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Keeping clothes in circulation: how EU research is transforming textile waste

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EU researchers are pioneering innovative textile recycling technologies that could transform waste management, aiming to reduce textile waste by up to 80% and create a more sustainable, circular fashion ecosystem across Europe.

"Upcycling is less than 1 % at the moment and until that increases, we won't bring the total amount of waste down - Koen De Ruyck, PURFI

In a factory in Waregem, north-west Belgium, a unique piece of machinery accessible only by fingerprint to trusted staff, is transforming old clothing and textiles with the utmost precision, away from prying eyes.

Stretching 170 metres, the machine gently untwists woven and knitted fibres, preparing them for reuse. These fibres are at the heart of a four-year EU-funded research initiative called tExtended to transform the future of textile recycling.

The motivation is clear: each year, 7 million tonnes of textile waste end up in European landfills or incinerators, according to the European Environment Agency.

There is only one such machine in the whole world, pointed out Koen De Ruyck, general manager of PURFI Manufacturing, a company pioneering sustainable textile "rejuvenation".

"If you're a visitor to our factory, you only see what goes in and what comes out," he said. "Most of the technology operates

within a black box, to keep the process as secret as possible."

Unlocking upcycling

The technique is called "soft mechanical recycling". Instead of shredding or tearing fabric to gather fibres, this process unravels the material so the fibres keep their strength and length.

This makes a big difference. High-quality fibres can be turned into new clothes rather than ending up as low-grade products like cleaning cloths or car insulation.

"Most recycling is actually downcycling," said De Ruyck. "You start with something beautiful and end up with something very basic. Upcycling is less than 1 % at the moment and until that increases, we won't bring the total amount of waste down."

A Europe-wide ambition

The Waregem trials are just one part of tExtended, which runs until November 2026. It brings together research and industry partners across Finland, Sweden, Belgium, France, Ireland, Latvia, Slovakia, Spain, Portugal and Switzerland.

Together, they want to show the way for Europe to slash its textile waste by up to 80 %. It is a bold target, but one that reflects the huge environmental footprint of textile production – and the EU's determination to make sustainable products the norm.

Since January 2025, EU countries have been rolling out separate collections of textile waste in response to EU rules. This means that old clothes and fabrics can no longer go in with the rest of the rubbish.

The change is designed to give garments a second life – whether through reuse, repair, or recycling – and to push fashion brands to design products that last longer and are easier to recycle. For many in the textile sector, however, it is still a new concept.

"There's very little information at the moment about how different kinds of textile waste can replace raw materials in textile production," said Dr Pirjo Heikkilä, principal scientist and

project manager at the VTT Technical Research Centre of Finland, who coordinates tExtended.

Keeping textiles in circulation

The tExtended team is working on a blueprint for producers, detailing how to sort and process different types of textile waste, and the best ways to reuse them. Their work directly supports the EU Strategy for Sustainable and Circular Textiles, which aims to reduce overproduction, encourage repair and reuse, and make recycling a mainstream option.

For Heikkilä, who has researched textiles for 25 years, the project has also changed her personal behaviour.

“Nowadays I think very carefully about what I buy. I choose second-hand clothes, and if I buy new, I check where and how they were made,” she said. “I repair items and think about how to pass them on if I no longer need them.”

While consumers have a role to play, she stressed that the main responsibility lies with industry to create more sustainable products.

From waste to wear

The PURFI trials are putting recycled fibres to the test, checking their quality and performance before spinning them into yarn for clothing and bed linen.

Pilot runs are already underway, with recycled denim being produced from an even split of production waste and old clothes. The tExtended team’s long-term goal is to reach denim made entirely from pure recycled cotton.

In Portugal, JF Almeida, a leading towel producer, is experimenting with recycled materials in its spinning mills, looking for the best mix of recycled and virgin fibres.

Already experienced at recycling waste textile from its own factories, the company is seizing the opportunity to further advance its recycling capacity with support from international partners.

“Sustainability is part of our DNA,” said Liliana Miranda from JF

Almeida's commercial department.

"Every day, customers ask us about recycled products. For us, this project is a chance to create new products with less impact on the planet – and to open up new markets."

Global leader

By reducing incineration and boosting recycling, the tExtended team aims to reduce Europe's reliance on imported raw materials and make the textile sector more competitive worldwide.

"There is an opportunity for Europe to become a global leader in sustainable, high-quality textile products," said Heikkilä.

The progress of initiatives like tExtended shows how innovation and collaboration can turn waste into value and offers a blueprint for textile recycling far beyond Europe.

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