excess heat. Instead of letting this energy go to waste, it is captured and converted into district heating, now meeting nearly 90% of Timrå's heating needs.

The implemented solution

When the collaboration started over 40 years ago, heat pumps were needed to increase the temperature of the residual heat. Over the years, the production processes have been streamlined to save energy and deliver higher-quality residual heat. When SCA's residual products gain economic value, demands for quality rise, and the company benefits from further streamlining its production processes. Today, the energy delivery to Adven is already at a high temperature and can be directly transmitted into the district heating network.

The key hurdles solved

By integrating residual heat into Adven's district heating network, the partnership has significantly reduced reliance on biofuels, lowered carbon emissions, and strengthened local energy security. Rather than competing for fuels, Adven and SCA have demonstrated how one can cut energy consumption and create more sustainable heat for society.

Beyond Timrå, this model is scalable. Any region with industrial operations and the right infrastructure can adopt it, making better use of local resources and turning excess energy into a shared asset for both industries and communities.

Key suppliers / partners

Adven

The Project's Achievements:

- **CO_2 emissions saved**
  18.000 tonnes CO_2 per year.
- **Any other sustainable benefits**
  By harnessing waste from pulp production, the process maximises raw material efficiency while reducing energy waste. Residual heat that would otherwise be lost is now repurposed for district heating, benefiting over 800 properties in the community. Through constant energy optimisation, SCA's system simultaneously generates green electricity equivalent to 1 TWh per year. This collaboration with the industry not only supports the transition to sustainable energy but contributes to resource optimisation, reduces dependence on biofuels, and enhances industrial efficiency.

Jens Olsson
Technical Director at SCA

"Collaborating with the surrounding community is important for us. In this case, it is about making the most of existing resources as the community can now be heated with energy sources we made available."

By upgrading residual heat from SCA's production into district heating, the partnership has created a solution that benefits both industry and society.

"The partnership results in an energy supply with very low emissions and minimal reliance on fossil fuels. It provides Timrå with a very green and clean energy supply."

Gothenburg Biorefinery

SCA

Project description

In April 2024, a biorefinery jointly owned by SCA and St1 was inaugurated in Gothenburg. The refinery produces large volumes of renewable fuel for vehicles and aviation. One important raw material is tall oil, supplied by several of SCA's kraftliner and pulp mills. This is one of many examples of how SCA processes their by-products, strives towards a fossil-free world, and maximises the value of every part of a tree.

When fully operational, the refinery will produce around 200,000 tonnes of renewable fuel annually. This is estimated to create an annual climate benefit of approximately 500,000 tonnes of carbon dioxide equivalents. SCA's share in the facility is 25%.

Biofuels made from sustainable raw materials play a key role in the climate transition, and the biorefinery will produce both sustainable aviation fuel (SAF) and biodiesel (HVO).

The implemented solution

A biorefinery operates in essentially the same way as a refinery based on fossil crude oil. Raw materials for a biorefinery can be a wide range of different plant and animal fats and fatty acids. An important and suitable raw material is tall oil, a by-product from kraft pulp production. SCA's mills produce roughly 40–60 kilotonnes of tall oil per year, and this amount will be used entirely for biofuel production.

When tall oil is further refined into liquid biofuel, greenhouse gas emissions are reduced by more than 90% compared with fossil fuels.

The key hurdles solved

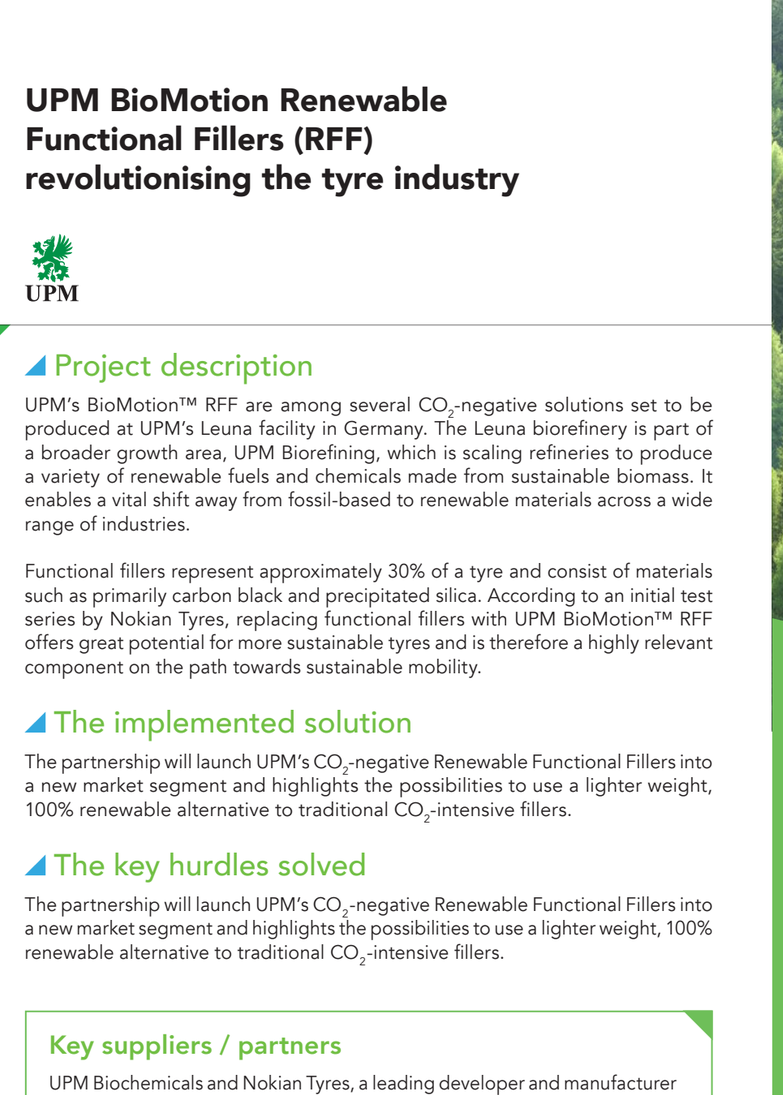
The inauguration of the biorefinery in Gothenburg marked the culmination of a long process where an idea and a vision were transformed into a state-of-the-art facility. The plant, built next to an operational refinery and during a pandemic, required 3,6 million working hours to complete.

Key suppliers / partners

- ST1, holds a 75% ownership share
- Honeywell UOP
- Alfa Laval
- Rodoverken
- Afry
- IREM
- Techimp Impianti
- West Pipe
- Veidekke
- VBK

The Project's Achievements:

- **Investment**
  4 billion SEK.
- **CO_2 emissions saved**
  500.000 tonnes CO_2 per year.



UPM BioMotion Renewable Functional Fillers (RFF) revolutionising the tyre industry

UPM

Project description

UPM's BioMotion™ RFF are among several CO_2-negative solutions set to be produced at UPM's Leuna facility in Germany. The Leuna biorefinery is part of a broader growth area, UPM Biorefining, which is scaling refineries to produce a variety of renewable fuels and chemicals made from sustainable biomass. It enables a vital shift away from fossil-based to renewable materials across a wide range of industries.

Functional fillers represent approximately 30% of a tyre and consist of materials such as primarily carbon black and precipitated silica. According to an initial test series by Nokian Tyres, replacing functional fillers with UPM BioMotion™ RFF offers great potential for more sustainable tyres and is therefore a highly relevant component on the path towards sustainable mobility.

The implemented solution

The partnership will launch UPM's CO_2-negative Renewable Functional Fillers into a new market segment and highlights the possibilities to use a lighter weight, 100% renewable alternative to traditional CO_2-intensive fillers.

The key hurdles solved

The partnership will launch UPM's CO_2-negative Renewable Functional Fillers into a new market segment and highlights the possibilities to use a lighter weight, 100% renewable alternative to traditional CO_2-intensive fillers.

Key suppliers / partners

UPM Biochemicals and Nokian Tyres, a leading developer and manufacturer of premium tyres, are set for an industry first with a concept tyre partly based on UPM BioMotion™ Renewable Functional Fillers (RFF).

The Project's Achievements:

- **Investment**
  The company is investing 1.180 million euros to build the world's first industrial scale biorefinery in Leuna, Germany, that will convert sustainably-sourced, certified hardwood into next generation biochemicals. UPM Biomotion™ RFF is one of the products that will be manufactured in the new factory.
- **Any other sustainable benefits**
  Replacing fossil-based functional fillers with UPM BioMotion™ RFF offers great potential for more sustainable tyres and is therefore a highly relevant component on the path towards sustainable mobility.

Mikael Källgren

President Renewable Energy at SCA

"The foundation of SCA's business is to maximise the value of every tree from our sustainably-managed forests. This includes continuously improving how we utilise by-products and waste streams to create valuable products for society's green transition.

The partnership with St1 enables us to create additional value and greater climate benefits from every tree by refining our tall oil. The inauguration of the Gothenburg biorefinery is a historic step for SCA, as it is the first facility where we produce renewable vehicle fuel.

A large number of countries have requirements for blending biofuels in vehicle and aviation fuel, and the demand is expected to exceed supply for the foreseeable future."

Michael Duetsch

Vice President Biochemicals at UPM

"Our partnership with Nokian Tyres marks the exciting entry of our Renewable Functional Fillers into the global tyre market. Successfully demonstrating their application value helps us to lay the groundwork for scaling our biorefinery business and enables us to make a significant contribution to the sustainable transformation of the mobility sector and beyond."

Hygiene Paper of the Future: Innovation through Recycled Cardboard

Project description

WEPA introduced an innovation in hygiene paper production by using post-consumer recycled cardboard as a raw material. WEPA demonstrates that premium-quality hygiene paper can be manufactured from recycled cardboard, offering significant benefits compared to virgin fibre products, including a reduced ecological footprint and the elimination of bleaching agents.

Traditionally, recovered paper sources, such as office paper, have been used, providing primarily white fibres suitable for a wide range of products. Recycled cardboard and corrugated board already contain frequently recycled beige fibres of lower quality. With its innovation WEPA moves further down the wood fibre cascade utilisation, maximising the potential of fibres before they reach the end of their life cycle.

To support the market launch of its sustainable beige products, WEPA initiated a business-to-consumer campaign called 'Beige is better'.

The implemented solution

The development of this new generation of raw material is the result of intensive research and development and a step by step upgrading of production plants. The transformation spans the entire production chain, from stock preparation with new sorting technologies, through optimised paper machine settings, to the final converting of tissue, without compromising product quality. The initial goal to match the quality standards of white recycled paper has been surpassed: the result is a hygiene paper that is not only sustainable but also significantly softer than conventional recycled paper.

The key hurdles solved

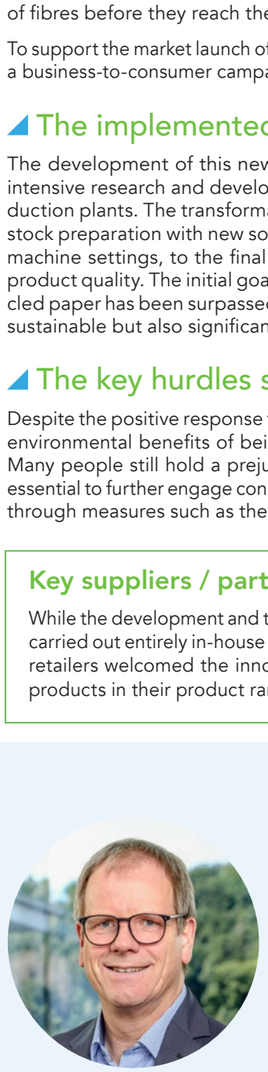
Despite the positive response from our partners, consumer awareness of the environmental benefits of beige recycled hygiene products is still limited. Many people still hold a prejudice against non-white paper. It is therefore essential to further engage consumers and raise acceptance of these products through measures such as the marketing campaign 'Beige is better'.

Key suppliers / partners

While the development and technical implementation of the project were carried out entirely in-house relying fully on internal resources, European retailers welcomed the innovation and have integrated WEPA's beige products in their product range.

The Project's Achievements:

- **Investment**
  WEPA has made significant multi-million investments to upgrade stock preparations across multiple sites, enabling a transition to the new raw material process. Additionally, extensive resources have been dedicated to intensive research and development work in order to optimise production processes. While substantial funds have already been invested, this transformation is ongoing and will continue over the coming years. In parallel, we invested in our nationwide marketing campaign 'Beige is better'.
- **CO_2 emissions saved**
  Our recycled fibres produced with renewable electricity can reduce CO_2 emissions by approximately 30% compared to the virgin fibres we use. This equates to about 110 kg CO_2eq per tonne of fibres.
- **Any other sustainable benefits**
  By using our recycled fibres, we reduce water consumption by 87% and energy use by 78% compared to our used fresh fibres. Utilising lower grade recovered paper enables local sourcing and helps protect biodiversity while reducing land use pressure.



Wolfgang Köster
Director Group Fibre Management, Germany

"This innovation reflects a strong commitment to recycling, resource efficiency, and circular economy. It is about the continuous improvement of recycling practices that are particularly well-suited for single-use products such as hygiene paper and contribute to a bio-based economy – an approach that requires widespread support. It is rewarding so see our beige hygiene products reaching customers across Europe and receiving such recognition within industry circles, including several prestigious awards. Being part of WEPA, a company so open to innovation, is incredibly motivating and reinforces the value of being part of a team that drives meaningful change."

TRANSPAC - Integration of a high-temperature heat pump in transcritical mode on an industrial dryer for De-inked Pulp

Project description

The TRANSPAC project integrates an innovative and efficient heat pump to decarbonise industrial hot air dryers. By combining a transcritical cycle with a refrigerant adapted to temperature needs, it reduces energy consumption and CO_2 emissions, addressing a major challenge.

The heat pump recovers heat from the pulp dryer air and uses it to preheat the new fresh air before it enters the dryer. A demonstration was carried out as part of a thesis hosted by ARMINES and co-funded by EDF (2012-2015). The 30 kW thermal model demonstrated a coefficient of performance (COP) of around 4 for the temperature lift from 50°C (heat source) to 120°C (final temperature need).

The TRANSPAC project sought to design, build, and implement a full-scale industrial transcritical heat pump on a paper pulp dryer at WEPA Greenfield in Château-Thierry.

To support the market launch of its sustainable beige products, WEPA initiated a business-to-consumer campaign called 'Beige is better'.

The implemented solution

The heat contained in the extracted vapours (80°C) from the dryer is recovered through a heat exchanger, which evaporates the refrigerant fluid contained in the heat pump at 65°C. The compressor, installed in an external container, raises the temperature of the fluid to 155°C, enabling the new fresh air in the same dryer to be heated to 130°C with a COP exceeding 3.5.

The expected COP was achieved: more than 3.5 for a temperature increase of 60°C to 80°C depending on the periods and the load of the paper pulp dryer, with a heat pump availability of 97% since 1 January 2024. Today, no other installation can achieve this level of performance.

The key hurdles solved

Installed in early 2023, the heat pump was assembled by Dalkia Froid Solutions and commissioned Dalkia on the cold and hot batteries for the drying process in April 2023 during the paper mill's shutdown.

Key suppliers / partners

Armines, EDF and Dalkia (including Dalkia Froid Solutions).

The Project's Achievements:

- **Investment**
  The overall investment was 1 million euros.
- **CO_2 emissions saved**
  More than 1.000 tonnes of CO_2 savings per year (more than 5.500 MWh of natural gas).
- **Any other sustainable benefits**
  The project's results are applicable across all industrial sectors, with particular relevance to the food and chemical industries, where energy consumption for drying operations is substantial. In France alone, there are 30 TWh from dryers of available waste heat alongside a simultaneous demand for hot air.

Bernhard Gross
Director Group Operational Excellence

"WEPA has a strong commitment to energy efficiency and the decarbonisation of fibre and paper production. By fostering innovative ideas and leveraging cutting-edge technologies, we continuously rethink processes and practices to develop smarter, more sustainable solutions. The Transpac project exemplifies our daily efforts to transform these ambitions into concrete achievements."

Laurent Bernault
Mill Manager, WEPA Greenfield in Château-Thierry

"The TRANSPAC project reflects our focus on optimising operational performance, enhancing quality, and ensuring greater equipment reliability while maintaining safety standards. We actively support environmental sustainability, creating long-term value for businesses through cost and resource savings."

Demo plant for developing new lignin products

Metsä

Project description

Metsä Group will construct a demo plant for lignin refining in connection with its Äänekoski bioproduct mill. Construction began in summer 2024, and will be completed in late 2025. The plant's daily capacity will be two tonnes of the lignin product.

Lignin is a substance in wood that binds wood fibres together. In pulp production, lignin is separated from the fibres into black liquor in the chemical cycle and used as bioenergy. Lignin could also be used in chemical and material applications.

Metsä Group aims to develop its mills according to the bioproduct mill concept. This means that the company will increasingly use the side streams of pulp mills to process wood into increasingly valuable bioproducts in a resource-efficient manner. The use of lignin as a raw material is one example of this. New products made from renewable natural resources can replace fossil-based raw materials and products.

The implemented solution

Lignin could be used in various chemical and material applications, for example to meet the future needs of the building and construction industry. In a pilot-scale EU project coordinated by VTT Technical Research Centre of Finland, Metsä Group, ANDRITZ and Dow have already demonstrated the suitability of modified lignin as a replacement for fossil-based chemicals in concrete production.

The key hurdles solved

The demo plant will be built at Metsä Group's mill area in Äänekoski, next to the bioproduct mill. As it is a demo plant, permits for pilot operations have been applied for. If an industrial-scale mill is built, it will require an update of the existing permits for the bioproduct mill.

Key suppliers / partners

- ANDRITZ
- Dow

The Project's Achievements:

- **Any other sustainable benefits**
  Wood is a renewable natural resource which can replace fossil-based raw materials and products. Efficient use of side streams in pulp production ensures the greatest possible added value.

Timi Hyppänen
SVP, business development, Metsä Fibre

"The aim is to create a product that can be used in many different ways, replacing fossil-based raw materials and products. It is also essential to refine the process so that it can be successfully integrated into a bioproduct mill. If everything goes smoothly, we will discover within a few years that we have a great product highly demanded in the market, suitable for different applications and that the process can be integrated into bioproduct mills without insurmountable problems. Certain uses for lignin have already been identified, and we are trying to find new uses that have not yet emerged. Customer feedback plays an important role in developing the product and finding its new uses."

Paper mill advances in sustainable and predictable energy

ARCTIC PAPER

Project description

Together with its energy partner Adven, Arctic Paper in Munkedal, Sweden, is transitioning the mill's energy supply from natural gas to a new solid fuel boiler, reducing costs and its climate footprint. Through several recent investments, the mill is now one of the world's most environmentally-advanced paper producers.

Through the partnership, Arctic Paper takes a major step forward in its sustainability efforts by enabling a shift away from natural gas and reducing the environmental impact of the mill's steam production. By converting recycled materials into energy, energy costs have been stabilised and reduced.

The implemented solution

In order to enable the energy transition, the mill partnered with Adven to design a tailored energy solution for the mill. The facility, inaugurated during spring 2024, is a 30 MW steam boiler. The key difference from the previous energy system is that it is fully powered by recycled fuels from recycled woods, paper spill and industries. This gives new life to waste that cannot be recycled or otherwise returned to the circular economy. The facility is also equipped with the best available flue gas cleaning technology to meet both current and future environmental regulations for emissions.

The key hurdles solved

Arctic Paper Munkedals has previously invested in expanding its own hydropower, which has contributed to the mill being one of Europe's most resource-efficient mills today. Several other environmental initiatives are also underway to take care of and improve biodiversity in the nearby river and nature.

Key suppliers / partners

The key supplier in this energy transition is Adven.

The Project's Achievements:

- **CO_2 emissions saved**
  30.000 tonnes CO_2 per year.
- **Any other sustainable benefits**
  This initiative not only reduces dependence on fossil fuels but lowers energy costs and enhances resource efficiency. The transition in Munkedal strengthens Arctic Paper's position as a leader in sustainable paper production. Furthermore, this project serves as a scalable model for other industries looking to begin their energy transition and have lower CO_2 emissions, while making the most of the existing recycled resources.

Michal Jarczyński
CEO of Arctic Paper S.A.

"Energy prices are volatile and there is a significant political risk for the future. This agreement ensures Arctic Paper Munkedal long-term competitiveness through lower, more stable and predictable energy costs, and will also strongly reduce our environmental footprint."

Participating companies

ALIER

ALIER is a Spanish company present in more than 25 countries across Europe, Africa and Asia. It specialises in the production of 100% recycled paper mainly for the manufacture of plaster board and plaster board liner, kraft bags and sacks. A different characteristic from other paper mills is the capacity to recycle paper that is difficult to treat, such as moisture-resistant, laminated or plasticised and liquid packaging.

Arctic Paper

Arctic Paper Group is a European company and a leading producer of high-quality graphical fine paper, bio-based packaging solutions, high-quality wood pulp, and energy, increasingly of non-fossil origin. The company is present with its own sales offices in Europe. Arctic Paper S.A. is listed on the Warsaw Stock Exchange and NASDAQ in Stockholm. The Group is the main owner of the listed Swedish pulp producer Rottneros AB.

Koehler Group

Founded in 1807, the family-run Koehler Group specialises in high-quality, specialty paper. The company, with 2,500 employees across five sites in Germany and three in the USA, operates internationally, achieving an export ratio of around 70% in 2023 and an annual revenue of 1.1 billion euros. Koehler Renewable Energy invests in renewable energy. Koehler Innovative Solutions collaborates with start-ups to promote innovations.

Lecta

Condat is part of the LECTA Group, a leading European group in the manufacture and distribution of special papers, and coated and uncoated paper. With an extensive international presence and a wide range of innovative products, LECTA is a leading global supplier of paper solutions. The CONDAT paper mill produces coated paper with a paper machine dedicated to specialty paper that started in 2021 (annual production capacity of 340.000 tonnes).

Lenzing

The Lenzing Group is a leading global producer of specialty fibres for the textile and nonwovens industries. Committed to innovation and sustainability, Lenzing pioneers eco-friendly solutions that support global efforts to combat climate change.

Essity

At Alucha we work towards a future where industrial minerals are no longer mined but indefinitely recycled. Our pioneering technology turns post-consumer papermaking waste into high-quality circular calcium carbonate (CCC), a filler with cross-industry applications such as paper, adhesives and sealants, plastics, paints and coatings and rubber.

Metsä

Metsä
Metsä Group's innovation company Metsä Spring invests in and supports potential innovations and technologies that find new purposes and higher value for Nordic wood to replace fossil-based materials and chemicals in everyday products. We promote a culture of diversity, equality and inclusion. To date, Metsä Spring has made six external star-tup investments (Woodio, Innomost, Montinutra, Fiberwood, Adsorbi, and FineCell), and has launched three in-house development projects, Kuura™ textile fibre, Muoto™ packaging solutions and capture of biogenic CO_2.

Norske Skog

The Norske Skog Group operates five mills in Europe and Australia, producing publication paper, recycled packaging paper, energy and bioproducts. The annual publication paper production capacity is 1.6 million tonnes. The annual production capacity of packaging paper will be 0.8 million tonnes following the start-up of containerboard production at Golbey in the first quarter of 2025. The Group is headquartered in Norway and listed on the Oslo Stock Exchange.

Sappi

Sappi is a leading global provider of everyday materials made from woodfibre-based renewable resources. Its raw materials and market pulp (including dissolving pulp, wood pulp and biomaterials) and end-use products (packaging papers, specialty papers, graphic papers, casting and release papers, forestry products) are manufactured from woodfibre sourced from sustainably-managed forests and plantations.

SCA

SCA's core business is the growing forest, Europe's largest private forest holding. Around this unique resource, we have built a well-developed value chain based on renewable raw material from our own and others' forests. We offer packaging paper, pulp, wood products, renewable energy, services for forest owners and efficient transport solutions. In 2023, SCA employed 3,100 people and sales amounted to 18 billion SEK.

Participating companies

Sofidel

Sofidel Group is one of the leading manufacturers of paper for hygienic and domestic use worldwide. Established in 1966, the Group has subsidiaries in 13 countries: Italy, USA, Spain, UK, Ireland, France, Belgium, Germany, Sweden, Poland, Hungary, Greece and Romania. Sofidel's greenhouse gas (GHG) emissions reduction targets by 2030 have been approved by the Science Based Targets initiative (SBTi) in line with the goals of the Paris Agreement. The Group has also committed to Net Zero by 2050.

Solidus

Solidus San Andrés is a paper mill that has been in business for almost 75 years. The Solidus group is a multinational company dedicated to 100% recycled paper. At our paper mill we manufacture paper for solid cardboard, recycling more than 150,000 tonnes of paper per year. We have a strong commitment to quality, safety, the environment and energy efficiency. We carry out improvements every year that help us to be more efficient and sustainable.

Stora Enso

We are the leading provider of renewable products in packaging, biomaterials, and wooden construction, and one of the largest private forest owners in the world. We create better choices for society by accelerating the transition to a circular bioeconomy. Today, our solutions are found in such segments as building, retail, food and beverages, manufacturing, e-commerce, pharmaceutical, cosmetics, confectionary, hygiene and textiles.

Billerud

Billerud makes high performance packaging materials for a low-carbon society. We are a global leader in paper and packaging materials made from cellulose fibres, and are passionately committed to sustainability, quality and customer value. We serve customers in more than 100 countries through nine production units in Sweden, USA, and Finland and employ 5,800 people in 19 countries. Billerud is listed on Nasdaq Stockholm.

Ence

Ence - Energía y Celulosa - is the European leader in the production of eucalyptus pulp, the first Spanish company in the production of renewable thermal and electrical energy from agricultural, livestock and forestry biomass, and leader in Spain in the comprehensive and responsible management of forest areas and crops.

LC Paper

LC Paper is a midsize family-owned paper company producing parent reels, with three sites located in the Catalonia region of Spain, close to the French border. It was founded in 1881 and was among the first companies to obtain the European Ecolabel in 2000, and B Corp certification in 2017. LC Paper produces machine-glazed kraft and tissue paper as well as converted tissue products with a strong focus on sustainability.

UPM

UPM delivers renewable, responsible solutions and innovates for a future beyond fossils across six business areas: UPM Fibres, UPM Energy, UPM Raflatac, UPM Specialty Papers, UPM Communication Papers and UPM Plywood. It is listed on Nasdaq Helsinki Ltd., employs 16,600 people globally with annual sales of around 10.5 billion euros. A leader in responsibility, UPM is committed to the UN Business Ambition of 1.5°C and science-based targets.

WEPA

As one of Europe's top three hygiene paper manufacturers, the family-run WEPA Group specialises in the production and distribution of sustainable hygiene paper, an expert in the production of hygiene paper from recycled fibre. WEPA offers sustainable and innovative hygiene solutions that provide a safe feeling of hygiene and contribute daily to the well-being of millions of people. The WEPA Group employs more than 4,000 at 14 European sites.

Cepi would like to thank all companies, national associations and individual experts that participated in the project.

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INVEST
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Cepi
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