



Bio-Industrial Revolution

Generating and transforming
Materials and Products to
Sustainable Progress:
examples from Syensqo

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Renewable materials and biotechnology

December 2024



Bio-industrial revolution



Syensqo: a major player in sustainable chemistry



Carbon Ambition: origin, transformation, end of life

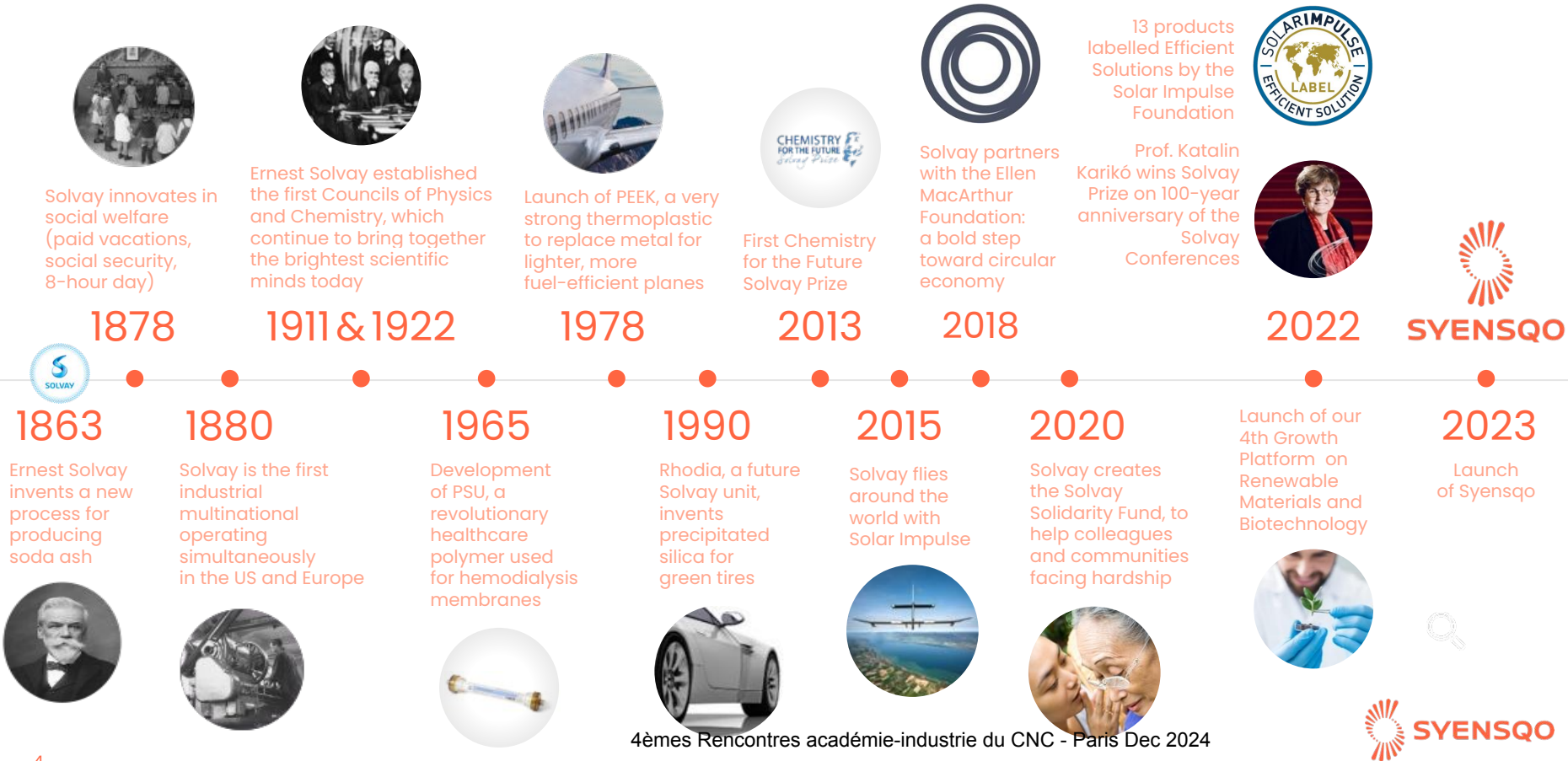


Sustainability business, open innovation, better life

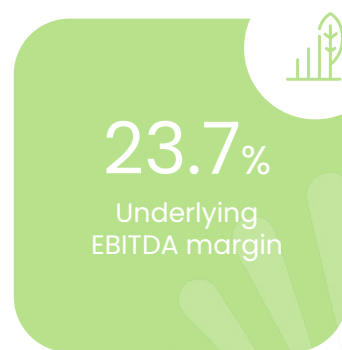
Syensqo
1 year old.
161 years wise.



A strong legacy and a passion for science



Top-tier specialty player



2023 Syensqo audited combined financial statements
FTE figures as of March 31st 2023

Syensqo is a market leader in Materials & Consumers

MARKET POSITION

MATERIALS

#1

High-performance polymers; leading position in thermoplastic composites

#2

Materials for civil aerospace

#1

Materials for defense

#2

Specialty surfactants and polymers

#1

Flavors & Fragrances; Natural Vanillin

#1

Mining reagents

#1

Biocides for recycled water

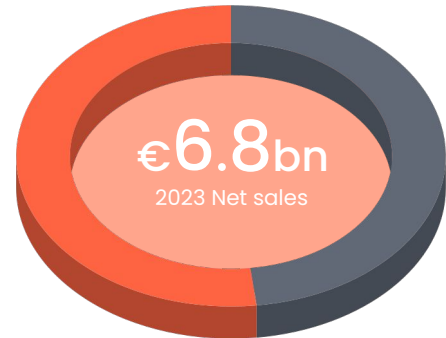
CONSUMER & RESOURCES



59%
Materials

€6.8bn
2023 Net sales

41%
C&R



An aerial photograph of a winding asphalt road through a dense forest. The trees are in various stages of autumn, with some showing vibrant orange and red leaves, while others are still green. A white truck is visible on the road in the upper left, and a white car is on the right side. The overall scene is bright and clear.

**What we create today
enables carbon neutrality**

One Planet roadmap

50% of carbon reduction targets already achieved



CLIMATE AND NATURE

Carbon Neutrality by 2040

40% reduction
Scope 1 & 2
by 2030^[1]

20%

structural reduction
versus 2021 baseline

23% reduction
Scope 3 Focus 5^[2]
emissions
by 2030

11%

structural reduction
versus 2021 baseline

20% reduction
in water intake^[6]
by 2030

NEW



GROWTH

18% of Circular sales

by 2030^[3]

13%

+1% point
versus 2021



BETTER LIFE

Safety

Aim for
zero RIIR^[4]



38%

reduction
versus 2021

Gender parity

by 2033^[5]

28%

+4% points
versus 2021

PROGRESS IN 2023

[1] Reference year is 2021

[2] Focus 5 categories of Scope 3 emissions: (a) purchased goods and services (b) fuel-and energy-related activities (c) processing of sold products (d) use of sold products and (e) end-of-life treatment of sold products

[3] Methodology aligned with the Ellen MacArthur Foundation Circularity team

[4] Reportable injuries and illnesses per 200,000 work hours

[5] % of women in mid and senior management

[6] At sites facing water availability challenges

Bio Industrial revolution: (synthetic) biology

Transforming feedstock into valuable molecules using living organisms

FEEDSTOCKS

Fossil based

Sugars

Lignin

CO₂

Biogas

Etc.

BIOTECH SynBio

Microbes
(bacteria, yeasts,
microalgae)

Enzymes
(ex vivo)

PRODUCTS

Proteins

Monomers

Polymers

Fibers

Solvents

Emulsifiers

Surfactants

Terpenes

Lactones

Etc.

Expanding our possibilities: combining biology and chemistry

Petroleum
Molecules



Limited
building
blocks

Biology

Green
Chemistry



Biology can
provide novel
molecules

Innovation

Performance

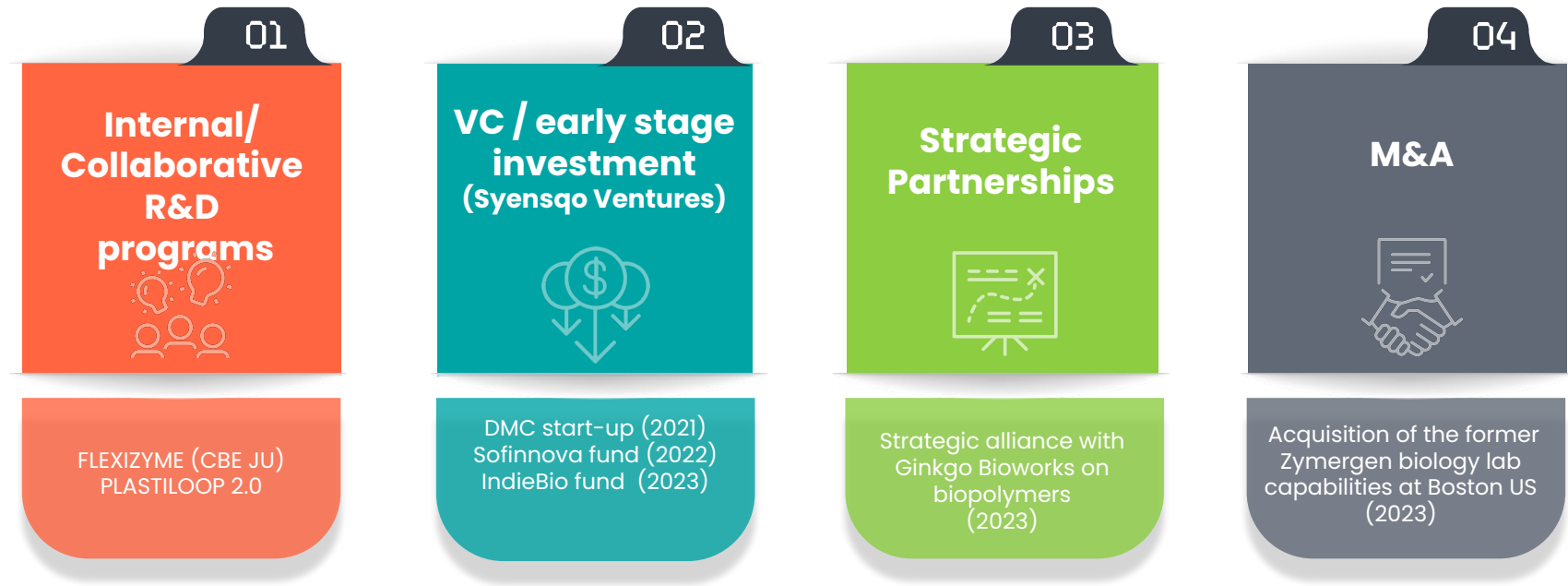
Sustainability

Chemical
modification of
biomolecules



Syensqo combines different strategic levers

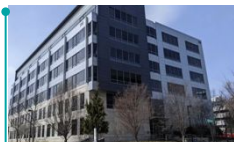
to drive growth in the space of renewable materials & biotechnology



Acceleration journey | Syensqo's recent initiatives to bolster its standing in the Renewable Materials and Biotechnology sector



Syensqo invests in **Suanfarma** to expand fermentation capacity in natural vanillin



Syensqo announces a strategic partnership with **Ginkgo Bioworks** and **acquires a former Zymergen lab in Boston** to expand its R&I footprint in the US



Syensqo Ventures invests in **Bioeutectics** to support our growth in extraction technologies space



Syensqo signs an **MOU with Allozymes (SG)** focused on **biotechnologies** for Home and Personal care

Dec. 2021

May 2022

Feb. 2023

Apr. 2023

Jun. 2023

Jan. 2024

Apr. 2024

May 2024

Jul. 2024

Syensqo Ventures invests in **DMC Biotechnologies** to support our growth strategy in renewable carbon/biotech



Syensqo joins the **Genesis Consortium** and **SOSV's IndieBio (US) and Sofinnova fund (EU)** to strengthen its biotech position



Syensqo announces the construction of **a multi-purpose microbiology lab in Europe** to accelerate its developments in biodegradables



Syensqo announces the acquisition of **JinYoung Bio** a biomimetic ceramides specialist in beauty care



Syensqo acquires controlling stake in **AZERYS**, a natural rosemary extraction business



We fund start-ups

Via Direct Investments

Lightweighting



9T LABS
Continuous Carbon Fiber Additive Manufacturing

Electrification



SEPION
Li-Metal battery leveraging liquid electrolytes

Advanced Connectivity



Noble AI
AI software platform for science based R&D organizations

Resource Efficiency



DePoly
Polymer Recycling, from polymer back to monomer

Improving Quality of Life



INVIZIUS
Coating to improve biocompatibility of hemodialysis systems

Sustainable Sourcing



DMC
Precision fermentation of bio-based chemicals



ICOMAT
Automated Composite Manufacturing



Sionic Energy
Li-ion Battery w/ Silicon Anode & electrolyte additives

Via Fund Investments

Focus on China



川流投资
China, growth stage materials



沃衍资本
China, early and growth stage materials

Focus on Bio



SOFINNOVA
Europe, early stage industrial biotechnology



INDIE BIO
Global, seed stage biotechnology



zeda
Fullstack 3D printing services for medical implants



KUMOVIS
Medical grade 3D Polymer printing
Acquired: 3D Systems



Chengyang
Electrochemical H2O2 & long duration storage



Ardent
Membrane based CO2 capture



bioeuctetics
Green Solvents



MultiMechanics
Modelling & failure analysis software
Acquired: SIEMENS



SolidPower
Sulfide solid-state batteries
Nasdaq: SLDP



plyable
Online Marketplace for composite molds using a global tooling network



TAU
Magnet Wire for high performance EV motors

Accelerating growth through Platforms

Contributes **22%** to total R&I effort

Battery Materials

Thermoplastics Composites

Green Hydrogen

Renewable Materials & Biotechnology



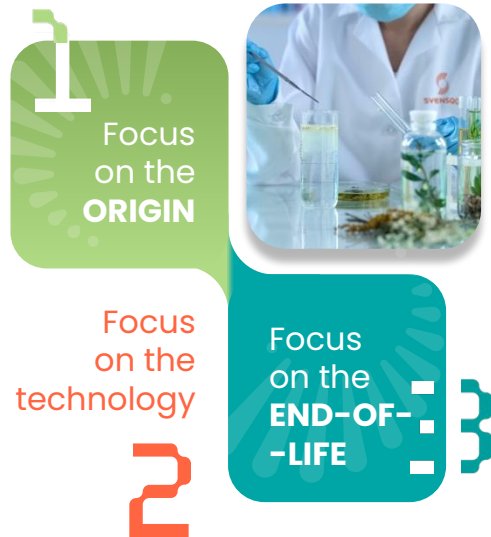
>€10bn
market opportunity¹
by 2030

(1)Addressable market for Syensqo by 2030

Developing innovative, sustainable solutions using Renewable Materials and Biotechnology



Generate new businesses in the bio-space by focusing on three key areas, answering customers' pressing need for more carbon-neutral and circular solutions



- Focus on the **ORIGIN**
Increase the content of Sustainable Renewable Carbon* in Syensqo's product offering

*renewable carbon encompasses all sources of carbon other than fossil fuels, like biomass, captured CO2 and recycling.

- Focus on the **TECHNOLOGY**
Develop new growth businesses enabled by **Biotechnology** that will enrich our portfolio of solutions

- Focus on the **END-OF-LIFE**
Develop **Biodegradable-by-design** technologies to manage the end-of-life of our products, striving toward zero environmental pollution

Combining chemistry and biology to convert renewable feedstocks into sustainable solutions that will preserve natural resources and support the transition to a carbon-neutral future. Fostering circularity by increasing the use of renewable resources and exploring new ways to manage the end of life for our products.

50% consumers ready to pay more for a product designed to be reused or recycled¹

Source: Accenture 2019



Syensqo is leading the growing market of global natural vanillin made by fermentation of ferulic acid

Vanillin is the world's most popular food flavoring, but vanilla bean supply is subject to variable availability, price and quality.

Our **Rhovani^l Natural** is a natural vanillin, obtained through the bioconversion of ferulic acid, found in non-GMO rice bran oil. The range is compliant with the strictest EU and US regulations on natural flavoring substances and allows manufacturers to obtain the vanillin note characteristic of vanilla, with the advantage of a natural flavor labeling.



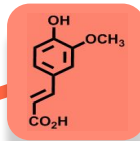
Rice



Rice bran

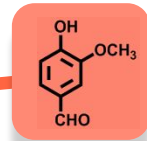
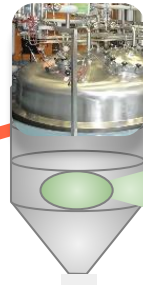


Rice bran oil



Natural ferulic acid

Fermentation



Natural vanillin



2018 New CW grade



Developments in Biopolymers

polymers via fermentation



FOOD



HOME &
PERSONAL CARE



AGRICULTURE

Biobased Polymer

Example of Guar

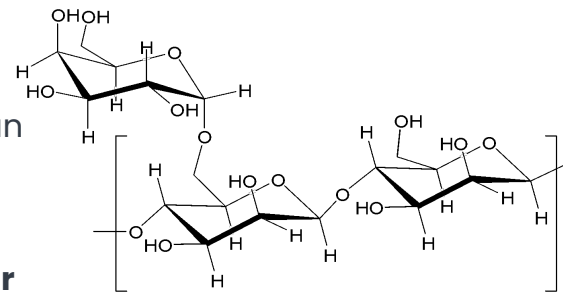
High Mw
(3 million g/mol)

Water
soluble

High viscosity
of water
solutions (1% -
5000 mPa.s)

The guar or cluster bean, with the botanical name "cyamopsis tetragonoloba", is an **annual legume and the source of guar gum**. Guar grows well in semiarid areas.

- 80% of world production occurs in India and Pakistan
- Beans contain ramified polymannose galactose : the **guar gum**



Sustainable Guar

Guar Supply Chain



The three pillars of Sustainable Guar



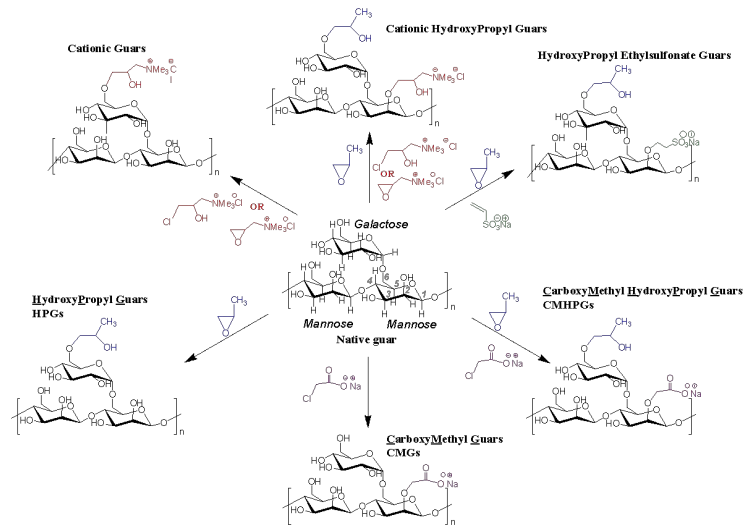
Powered by Agribio



Biobased polymer:

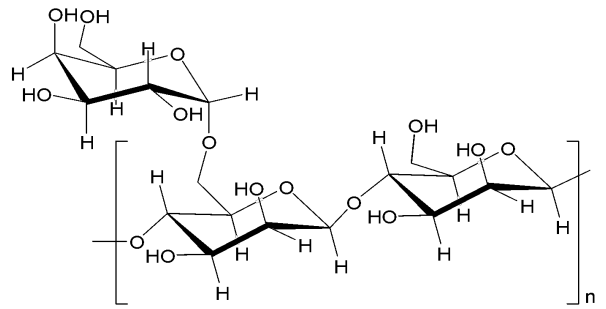
Example of Guar

The classical chemistry
for guar and Polysaccharides



New chemistry developed
for guar and Polysaccharides

- Quat derivatives with improved biodegradability
- New functionalized guar
- **Enzymatic driven modifications**
- New patents filed protecting innovative products

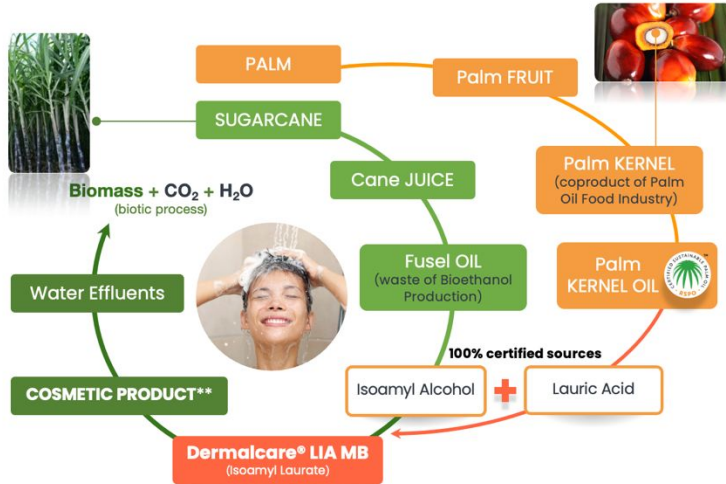


DermaCare LIA MB

Advanced Emollient for skin and hair care

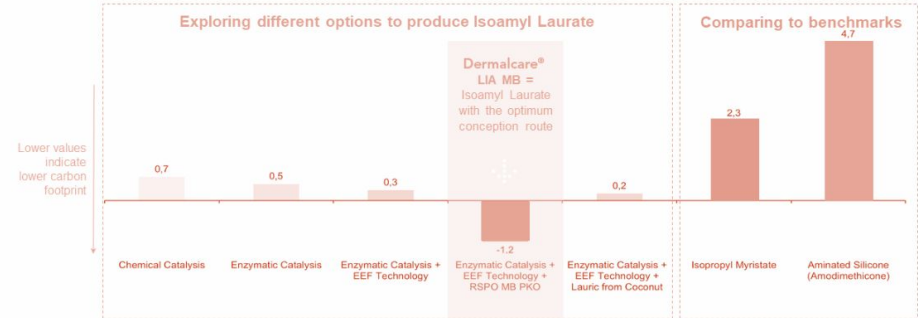
Key Features

- **Sustainable:** derived from renewable sources and produced by an innovative route that replaces chemical catalysis with **enzymes**, allowing for more energy efficient processes, with less waste generation and a higher degree of purity.
- **Versatile:** Suitable for various formulations in skin and hair care products, with excellent performance, being also an alternative to silicone. excellent sensorial properties: A natural modern touch!
- **Fully biodegradable and microbiome friendly.**

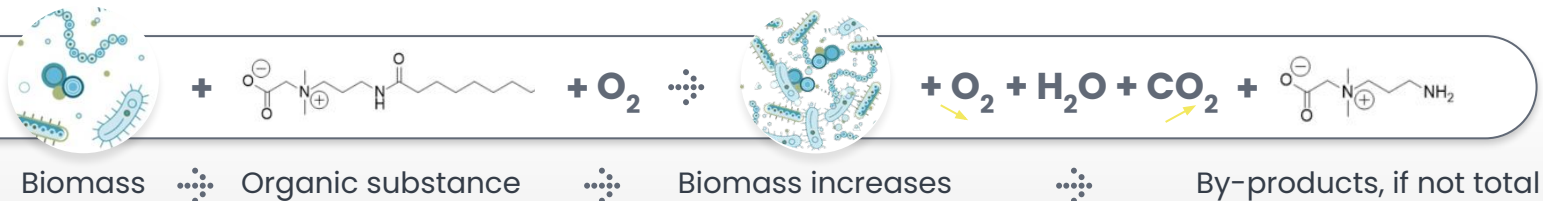


From the natural origin to biodegradability and net negative carbon footprint, it doesn't only **fulfill consumer expectations for more natural solutions**, but it also enables formulators to make a **significant step toward carbon neutrality.**

Net GWP Emissions cradle-to-gate (Kg CO₂ EQ/Kg)



Definition of the Biodegradation



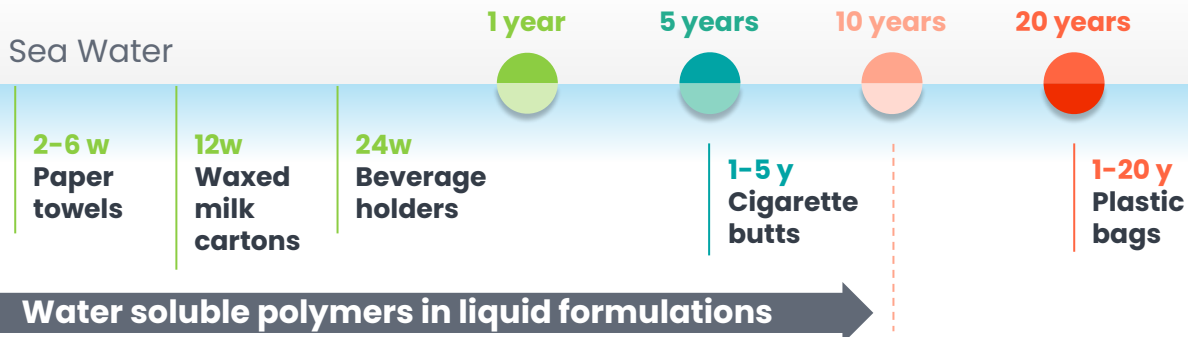
C Parent compound + **C** Transformation products

PRIMARY BIODEGRADATION

C biomass + CO_2 + H_2O + inorganic salts

ULTIMATE BIODEGRADATION

Biodegradability describes **how completely** and **how quickly** a chemical is decomposed in a **particular environment**.



450 y Disposable diapers

400 y Old plastic beverage holders

600 y Monofilament fishing lines

Source: South Carolina Sea Grant Consortium, MOTE marine laboratory



Polymers in Liquid formulations (PLF) the circularity challenge



Household cleaner



Shampoo



Laundry detergent



Paints



Agrochemical formulations



~36 million tonnes

polymers in liquid formulations produced today



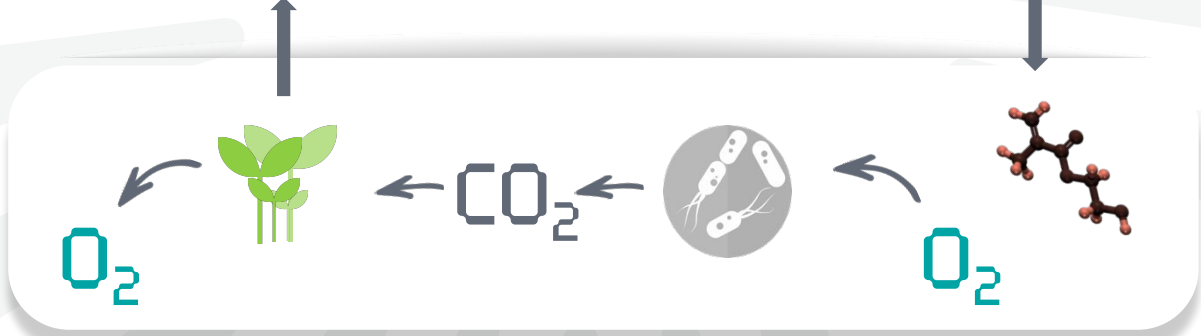
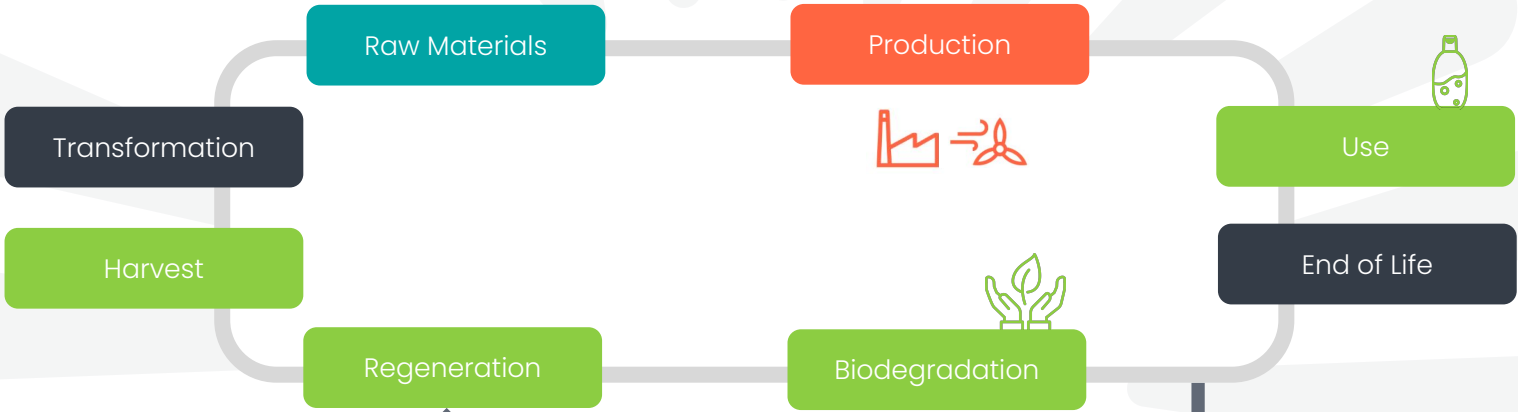
~125 Billion dollars

Market value across 8 markets

Recycling or reuse is impossible for most polymers in liquid formulations. An unseen pollution problem



How can we make PLFs circular?



Sustainable polymers in liquid formulations





Construction of a FLEXible and adaptable enZYMatic biotechnological platform for sustainable industrial production of bio-based fatty amines from side stream materials C

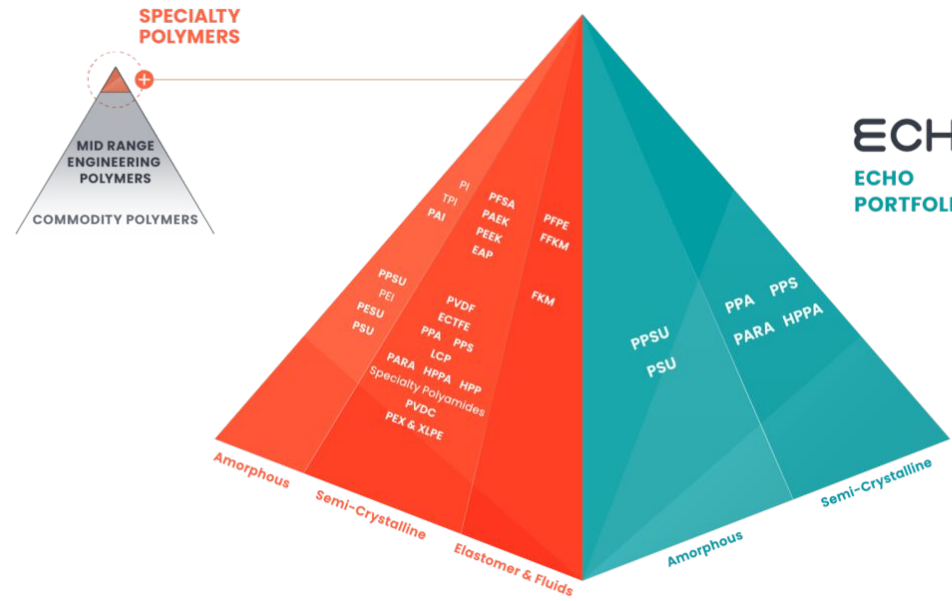
1

2



This project has received funding by the European Union under the Circular Bio-Based Europe Joint Undertaking under grant agreement No 101157528

ECHO circular polymer portfolio



ECHO
ECHO
PORTFOLIO



Echo bio-based solutions

Echo mass balance certified solutions

Echo recycled solutions



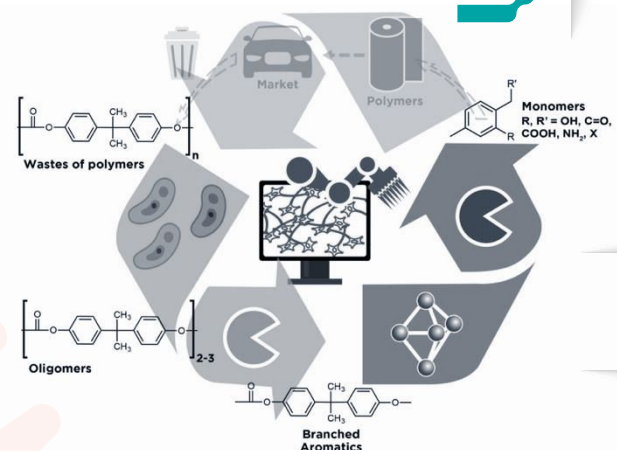
PLASTILOOP 2.0 Digital

enabled acceleration of the full circularity of aromatic polymers

1

From PC, PS, PU, PPS and PSU wastes...

TOP-DOWN approach



3

... to building blocks for PPS and PSU industry

BOTTOM-UP approach

2

... via branched aromatics...

Synergistic multidisciplinary approach:

Biotechnology, chemistry, data sciences (AI), theoretical and experimental sciences, high-throughput screening and sustainability assessment.



anr®
agence nationale de la recherche



A few takeaways

Renewable
and
Sustainable
Carbon

Biotechnology
is disrupting
our industry

The race to
carbon
neutrality is on
the way

**Syensqo is
part of the
race!**



Ernest Solvay Prize

Recognizing scientific originality and invention

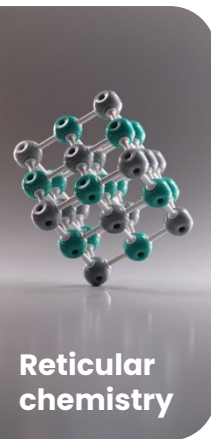


2024

Ernest Solvay prize winner 2024

Dr. Omar Yaghi

James and Neeltje Tretter Chair
Professor at Berkeley University, California



Reticular
chemistry



2022

**Dr. KATALIN
KARIKÓ**



2020

**Dr. CAROLYN
BERTOZZI**



2017

**Dr. SUSUMU
KITAGAWA**



2015

**Dr. BEN
FERINGA**



2013

**Dr. PETER G.
SCHULTZ**

*“We are
explorers
creating
breakthroughs
that advance
humanity*



1st Solvay
Conference
1911