

# THE ERJ FUTURE TIRE & RUBBER AWARDS 2024

The spirit of innovation remains the greatest resource for the global rubber & tire industry having defined the sector since its very early days. Today, R&D teams are strongly focused on enhancing the environmental profile, as well as the performance and efficiency, of rubber-based products and production processes.

The FTR Awards, therefore, recognise developments within our industry that make the world a better, safer, and more sustainable place for everyone.

The programme recognises innovations across a broad range of application areas, including: con-



sumer & medical products, mobility & transport, construction & engineering, and industrial & materials handling.

For the inaugural staging, *ERJ's*

editors, correspondents and industry partners have identified 25 innovations that, they believe, show the way forward for the rubber & tire industry.

Presented in alphabetical order within six categories, the selected entries encompass a range of technologies and developments from across our global industry.

As well as recognising best-practice in innovation, the awards offer a reference for the technologies that look set to shape the rubber & tire industry of the future.

Full details of each entry are available on the *ERJ's* Future Tire & Rubber Awards webpage.

## Winners to be announced in next issue of *ERJ*

*ERJ* readers will be invited to identify, and comment on, entries they believe to be of particular significance for the industry. The feedback will guide our selection of the winners in each category, to be published in *ERJ* Sept/Oct 2024 issue.

### PLANT AUTOMATION

*Advances in tire & rubber product manufacture – at one or more stages of the production process*

#### HF Mixing Group

##### Smart Final Mix

HF Mixing Group has developed an AI-based algorithm, called Smart Final Mix, which analyses and optimises final-mixing processes in tire and rubber-product manufacture. Studies have shown that the tool can deliver major savings in terms of mixing-time, throughput, and energy. For instance, during tests on industrial machines a mixing-time saving of up to 39%

and an energy-reduction of up to 29% were achieved.

#### Michelin

##### Visual SLAM AI robotics project with ABB

A new AI robotics technology Visual SLAM technology from ABB has been validated for smart factory applications in collaboration with Michelin in a real production environment – for intralogistics at a factory in Spain. The navigation technology combines AI and 3D vision, enabling autonomous mobile robots to “safely” collaborate with humans while making intelligent decisions in dynamic factory environments.

#### Rodolfo Comerio

##### Calender quick-change system

The patented system is designed to minimise the time required for production-changes: making a configuration change at the materials inlet to the calender, in order to pass from the textile cord production to the steel cord one and vice versa.

The calendaring line has been designed and manufactured to allow the textile and steel cord to have a quick and automatic change with also the insertion and change of grooved rolls for steel cord end-count.

The design can also make quickly available, in front of calender

roll three, the textile laminating roll to laminate the fabric and then the two end-count rolls to laminate the steel cord.

## VMI

### *Revolute*

Introduced in 2022, the highly automated VMI Revolute machine is designed to cut cycle times – about half that of its predecessor – without compromising quality and allow one operator to manage multiple machines. Innovative features also include automatic tooling changes and minimal operator intervention for recipe adjustments contribute to reduced downtime and higher productivity, resulting in increased OEE. The highly automated design allows for the use of a wider range of compounds than is possible with traditional machines.

## SUSTAINABLE MANUFACTURING

*Developments that most significantly reduce plant emissions and usage of energy, water and other resources*

## Ecombine

### *Liquid-phase rubber mixing technology*

The advanced liquid-phase mixing, enables the production of rubber compounds which 'can be directly used in final mixing processes and so eliminate the need for multi-stage mixing,' largely by enhancing dispersion of fillers as well as filler-polymer interaction. The technology is said to significantly improve the rolling-resistance, wet-braking, and wear-resistance of tires and deliver a 35% reduction in total energy consumption across the production-chain.

## Hankook

### *C.L.E.A.R. (Circular. Low-Emission. Advanced. Renewable)*

The Korean tire maker has taken a root & branch approach to minimising the carbon footprint of its manufacturing processes: including its initiation of a tire-to-tire (T2T) circular economy consortium of ten global companies and three institutes. Among a range of outcomes to date, Hankook has reported: An agreement with KKPC for developing eco-SSBR using recycled styrene monomer, with the goal of commercial use in tires by

2026; Development of sustainable carbon black using 100% tire pyrolysis oil; and Collaboration with SK Chemicals and Hyosung Advanced Materials, whereby tire cord based on chemically recycled PET was developed and applied to a premium EV tire 'iON'.

## Klockner Desma

### *Carbon footprint app for rubber injection moulders*

Fridingen, Germany-based Desma has introduced an app that provides a detailed overview of the factors that determine the product carbon footprint PCF of rubber mouldings. The PCF Navigator Ecos also shows which measures can be used to achieve specific reduction effects "thus making an important contribution to understanding the connection between all influencing factors" across a wide range of elastomer types.

## Siemens

### *SiGreen dynamic carbon footprint measurement tool*

Siemens has developed this innovative management tool to enable dynamic PCF management across tire manufacturing operations. Called SiGreen, the system is designed to enable the industry to manage its PCF more effectively via a system that allows for frequent and pro-active updates of PCF data – including quantifying improvements by suppliers.

Tire makers can, therefore, gain access to dynamic PCF calculations – towards accelerating the decarbonisation of their own operations as well of their supply-chains.

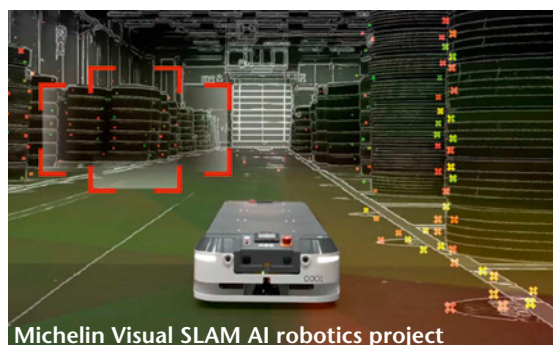
## SUSTAINABLE MATERIALS

*Materials science-based developments that enhance sustainability across the tire & rubber industry*

## Asahi Kasei

### *Hydrogenated styrene-butadiene rubber with enhanced ozone resistance*

Asahi Kasei's approach to tackling the marine-toxicity issues caused by emissions of 6PPD\* antiozonants from tires and other rubber products deserves a place in any current listing of materials science innovations. While the industry has focused mainly on finding alternatives to 6PPD, Asahi Kasei has instead developed a selectively



Michelin Visual SLAM AI robotics project

hydrogenated styrene-butadiene rubber (HSBR) with enhanced the ozone resistance.

*\*(N-(1,3-dimethylbutyl)-N'-phenyl-p-phenylenediamine)*

## Cabot Corporation

### *Reclaimed carbon surface regeneration to achieve equivalent performance to reinforcing carbon black*

Cabot says its regenerated carbon can provide ASTM N300 series level reinforcement and increased loadings of up to 30% of the total filler. The 'reclaimed carbon regeneration' technology improves the surface reactivity of the final product, thereby improving the overall in-rubber performance so that rC behaves similarly to virgin carbon black in rubber compound formulations.

## Pirelli

### *Wood-derived lignin fillers*

Employing novel chemical treatment and co-precipitation techniques, Pirelli has developed patented process technology to support the industrial-scale production of wood-derived lignin fillers. The development follows years of R&D to overcome the challenges of successfully mixing lignin into rubber compounds. As a bio-based material, lignin – a by-product of the paper pulping process in the paper industry – offers a sustainable part-replacement for carbon black as a reinforcing filler in tires and rubber products. The patented technology has already supported Pirelli in using lignin in the production of bicycle tires and more recently in the P Zero E passenger car tire.

## Reselo AB

### *Birch bark rubber*

Last year, the Swedish developer of renewable rubber made from residue birch bark emerged as the



➔ CONTINUED ON PAGE 18

➔ CONTINUED FROM PAGE 17

winner from 50 entries in Nokian Tyres' 'Fast Race, Big Change' competition.

The Reselo Rubber was said to have shown its "versatility and future potential" including in ice-track testing of tires at Nokian's White Hell test track in Finnish Lapland.



"We believe that Reselo will be one of the stepping-stones towards our own goal of having 50% of the raw materials in our tires renewable or recycled by 2030," stated Nokian in announcing the result.

In a recent update, Resolo said it had received interest from the automotive industry resulting in a multi-partner project involving Volvo and Polestar. The company is also exploring applications with footwear manufacturers.

### Synthos

#### *Extending the EV tire magic triangle with multi-functionalised S-SBR*

A stand-out entry to the ERJ Elastomers for Sustainability programme, Synthos' Sprintan 918S solution styrene butadiene rubber (S-SBR) is claimed to offer a uniquely optimised balance of properties in tire compounds. The polymer is tailored to deliver improved wet and dry braking performance, increased abrasion resistance and lower rolling resistance.

### ADVANCED DESIGN – TIRES

*Developments that offer breakthroughs in terms of performance, safety and sustainability*

### Continental

#### *UltraContact NXT*

Combining a remarkably high share of sustainable materials with high-end levels of safety and performance, Continental's UltraContact NXT is a worthy contender for a top innovation award. With a share of up to 65% of renewable, recycled and mass

balance certified materials, the tire is claimed to be the most sustainable production tire on the market to date. All 19 sizes available are said to carry the highest possible rating ('A') of the EU tire label in rolling resistance, wet braking, and exterior noise.

### Goodyear (with ZF)

#### *Integrated technologies for enhanced safety and driving dynamics*

A collaboration with ZF has delivered the integration of Goodyear's innovative SightLine suite of tire intelligence technologies with cubiX vehicle motion control software. In particular, Goodyear SightLine can reduce the risk of hydroplaning: detecting partial hydroplaning early while offering recommendations for optimal speed to enhance vehicle control.

### Nokian Tyres ( with UPM)

#### *Wood-based fillers in tires*

Nokian Tyres in partnership with UPM has developed a tire in which a significant part of carbon black is replaced with wood-derived renewable fillers.

Introduced in June, the Green Step Ligna is said to be the "first ever" concept tire made with renewable lignin raw material.

According to the tire maker, all fossil carbon black in the tire's sidewalls is replaced by the new raw material.

Under the innovative partnership, Nokian is licensing IP to enable UPM to supply the functional fillers throughout the global tire industry.

### Pirelli

#### *P Zero E summer tire*

In 2023, Pirelli unveiled its P Zero E summer tire, which combines the Italian tire maker's latest technical innovations to meet the highest demands of electric and sustainable mobility. New Runforward technology makes it possible to maintain control of the car in the event of a puncture and to continue driving for up to 40km at 80km/h without tire pressure. Moreover, the P Zero E is said to be the first UHP tire made of more than 55% bio-based and recycled materials. The entire range at launch has been awarded a Triple A rating on the EU tire label.

### Trelleborg Tires

#### *Adaptive Tire Management System*



For clear proof that tire innovation is not limited to on-road applications look no further than the new Trelleborg adaptive tire management system (ATMS) technology for agricultural and other off-road vehicles. The ATMS employs sensors, mounted on a tire integrated support, to detect working conditions in real-time and, so, can advise drivers on how to optimise tractor productivity and to reduce fuel consumption.

### ADVANCED DESIGN – RUBBER

*Developments that offer breakthroughs in terms of product performance, safety and sustainability*

### Continental / ContiTech

#### *Tough RuNR air springs*

For the Tough RuNR air springs, the Continental industrial rubber products business sector has significantly upgraded its materials compound for commercial vehicle air springs. In developing the product, ContiTech's material experts substituted synthetic rubber with natural rubber enhanced with the incorporation of EPDM. In doing so, the rubber compound's carbon 'backpack' is said to have been reduced by more than 50% compared to conventional air springs. At the same time, product features have been improved so that the new air springs can handle a wider range of climate conditions due to increased resistance to both extreme heat and extreme cold.

### Cooper Standard

*eCoFlow automotive switch pump*  
Cooper Standard has developed a novel automotive switch pump aimed at simplifying thermal management systems, particularly in electric vehicles.

Created with Italian automotive thermal management systems supplier Saleri, the eCoFlow offers "both an electric water pump and electrically driven valve in a single

integrated coolant control module.”

The “gamechanger” product is claimed to provide car makers with “efficiency improvements, part consolidation, electrical wire harness reduction and reduced packaging space.”

## Eneos Materials Corp.

### *SBR binder for SiOx anode in lithium ion batties*

While the SiOx anode is a promising candidate for next generation LIBs, expansion and shrinkage of the particles during charge and discharge leads to the loss of the electrically conductive path and deterioration of the anode capacity.

These effects reduce both cycle performance and battery life, while there are also safety issues due to degassing during storage at high temperature, which causes the swelling that.

Eneos, therefore, developed a new binder with precisely controlled property at particle surface and functional groups to solve both problems.

SiOx anodes with this binder showed 70% better cycle performance than that of conventional SBR and suppressed electrode expansion due to its high elastic modulus.

## Freudenberg Sealing Technologies

### *DIaVent HighFlow*

The pressure compensation elements are designed to enhance the safety of electric vehicles employing elements that merge pressure-equalisation and emergency degassing into a single unit. According to FST, the component occupies 50% to 70% less space than similar solutions and is significantly lighter due to its polymer housing.

## Hutchinson SA

### *Elastomer for sealing EV heat pumps*

Hutchinson SA has developed an elastomer compound specially designed to meet the sealing requirements of electric-vehicle heat pumps using R744 – refrigerant grade CO<sub>2</sub>, which requires the adaption of all circuit components. Formulated specially for German car maker VW, the compound is capable of withstanding the operating constraints of R744, according to the French rubber components supplier.

## SUPPLY-CHAIN & LOGISTICS

### *Advances in the efficient storage, handling and management of raw materials, semi-finished materials and finished tire products*

## Cabot Brazil

### *Sustainable transportation fleet*

The huge potential for the reduction of emission via efficiencies in the supply-chain is underlined by Cabot Brazil, which has taken significant steps toward a more sustainable transportation fleet by switching to compressed natural gas (CNG) fuel for trucks delivering raw materials to its Maua plant. The project is claimed to offer a model for others in the tire & rubber industry on how changes in supply chain & logistics can help to solve sustainability challenges.

## Kirana Megatara

### *Project with Amazon Web Services to increase its speed of reporting business data*

Indonesian company Kirana Megatara buys more than 1,000 tonnes of raw rubber from domestic suppliers every day: shipping the commodity to its processing plants across the country. The material is then processed into standard Indonesian rubber (SIR) for tire makers such as Bridgestone, Goodyear, and Pirelli – in 2021, its 16 plants produced 508,000 tonnes of SIR, worth a total of \$857 million.

## RESEARCH & DEVELOPMENT

### *Use of advanced laboratory and analysis techniques to guide the development of tires & rubber products*

## Fraunhofer

### *NaMoKau project for development of bio-based raw materials and new types of rubber*

This April saw the launch of an ambitious three-year project led by the Fraunhofer Institute for Applied Polymer Research IAP to develop alternative, bio-based raw material sources for synthetic rubber. The research team from four Fraunhofer Institutes aims to come up with “completely new types” of rubber for car tires, under the project titled “Sustainable biomonomers for synthetic rubbers with application-related adjustable viscoelastic properties (NaMoKau).” A particular focus is on producing

the rubber monomers butadiene, isoprene and dimethylbutadiene from bio-based alcohols.

## Hankook

### *Using AI to accelerate tire development*

Hankook has partnered with US cloud and software specialists Amazon Web Services and Snowflake to develop an AI platform for tire technology. The project is already delivering on its goals: creating an integrated AI-based data analysis infrastructure that improves tire performance and quality, said an update from the South Korean manufacturing group.

## Sumitomo Rubber Industries

### *Synchrotron radiation measurement technology*

Sumitomo Rubber Industries (SRI) has developed a ‘synchrotron radiation’ technology that can measure the motion of atoms, molecules, and nanostructures across a wide range of time domains. With the newly developed technology, it is possible to measure motions from 0.1 nanoseconds to 100 nanoseconds – as well as over a much wider time-range when combined with conventional techniques. Through the research, SRI expects to advance the development of tires with high strength and excellent wear resistance.

## Trelleborg (with Airbus)

### *Sealing for hydrogen-powered aircraft*

Trelleborg Sealing Solutions is working in partnership with Airbus to develop sealing technologies for hydrogen-powered commercial aircraft by 2035.

The Swedish rubber parts maker is developing safe and reliable



seals for the hydrogen propulsion systems of the ZEROe concept aircraft, enabling Airbus to explore a variety of configurations and hydrogen technologies.

For the programme, a high-pressure cryogenic test rig has already been designed and built at a Trelleborg Sealing Solutions centre in Bridgwater, UK.

