Elastomers for SUSTAINABILITY

E4S TOP 10 TABLE

Position	Company	Location	Project title
1	Queen Mary University London	London	Increasing the circularity of sulphur-crosslinked natural rubber
2	Innventik SL	Santander, Spain / Mexico City, Mexico	Compact plug-flow pre-polymerisation reactor
3	Trelleborg Sealing Solutions	Trelleborg, Sweden	Lower-carbon EPDM grades
4	Cabot Corp.	Boston, Massachusetts	Evolve reinforcing carbons
5	Zeon Corp. and Yokohama Rubber Co.	Tokyo, Japan	Highly efficient production of butadiene from sustainable ethanol
6	Monolith (with Goodyear)	Lincoln, Nebraska	Carbon black from pyrolysis matching tire furnace blacks
7	Addible	Allenwood, Co. Kildare, Ireland	OxyCycle – tire recycling technology
8	UPM Biochemicals	Leuna, Germany	Renewable functional fillers
9	Asahi Kasei	Düsseldorf, Germany	Hydrogenated SBR to reduce 6PPD usage
10	Nokian Tyres (with Reselo)	Nokia, Finland	Betula concept tire with rubber made from birch bark

New ranking of materials science-based projects in the global rubber & tire industry

Three new projects have made it into the latest Top 10 Elastomers for Sustainability (E4S) rankings, as the programme continues into 2026 with further new leading-edge developments in the field of materials technology.

The programme will culminate in the announcement of the new winners of the Elastomers for Sustainability Awards in the Jan/Feb 2027 issue of European Rubbber Journal magazine - the top projects being decided by an independent judging panel in combination with the results of a vote by ERJ readers.

As before, the top E4S rankings are guided by specialists in materials science using established criteria for assessing the level of innovation, progress with commercialisation and potential significance going forward.

The latest ranking is headed up by new project entries as well as previous entries, which have been updated with a significant level of new information. Supporting information is provided here, with further details about these and other leading E4S projects available on ERJ Online:

About the Top 10

Further details about these and other Top 10 E4S projects available on ERJ Online. The E4S rankings are compiled throughout the year, with projects assessed for: Level of innovation; commercial potential; and contribution to sustainability.

NEW PROJECT ENTRIES

Queen Mary University London

Project: **Increasing the circularity of sulphur-crosslinked natural rubber**

Challenge: Current methods of recycling cross-linked natural rubber result in a significant loss of elasticity and other properties of the recyclate – including when blended back into virgin NR compounds.

Solution: QMUL's solution is focused on exploiting the reversible disulfide bonds of sulphur cross-linked rubber, by adding an inhibitor to control the reaction. The research team used solid-state shear milling to selectively break the weaker bonds. Initial research found that by adding copper methacrylate (CuMA) as an inhibitor, the properties of the recycled NR could be fully recovered, enabling reuse back into its original application.

Details: As QMUL explains: Disulphide metathesis can be suppressed by inhibitors such as CuMA – and more recently TPP (triphenyl phosphine) – to yield reversible covalently bonded cross-linked networks. Resulting compounds, including carbon black-filled systems, achieved good recycling efficiencies with different sulphur vulcanisation systems.

Next steps: QMUL is developing a range of characterisation methods to more fully understand the circularity of these compounds in commercial products. Research is, meanwhile, continuing into alternative inhibitor systems, with lower-cost and better safety profiles – along with industrial collaborations around use of the technology in the recycling of 'real-world' compounds.

Innventik SL

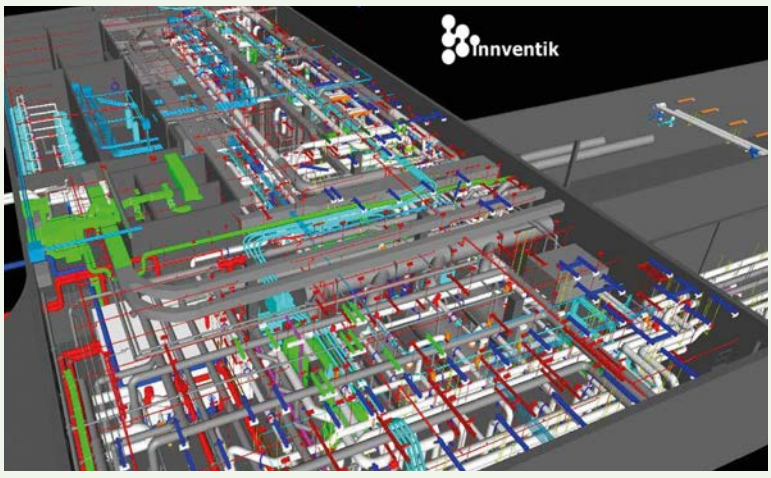
Project: **Compact plug-flow pre-polymerisation reactor**

Challenge: The rubber industry is entering a period in which sustainability, flexibility, and operational efficiency must coexist. Producers are under increasing pressure to reduce energy consumption and emissions while simultaneously delivering more specialised and differentiated products.

Technology: To address the widening operational gap being created by this transformation, Innventik has developed a patented* 'compact plug-flow pre-polymerisation reactor' – leveraging advanced reactor technologies, optimised reaction systems, and modern finishing concepts. The new reactor was conceived as a modular device capable of stabilising the earliest and most sensitive stages of polymerisation before the main reactor system, according to the Santander, Spain- and Mexico City-based engineering company. The technology is not intended to replace existing reactors, but rather "to strengthen process robustness and flexibility by preconditioning the reaction mixture under controlled plug-flow conditions."

Commercial application: "By stabilising the most sensitive reaction stages and enabling greater integration between batch and continuous reactor assets, this reactor concept may help producers improve consistency, flexibility, and process robustness while minimizing disruption to existing operations."

**The reactor technology is protected by granted Spanish Patent ES 2983867 B2 and international PCT publication WO2025/221134 A1 (PCT/MX2025/050031), with national phase strategy underway including China Patent Application 202580003162.7 and US patent pending.*



UPM Biochemicals emerged as the overall winner in the E4S Awards 2026 with a project for the commercial production of renewable functional fillers (RFFs) at its bio-refinery in Leuna, Germany. The recognition by ERJ readers and E4S judging panel reflected the Finnish group's progress with commercialising its wood-based RFFs, including via projects with major tire and rubber product-user OEs.

Trelleborg Sealing Solutions

Project: **Lower-carbon EPDM grades**

Challenge: Develop sustainable EPDM rubber with "uncompromised performance" compared to conventional grades.

Technology: Trelleborg Sealing Solutions has developed two sustainable EPDM grades delivering up to a 55% reduction in product carbon footprint (PCF). Based on materials created from "non-fossil sources," the new range includes 70 Shore A and 80 Shore A materials. The rubber grades are created from "raw polymers based on non-fossil sources derived from renewable ingredients such as cooking oil, straw, forestry residue and tall oil." Furthermore, the materials offer significant environmental benefits as the feedstock comes from circular sources. The final formulations are "comparable" to traditional EPDM elastomers made from fossil-sourced inputs and provide "equivalent application performance."

Details: Trelleborg said its calculations, based on "recognised methodology," have shown that moulded articles made from the 70 Shore A and 80 Shore A grades can achieve "up to a 33% and 55% reduction in PCF respectively." In compound form, the materials achieve carbon footprint reductions of 51% (E7T11) and 61% (E8T12) compared to traditional EPDM. The grades were developed in partnership with Arlanxeo and are based on its ISCC+ certified bio-circular EPDM, produced using a "mass balance approach" to track renewable feedstock use.

Commercial applications: Trelleborg further compounds the materials with recycled carbon black sourced from used tires and other secondary materials. The range – E7T11 (70 Shore A) and E8T12 (80 Shore A) – is targeted at applications including O-rings, gaskets and custom-engineered components across sectors such as automotive, industrial processing, energy and construction equipment.

Further details: To support PCF claims, Trelleborg said it worked with Sphera Solutions on calculation methodology, which is currently undergoing validation by certification authority Dekra.

See ERJ Online for full details of all Top 10 E4S projects