



Repurposing wood waste for a clean, green alternative to fossil-based chemicals

The EU and Europe's bio-based industries are tapping into the hidden potential of wood to replace fossil resources in the production of high-performance resins with a low carbon footprint.

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In one of Europe's most forested nations, Estonia, a quiet revolution is transforming the way we think about wood. For centuries, timber has shaped everyday life. It's used for building homes, crafting furniture and fuelling fires.

Now, a lesser-known wood product is taking centre stage. This natural substance is opening new doors for replacing fossil-based materials in modern manufacturing, making wood not just a traditional resource, but a key to a more sustainable future.

Sustainable performance

What if we could replace fossil-based chemicals with something as simple and renewable as wood?

With support from the EU, Estonian biotech company Fibenol joined forces in 2018 with partners from Belgium, Finland, Germany, Italy, Latvia and Sweden to find out.

Their mission was to turn hardwood leftovers – materials that might otherwise go to waste – into clean, high-performance alternatives to the polluting substances currently used in many everyday products.

"Lignin can replace bitumen in asphalt mixes for example," said Peep Pitk, Fibenol's chief development officer. "It can also replace phenol in resins used to glue together veneers in wood panels and sugars can be used as a binder in insulation products."

This collaboration, known as the SWEETWOODS project, is part of a much larger €2 billion EU- and industry-backed push to build a more circular, bio-based economy where nothing goes to waste and nature is part of

the solution.

Nature's glue

At the heart of the SWEETWOODS team's work was the extraction of lignin – a natural polymer that acts like a plant's glue, giving it rigidity and strength.

Once dismissed as a byproduct, lignin is now being transformed into a valuable resource for applications ranging from construction materials and packaging to food, cosmetics, and even pharmaceuticals. And this is just the beginning.

The EU plans to introduce a new Bioeconomy Strategy by the end of 2025. The aim is to speed up the shift toward a circular, bio-based economy across Europe.

Part of the Clean Industrial Deal, this strategy is about more than sustainability – it is about scaling up breakthrough technologies like those pioneered in Estonia and turning them into mainstream industrial solutions.

Fuelling the future

Fibinol's story began in the wood-for-energy sector, but by 2016, its founders started asking a bigger question: how can we unlock more value from wood than simply burning it? They envisioned uses that would deliver longer lifecycles, higher value and greater sustainability.

"After scouting the world for two to three years, we decided to go with a new technology to extract lignin and sugars using minimal chemicals," said Pitk. "Our goal was to scale it up, commercialise it, and ultimately license this technology worldwide."

With EU support, Fibinol built a flagship biorefinery in Imavere, Estonia, designed to tap the potential of lignin – known in the bioeconomy as "brown gold". The biorefinery started scaling up production in 2024 and now produces high-purity lignin and wood sugars that are already replacing toxic petrochemicals in a range of industries.

The process relies on low-grade wood from sustainably managed forests or waste wood from the plywood industry, material that traditionally would have been burned for energy.

What's more, the Imavere biorefinery runs entirely on renewable energy, operating with zero waste and creating a truly circular bioeconomy model for the future.

New alliances driving innovation

Building on the success of the SWEETWOODS project that wrapped up in 2024, Fibinol is now part of a new international consortium pushing lignin innovation even further.

The initiative, called VIOBOND, brings together partners from Austria, Estonia, Finland, Germany, Latvia and Spain to develop next-generation bio-based resins.

As with SWEETWOODS, the new collaboration draws on the expertise of multiple partners in different countries to strengthen the bioeconomy across Europe and reduce reliance on fossil resources.

Central to the VIOBOND effort is a unique bio-based resin factory being built in Riga, Latvia, with trials set to begin in summer 2026.

The research team is being led by Latvijas Finieris AS, the EU's largest birch plywood producer. It has relied for decades on phenol-formaldehyde resins derived from fossil resources.

These engineered woods are essential for industries where strength and durability are non-negotiable – think flooring for transport trucks or liners for liquefied gas tankers.

According to project coordinator Kristaps Stankus, lignin's unique properties have led to a breakthrough product – one that defies common trade-offs in sustainable solutions.

“It's not typical for green technologies. You usually have to compromise – either cost, strength or appearance. But that's not the case here.”

Still, producing sustainable resins at an industrial scale while preserving critical performance remains a technical challenge. For now, a small proportion of fossil-based components is still required.

“Our goal is to replace 70% of phenol and formaldehyde with lignin in the resins used in our plywood factories,” said Stankus. “We will be using lignin as nature intended, as a superior adhesive.”

Scaling up sustainability

Once refined, the VIOBOND technology will enable manufacturers across Europe to produce more sustainable resins for a variety of applications, from plywood and sandpaper to insulation wool.

“In the next 5 to 10 years, we expect lignin prices to fall significantly. That will attract more industries to make the shift toward sustainable solutions,” said Stankus.

Fibinol shares this vision, but sees an even broader future for lignin and wood sugars, extending well beyond resins to replace fossil-based chemicals across the material and chemical sectors.

“We are enablers of change,” said Pitk, stressing that there are viable alternatives available today. What is needed now, he said, is for end users to demand sustainable solutions and for major market players to prioritise sustainability alongside cost efficiency.

“When sustainability becomes a key criterion, innovation can truly compete – and when that happens, it will be inspiring to see what can be done.”

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- [VIOBOND \(CORDIS\)](#)
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- [Circular Bio-based Europe Joint Undertaking](#)
- [EU circular economy research and innovation](#)
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