

PRESS RELEASE

Michelin and Axens enter exclusive talks to accelerate deployment of a key bio-based molecule for green chemistry, developed with IFP Energies Nouvelles

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- Michelin, through its ResiCare brand, and Axens are negotiating an exclusive partnership to accelerate the industrialization and rollout of 5-HMF, a strategic bio-based molecule for decarbonized chemistry, developed with IFPEN
- Axens would contribute its licensing and engineering expertise to deploy the technology globally and substitute fossil-based products with renewable alternatives
- Capacity available from early 2027, with the commissioning of a first 5-HMF production unit operated by Michelin ResiCare in Péage-de-Roussillon.

Michelin ResiCare and Axens announced they have entered exclusive discussions toward a strategic partnership around an innovative production technology for 5-Hydroxymethylfurfural (5-HMF), a key molecule for green chemistry.

This partnership aims to accelerate the large-scale industrialization and rollout of a bio-based solution, addressing the growing decarbonization needs of the chemical and materials industries.

In practice, 5-HMF serves as a building block for producing resins, polymers, and other more sustainable materials, progressively replacing certain petroleum-derived molecules. This platform molecule — notably promising because it is bio-based, non-toxic, and versatile — enables the development of resins and adhesives, as well as bio-based polymers. One example is polyethylene furanoate (PEF), a bio-based plastic now considered one of the most credible substitutes for PET, opening major industrial prospects in food packaging, bottles, and textile fibers. 5-HMF also holds strong potential for a wide range of solvents, intermediates, and products for fine and specialty chemicals.

Thanks to its compatibility with existing industrial processes, this molecule can replace certain fossil-derived compounds, such as formaldehyde, with renewable alternatives sourced from plant material.

The result of an R&D program jointly conducted by Michelin ResiCare and IFP Energies Nouvelles (IFPEN), with support from ADEME in France and the CBE JU in Europe, this technology is now at the heart of a major industrial project. A first unit, located in Péage-de-Roussillon (France) with a capacity of about 3,000 tonnes per year, will be operated by Michelin ResiCare. It is expected to be commissioned in early 2027.

By combining Michelin's innovation strength — through the excellence of Michelin ResiCare — with Axens' expertise in industrialization and global deployment capacity, this collaboration aims to bring to market a solution that is high-performing, competitive, and sustainable.

"This project fully illustrates Axens' ambition to turn breakthrough innovations into concrete industrial solutions on a global scale. By combining a technology born from leading research collaborations with IFP Energies Nouvelles with our licensing and engineering know-how, we have the opportunity to accelerate the deployment of key bio-based solutions for the transition to more sustainable chemistry," said Jacinthe Frecon, VP Process and Equipment Innovation at Axens.

"We are convinced that 5-HMF is set to become a reference platform molecule for sustainable chemistry. Our planned partnership with Axens is a decisive lever to accelerate its global deployment and meet growing demand for high-performing bio-based solutions. This collaboration confirms the strong development potential of 5-HMF across a wide range of applications, as well as the performance of our technology developed with IFPEN. It fully reflects Michelin ResiCare's commitment to developing innovative solutions that contribute to a safer, more sustainable world," added Laurent Lemonnier, CEO of Michelin ResiCare.



About Axens

Axens group (www.axens.net) provides a complete range of solutions for the conversion of oil and biomass to cleaner fuels, the production and purification of major petrochemical intermediates, the chemical recycling of plastics and all natural gas treatment and conversion options. The offer includes technologies, equipment, furnaces, modular units, catalysts, adsorbents and related services. Axens is also specialized in Carbon Capture. Axens is ideally positioned to cover the entire value chain, from feasibility study to unit start-up and follow-up throughout the entire unit life cycle. This unique position ensures the highest level of performance with a reduced environmental footprint. Axens global offer is based on highly trained human resources, modern production facilities and an extended global network for industrial, technical supports & commercial services. Axens is an IFP Group company.

About Michelin ResiCare

MICHELIN ResiCare, a Michelin Group brand, develops adhesive solutions that help make industry more sustainable, competitive, and safe. Leveraging Michelin's extensive expertise in polymers and materials science, MICHELIN ResiCare supports the Group's strategy of expanding beyond tires to create value across a wide range of industrial sectors.

About Michelin:

Michelin is building a world-leading manufacturer of life-changing composites and experiences. Pioneering engineered materials for more than 130 years, Michelin is uniquely positioned to make decisive contributions to human progress and to a more sustainable world. Drawing on its deep know-how in polymer composites, Michelin is constantly innovating to manufacture high-quality tires and components for critical applications in demanding fields as varied as mobility, construction, aeronautics, low-carbon energies, and healthcare. The care placed in its products and deep customer knowledge inspire Michelin to offer the finest experiences. This spans from providing data- and AI-based connected solutions for professional fleets to recommending outstanding restaurants and hotels curated by the MICHELIN Guide. Headquartered in Clermont-Ferrand, France, Michelin is present in 175 countries and employs 129,800 people. (www.michelin.com).

Michelin ResiCare: Its Journey with 5-HMF

The Michelin Group began exploring alternatives to formaldehyde and resorcinol in adhesive resin formulations as early as 2008. In 2016, 5-HMF was incorporated into Michelin ResiCare formulations for resins used in applications outside the tire industry, initially for plywood manufacturing, after Michelin identified a limited-volume and high-cost supply source.

Since 2021, Michelin has collaborated with IFP Energies Nouvelles (IFPEN) to develop a robust and cost-competitive production process based on fructose. This collaboration has included testing at various scales and engineering studies conducted through the end of 2023.

Today, 5-HMF is used in all new Michelin ResiCare formulations, including those designed for composites, plywood, abrasives, and molded compounds.

The prospect of large-scale 5-HMF production paves the way for even broader industrial applications of this bio-based molecule.

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