



PRESS RELEASE

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Tyre-development simulation: advanced technology for enhanced racing performance and mobility

- Simulation technology is accelerating progress in motorsport and the automobile industry
- Following its acquisition of the market-leading simulation-software specialist Canopy Simulations, Michelin can count on the perfect 'virtual driver'
- Michelin: a data-driven company and pioneer in the field of simulation thanks to data and its mathematical expertise

When it comes to the development of tyres for racing or production sports cars, simulators are the ideal tool. At the 2023 Le Mans 24 Hours, for example, all the prototypes competing in the race's headlining Hypercar class will be equipped with tyres that were developed entirely using simulation software. The technology forms an essential part of Michelin's relationship with its automobile industry partners because of the indispensable role it plays in the development of original-equipment, high-performance tyres. The combination of mathematical modelling and simulators effectively makes it possible to determine which tyre sizes and technologies are best-suited to a new car model as a function of its technical and weight-distribution characteristics.

Based on data-processing technology and advanced mathematical algorithms, it is a tool that consolidates Michelin's status as a technological leader and data-driven company. By accelerating innovations that favour increasingly efficient racing and mobility, simulation optimises Michelin's work with its partners and vehicle manufacturers, while at the same time reducing its Research and Development environmental footprint and providing real savings compared with longer, more traditional development cycles.

In concrete terms, the technology reproduces dynamic reality thanks to the interaction of three digital models. The first replicates the characteristics and grip properties of circuits, the second covers the properties of the vehicle's chassis (or even the entire vehicle), and the third reproduces tyre behaviour in extreme detail. Behind the wheel of a simulator, drivers are able to test different types of tyre across an exceptionally wide spectrum of configurations.

To complete the process, the drivers' subjective impressions and feedback are taken onboard alongside the objective data provided by the simulator, on which drivers perform just as they would in a real car or on a real racetrack.



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As drivers adapt to this digital revolution, their mission has evolved considerably, with younger drivers honing their race-craft at the same time as they acquire simulator-related skills. The bridges between the real and virtual worlds has become a priority.

Acquisition of global lap-time simulation leader Canopy Simulation

It is against this background that Michelin recently acquired the global lap-time simulation leader, Canopy Simulation. The British company provides one of the market's most sophisticated simulation software tools. Its cloud-based system combines circuit, car and tyre models with an advanced trajectory optimisation function to simulate the input of the perfect 'virtual driver'.

It is conceived to evolve and take increasingly detailed and varied driver models into account for both racetrack and road development applications:

- When used for motorsport purposes, the virtual driver performs the basic tasks, such as a simulated four-hour stint at Le Mans to evaluate tyre consistency.
- In the case of road tyres, it enables automobile manufacturers to reproduce a variety of driver profiles, plus different car and tyre usages.

Humans nonetheless have the final say, since the real driver has the opportunity to approve the tyre's final specification and its match for the vehicle in question.

Michelin, a data-driven company and pioneer in the field of simulation

Introduced in motorsport 30 years ago to handle the data harvested at races and for forecasting purposes, mathematical software underwent an initial transformation at the turn of the century. It evolved further in 2005 - at the time of Michelin's involvement in Formula 1 - when the Group took the step of making its virtual tyres 'dynamic'.

Its research experts broke tyres down into independent mathematical models for each element of their construction. Meanwhile, Michelin's all-new thermodynamic Tame Tire software made it possible for these different elements to interact by replicating the way they deform and how the properties and behaviour of raw materials and tyre pressures were influenced by temperature fluctuations.

Tame Tire has since continued to evolve and is permanently improved thanks to smart data collected at races. Today, Michelin's unique mathematical data-processing expertise puts it a step ahead when it comes to tyre modelling and simulation.



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About Michelin

Michelin's ambition is to sustainably improve its customers' mobility. The leader in the mobility sector, Michelin designs, manufactures, and distributes the tires best suited to their requirements and uses as well as services and solutions to improve transport efficacy. Michelin also puts forward offers that allow its customers to enjoy unique moments when traveling. Michelin also develops high-technology equipment intended for multiple fields. Based in Clermont-Ferrand, Michelin is present in 175 countries, employs 132,200 people and operates 67 tire factories that, together, produced approximately 167 million tires in 2022. (www.michelin.com).

Photos and videos available here:

<https://contentcenter.michelin.com/portal/shared-board/c694afb0-c8f2-4f1d-afaa-24bd1f58930a>

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