

**Media Contact:** +33 1 45 66 22 22 - [elisabeth.boucher-anselin@michelin.com](mailto:elisabeth.boucher-anselin@michelin.com)





***THE MICHELIN GROUP'S  
INNOVATION STRATEGY  
TO SERVE SUSTAINABLE  
MOBILITY***

**PRESS KIT** SEPTEMBER 2016

Media Contact:

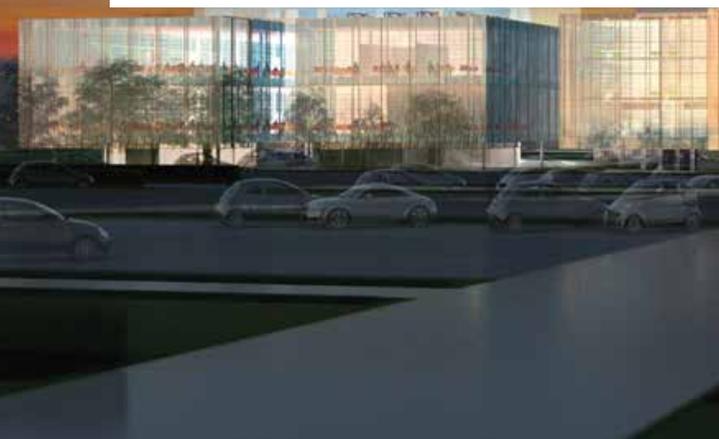
+33 1 45 66 22 22 - [elisabeth.boucher-anselin@michelin.com](mailto:elisabeth.boucher-anselin@michelin.com)



# THE MICHELIN GROUP'S INNOVATION STRATEGY

## THE CHOICE OF PERFORMANCE FOR SUSTAINABLE MOBILITY

At a time when MICHELIN is inaugurating its new RDI Campus, the Group's Technology Center is, more than ever, at the heart of our Company. This heart is dedicated to serving MICHELIN'S ever-growing ability to meet its customers' needs.



These customers, through their uses, are driving the digital revolution – a major change that is requiring all companies with growth ambitions to make adjustments. Consumers are more volatile and winning their loyalty means offering them, at an ever-faster pace, products that are truly useful and make a difference. A bonus is given to agile companies. Frontiers are disappearing and unexpected players are brutally shaking up well-installed companies. Digital technology is not a fashion; it's a powerful force for transforming the economy.

MICHELIN has chosen to actively incorporate this change into its operations, rather than submit to it. This means transforming ourselves, rethinking our customer relationships, organizing ourselves more efficiently, and sharing major innovations more quickly across as many of our product lines as possible.

For MICHELIN, a visionary enterprise that has become a market leader thanks to its inventiveness and creativity, innovation – and not just digital innovation – remains the key to profitability as well as the prerequisite for its competitiveness and its ability to remain a market leader.

### **The first reason is realism.**

The digital revolution involves more than e-commerce, tablets or support for startups. It has deeply shaken relations with customers, who now hold the power and expect content that is richer in services, simplicity and above all who expect an integrated offering to serve its mobility needs. Modifying the market is possible in all business sectors because disruptive technologies are omnipresent and crosscutting. MICHELIN knows full well that the only way to resist is to embrace this new economy. Without even mentioning possible new comers, competition is already intense and requires us to move faster and to find new sources of value.

### **The second reason has to do with all the incredible opportunities**

that are provided by the proliferation of technology. MICHELIN has been committed to mobility for more than 125 years. For 70 years, it has been developing radial technology, the greatest tire-related innovation of the 20th century. Since the early 1990s, when green tires were invented, it has been a pioneer serving sustainable mobility. In recent years, it has gained

additional advantage by developing the connected tire, while investing in startups around the world as well as in car-sharing, hydrogen batteries and digital management of car fleets.

Our goal is to develop an integrated offering of services for all types of mobility, uses and customers. Our strategy of acquiring an equity investment in companies offering new services in France, China and Brazil, for example, is in line with this objective.

**The third is that technological innovation is a lever that serves both our values and our vision of mobility.** Innovation is not an end in itself.

It is a prerequisite for progress and, for MICHELIN, a lever of change that we apply to serving our values, in order to capture our share of human progress and to maintain a long-term vision of transportation that is cleaner, safer, simpler and less costly. The circular economy and road safety nurture our R&D strategy every day. The post-petroleum world is being invented today and this new economic, technological and social space is a crucial challenge for a major tire producer.

That's why MICHELIN made a commitment at COP21 to reduce the

carbon footprint of its tires 20% by 2030. By intensifying our R&D efforts and methods further upstream, we can achieve this objective.

**The inauguration of the RDI Campus gives the MICHELIN Group the resources to remain the most innovative company in its industry while serving sustainable mobility.**

To give form to this vision of sustainable mobility, the Group's innovation strategy is supporting several initiatives.

**The first is open innovation.** Our innovation communities are not limited to the Group's Technology Centers, even if the latter represent our strategic hub, with a budget of nearly 700 million euros. Through our support for startups, research partnerships, joint ventures created with other large companies and contests open to our employees, we believe in the need to look elsewhere for ideas that will comprise our offering of tomorrow. Without this openness and without a creative ecosystem, even a large manufacturing company in a position of strength suffocates in the end.

This openness is expressed in the architecture of the new RDI Campus. On each of its ten work platforms, advanced research engineers, market and customer use experts and developers work together,

cross-functionally and with a shared spirit of enthusiasm.

2016 is the year in which the various elements that the Group put in place – several decades ago for some of them and a few years ago for others – are energized, from governance, with the Corporate Innovation Board, to some 300 technological partnerships forged throughout the world. The initial results are promising, such as the CrossClimate, the first summer tire certified for winter use, for which design time was halved.

In this way, MICHELIN is acquiring the resources to remain the most innovative company in its industry, while fine-tuning an integrated mobility strategy, changing everything while remaining faithful to what we are: a solid, visionary, responsible enterprise with an outlook that is both global and local.

**The second is sustainable performance.** A tire's performance is an incredibly complex equation that MICHELIN's expertise knows how to resolve in order to offer just the right compromise as well as an incomparable driving experience. Tires are a high technology product and each one of their components involves hundreds of researchers, engineers and technicians, sometimes from non-tire-related fields.

**While many companies focus on programmed obsolescence – meaning an ever-shorter life span for products – MICHELIN has chosen to focus on the programmed longevity of its tires, while also strengthening their safety performance. That's what we mean by sustainable performance and what is expected of MICHELIN's experts.**

Ours is a long-term vision that is committed to consumption, doubtless more demanding but one in which everyone comes out a winner.



# CONTENTS\_



## 1\_

### Types of mobility

Providing solutions for a full range of mobility needs is the purpose of innovation within the MICHELIN Group  
**Page 6**



## 2\_

### Long-term performance

R&D is the fundamental tool for improving the performance and longevity of MICHELIN products  
**Page 14**



## 3\_

### Sustainable innovation

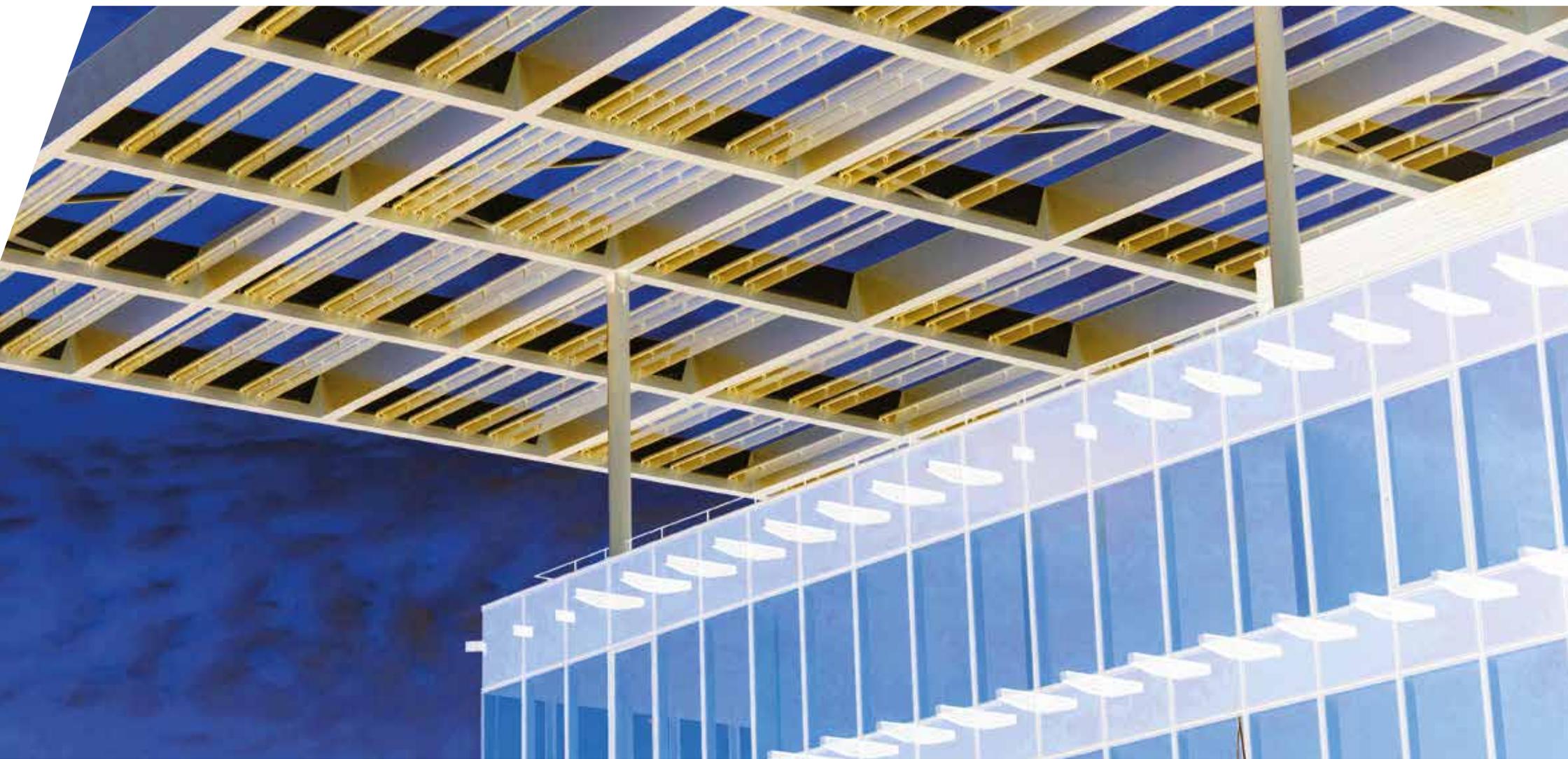
Strengthening MICHELIN's position as the undisputed leader in terms of sustainable mobility  
**Page 20**



## 4\_

### Open innovation

Enhancing the skills of the MICHELIN Group through open innovation  
**Page 26**





# 1\_Types of mobility

Providing solutions for a full range of mobility needs is the purpose of innovation within the MICHELIN Group.

**MICHELIN's mobility offering is comprised of four key ideas that the Group's R&D strategy is developing every day:**

**1/ begin all projects with the needs of customers**, which are at the heart of the Group's strategy. Customers include motorists, families, truck drivers, farmers, airplane pilots and sportsmen.

**2/ develop a mobility offering combining products**, such as tires, as well as more and more services. Digital technology, through the additional opportunities that it provides, expands the panel of services and products most closely aligned with use. That's why MICHELIN is taking advantage of the opportunities available through the digital transformation with the goal of expanding its offering.

**3/ provide solutions for the three phases of travel:** the before, the during and the after. The Group is actively innovating in all three areas.

- **BEFORE:** preparing the trip as effectively as possible, for example by recommending dining and lodging solutions. (MICHELIN guides).
- **DURING:** benefiting from safe solutions, beginning with the tires.
- **AFTER:** Reviewing the trip, which is enabled by the Tire Care offering.

**4/ integrate the sustainability of these solutions' performance.**

**Providing solutions for a full range of mobility needs is the purpose of innovation within the MICHELIN Group.**

Since its founding in 1889, Michelin has made mobility its primary objective, at a time when modern transportation means were just taking off. The innovation efforts deployed by the Group support MICHELIN's historical legitimacy in providing mobility solutions.

The Group remains faithful to the spirit that has guided it – and the first MICHELIN tires – from the outset: to make travel faster, easier, safer, more environmentally friendly and less costly. Sustainability has been integrated into each technological leap that the Group has achieved because, for MICHELIN, mobility must be sustainable. That's the meaning of the commitments made by Jean-Dominique Senard on behalf of the Group at COP21, in particular the commitment to reducing the carbon footprint of its tires 20% by 2030.



## INNOVATING FOR SUSTAINABLE MOBILITY IS PART OF MICHELIN'S DNA

### 3 questions for Terry GETTYS, Executive Vice President, Research and Development, and a member of the Group Executive Committee

#### How can we understand the notion of "sustainable mobility?"

Sustainable mobility means offering everyone the opportunity to travel safely and comfortably while also demonstrating greater respect for the environment. It also means having an integrated vision of what could be the mobility of the future. The constraints weighing on our large cities, on natural resources and on the climate require us to totally rethink transportation, vehicles and fuel. If MICHELIN has made sustainable mobility the focus of its development strategy, it's because we believe as much in the business opportunities that it creates for us as in the values of thriftiness and sustainability that MICHELIN has long embraced. Technologies open a realm of possibilities that MICHELIN is pursuing consistently and efficiently. I'm thinking not just of digital technologies but also of green technology companies with alternative fuels and bio-sourced synthetic rubber. We have demonstrated our legitimacy in offering sustainable mobility solutions, from the radial tire to the green tire and now the CrossClimate. And there are more solutions to come.

#### How is the Group's innovation strategy serving this vision of mobility?

First of all, services are being developed, which is a fundamental key to the Group's growth. Since the beginning, as Jean-Dominique Senard says, MICHELIN has been a services company. Today, tire consumers are above all individuals or professional users that have expressed mobility needs. This means not only the trip itself but also preparations for the trip upstream as well as vehicle control, maintenance and debriefing downstream. Digital technology makes it possible to adjust in real time, with the sensors that equip connected tires, and to play a special role with regard to our customers in guiding them toward service providers and offering them collaborative consumer platforms. It's important to bear in mind that the tire is the only part of the vehicle in contact with the

road. Since the idea is to provide motorists or truck drivers with mobility performance that offers an optimal combination of safety, cost-efficiency and sustainability, tires have enormous potential as a point of entry.

Then, more concretely, we are addressing two challenges, with the support of the Corporate Innovation Board, regarding our core product – the tire – and mobility services.

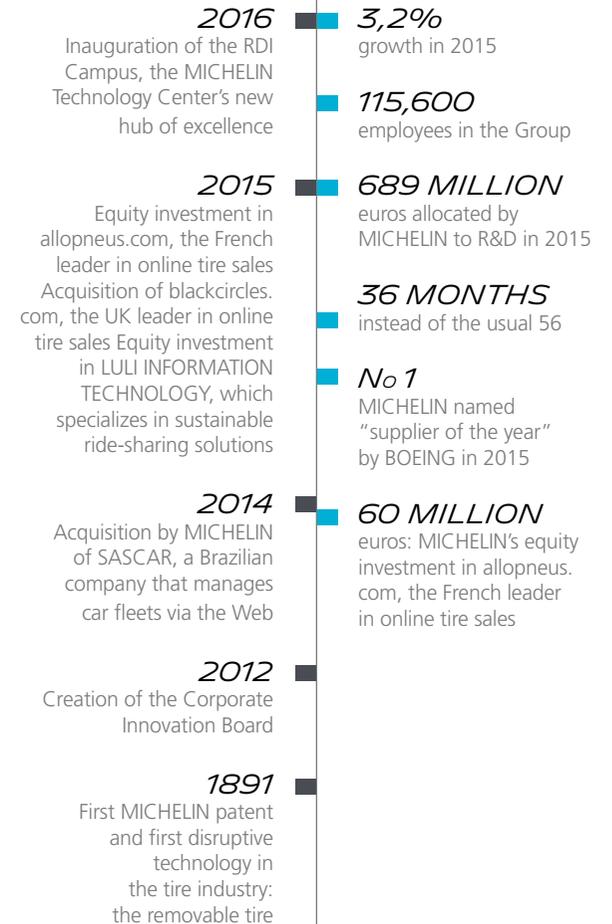
On the one hand, there is our potential for innovation, which, although already substantial, we have further strengthened through open innovation and the many partnerships that we have forged. On the other hand, there are technology transfers, which enable us to provide many of our tires with technologies and a level of performance initially developed in racing, for example. Competitive sports serve as a laboratory for us. That's where many of our ideas come from.

#### What were your ideas as head of research and development?

Innovating for sustainable mobility is part of MICHELIN's DNA. When I arrived at Michelin, I joined an industry leader with a highly developed research and innovation culture. The Ladoux Technology Center is an example for the entire industry, not just for its tires but also for its research on materials and modeling capabilities.

This outstanding asset must be adapted to new types of more open innovation and must go further in its focus on uses and reduced time to market. We have created a nursery of startups and innovative projects that support around 20 promising initiatives in Europe, China and the United States. We have strengthened our technology transfer dynamic in order to share more quickly and more broadly the performance gains achieved by our products. We have reduced the time it takes to design our tires, halving it in fact for the CrossClimate. These investments are intended to make us more competitive – and we have already seen the initial effects, which are the key to our future successes.

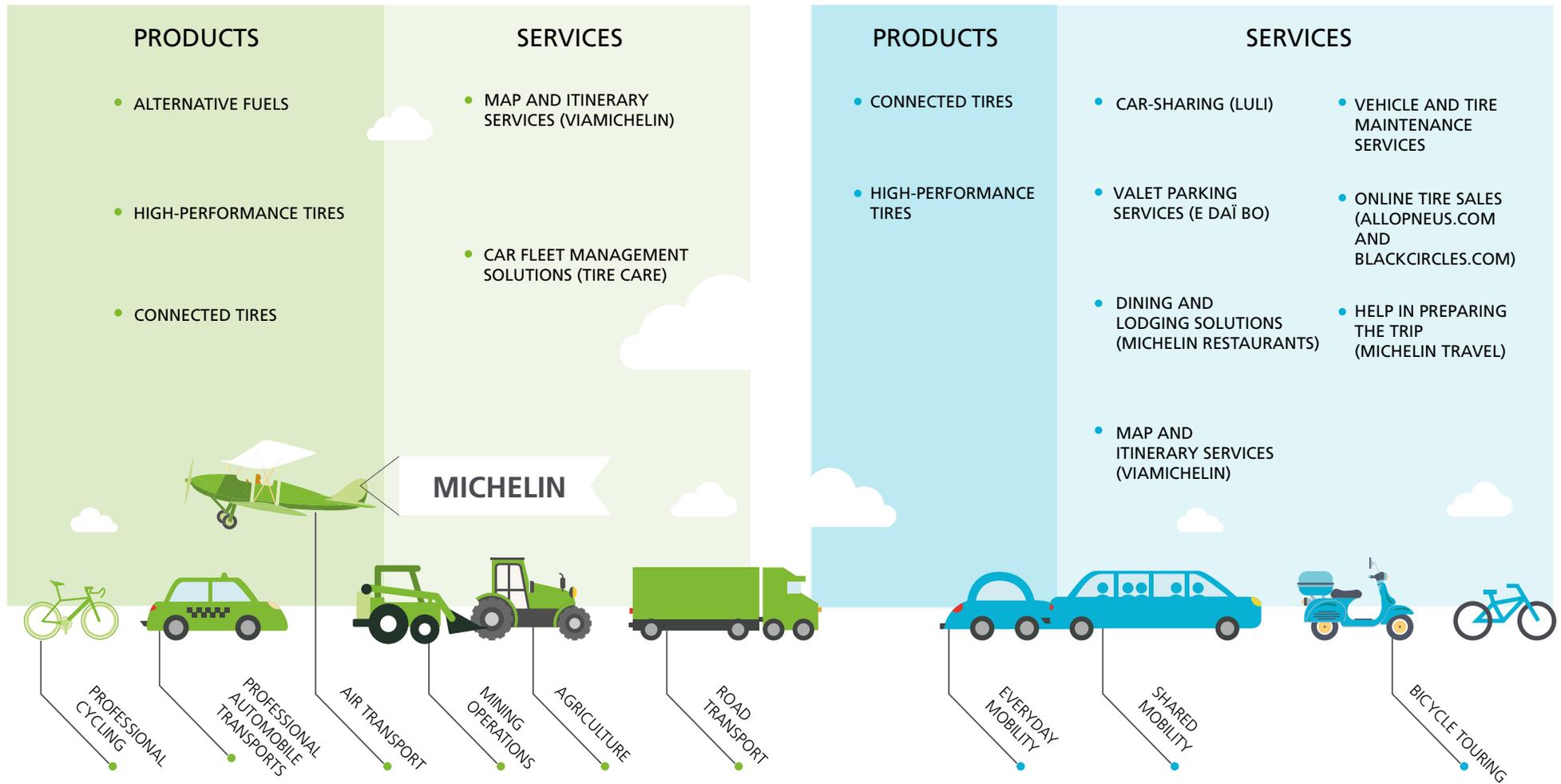
## FACTS & FIGURES



# An offering of products and services to facilitate all types of mobility

## FOR BUSINESS USERS

## FOR INDIVIDUALS



## MICHELIN, a partner to all kinds of mobility and a provider of technological solutions that support everyone's mobility

### For all of its customers, MICHELIN wants to provide a technology-enhanced offering that is adapted to their mobility needs.

The diversity of MICHELIN product users is equal to the excellence and leadership of its tires.

First of all, the general public wants tires that are ever safer in all driving conditions as well as affordably priced. Examples include the recent CrossClimate for automobiles, the first summer tire certified for winter use, and the dedicated MICHELIN E-V range for electric vehicles, as well as tires for motorcycles, scooters (for urban mobility) and bicycles.

### Then come industrial and other business users.

- In **civil aviation**, the Group offers not only high-quality tires but also guarantees a certain number of landings and provides a dedicated maintenance service. Constructors of civil and military planes, airlines and maintenance providers look to the Group's products and services for reliable solutions that are also longer lasting and deliver sustainable performance. Near Zero Growth (NZG) technology applied to radial aircraft tires makes it possible to increase the number of landings. That's why in 2015 MICHELIN was named supplier of the year by BOEING.
- In **agricultural** tires, a segment in which the tiremaker has long been present, the MICHELIN brand is today developing tires that more effectively respect cultivated land – thanks to the MICHELIN UltraFlex range – which reduces compaction of the soil.
- For the **mining industry**, Michelin has risen to the challenge, developing tires adapted to ever-larger vehicles. One example is the XDR3, the world's largest tire, which was especially designed for the industry.
- For **trucking companies**, MICHELIN designs innovative tires capable of carrying even heavier loads (the MICHELIN X-ONE), as well as services for managing truck fleets online (acquisition of Brazil's SASCAR) and tires (MICHELIN TIRE CARE).

- **Lastly, there are competitive sports**, in particular car racing. MICHELIN supports amateur and professional drivers on racing circuits and roads around the world. This support involves marketing and distribution of very high-performance tires that are aligned with the expectations of customers in search of sensations, records and speed.

MICHELIN Motorsport also works with the world's leading carmakers, offering them tires that safely allow them to maximize performance. "Michelin's powerful commitment to motorsports has led to the development of innovative technologies and high-performance tires," says Pascal Couasnon, head of MICHELIN Motorsport.

The Motorsports Division is focused on enhancing tire longevity, safety, energy-savings and driving enjoyment. MICHELIN has demonstrated the superiority of its tires, being the only manufacturer to win all individual races and all major world championships in car and motorcycle racing including Formula 1, MotoGP, WRC, the 24 Hours of Le Mans, and Dakar, competing head to head with other tiremakers.





## focus 1 WHEN MICHELIN SUPPORTS INNOVATION IN OTHER SECTORS OF MOBILITY: THE XDR3

The new MICHELIN XDR3 meets the needs of mine operators by incorporating three major innovations that, together, increase tire life by 10% compared with its predecessor, the XDR2

- A revolutionary tread. The XDR3's tread offers several advantages over that of the XDR2. One is its greater endurance thanks to the tire's ability to get rid of excessive heat, reducing it by 8° C on the tread. A larger quantity of rubber is in constant contact with the ground, which reduces wear while guaranteeing that the load is more evenly distributed over the entire contact area and that the pressure and wear rate are lower.
- Four innovative components for a higher-performance blend: MB4, MB, MC4 and MC. A new exclusive procedure for blending the rubber compound ensures a more uniform tire composition and a higher level of carbon black dispersion, which increases wear resistance. Each component provides specific performance characteristics across the entire range of wear resistance as well as for tonnes per kilometer per hour (TKPH).
- Steel cables protect the casing against corrosion. The highly resistant steel cables integrated into the tire casing are 10% more solid than those used for the XDR2. They are encapsulated in the rubber to avoid corrosion being transferred to the casing, which effectively increases tire life

The XDR3 is compatible with MEMS technology, which means that tires can be equipped with the latest pressure and temperature sensors, thereby ensuring that a great deal of information on tire condition is available in real time. What's more, the XDR3 is the world's biggest tire, enabling the mining industry to increase the size of its machines.



## focus 2 THE MICHELIN ENERGY E-V LINE-UP FOR ELECTRIC VEHICLES

Released in 2012, the MICHELIN Energy E-V lineup is the first range of tires designed especially for electric vehicles. Developed through a four-year research and innovation program conducted jointly by Renault and Michelin, the new, highly energy-efficient range of tires helps increase the car's overall range.

The tire plays a key role in vehicle energy consumption. Tires account for up to 30% of the energy consumed by an electric powertrain. While the MICHELIN ENERGY™ E-V tire heats up little when driving, thus reducing energy consumption, the rubber in the contact patch heats up quickly when the brakes are applied, thereby shortening braking distances. Michelin's goal is to design tires that help to reduce energy consumption while maintaining the same high performance in the areas of safety – especially wet grip – and longevity, using two technologies:

- Self-blocking sipes that stiffen the tread on the ground, thereby ensuring optimal vehicle control.
- A very flexible multi-polymer blend that delivers excellent grip on both dry and wet roads.



## focus 3 NZG TECHNOLOGY: INNOVATION TO INCREASE THE NUMBER OF AIRCRAFT LANDINGS

Near Zero Growth (NZG) technology was developed by Michelin in 2001. From the adaptation of radial technology to airplane tires in 1981 to the latest-generation NZG tires, Michelin has constantly improved the performance of its commercial and military aircraft tires.

Thanks to the combination of radial technology and a layer of Kevlar added to the composite structure that is characteristic of NZG technology, tire resistance increases and its weight decreases by up to 15%. By reducing the airplane's total weight, NZG generates fuel savings. At the same time, because the Kevlar makes the tires more resistant, they are also longer lasting. In this way, NZG increases the number of potential landings.

**A long-time supplier of Airbus, MICHELIN was named "supplier of the year" by Boeing in 2015. The latest-generation NZG tires are now fitted on more and more planes built by the US-based manufacturer, a sign of their reliability and the benefits that NZG technology provides airplane constructors.**

## focus 4 LULI, A RESPONSIBLE PLAYER IN THE RIDE-SHARING SEGMENT

Ride-sharing is the core business and expertise of LULI, which has developed and distributes a mobile smartphone app called Lu You Tong Xing that provides innovative ride-sharing services.

The application streamlines processes, thereby helping people to find car-sharing solutions, mainly for getting to work.

**"This investment clearly strengthens Michelin's position as a player in sustainable mobility," said Philippe Barreaud, head of the Incubator Program Office in Asia, when the partnership was first announced. "It also enhances our ability to promote our product and service offerings to Chinese consumers."**

## Opportunities provided by digitization: Maintaining and strengthening the MICHELIN brand's special relationship with customers



The digital revolution has radically changed how we produce and consume goods. MICHELIN's core business is no exception to the rule. Fully aware of the dangers of digitizing its operations too late and of the threat posed by major data providers, the Group decided to respond proactively and embrace the challenge of the digital revolution, with the goal of protecting and enriching its privileged relationships with customers. That's the reasoning behind MICHELIN's investment in pure players in the tire dealership segment that operate exclusively on the Web.

Jean-Dominique Senard has made a unique choice in the tire manufacturing industry by developing a Digital Department to manage the Group's transformation. The Chief Executive Officer of Michelin wants to continue manufacturing the best tires while at the same time being able to develop innovative digital services cross-functionally.

This involves pursuing three initiatives:

- 1-** Creating a more personalized relationship with our customers and getting to know them better
  - 2-** Developing a structured, disruptive digital services offering
  - 3-** Enhancing our employees digital skills
- MICHELIN is exploring the potential of the connected tire, first in the industrial arena. An emerging technology, this use of the Internet of Things in MICHELIN's core business provides considerable potential for real-time monitoring of the tire's condition and related services. The MICHELIN TIRE CARE offering is one example.
  - A suite of mobile applications available through the App and Android stores extends the service content of the MICHELIN offering, in line with the mobility expectations of customers in such areas as maps, lodging solutions and tire maintenance assistance.
  - Lastly, MICHELIN is investing in shared mobility platforms, such as the application developed by LULI in China.

## Co-construction and focusing on use: imagining the tires of tomorrow, aligned closely with customer needs

At MICHELIN, innovation is not an end in itself. Rather it serves the mobility needs and uses of customers whoever they may be. Innovation must be useful to them and improve performance in all areas, namely safety, maintenance and durability.

Beginning with customer needs means that innovation doesn't come from the laboratory but rather from the field, from mobility uses and practices and from weather conditions.

**The CrossClimate was designed in this way. This has been proven by the tire's success in the marketplace.**

The same logic of co-construction is also at work in automobile racing. MICHELIN Motorsport has forged technological partnerships with prestige brands such as Porsche (for over 50 years), Audi, Peugeot, Toyota, Volkswagen, Hyundai, Ferrari and Corvette. The goal is to jointly develop tires and cars with a shared focus on performance and on winning, regardless of the sport.



### focus 5

CROSSCLIMATE,  
CREATED BY CLOSELY OBSERVING  
CUSTOMER NEEDS

MICHELIN designed the CrossClimate tire by closely observing customer needs and uses.

Brought to market in 2015, the tire addresses a need that was never satisfied in Europe for a tire adapted to all seasons, meaning to the extreme conditions encountered in both summer and winter.

CrossClimate is the first summer tire certified for winter use. Capable of safely adapting to a variety of weather conditions, it was awarded the highest-grade – an "A" – on the European label for wet-braking while at the same time being certified for winter use.

The tire's initial success, with three million units sold in the ten months following its market launch – 30% more than the Group's target – clearly shows the advantages of an industrial approach focused on customer needs and uses.

For three years, some 150 people worked to bring together the complex technological bricks developed over the years in order to produce a tire whose different areas of performance previously seemed irreconcilable.



## 2\_Sustainable performance

R&D is the fundamental tool for improving the performance and longevity of MICHELIN products

A tire's performance is an equation that is hard to solve, in particular because the different qualities sought after are contradictory. These include the tire's ability to hold the road in all weather conditions and its braking performance on corners and in straight lines as well as its longevity and carbon footprint.

MICHELIN has resolved this equation by producing tires that are simultaneously safe in all driving conditions, reduce fuel consumption and are very long-lasting, - since programmed obsolescence has no place within the Group – while also ensuring driving enjoyment.

Thanks to intense, on-going R&D programs, MICHELIN tires – which are high technology products – are able to reconcile contradictory forces and provide customers with a driving experience whose performance is optimal and lasts over the long run.

**That's the sustainable performance commitment.**

Every day, MICHELIN's R&D teams develop new technologies, adding to the range of patents filed by the Group, which has 10,000 active patents at present. What's more, technology transfers allow customers to take advantage of performance gains, especially those achieved in racing.

The MICHELIN Group's innovation strategy serves this powerful commitment to allowing all our customers to benefit from sustainable performance that is being constantly improved by observing uses and thoroughly understanding needs.



**SUSTAINABLE PERFORMANCE PROVIDES THE GUARANTEE THAT YOU WILL TRAVEL FURTHER ON YOUR TIRES WITH NO LOSS OF SAFETY OR DRIVING ENJOYMENT.**

**4 questions for Thierry Chiche, Managing Director of the Passenger Car and Light Truck business and member of the Group Executive Committee**

**What is sustainable performance?**

*Sustainable performance is a radically different vision from that which we call programmed obsolescence. For tires, sustainable performance means a guarantee of exceptional longevity while also maintaining performance levels. The MICHELIN tires purchased by our customers do not lose their high degree of safety as they wear. At the same time, they continue to meet the Group's environmental commitment in terms of fuel consumption. Moreover, thanks to our capacity for innovation, we are constantly seeking to make our tires last longer. That's a fundamental aspect of our product lines. We don't want to encourage consumption when there is no real gain for the consumer. Our commitment to sustainable performance for our customers is both ambitious and demanding. We want to guarantee that you will travel further with your tires with no loss of safety or driving quality.*

**How is sustainable performance measured?**

*It's crucial that the tests conducted by independent organizations make it possible to demonstrate these performance levels, also for end-of-life tires, and to openly inform consumers of the results. In addition, MICHELIN is committed to guaranteeing the reliability and pertinence of these tests. We have the resources to measure these performance levels exactly and to demonstrate them. MICHELIN was the world's first tire manufacturer to use test tracks to try out its tires in conditions that correspond to how they are really used. That's the main purpose of the Ladoux Technology Center. And every year, nearly two billion kilometers are covered by driving at our test centers. That's the equivalent of driving around the world once every 12 minutes!*

**Is a tire that is used longer less safe?**

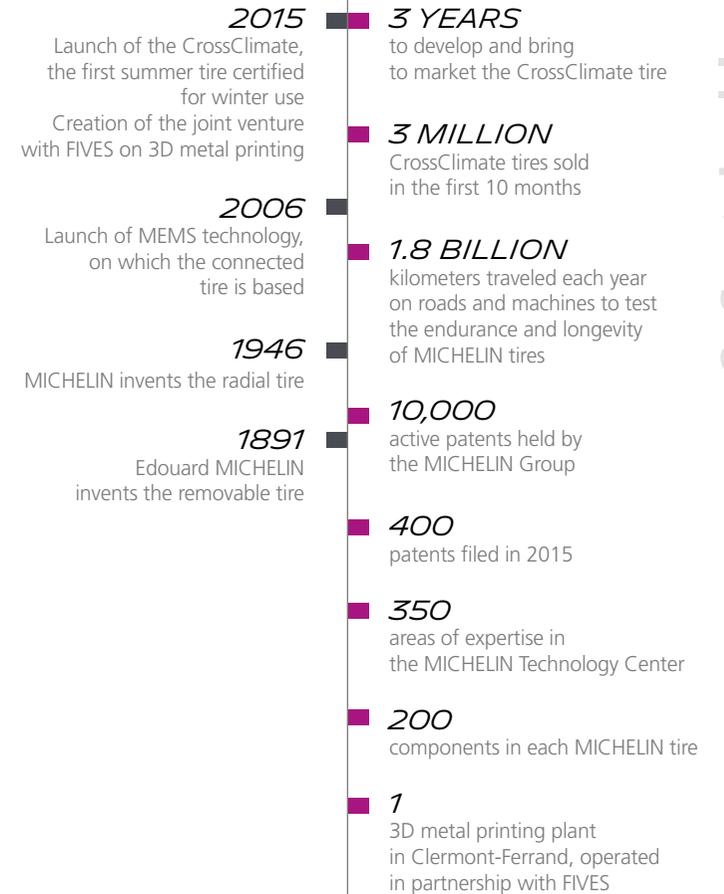
*It's too easy to pretend that reducing a tire's life is necessary to its safety performance on the road. At MICHELIN, we know full well how to guarantee a high level of performance, even when braking, throughout a tire's life, because we have opted for sustainable performance, while other brands are focused on programmed obsolescence. This is a decision that can't be seen with the naked eye but which is crucial for motorists.*

*It's important to be fully aware that replacing a tire prematurely has both an environmental and an economic impact. Changing tires when the wear indicator shows 3 mm, and not the 1.6 mm that is recommended by European authorities, would mean that every year an additional 25 million tires would be used in Europe and 26 million in the US. Overall, this is the equivalent of 600,000 tonnes of raw materials and one additional tire per car every two years. Our position is simple, almost trivial because it is so obvious. If performance levels are maintained, there is no reason to change your tires!*

**Why is racing so important to this commitment to constantly improving tire performance?**

*At MICHELIN, racing is an innovation laboratory. On one hand, our success in car, motorcycle and bicycle racing serves as a showcase for our excellence. On the other, racing also provides the means for analyzing, often in extreme conditions, the responsiveness of our tires. This experience is decisive because it enhances our knowledge, thereby making it possible to develop tires for the general public that feature advanced technology.*

**FACTS & FIGURES**



## The sustainable performance of a tire: a complex equation perfectly managed by MICHELIN



**Some performance parameters conflict with others, in what is known as a design conflict. In the case of tires, there are two main types of design conflict:**

- For safety performance, the opposition between dry and wet grip has to be resolved. On dry pavements, the tire has to put as much rubber as possible on the road, much as a slick tire does in racing. On wet pavements, on the other hand, the tread has to have patterned blocks, to evacuate the water, and ridges, to break up the surface film and let the rubber grip the pavement.
- In the area of energy efficiency, the tradeoff concerns the opposition between reducing fuel consumption and increasing tread life. To maximize mileage, the easiest solution is to add more rubber to the tread, so that it wears longer. However, this increases the tire's fuel consumption, because there is more rubber being deformed with each rotation of the wheel.

Our researchers and experts know how to resolve these conflicts with a minimum of tradeoffs. Ongoing programs are helping to drive continuous improvement in tire materials, casing architecture and tread design. On a day-to-day basis, MICHELIN's ability to analyze a tire's life and its in-depth understanding of motorists' driving habits and expectations as well as carmakers' demands and the European regulatory framework, and its expertise in accidentology developed in partnership with well-known institutions such as the Accidentology Chair at the University of Dresden provide the Group with advantages that enable it to simultaneously drive improvement in different areas.

**MICHELIN is committed to providing its customers – for all types of use – with the best possible performance and an optimal combination of safety, longevity and energy efficiency throughout a tire's life and not only when it is new. Tires must guarantee their performance right down to the wear indicator. These are the pillars on which the MICHELIN brand's commitment to sustainable performance is built.**

## Technology transfers: when innovation for some people becomes a source of performance for others

The performance of MICHELIN tires is based on innovation clusters, originally developed for one range and then extended as broadly as possible to other uses, as with passenger cars.

**This cross fertilization between uses and product ranges benefits from highly different customer profiles as well as from sometimes similar needs. Shared innovation is a concrete reality and makes it possible, for example, to enhance certain tires for SUVs with technologies developed for earthmoving equipment. What these two segments have in common is the need to transform the tire into a tool for managing uneven terrain.**

Grip and resistance over long distances needed for large mining machines are similar in fact to the performance sought by people who enjoy driving powerful SUVs on all types of terrain.

Under the leadership of Terry Gettys, technology transfers between different types of use are accelerating. Thanks to this intense exchange between all types of use, innovation for some people is becoming a source of performance for all ranges, all types of use and all MICHELIN brand customers.

Many technologies developed through racing have found applications on series-produced vehicles, including radial technology, silica, slick tires and dual compound tires for motorcycles, as well as PSS and PSCup 2 technologies and the Variable Compact Patch (VCP).



# focus 6

## A FEW EXAMPLES OF TECHNOLOGY TRANSFERS THAT BENEFIT GENERAL PUBLIC USERS

### MOTORCYCLE TIRES

High-performance tires for store-bought motorcycles are fully derived from racing innovations. Radial technology adapted to the motorcycle was introduced recently, in 1987. It was developed through motorcycle Grand Prix events and the rubber components are sometimes identical as those used in competition. The technology has enabled the recent development of the latest tire in the Pilot Road lineup – the MICHELIN PR 4— whose Dual Angle Technology combines elements from both radial and cross-ply technology in order to obtain the best possible tradeoffs.

### AUTOMOBILE TIRES

The latest high-performance car tire brought to market – the Michelin Pilot Sport 4 – integrates technologies developed for Formula E tires.

### BICYCLE TIRES

The latest range of road bicycle tires – the MICHELIN Power lineup – delivers performance never before achieved in the segment in terms of energy efficiency, which is expressed in watts. The gain is 10 watts, which corresponds to a 1-minute 2-second reduction in the time needed to climb l'Alpe d'Huez and the gain is due solely to the tires. This tire comes directly from low-fuel consumption car tires that feature low rolling resistance.



Tires are a composite of high technology that integrate 200 different components. These include elastomers, plasticizers, synthetic additives, reinforcing fillers, and metal and textile reinforcements. The challenge is to blend the various materials together as seamlessly as possible to ensure that the tire delivers all of its safety, grip, durability and mileage performance.

**A leader of this important new disruptive technology, MICHELIN is now exploring the potential offered by the connected tire.**

By incorporating RFID-type sensors into the compound, the brand has made it possible to monitor in real time several tire parameters, including pressure, temperature, inflation levels and mileage. These data provide a gold mine of information about a tire's handling and condition. Transmitted and used in real time, they are a rich raw material that serve customers, helping them to manage their vehicle fleet and their tires, directly, from a computer, tablet or smartphone. Optimizing fuel consumption, reducing maintenance costs, enhancing safety and providing personalized advice on the tire best adapted to one's driving style – all of these data, if used properly, provide key added-value to mobility.

# Accelerated innovation is the key to quickly providing customers with better performance



## focus 7

### MICHELIN TIRE CARE : THE CONNECTED, INTELLIGENT TIRE IS A MEANINGFUL RESPONSE ISSUES FACING TRUCKING COMPANIES

Truckers operate in an increasingly difficult environment, shaped by fierce competition and powerful constraints. Their expectations are clear: the safety of drivers and goods transported, rapid and efficient maintenance service to reduce truck down time, reliable services associated with vehicle upkeep and lower costs. Every euro counts. In today's market, every euro gained on the tire means one additional euro of profit for truckers.

Truckers have real-time access to data about their tires, including:

- Pressure
- Tread wear
- Damage to sidewalls and foreign objects, such as stones or nails
- Availability of inventory in each size

Michelin Tire Care is comprised of three offerings. For small fleets with fewer than 20 vehicles that outsource their maintenance operations, the TireLog™ offering provides the customer with a simple, practical, digital maintenance notebook that fits in the pocket. For fleets with more than 100 vehicles that have their own maintenance workshop, Michelin suggests the iCheck offering, for predictive tire diagnostics. Lastly, the integrated iManage offering provides connected management of all tires.

Providing customers with the most advanced technology as quickly as possible is a goal set by Jean-Dominique Senard for the Group's research teams. MICHELIN has decided to drastically reduce the time between when an idea first emerges and when the product is brought to market.

A key component of the Group's innovation strategy, reducing time to market is a reality, requiring an extensive dialogue and agile coordination between different players in the R&D process. There is also a need for our sales and marketing teams to accelerate the testing phase and market launch plans. To design the tires of tomorrow, we are counting on networking our skills.

The new RDI Campus at the Michelin Technology Center, located in the heart of France's Auvergne region, will represent the achievement of our accelerated innovation strategy. The architecture of the new campus has been designed to promote fast and flexible work methods. In all, 80 fully adjustable 300-square-meter platforms will each host around 20 engineers capable of working in a cross-functional, multidisciplinary manner. This bold organization will make it possible to link the poles of expertise – in materials and structure, for example – while sitting atop the test tracks.

The first product manufactured by this acceleration in innovation time is the CrossClimate tire. Only three years were needed to stabilize the recently developed technologies, design how they would be combined into a single tire, organize the industrialization phases on the production equipment and adapt this new tire so that it can be fitted on all available passenger car sizes. Just a few years ago, a tire that caused such an important technological rupture would have taken twice as long to get out of the laboratory and into the market.

**In this way, MICHELIN is equipped to maintain its technological leadership and stay ahead of the competition.**



## 3\_Sustainable innovation

Strengthening MICHELIN's position as the undisputed leader in the area of sustainable mobility

**Since the beginning, the MICHELIN Group has designed its products and services around the conviction that mobility is driving society's development.**

MICHELIN wants this growth to be harmonious and respectful of both people and the environment because mobility and sustainable development should not be in opposition. Another of the Group's powerful convictions is that innovation can only be lasting if it is responsible, offering the conditions for progress that is more energy efficient and capable of preparing us for the post-oil world while also improving the safety of people and goods.

To make this happen, MICHELIN is investing in R&D in three inter-related ways.

On one hand, MICHELIN wants to enhance its tires' environmental performance. One tank of fuel out of five is consumed by tires as they are driven on the road, which means that tires account for 20% of a vehicle's carbon dioxide emissions. Reducing tires' carbon impact thus represents a major step on the road to green mobility.

**That's the essence of the message expressed by the Group in major international forums such as COP21 and COP22.**

On the other hand, the Group is wagering on the circular economy, which reduces the impact of mobility on the environment. That's the meaning of the 4R strategy, which stands for Reduce, Recycle, Repair and Renew.

MICHELIN is developing partnerships with green technology companies, in order to invent new materials and energy sources based on biomass or hydrogen, make tires more recyclable and go even further in reducing the environmental impact of its tires. The Group is activating all its innovation levers to more fully reconcile transportation with the major environmental challenges and is promoting these beliefs in major international forums such as COP21.

Lastly, reducing the human costs of transportation will lead to enhanced safety.



**MICHELIN HAS CHOSEN THE CIRCULAR ECONOMY AND ITS DECISION IS REFLECTED IN ITS R&D AND OPEN INNOVATION STRATEGY**

**2 questions for Ramesh Mashelkar, member of the Corporate Innovation Board and President of the Global Research Alliance**

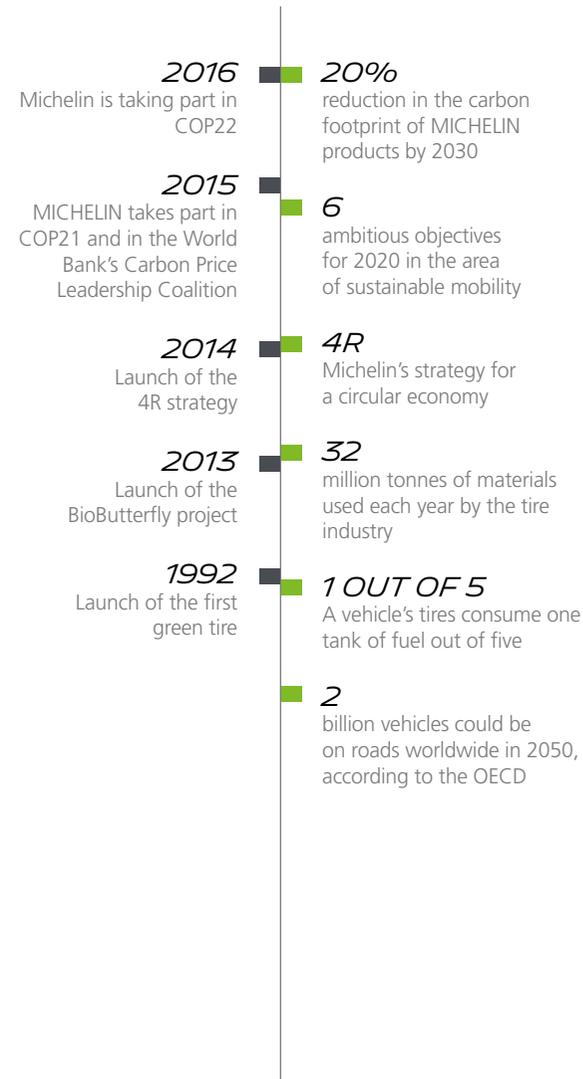
**You are a member of MICHELIN's Corporate Innovation Board. What is the Board's role in implementing the Group's strategy?**

Created by Jean-Dominique Senard, the Board brings together MICHELIN Group experts and outsiders such as Barbara Dalibard and myself. It is both an in-house think tank and a participant in the innovation strategy. Our mandate is to suggest research priorities and animate the Group's innovation ecosystem. We review innovations that may concern tires as well as – more and more – mobility and services. And to make these objectives real, we can rely on the Group's IPO incubator to invest in innovative companies and suggest partnerships with outsiders. We also discuss the allocation of research budgets to ensure their long-term alignment and take advantage of opportunities, with agility. The CIB is the key element of innovation governance at MICHELIN

**Why has the circular economy taken on so much importance in MICHELIN's innovation strategy?**

It's the logical outcome of powerful convictions expressed by MICHELIN. Let's think about the integration of environmental concerns regarding tires and transportation. MICHELIN was a pioneer in this field by producing tires that reduced vehicle energy consumption. At a time when sustainable development was not so widely discussed, MICHELIN believed that it was valid and incorporated it into its offering. Today, sustainable development is a well-known concept and the circular economy has more and more adepts. MICHELIN's core business is based on the use of complex materials and willing to address the question of what happens to end-of-life tires. It was logical that the Group also focus on recycling its tires, extending their useful lives and developing production methods that use bio-sourced polymers. MICHELIN has chosen the circular economy and this decision is reflected in its R&D and open innovation strategy. This is a choice that many companies refuse to make, undoubtedly for short-term reasons. I am happy to take part in making real what is a true vision of society and the economy.

**FACTS & FIGURES**



# The circular economy at MICHELIN: the 4R strategy is driving innovation to support sustainable mobility and performance



## REDUCE

the consumption of raw materials and fuel as well as the number of road accidents



## REUSE

tires to extend their useful lives



## RECYCLE

tires to reuse an ever-larger portion of the materials in them



## RENEW

sources of materials and energy

## HOW?

## WHY?

There is too much pollution at both global and local levels. Traffic is responsible for 18% of carbon emissions. There is also a decline in the quality of air in cities, too much noise pollution due to traffic and overdependence on fossil energies.

Problems of raw material availability

Too many road accidents

More and more congestion in cities

## WHAT OBJECTIVES?

To meet these challenges, MICHELIN feels strongly that mobility must be:

- Safer
- Cleaner
- More efficient
- More pleasant

## focus 8

BIOBUTTERFLY, A RESEARCH PARTNERSHIP TO CREATE SYNTHETIC RUBBER FROM BIOMASS

**Field:** To create a synthetic rubber production channel using biomass

**Project supported by France's Agency for the Environment and Energy Management (ADEME)**

**Partners:** IFPEN and AXENS

**Launch:** 2013

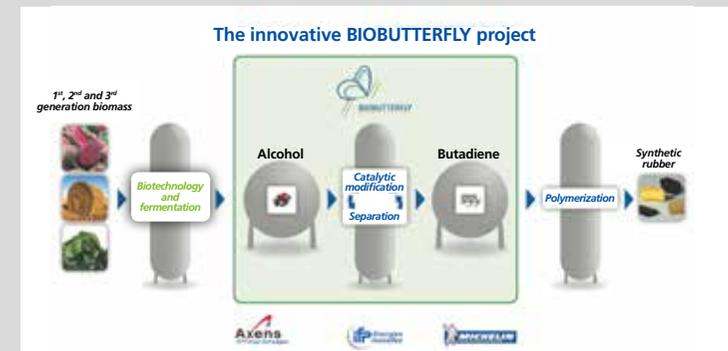
**Duration:** : 8 years

**Coordinator:** Michelin

Developed from petrochemicals, butadiene is widely used in the manufacture of synthetic rubber. Worldwide, manufacturing companies use more than 10 million tonnes of this product every year. Securing supply of this raw material is difficult in a challenging market and is expected to remain difficult. **That's why diversifying resources and methods for producing butadiene have become a strategic challenge for users.**

**The BioButterfly project aims to:** reduce the environmental impact of butadiene production by **replacing products of fossil origin with products of renewable origin**; develop and market an innovative, high-performance technology for producing bio-sourced butadiene from **intermediate alcohols derived from biomass through fermentation**; open **new channels and secure sourcing** of butadiene for the years ahead; develop **high-level expertise in France**, especially in the area of plant-based chemistry.

**The creation of a "green" chemicals industry for producing bio-sourced butadiene in France** remains a key challenge for this project. It will federate major industry players, from producers of bio-sourced raw materials to producers of chemical intermediates and polymers.



MICHELIN is constantly improving its tires' environmental performance, making them cleaner and more energy-efficient



One tank of fuel out of five is consumed by tires as they are driven on the road, which means that tires account for 20% of a vehicle's carbon dioxide emissions. Reducing tires' carbon impact thus represents a major step on the road to green mobility. **That's the essence of the message expressed by the Group in major international forums such as COP21 and COP22**

## focus 9 AFTER COP21, MICHELIN IS GEARED UP FOR COP22 IN MARRAKECH

An active participant at COP21, held in Paris in December 2015, the MICHELIN Group has reaffirmed its support for sustainable development. The Group was co-organizer of Transportation Day, which was dedicated to sustainable transportation solutions. This led to the Paris Process on Mobility and Carbon project, a commitment from companies and organizations, including Michelin, to support cleaner transportation.

### In particular, the Group

- Reiterated its support for the creation of a mechanism to set the price of carbon, in line with the World Bank's Carbon Pricing Leadership Coalition, of which MICHELIN is a member.
- Announced that by 2030 it would drive a 20% reduction in the carbon footprint of its tires over their entire life, from raw materials production through use and recycling. Lastly, MICHELIN confirmed its commitment and its leadership to support sustainable mobility by taking part in preparations for COP22, to be held in Marrakech in 2016.



## focus 10

**BASYS, A RESEARCH PARTNERSHIP INTENDED TO PRODUCE CAR TIRES THAT REDUCE VEHICLE CARBON EMISSIONS**

**Field:** Materials for tires that reduce carbon emissions for cars.

**Project supported by France's Agency for the Environment and Energy Management (ADEME)**

**Partners:** Solvay and IRCCP

**Launch:** 2014

**Duration:** 4.5 years

**Coordinator:** Michelin

Social and regulatory pressure concerning greenhouse gas emissions and the energy efficiency of road transport is leading the automobile industry to activate all technical levers that could help to reduce its impact in this area. One of the areas for improvement identified is to make tires more energy efficient.

The BASYS project aims to reduce carbon emissions per kilometer by 4 grams for a segment B car while ensuring industrial feasibility and overall tire performance.

**Achieving this objective will be possible thanks to the creation of unique materials solutions:**

- New generations of functional elastomers
- Innovative silica for the tread
- Crown solutions that have been optimized from an energy perspective

The project is intended to create an asymptotic change in the environmental impact of car tires. By bringing together two leaders in tire development and specialty chemicals, as well as several leading academic laboratories, the project is allowing for significant innovation in key tire technologies at a time when competitive pressure is growing more and more, especially in Europe.

In addition to the tire itself, the project also addresses the challenges of more sustainable mobility.

## focus 11

**MICHELIN ULTRAFLEX:  
AN AGRICULTURAL TIRE THAT  
IS GENTLER ON THE SOIL**

The specifications for agriculture tires are more and more complex. Farmers need to carry their load safely, respect regulatory constraints in terms of road use and, above all, guarantee the long-term sustainability of harvests while protecting the soil.

The patented Michelin UltraFlex technology responds to all of these requirements. MICHELIN agriculture tires featuring this technology are capable of operating with unique flexion rates. This reduces soil compaction, thereby enabling the soil to "breathe" better. Making farms more productive and profitable comes not only from more respect for the soil but also from a reduction in fuel consumption and greater tire longevity.



## focus 12

### MICHELIN® PREMIER A/S: INNOVATION THAT LEVERAGES EVERGRIP TECHNOLOGY TO FURTHER ENHANCE ROAD SAFETY

Tires have grooves between the tread to evacuate water and maintain grip on the road. Until now, tire traction diminished on wet surfaces as the tread became worn over time. Groove depth decreased, thereby reducing the tire's capacity to evacuate water and increasing braking distances and the risk of aquaplaning. Wet grip is a particularly important factor in road safety: for a given distance, the risk of accidents is twice as high in wet conditions as in dry conditions.

Unlike conventional tires, MICHELIN® Premier® A/S tires have unique features that allow them to deliver excellent grip on wet surfaces. Even when worn, the MICHELIN® Premier® A/S brakes more quickly on wet roads than new tires produced by most competing brands.

**This performance is due to EverGrip technology, which combines three key elements:**

- A high-traction rubber compound. The MICHELIN® Premier® A/S is manufactured using an exclusive rubber compound that contains large quantities of silica and sunflower oil. The silica provides the necessary contact and grip to keep the tire on the road, even on wet surfaces. The sunflower oil helps the tire to grip on wet and snow-covered roads at low temperatures. These ingredients are blended using a rigorous process that guarantees continuous contact between the material and the road, whether the tire is new or used.
- Expanding rain grooves. On most tires, the shallower the rain grooves become, the less water is evacuated. The MICHELIN® Premier® A/S has rain evacuation grooves covering its entire circumference. Because the rain grooves' special shape widens as the tire is used, the same amount of water is dispersed, even though the grooves are not as deep.
- Invisible grooves. The MICHELIN® Premier® A/S has an extra layer of grooves. Placed along the tire's shoulder, the grooves appear as the tire wears down. More than 150 additional grooves evacuate water and ensure solid grip throughout the tire's life.



# 4\_Open innovation

## Increasing the skills of the MICHELIN Group through open innovation

Because MICHELIN believes in the need to look outside the organization for skills that support its own and also believes that each individual is a source of creativity, the Group has developed an ambitious open innovation strategy.

- A research and development partnership consists of seeking skills outside the Company to develop innovative products and services. The more these skills are original and fit with ours, the more they fertilize our innovation process.
- Partnerships are perhaps the best way to detect emerging technologies and to mobilize a critical mass of adapted resources for a given period and theme, thereby accelerating our research process.
- R&D partnership modalities are extremely varied. The most traditional are research contracts with academic laboratories and co-development projects with suppliers or customers.
- More recently, the Group has expanded its field of partners to include experts recognized for consulting, small and mid-size businesses and startups for producing a technological prototype quickly and even consortiums involving industrial partners and universities, financed by government authorities that want to develop innovations that have a powerful beneficial effect on society.

These communities comprise an extensive network whose flagship is the Ladoux Center, which is located at the geographic heart of the Group's operations.

Collaborative and open, combining in-house expertise and external creativity, this network enables all players, whether researchers, startups or students, to work together and enhances the Group's ability to support the emergence, in an agile manner, of ideas that will be developed into the mobility of tomorrow.





**THE 300 RESEARCH PARTNERSHIPS FORGED BY THE GROUP ARE ONE OF THE KEYS TO MICHELIN'S INNOVATION STRATEGY**

**3 questions for Maude Portigliatti, Scientific Director of the MICHELIN Technology Center**

**How does open innovation represent a change of culture for Michelin?**

MICHELIN is fully aware that it must also look for sources of creativity outside the Group. The era of the absolute secret has given way to the era of cross-fertilization. Innovators from other sectors around the world, regardless of their size and degree of maturity, provide us on a day-to-day basis with new technologies and ideas and are delighted to benefit from our scientific know-how, the power of the MICHELIN brand and the quality of our engineers. Depriving ourselves of this expertise would mean moving forward more slowly and, in the end, being overtaken by our competitors. Open innovation provides a breath of free air, a source of enrichment and a vibrancy that has now become the underlying tool of our technological excellence. The 300 research partnerships forged by the Group are one of the keys to MICHELIN's innovation strategy. They represent an incredible source of energy for the MICHELIN Technology Center.

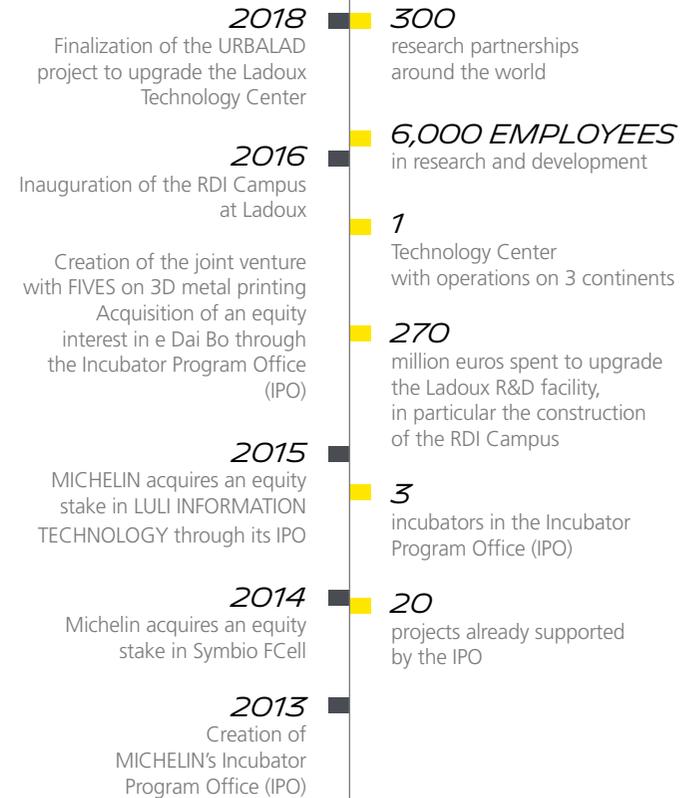
**What are the conditions for a successful open innovation strategy?**

The first condition is reciprocity. Everyone must come out a winner. Complementarity is indispensable. The second condition is to have clear rules for protecting industrial property. Open innovation doesn't mean weakening the profitability of investments that we approve. The third condition – and it's a vital one – is to have an open mind. So it's a question of culture and conviction that enables us to expand our expertise by interacting with the outside world.

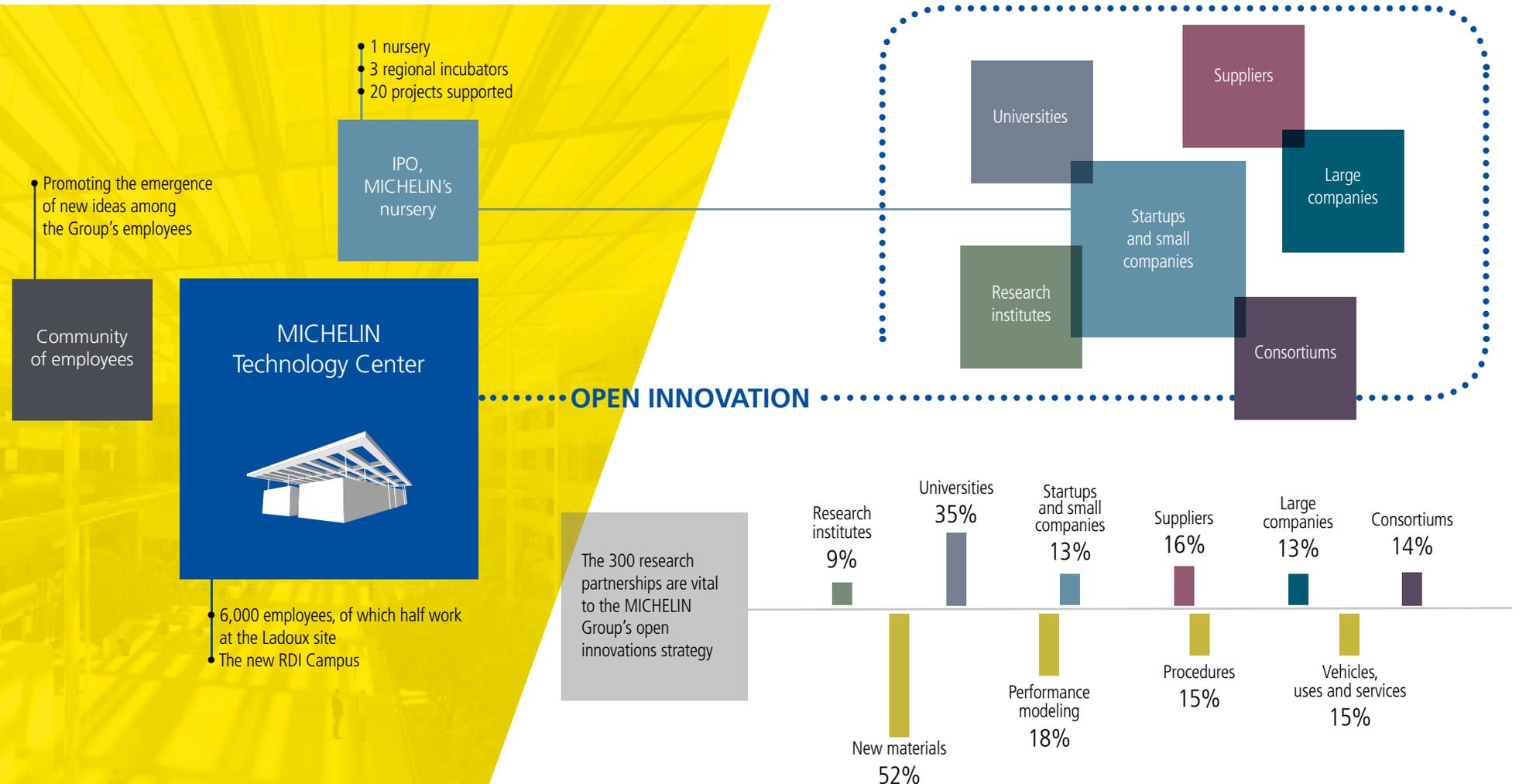
**What do you think are the most meaningful examples – and the first successes – of the open innovation strategy?**

Some of our products come directly from cooperative ventures. This is true for the MICHELIN Energy E-V range, which is dedicated to electric vehicles and was designed in partnership with Renault. Very large projects are being developed at the moment. Examples include TREC, the project to improve tire recyclability, the hydrogen battery being developed with the startup Symbio FCell, and our work on bio-sourced materials. Deploying this research takes a long time because we're talking about technology with highly innovative content. The pertinence of an in-house innovation ecosystem is also deployed over the long term. Its main added value is that it enriches our potential for creativity. This helps us find new ideas as well as hire high potential new people. It's also why we created a partnership with the National Institute for Applied Sciences (INSA) in Lyon. When combined with faster time to market and faster, more intense technology transfers, this enrichment enables the Group's Technology Center to build the competitiveness of tomorrow.

**FACTS & FIGURES**



# The MICHELIN Group's open innovation strategy is intended to create and energize innovative communities



## focus 13

### AN EXAMPLE OF ACADEMIC RESEARCH PARTNERSHIPS: THE GIREF CHAIR

**Field:** Digital simulation

**Partner:** Université de Laval (Canada) – Interdisciplinary Consortium for Research on Finite Elements (GIREF)

**Launch:** Chair's first mandate in 2006  
3<sup>rd</sup> mandate (currently being renewed): 2016 - 2021

In the area of innovation, digital simulation is a powerful tool for understanding and making decisions. It is one of the key scientific disciplines for high-technology companies. For Michelin, it plays an ever-larger role as a complement to machine or vehicle tests. These virtual tests facilitate prospecting and speed up the design stages.

**The Group's objective is to have modern, high performance simulation software**, able to quickly integrate all types of new functionalities. This software will give us greater agility and flexibility to efficiently support tire innovation.

The professionalism and academic excellence of the GIREF laboratory and the scientific achievement of their academic digital simulation code were critical in the choice of this partnership in 2006 for the Chair's first mandate. 2016 marks the beginning of the Chair's third mandate. This mandate will see the inclusion of new industrial partners with whom we are close on many digital modeling questions despite the fact that they come from distant sectors.

## focus 14

### AN EXAMPLE OF TECHNOLOGICAL RESEARCH PARTNERSHIPS: FACTOLAB

**Field:** innovative technologies for the plant of the future that leverage collaborative robotics, augmented reality and autonomous trolleys.

**Partners:** Three laboratories in Clermont-Ferrand: the Pascal Institute (IP) the Social and Cognitive Psychology Laboratory (LAPSCO) and the Information Laboratory for Modeling and Optimizing System (LIMOS), under the supervision of France's National Center for Scientific Research (CNRS).

**Launch:** 2016

In FACTOLAB, the laboratory "without walls," Michelin promotes its industrial vision and its real needs to make production systems more efficient and ergonomic. Academics provide their expertise and advanced skills in areas that we have identified as creating a breakthrough for our industry.

This shared laboratory, which is to last four years, serves as a framework for common research projects that could take the form of student theses or post-doctoral programs.

The initial studies began in 2015 in the area of cobotics (robots capable of collaborating with people) and cognitive ergonomics (evaluating the effects and the validity of innovations concerning man assisted by augmented reality).

### 3 questions for e Dai Bo

#### Can you briefly describe what you do?

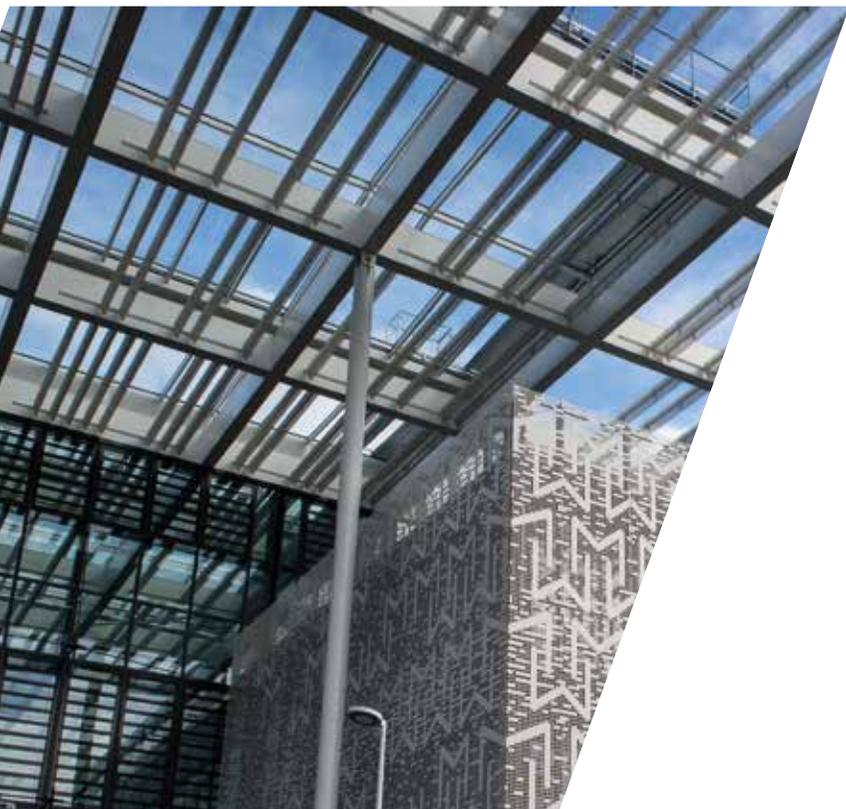
*We offer valet parking services. We take care of the vehicles that their owners entrust to us when they need to park them. We were the first company to introduce this activity on the Chinese market in 2014. We are already present in 24 airports in 23 of China's major cities. We are partners to China Eastern and Spring Airlines as well as to leading travel companies such as Ctrip and Qunar, which offer our services to their customers. We are also preferred partners of banks and credit card and insurance companies, which offer our services to their best customers. We innovate by offering additional automobile maintenance services. We recently opened our first service center at Pudong International Airport in Shanghai. We are proud of our customer service and of our digital platform that enables motorists to book and use our online services very easily.*

#### Why have you chosen to work with Michelin?

*In Michelin, we have a truly strategic partner. Michelin's equity investment means first of all the recognition of a brand that is very solid and well established in China. It's also for us a way of developing our car maintenance offering by taking advantage of the TyrePlus network that MICHELIN has deployed throughout China, where there are already 1,400 sales outlets. In this way, we can enhance our offering in airports by creating TyrePlus franchised service centers as well as deploying our offerings in city centers by using existing TyrePlus sales outlets. This will enable us to take advantage of the skills and support of one of the country's leading car maintenance networks. For Michelin, the partnership is a way for them to benefit from additional traffic that we can generate for its network.*

#### What's your opinion on innovation at Michelin?

*We see Michelin as a leader, innovative in its core product, which is the tire, as well as in mobility-related services. Michelin has successfully defined the standard for a nationwide maintenance network. Thus, we are very happy to be able to cooperate and work with them. It's only by innovating that we can maintain our leadership as a valet parking company, which is an emerging industry in China.*



## The MICHELIN Technology Center, the flagship of the Group's innovation ecosystem

**The MICHELIN Technology Center is the flagship of the Group's innovation strategy and the hub of its R&D operations.**

In all, 6,000 employees are involved in designing the products and services of tomorrow, of which half of them work at the Center's main site in Ladoux, France. The rest of the staff work in the United States, Brazil, Thailand, India, China, Japan and Switzerland. The fact that the Group's R&D operations are divided among three continents makes it easier to understand local markets and to develop products and services in phase with customer needs.

Created in 1955 in MICHELIN's home base in Auvergne and endowed with the most advanced infrastructure, the 450-hectare Ladoux site is home to multidisciplinary teams, with 350 different skills sets and 41 nationalities.

Fully secured, the Ladoux facility ensures that the Group's R&D operations are kept secret. A full 72% of the tires developed by MICHELIN come from the Center and 15,000 prototypes are produced there each year.

**The Ladoux site brings together all of the activities needed for the design of high-technology, high-performance tires, including:**

- Design of tire component materials
- Tire design
- Manufacture of rubber compound prototypes
- Design and production of prototype curing molds
- Manufacture of prototype tires
- Trials, measurements and tests on both track and machines
- Vehicle logistics and maintenance
- Simulation, analysis and measurement operations

URBALAD, the Ladoux site's vast urbanization project, will be completed in 2018. A total of 270 million euros are allocated to the project, which is intended to increase the Group's innovation power and to speed time to market for ever-higher performance products and services. All of the different field of research, development and industrialization are present in order to stimulate cross-fertilization.



## The RDI Campus will speed the MICHELIN Group's potential for innovation

### FACTS & FIGURES

The RDI Campus: key figures

- **67,000**  
square meters
- **THE LARGEST BUILDING**  
in France's Rhône-Alpes-Auvergne region
- **80**  
300-square-meter work platforms
- **1,600**  
workstations in the initial opening phase  
of the RDI Campus
- **26,000**  
square meters: the area covered by the shade  
structure intended to manage variations in  
temperature and energy savings
- **50**  
kWh/sq.m a year:  
the building's energy performance
- **6**  
services to make life easier for researchers:  
a bank, dry cleaner, shoemaker  
and hairdresser as well as delivered  
vegetable baskets and other shopping  
items ordered on line



URBALAD's first major accomplishment, the RDI Campus opens in 2016. With 1,600 workstations, it is the largest industrial building in France's Rhône-Alpes-Auvergne region.

With the RDI Campus, the Group now has a new work tool adapted to the operating methods that it needs today.

The Campus will promote a co-design approach and carry out cross-functional projects while making it possible to support exchanges and skills transfers within the global RDI network.

In this way, the Campus will help to enhance Michelin's innovation potential with the goal of strengthening its global leadership by delivering tire solutions and services that are also more closely adapted to mobility issues.

## Startups: a key community in the Group's innovation ecosystem.

Because creativity and open innovation are part of an efficient, innovative ecosystem, MICHELIN has forged special ties with innovators and startups in areas that extend beyond tires and the Group's traditional activities.

To identify and nurture projects of the future on which the Group is relying, in 2013 Michelin created a dedicated incubation unit called the Incubator Program Office (IPO), which oversees three incubators in Europe, the United States and China. Its goal is to support the emergence of tomorrow's sustainable mobility projects.

Since 2014, for example, the Group has supported Symbio FCell, which develops hydrogen batteries, since 2015, the Chinese startup LULL and since 2016, e Dai Bo. Michelin also takes part in a number of accelerators to identify new business opportunities. Examples include HAX in China, Tech Stars in the United States and Paris&Co in Europe.



**AMONG ALL THE ADVANTAGES PROVIDED BY A COLLABORATIVE VENTURE WITH MICHELIN, THEIR VISION OF SUSTAINABLE MOBILITY HELPS US INSERT OUR ACTIVITIES INTO THE LONG TERM**

### 3 questions for Fabio Ferreira (Symbio FCell)

#### What is Symbio FCell's business model?

*It all began with the need to invent less polluting types of mobility in urban environments, where air quality was deteriorating. The only non-polluting powertrain is an electric one but the problem is that electricity must be stored. Two storage techniques currently exist: batteries and hydrogen. Thanks to hydrogen, our storage ability is much greater but it is more expensive on a per-kilometer basis. The hydrogen model becomes profitable for trips of at least 130 kilometers. This mainly concerns the transport of goods by trucks or vans and buses that carry people. We have positioned ourselves in this niche, beginning with the Renault Kangoo.*

#### How has the partnership with MICHELIN helped you?

*Michelin acquired an equity stake in our company two years ago. This show of trust was for us an incredible source of opportunities. No only because of the funds provided by the MICHELIN incubator, which enabled us to deploy our activity but also the co-construction approach that we embraced. We worked with the Group's R&D teams to design a solution*

*that was capable of equipping a large number of vehicles. The strategic fit between our areas of expertise has proved fruitful. For us, it means an economic model and an efficient means of making electricity storage by hydrogen profitable. For Michelin, it means a broader understanding of the automobile, the expertise of a fuel cell developed in-house and the remarkable ability to move much faster from a prototype to a technology that could be developed on an industrial scale. Thanks to MICHELIN, we develop products faster, test and industrialize them faster. This partnership has also been recognized as exemplary. We received the CleanTech prize for the best large company/small company partnership in 2016. What's more, among all the advantages provided by a collaborative venture with MICHELIN, their vision of sustainable mobility helps us insert our activities into the long term. We share the same approach to the mobility of the future and that makes our partnership enriching and stimulating.*

#### How do you see the future?

*The prospects for hydrogen-based mobility are considerable. Urban areas are developing and the pressure on air quality is also increasing. That's why all the mobility solutions that call for a drastic reduction in atmospheric pollution caused by transportation will be pursued. In the short term, we are aiming for the market of "captive" vehicles. But in a few years, the passenger car segment will also be concerned. Hydrogen-based mobility will thus expand exponentially. While the arrival of series produced H2 vehicles is not forecast until the 2022-2025 period, we are positioned as a benchmark player in this market. When it explodes, we, along with our partners, will be in a position of strength.*

## Participative innovation at MICHELIN: mobilizing the Group's employees to get ourselves better organized and invent new products and services.

Open innovation also includes the ability to encourage the entire community of employees – not just R&D experts – to come up with ideas.



**THE MICHELIN INCUBATION PROGRAM IS A NURSERY OF NEW AREAS FOR EXPLORING BUSINESS OPPORTUNITIES WHILE ALSO REVEALING TALENT**

### 3 questions for Olivia Le Meur, a MICHELIN intrepeneur

#### How did you become a MICHELIN in-house startupper?

*It all began in 2014 with InnovationWorks, a broad appeal for ideas that was organized by the Group for employees in Europe. Its purpose was to identify new business opportunities. Another goal was to support the emergence of "intrepeneurs" – in-house entrepreneurs – within the MICHELIN organization. These are people capable of deploying the chosen initiatives. One of the themes of this internal contest was travel. What luck! Travel is my passion! So I started to review my personal experiences to sketch out an idea that responded to my dissatisfactions as a traveler. After completing this self-examination, I finalized a proposal and submitted it. This preliminary draft passed through different stages of the selection process and we put together a team of five people with different backgrounds to develop our idea within a Michelin incubator. At each step, we were challenged by senior employees who were specialized in business development, marketing, R&D and strategy. We were coached during intensive sessions that enabled us to follow through on our discussions until their logical end. We were confronted with the principle of market reality. The week we spent with members of the incubator and innovation consultants was like a boot camp. I will always remember it as a*

*unique professional and personal experience, when we were cut off from the world. In December 2014 we were named as one of five finalists, winners of InnovationWorks, among 4,000 ideas submitted.*

#### How did MICHELIN enable you to bring your idea to life?

*In April 2015, three of us were freed from our former responsibilities to organize the project. At last I am an intrepeneur! IPO, the MICHELIN nursery, supports us and helps us to structure the project in a "design thinking" and "lean startup" mode. We developed skills in two areas: the travel industry and the digital transformation. Our exploration was monitored closely by in-house specialists who provided their support, understanding and empirical knowledge. For several months, we worked to identify travelers' disappointments and dissatisfactions, define our target, design our offerings, position them in their competitive environment and validate their innovative character. Very quickly, synergies were created with Michelin Travel Partner, which was in the process of reworking its digital travel interfaces and our team was given the responsibility of replacing the Michelin Travel mobile application for next summer. iPhone users had access in late June and we are working actively on the Android version to get it to market as*

*soon as possible. The result can be improved but the Michelin Travel Partner team trusted us and this first delivery reaffirmed our faith in our approach which involved daring to take the plunge, testing the idea, confronting users' impressions, and improving, all with agility and as a team.*

#### What will the final product be?

*Enhancing people's outings with a turnkey solution is the key element of the initial concept and it's still there. The idea is to encourage a digital experience based on one of the strengths of the printed version of the Green Guide; the journey elaborated and calibrated by our authors in the field (interest of the sites, the choice of the most scenic way to get from A to B, breathtaking view points). These programs of visits of a town in two hours or in a weekend are an instantaneous response to the question "What should we do and see?", either when traveling or in our free time. We have worked hard to make Michelin Travel the best application for travelers. Ergonomics, design and functionalities are all areas that we have explored to promote contact between the traveler and tourist information, suggest in a flash the sites that our authors feel must be seen and select sites according to desires and the individual's areas of interest.*

# MICHELIN on the cutting edge

125 years of innovating to serve sustainable mobility

- 1891** First removable tire
- 1946** Radial tire
- 1965** MICHELIN XAS / first tire with an asymmetric tread pattern
- 1978** MICHELIN Bib X / first radial tire for farm equipment
- 1981** MICHELIN Air X / first radial tire for aircraft
- 1987** First radial tire for motorcycles
- 1992** MICHELIN Energy / world's first "green" tire
- 2000** MICHELIN X-ONE / truck tire with a zero degree metal belt replacing twin tires
- 2001** Near Zero Growth (NZG) / technology applied to radial aircraft tires that increase the number of landings
- 2003** MICHELIN UltraFlex / technology applied to agriculture tires that reduces their impact on soil
- 2007** MICHELIN Earth Mover Management (MEMS) / world's first solution for electronic tire monitoring
- 2010** MICHELIN Protek Max / inner tube that can cancel the effects of a blowout
- 2011** MICHELIN Tall & Narrow
- 2012** MICHELIN Energy EV / first tire designed especially for electric vehicles
- 2014** MICHELIN Premier AS / first tire featuring a self-regenerating tread; thereby improving grip on wet surfaces even when the tire is worn.  
MICHELIN Pilot Road 4 / first motorcycle tire featuring a revolutionary new architecture and MICHELIN Dual Angle Technology (2AT)
- 2015** CrossClimate / the first summer tire certified for use in winter
- 2016** MICHELIN XDR3 / the world's largest tire designed for mine transport vehicles

Page 6	<b>1_ Types of mobility</b> Providing solutions for a full range of mobility needs is the purpose of innovation within the MICHELIN Group
Page 14	<b>2_ Long-term performance</b> R&D is the fundamental tool for improving the performance and longevity of MICHELIN products
Page 20	<b>3_ Sustainable innovation</b> Strengthening MICHELIN's position as the undisputed leader in terms of sustainable mobility
Page 26	<b>4_ Open innovation</b> Enhancing the skills of the MICHELIN Group through open innovation

## \_ LIST OF FOCUS POINTS

Page 10	<b>focus 1</b> When MICHELIN supports innovation in other sectors of mobility: the XDR3
Page 10	<b>focus 2</b> The MICHELIN ENERGY E-V line-up for electric vehicles
Page 11	<b>focus 3</b> NZG technology: innovation to increase the number of aircraft landings
Page 11	<b>focus 4</b> LULI, a responsible player in the ride-sharing segment
Page 13	<b>focus 5</b> CrossClimate, created by closely observing customer needs
Page 18	<b>focus 6</b> A few examples of technology transfers that benefit general public users
Page 19	<b>focus 7</b> MICHELIN TIRE CARE: the connected, intelligent tire is a meaningful response to issues facing trucking companies
Page 22	<b>focus 8</b> BIOBUTTERFLY, a research partnership to create synthetic rubber from biomass
Page 23	<b>focus 9</b> After COP21, MICHELIN is geared up for COP22 in Marrakech
Page 24	<b>focus 10</b> BASYS, a research partnership project that aims to produce tires that reduce vehicles' carbon emissions
Page 24	<b>focus 11</b> MICHELIN UltraFlex: an agricultural tire that is gentler on the soil.
Page 25	<b>focus 12</b> MICHELIN® Premier A/S: innovation that leverages EverGrip technology to further enhance road safety
Page 29	<b>focus 13</b> An example of academic research partnerships: the GIREF Chair
Page 29	<b>focus 14</b> An example of technological research partnerships: FACTOLAB