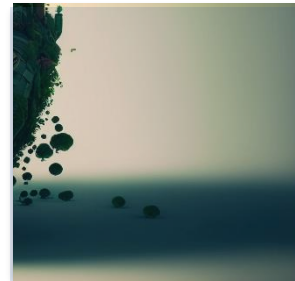
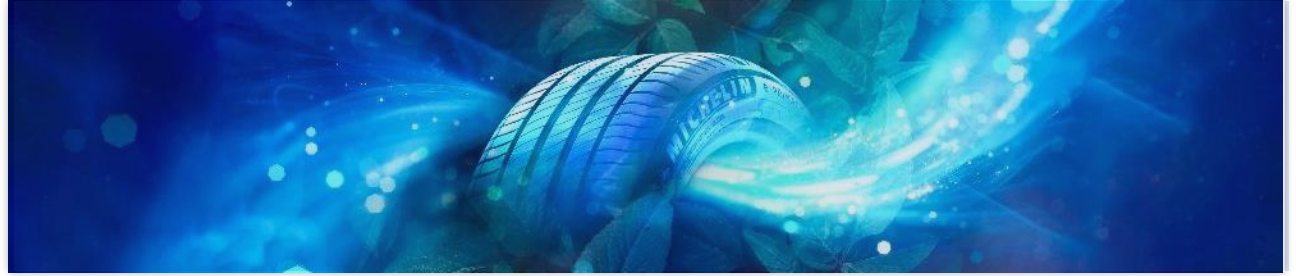


# ***SUSTAINABLE MATERIALS AND BIOTECHNOLOGIES: MICHELIN'S STRATEGY***

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# **THREE FIELDS OF ACTIVITY, SOURCES OF SUSTAINABLE GROWTH**

**20 TO 30% OF OUR SALES  
WILL COME FROM OUR  
ACTIVITIES AROUND AND  
BEYOND TIRES IN 2030**



# R&D KEY FIGURES

**755.7 M€**

budget\*  
2.7% of sales 2023

**6 000**

people in R&D

**80%**

of tire innovations  
come from materials

**55.5 M€**

Open Innovation  
Portfolio\*\*\*

**200**

tire components

**269**

patents filed in the  
year\*\*

**11 910**

active patents  
throughout the world\*\*

\* Source UDR 2024

\*\* Figures 2023

\*\*\* Averaged over 3 years (2021-2022-2023)



# **100% RENEWABLE & RECYCLED**

Breakthrough technologies  
in the field of bio-based or recycled materials

# WHAT ARE RENEWABLE OR RECYCLED MATERIALS ?

**Renewable materials** are made from raw materials derived from natural resources that are naturally replenished on a human lifetime scale, such as biomass.

This excludes fossil resources: oil, natural gas, coal, etc., as well as minerals.

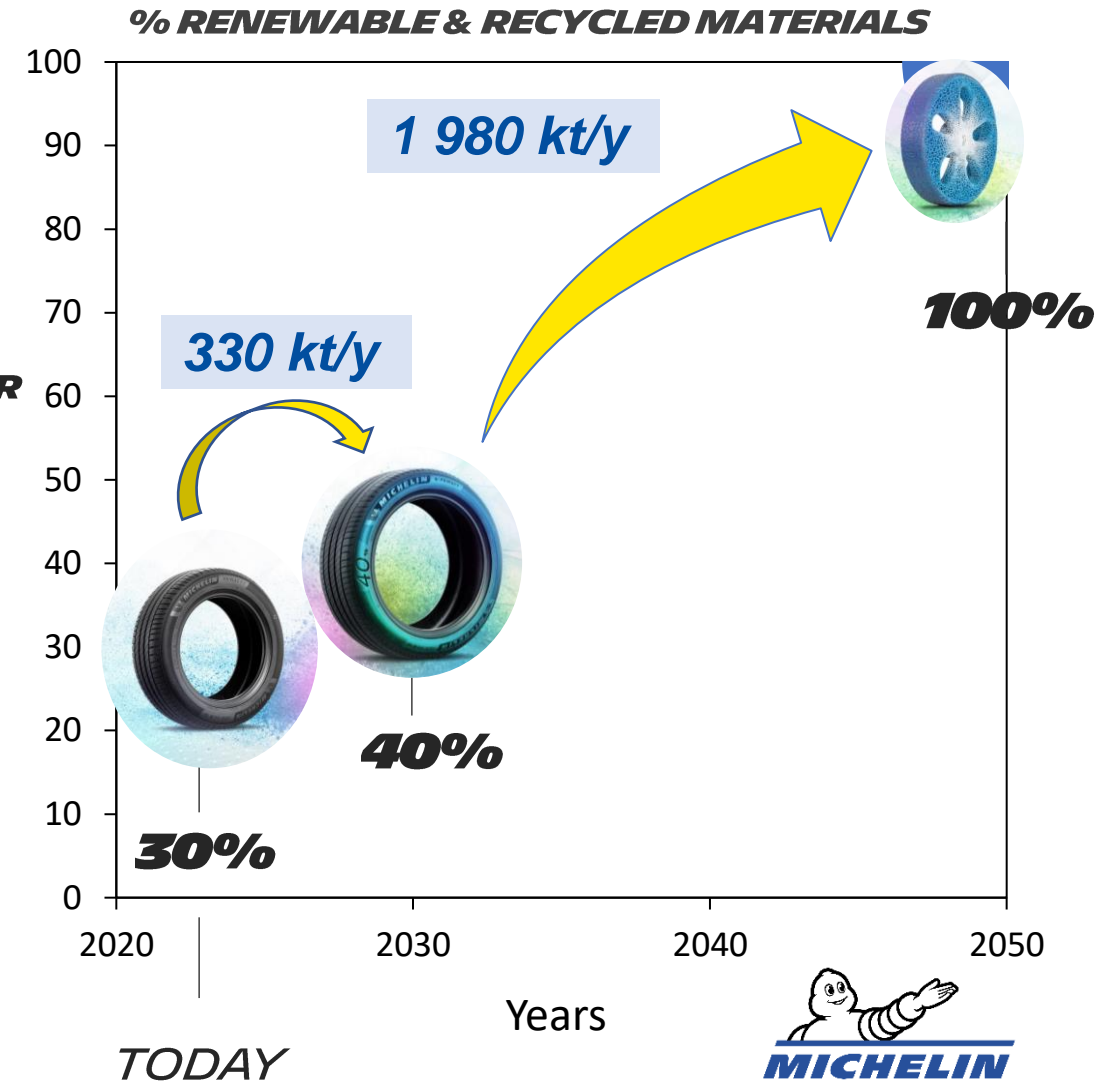
**Recycled materials** are derived from raw materials produced by any industrial or post-consumer waste recovery operation, reprocessed into products or materials or substances.

Recycling does not include energy recovery or reprocessing of materials for use as an energy source.



# ADDRESSING ALL TYRE MATERIALS IS A CHALLENGE

Due to strong **diversity** & more than 130 years of design & optimisation of tyres

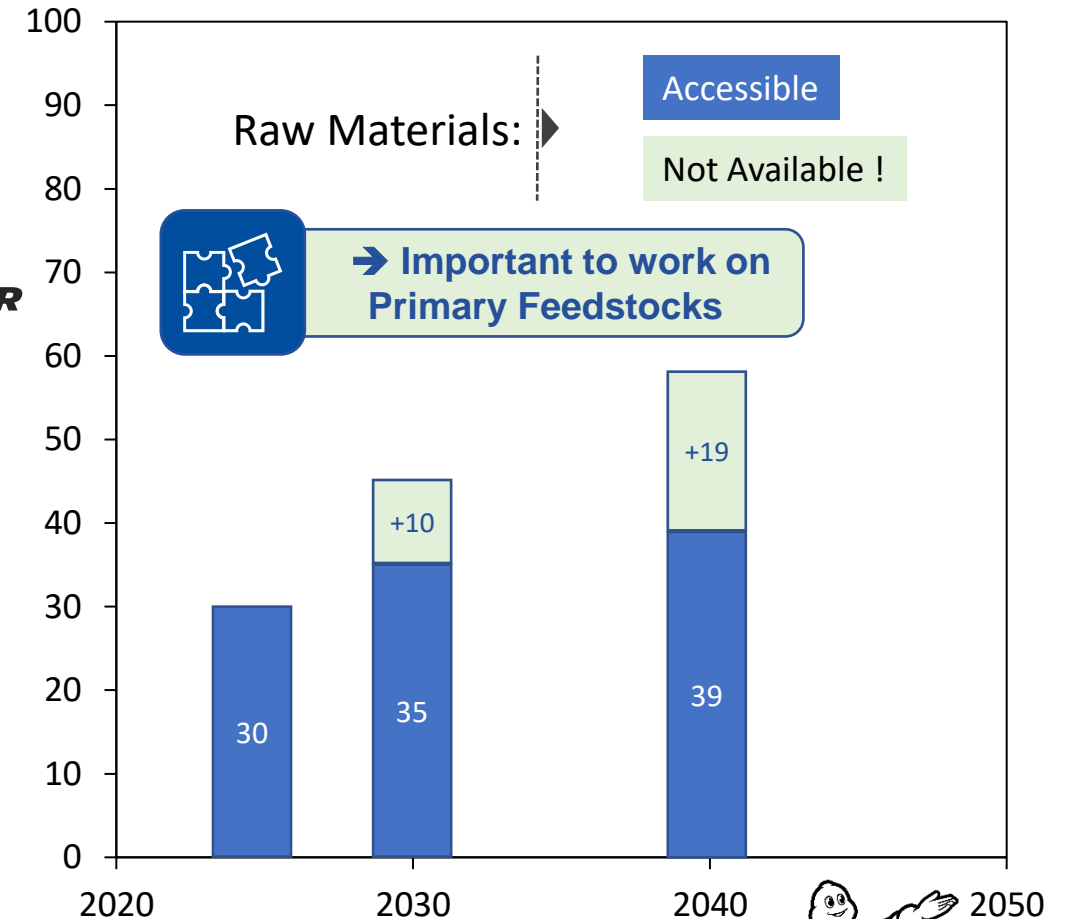


# ADDRESSING ALL TYRE MATERIALS IS A CHALLENGE

Due to strong **diversity** & more than 130 years of design & optimisation of tyres



## RAW MATERIALS ACCESSIBILITY



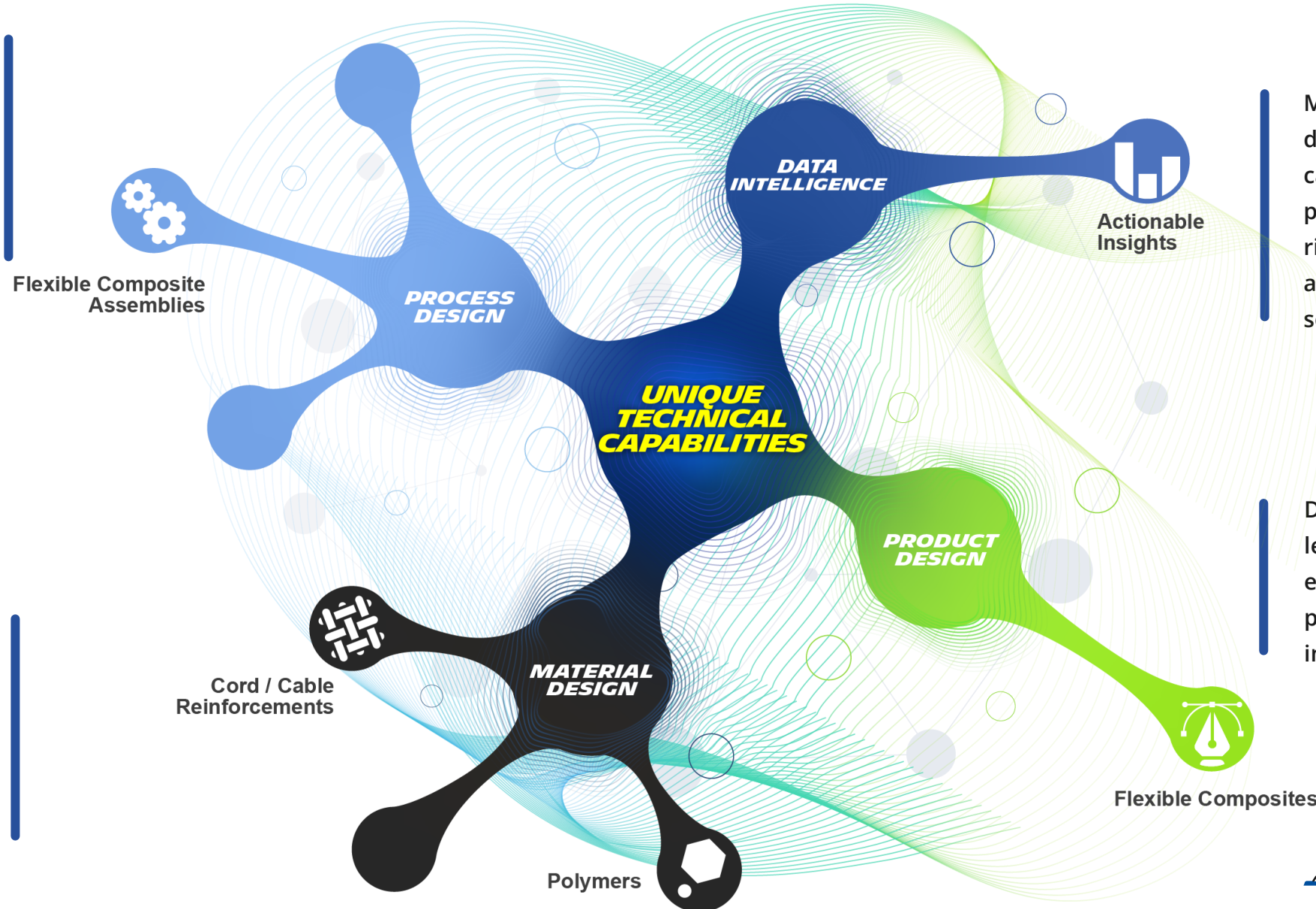
# ***MAXIMIZING SUCCESS CHANCES***

Biotechnology / Biocatalysis as a complementary path  
toward sustainable materials & composites



# Michelin's technological leadership is built on solid know-how

Designing and industrializing the processes necessary for the large-scale deployment of innovations.



Mastering the entire data chain, from capturing raw data to providing insights right through to the actual proposal of solutions or actions.

Designing products with less impact on the environment with iso-performance and without impact transfers.

Designing, developing and manufacturing innovative materials without any equivalence on the market.

# Biotechnologies as an addition to our expertise pillars

## Material Design

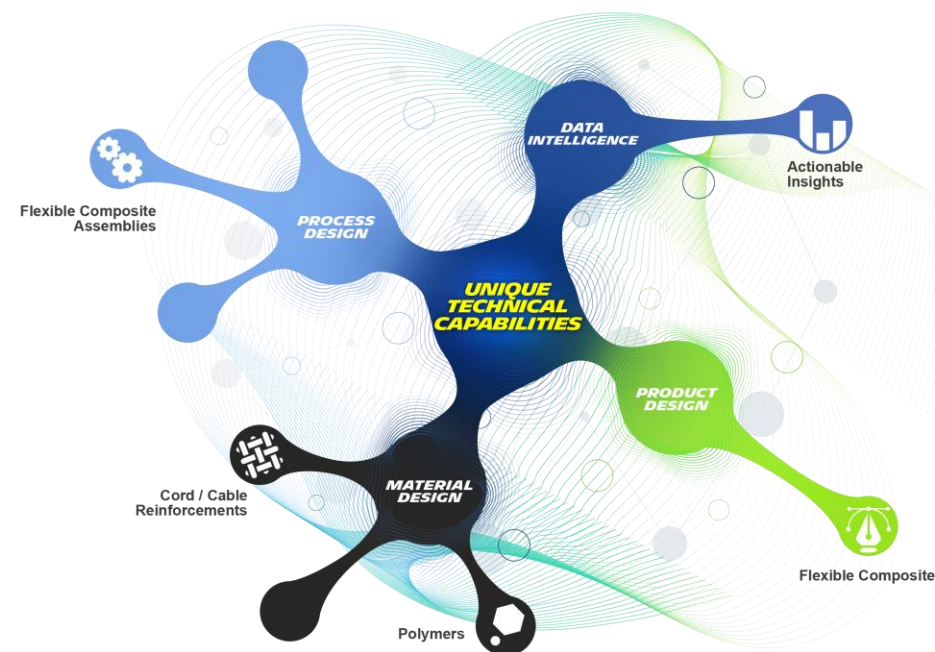
Accessing renewable feedstocks through microorganisms designed to produce molecules of interests

- Precursors toward drop-in molecules for existing formulations
- Accessing new molecular structures vs. existing products to access improved performances

Leveraging enzymes as synergistic catalysts to chemical processes for :

- Chemical synthesis of active molecules or functional polymers
  - Recycling of end-of-life products
- Understanding the science of tire particles

Leveraging Michelin know how in chemical engineering, design and large scale and scale up of chemical processes to support technology scale up



# Accelerating through open innovation

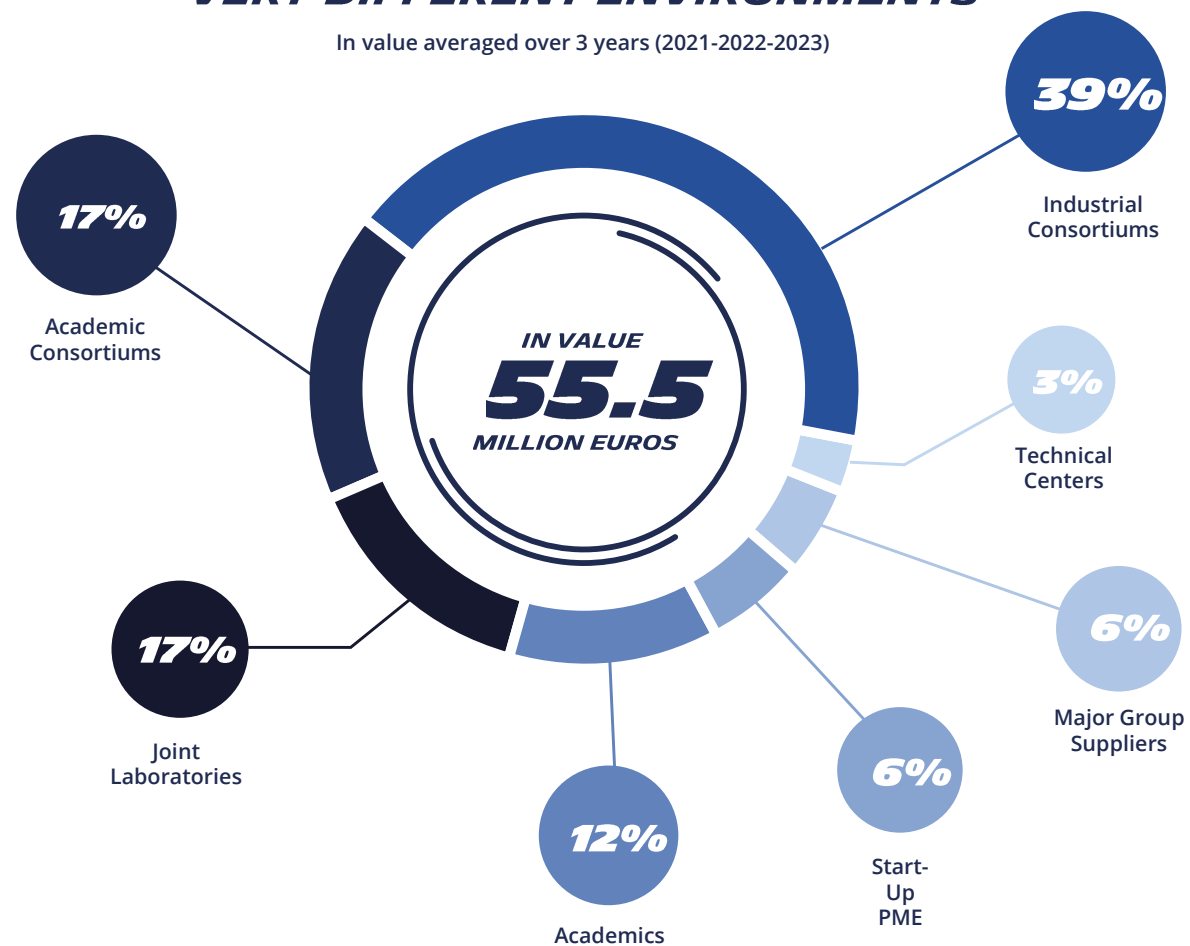
Michelin relies not only on its internal expertise, but also on a wide diversity of stakeholders who share its passion for technological progress. This willingness for openness makes it possible to pool expertise to accelerate disruptive innovation.

**Michelin Innovation Lab** : an incubator to bring out new innovation projects contributing to the Group's growth.



## A NETWORK OF PARTNERS FROM VERY DIFFERENT ENVIRONMENTS

In value averaged over 3 years (2021-2022-2023)





***A GLANCE AT SOME OF  
OUR INITIATIVES***



## A biotechnology project for addressing sustainable adhesives for the wood industry

With the support of  
Groupe Arbor





# The roots of the project : from tire to wood



RFL resins  
(Resorcinol-  
Formaldehyde  
Latex)

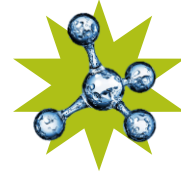


Textile  
reinforcement

Historical  
rubber / textile  
adhesion solution



R&D work for  
substituting SVHC\*  
related raw materials in  
historical resins



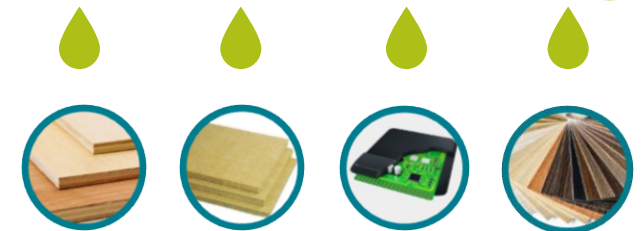
Breakthrough  
innovation from  
« MINT » molecule



Novel bioprocess for « MINT »



SVHC-free Resin development  
For other businesses



Wood  
panels

Insulation

Molded  
compounds

Laminated  
products  
...



2008



Too expensive to  
produce and  
poor availability

2019



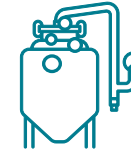
\*SVHC = « Substance Of Very High Concern » as defined by ECHA



# BiolImpulse, close to the finish line



Strain design and optimization



Fermentation process development

2019

INRAE twb tbi  
Toulouse Biotechnology Institute

Leaf  
by Lesaffre



Downstream process development

2023

Phase 1 demonstrator  
100 kg MINT

INSA TOULOUSE CRITT  
BIO-INDUSTRIES

Phase 2 demonstrator  
1 T MINT

2025

# A positive impact project accelerator

Since 2021, the Center for Sustainable Materials has supported the development of innovative materials and recycling facilities to accelerate the transition towards the circular economy.

Helping companies to develop their industrial demonstrator

Connecting to a collaborative and innovative ecosystem, provision of Michelin's services and technical expertise





## ***DANONE, DMC, MICHELIN AND CRÉDIT AGRICOLE CENTRE FRANCE JOIN FORCES TO CREATE A CUTTING-EDGE BIOTECHNOLOGY PLATFORM***

- Creation of the Open Biotech Open Platform, a service-providing company dedicated to acceleration of precision fermentation innovations
- The company will be located on the CMD site in Clermont-Ferrand
- The scope will cover sustainable materials related projects as well as food ingredients
- A complete scaling up line including upstream and downstream processes up to 10 m<sup>3</sup> fermenter size
- First demo-scale line will be installed by end of 2025
- A second line will be invested in the following years
- 16 M€ investment





***THANK YOU  
FOR YOUR  
ATTENTION***

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