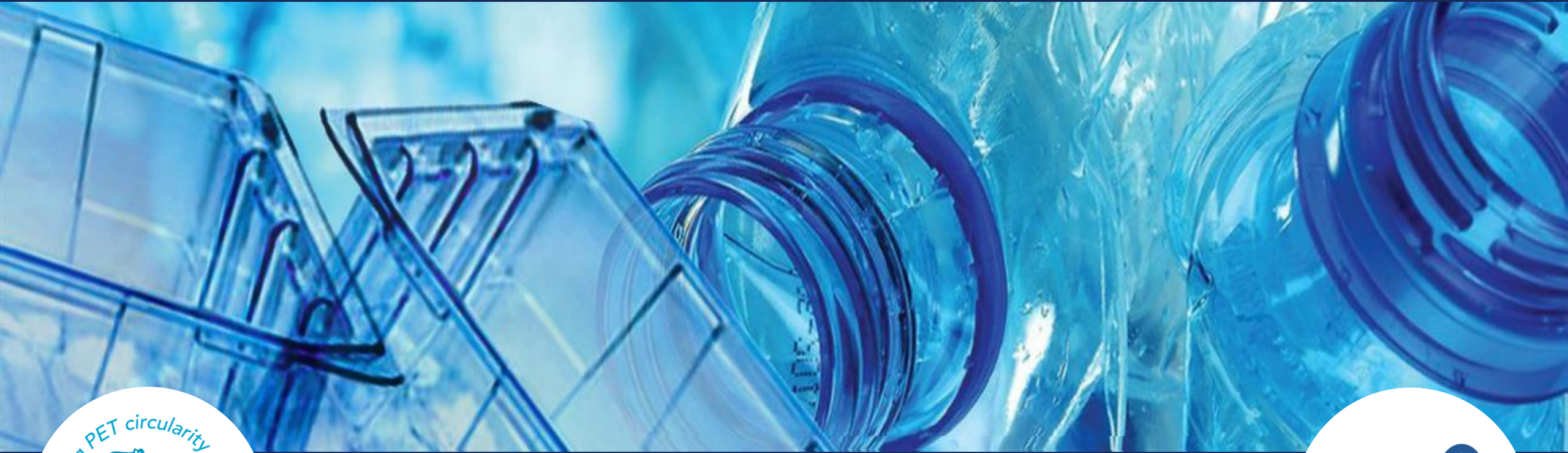


# PETCORE EUROPE



[www.petcore-europe.org](http://www.petcore-europe.org)



# ANTITRUST

For a competition safe environment

## MEETINGS MANAGEMENT

- PETCORE EUROPE staff and Chairperson of the meetings will issue in advance an agenda that must not cover subjects likely to infringe the competition laws;
- Agenda and registration forms shall carry the following words: "PETCORE EUROPE is committed to complying with EU Competition Law. The participants to this meeting agree to adhere to the PETCORE EUROPE manual on competition law compliance";
- A lawyer expert in EU competition matters or a PETCORE EUROPE executive from the staff, should be present in the meetings. Discussions which occur during the meeting will be recorded in the minutes;
- If any prohibited subject is raised, Chairperson and/or PETCORE EUROPE staff should request to stop the conversation. If the discussion is continued the meeting will be closed and the foregoing recorded in the minutes;
- If necessary, PETCORE EUROPE will provide its staff and members with training and up-to-date to ensure that no activity deemed to be anti-competitive is undertaken.

## MEMBERSHIP CONDITIONS

Membership rules should be transparent and non-discriminatory. In particular ,they should not place any member at a competitive disadvantage.

## TECHNICAL STANDARDS

Voluntary technical industry standards set up by PETCORE EUROPE members should be objective and accessible to everyone.

## PROHIBITED DISCUSSION TOPICS

Never discuss with undertakings in fact or appearance in formal or social meetings about:

### PRICES

Agreements or coordinated practice on individual prices, costs, discounts, allowances, price changes. Exchange information on price decisions, profit margins, terms of sales.

### PRODUCTION

Information on production capacity, suppliers or distribution. Fixing of production quotas.

### MARKET SHARES

Agreements on market shares, boycott suppliers, divide up the market, allocation of sales territories, distribution or marketing.

### CUSTOMERS

Blacklist customers, agree to classify or select potential customers.

### INVESTMENTS AND TRENDS:

Do not share credit terms, future plans concerning technology. Do not apply dissimilar conditions to equivalent transactions with other trading parties.

Please refer to the full PETCORE EUROPE competition law policy as distributed and available from the secretariat



# Agenda

**14:00 - 14:05 Welcome & Introduction by Roberto Bertaglia (PETCORE EUROPE)**

## Session 1

**14:05 - 14:25 Multi-submission strategy for EU funding by Lee Cohen (Argentum)**

**14:25 - 14:45 PEF a new clarifier and new barrier for PET by Robert Siegl & Roy Visser (ALPLA & Avantium)**

**14:45 - 15:05 Ensuring Plastic Safety and Standards Compliance with Quantum Software by Melania Gómez (Cadel Recycling Lab)**

**15:05 - 15:25 Q&A Session 1**

**15:25 - 15:40 Coffee Break**

## Session 2

**15:40 - 16:00 Revolutionizing Packaging with UPM BioPET by Nicko Reuter (UPM Biochemicals Sales GmbH)**

**16:00 - 16:20 Testing Methods and Risk Assessment of NIAS in Food Contact and Cosmetic Applications by Lisa Filindassi (Food Contact Center Srl)**

**16:20 - 16:40 Materials efficiency as a pathway towards price competitive sustainability by Tangui Van der Elst (Keiryopackaging)**

**16:40 - 16:55 Q&A Session 2**

**16:55 - 17:00 Wrap-up & closure by Roberto Bertaglia (PETCORE EUROPE)**

# INTRODUCTION



14:00 - 14:05

# Welcome & Introduction by Roberto Bertaggia (PETCORE EUROPE)

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**Roberto Bertaggia**

**Executive Director at PETCORE EUROPE**

Roberto Bertaggia spent over 30 years of his career in managing both complex contractual sales and coordination roles. Roberto has dedicated his line of work to the PET industry: recycling technologies, regulatory and business development. Moreover, he was PETCORE EUROPE'S Past President back in 2017.

14:05 - 14:25

# Multi-submission strategy for EU funding by Lee Cohen (Argentum)

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**Lee Cohen**

## **Business Development Manager**

Lee Cohen has a diverse work experience spanning several industries and roles. In 2008, Lee started working as a Teacher at New Start Communicaoes, where they taught business English. They continued in this role until 2011 when they joined New College Manchester as an English Teacher. From 2013 to 2014, Lee worked as a Research Assistant at B2B International, gaining experience in proposal writing, questionnaire creation, and translation. In 2015, Lee joined Ulpan-Or International as a Sales and Customer Relations Manager, a position they held until 2020. Currently, Lee works at Argentum Consultants as a Business Development Manager, a role they started in October 2021.



## **Non-dilutive EU funding through multi-submission strategy**

Lee Cohen  
27<sup>th</sup> March 2025

# Webinar Agenda



1. How to choose the correct grant
2. Bottom-up funding opportunities
3. Top-down funding opportunities
4. Multi Submission strategy
5. Argentum Consortia Link
6. Conclusion & questions



**How to  
choose the  
correct grant  
within 500+  
funding  
opportunities**

Top-Down

Bottom-Up

Single-Applicant

Consortia

# Bottom-Up Funding Opportunities

**EIC-  
Accelerator**

**EIC-  
Pathfinder**

**EUREKA**

**SPRIN-D**

# European Innovation Council (EIC)

## Accelerator

- Single applicant
- Grant of EUR 2,5M and option of EUR 10M equity
- Targets a breakthrough innovation
- Market-oriented

Timeline: Open call – first stage anytime, second stage several cut-offs; Challenge driven calls – yearly in October.

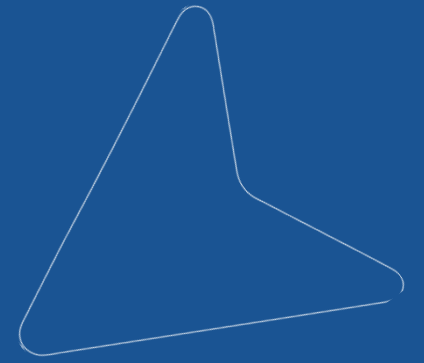
## Pathfinder

- Small consortium
- Up to EUR 3-4M grant
- Targets radically new deep-tech
- Research-oriented

Timeline: Open call and Challenge driven calls – yearly in March and October



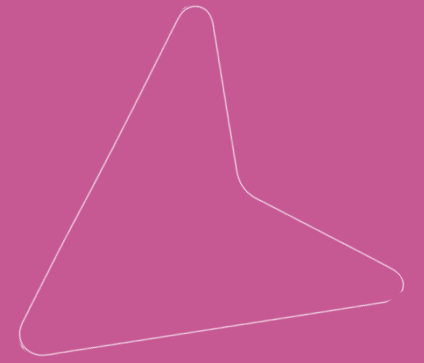
# EUREKA



EUREKA offers thematic funding programmes initiated by large companies, SMEs, and research institutes that enable you to work with close-to-market projects that meet your innovation objectives.

- Budget and submission depend on the cluster's call and the applicant's country
- SMEs, research institutes and universities can apply as part of consortia.

# SPRIN-D



- German National Fund (open for applicants worldwide)
- **Unlimited** funding budget
- Open to any application setting
- Looking for disruptive, radical innovations
- Continuously open to apply and short application

**SPRIN-D**

# Top-Down Funding Opportunities

## Cluster 1

Personalised medicine approaches

EP  
PerMed

## Cluster 4

Celtic Next

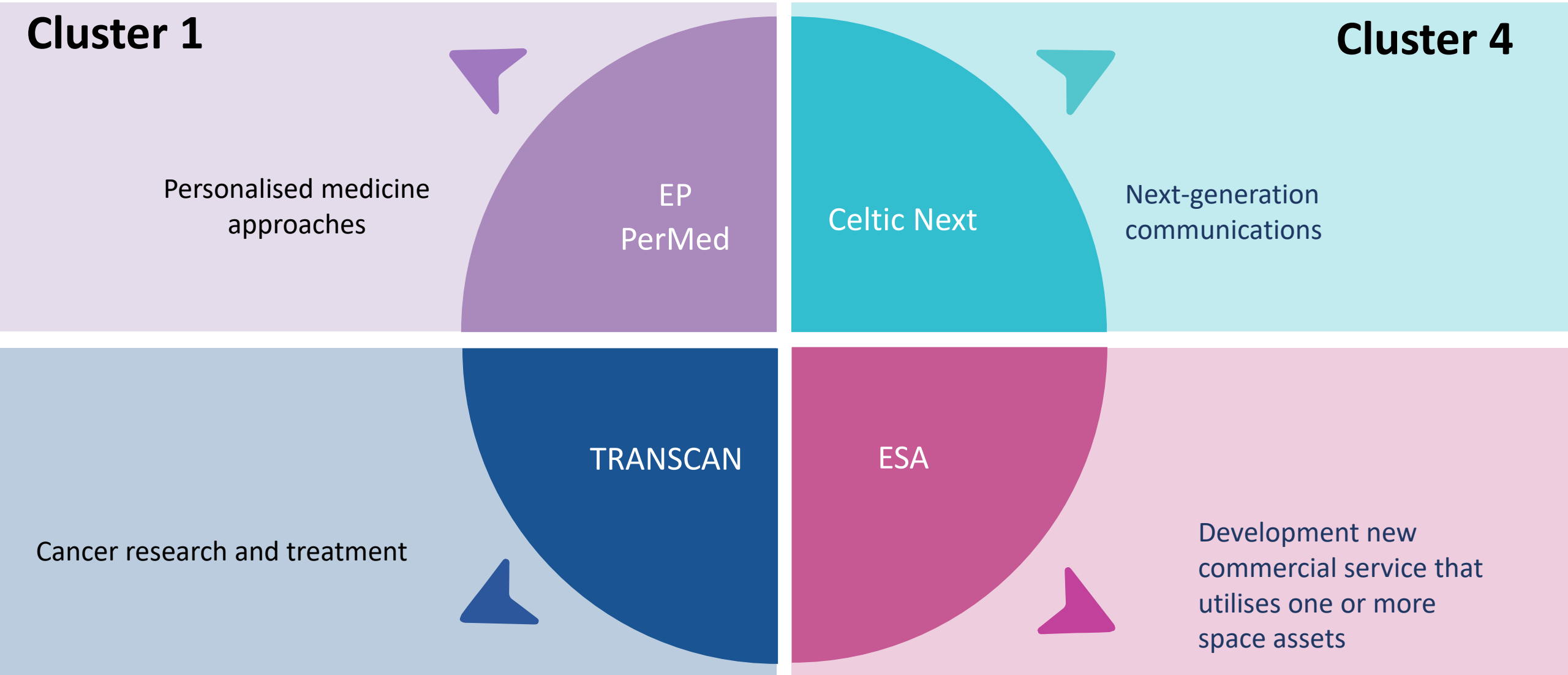
Next-generation communications

Cancer research and treatment

TRANSCAN

ESA

Development new commercial service that utilises one or more space assets



# Top-Down Funding Opportunities

## Cluster 5

Eurogia aims to contribute for a sustainable environment

**Eurogia**

## Cluster 6

Promote ambitious, long-term collaborations leading to food systems change

**EIT Food Impact**

Develop or significantly improve a new product/service/solution

**EIT Urban Mobility**

Advance projects that ensure responsible sourcing

**EIT Raw Material**

# Multi Submission Strategy (MSS)

*Non-dilutive funding as a long-term funding strategy*

## BEST FOR:

- ▶ An R&D performing, for-profit entity with market-oriented development activities.
- ▶ Looking to include non-dilutive funding as part of the company's growth strategy to finance the planned R&D.
- ▶ Interested in establishing, implementing, and leveraging R&D partnerships.

- ▶ Interested in exploring additional growth verticals.
- ▶ Willing to discover and exploit funding sources relevant to your current and planned activities.
- ▶ Willing to position your company in the center of the European Research and Innovation ecosystem.



# Multi Submission Strategy (MSS)

## *What to expect*

### GRANT STRATEGY

We assign a strategist to perform ongoing identification, analysis and targeting of the most suitable funding opportunities a company. In a joint effort, the strategist will create a tailor-made submission plan to maximise the grant funding potential based on the company's planned activities.

### PROJECT PROPOSAL PREPARATION

For each of the targeted funding opportunities, we assign a project manager from our consulting department to support your team during the entire proposal preparation and submission process aiming at high quality proposals with the highest chance to get awarded.

### Added values of the **Multiple Submission Strategy**:

- ▶ Maximise chances of success
- ▶ Reduce workload during proposal preparation
- ▶ Apply for otherwise overlooked funding opportunities
- ▶ Leverage partnerships
- ▶ Increase exposure and improve branding

# Argentum Consortia Link™

*Leverage Partnerships for Non-Dilutive Funding*

## BEST FOR:

- ▶ Companies interested to participate in large-scale EU collaborative projects (e.g. Horizon Europe); for funding purposes, scientific and technological interests, vertical and horizontal expansion, data and resources, networking and visibility.
- ▶ Interested in exploring new partnerships.
- ▶ Looking for connections between the first, second, and third sector, **bridging between academia and industry** in order to bring innovation to realisation.
- ▶ Ambitious to participate in projects coordinated by forefront industrial and research leaders.

# Argentum Consortia Link™

*What to expect*

## ARGENTUM CONSORTIA ECOSYSTEM

Participate in projects initiated, developed or coordinated by Argentum and its partners.

## JOIN EU CONSORTIA

A collection of activities initiated and managed by Argentum's strategist to create opportunities to join a large-scale research or innovation consortium led by an industry and academic partner.

## PARTNER SEARCH

Employ Argentum's teams to reach out and manage partnerships to participate in project proposals led by Argentum's clients.

### Added values of the **Argentum Consortia Link™** :

- ▶ Multiply your possibilities to be awarded
- ▶ Dramatically reduce workload by joining project proposals
- ▶ Form collaborations with relevant partners
- ▶ Collaborate with industry and academia leaders
- ▶ Improved positioning in the European R&I ecosystem
- ▶ Gain access to resources, data, infrastructures, and clients

# Conclusions and Questions

- There are many open bottom-up and top-down calls to target in all clusters.
- Some calls are recalling so you can see them with two or even three deadlines per year, which makes good use of our multi-submission.
- There is no time like the present when it comes to applying for grants.
- All of you here today have the potential to go on and win various calls to proposal, whether be it through a single application, bilateral call or a consortium setting.

# Thank you for listening!



We look forward to hearing from you  
[Lee@ArgentumConsultants.EU](mailto:Lee@ArgentumConsultants.EU)

14:25 - 14:45

PEF a new clarifier and new barrier for PET by  
Robert Siegl & Roy Visser  
(ALPLA & Avantium)

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**Robert Siegl**

Head of Material Research & Compliance – Alpla

Robert is working for Alpla since 1994. Since January 2022 as Head of Material Research & Compliance, in the Recycling Division of Alpla. Specialized in technologies related to Polyester, PET, Materials for stretch blow molding and Packaging Recycling. Robert joined the Technical Committee of EPBP early 2024.

**Roy Visser**

Head of Material Research & Compliance – Avantium

Roy Visser leads the team that is responsible for the R&D on the polymerization process, polymer product development and application development on FDCA based polymers. Roy has been working for Avantium for more than 8 years and previously worked as an Assistant Professor at the University of Twente where he also obtained his PhD on polymer engineering.



**ALPLA**

# PEF a new clarifier and new barrier for PET

Recycling Division in cooperation  
with



**avantium**

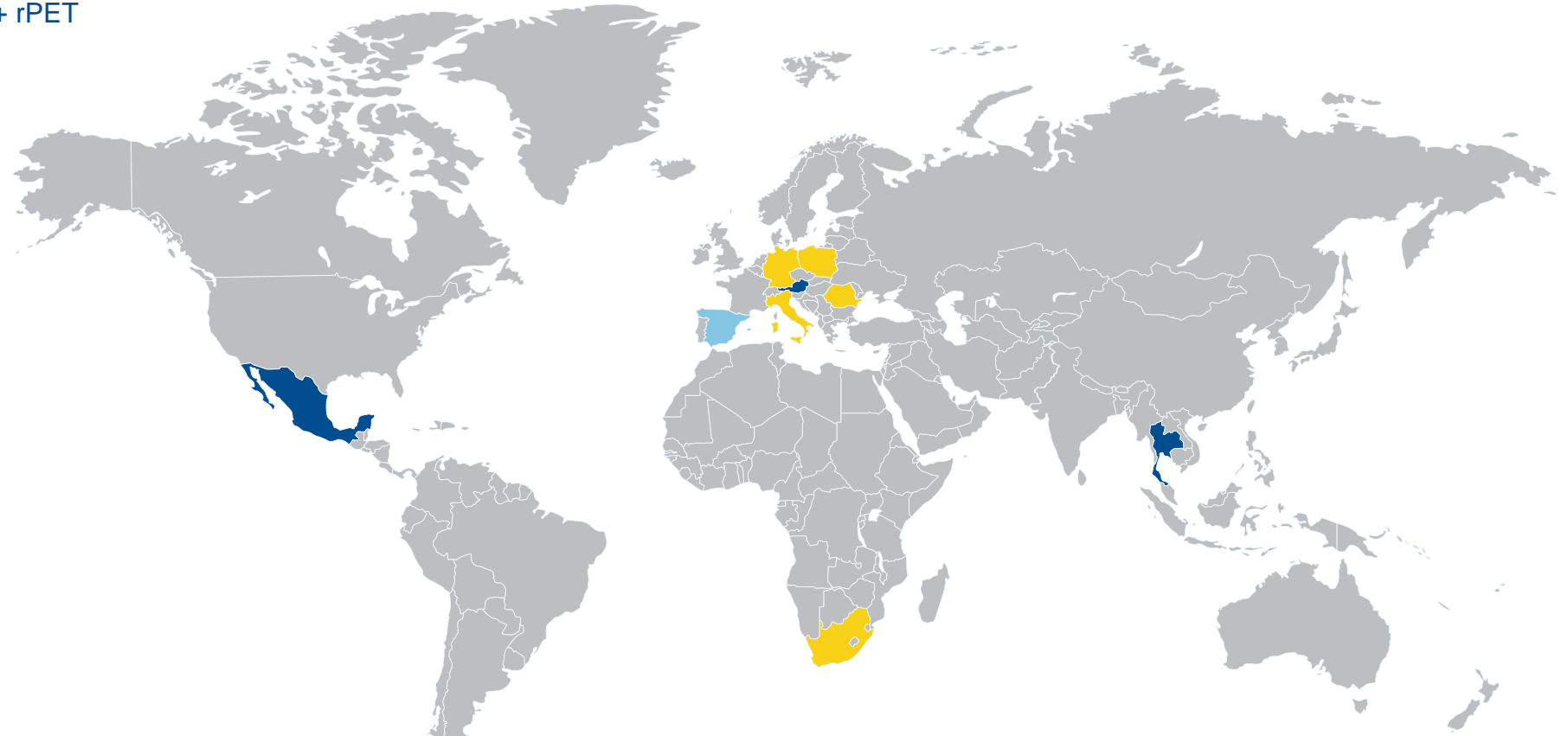
PETCORE Webinar March 2025

# ALPLA a global player with its origin in Europe, 350,000 tonnes installed recycling capacity

● rHDPE ● rPET ● rHDPE + rPET

rPET  
266,000  
tons

rHDPE  
84,000  
tons



**ALPLA recycles 30 million bottles per day**

Austria	Germany	Italy	Mexico	Poland	Romania	Spain	Thailand	South Africa
25.000t	42.000t	15.000t	81.000t	54.000t	18.000t	35.000t	45.000t	35.000t



# PET can be recycled several times with only minor compromises in color.

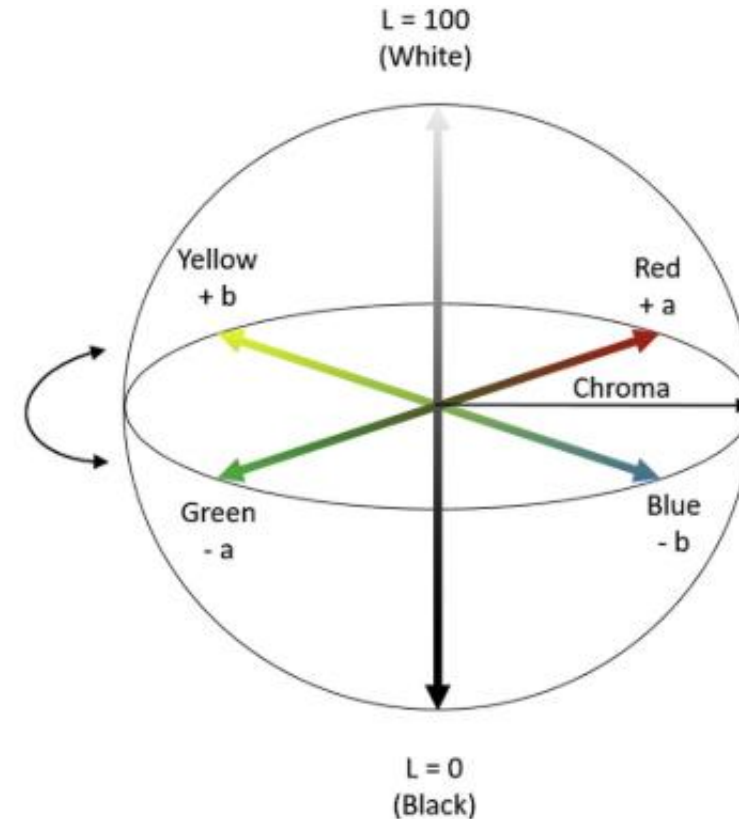


Figure 3. Produced 500 mL PET bottles from cycle 1, 4, 7 and 10 (right to left) through an injection blow molding process.

Source: DOI: [10.1016/j.jid.2019.11.003](https://doi.org/10.1016/j.jid.2019.11.003)

Source : [Circularity Study on PET Bottle-To-Bottle Recycling](#)

# Not all PET streams and bottles are suitable for recycling. rPET often too dark, too yellow too hazy.



- Additives, Colors, Glues, Labels very often do not allow a good recycling quality.
- Design Guidelines need to be respected.
  - + EPBP
  - + Recyclclass
  - + JRC
  - + CEN

The recycler is not able to sort out all non-compliant bottles. The PPWR is targeting ambitious recycling targets of 65%.

These targets are only possible with a mandatory structure excluding problematic bottles.

# We need to stop bottles detrimental to recycling. We need to promote alternative solutions



PET+10%PA



PET+5%PA



100%PET



PET+5%PEF

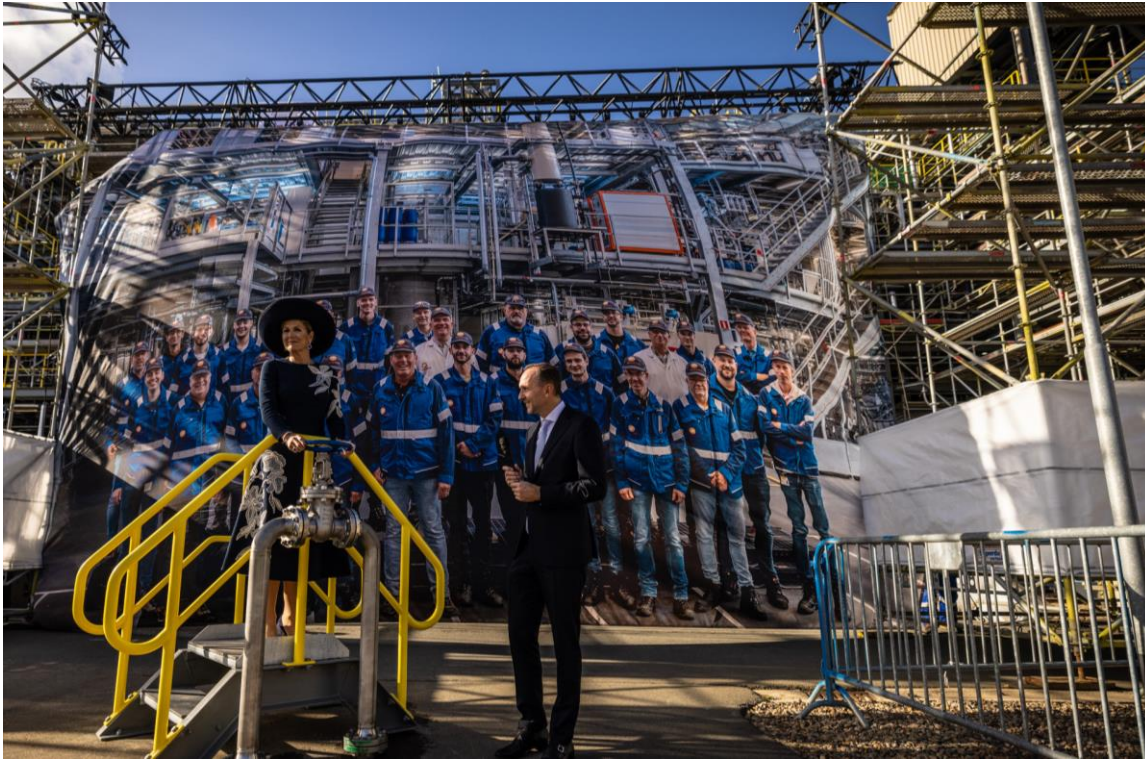


PET+10%PEF

In the recycling plant we do a quick test, the so-called roasting test (200 °C 30 min) to see if a bottle, a glue, a label is problematic. Please refer to the quick tests from APR and EPBP. Some bottles get totally yellow some labels even black.

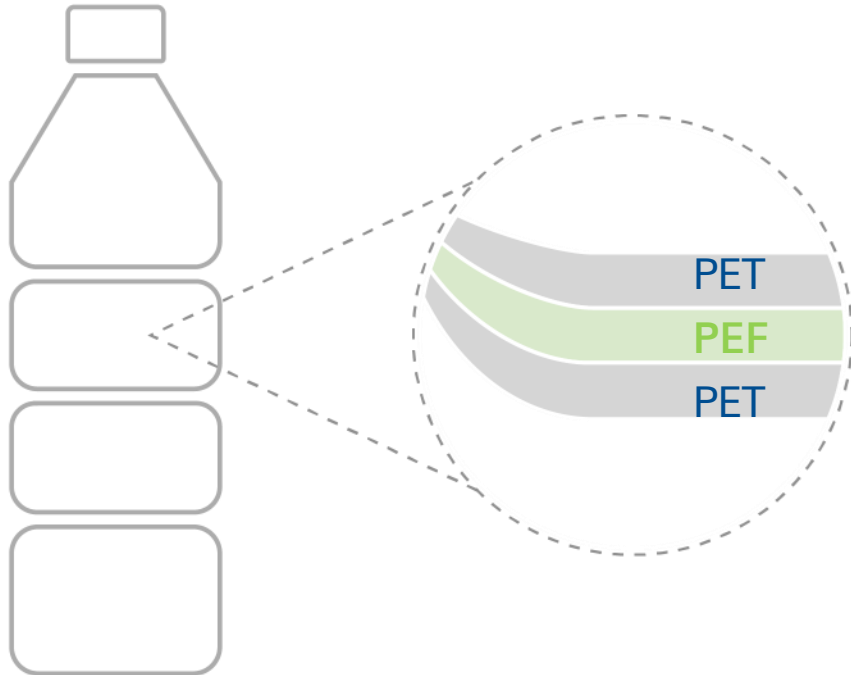
A lot of barrier bottles are still based on polyamide but there is a new barrier alternative. The Avantium plant in the Netherlands has just been opened. PEF is helping us to get the recycling stream less yellow, by replacing barrier solutions contributing to yellowness and darkness.

# PEF for the first time available in 2025 by Avantium



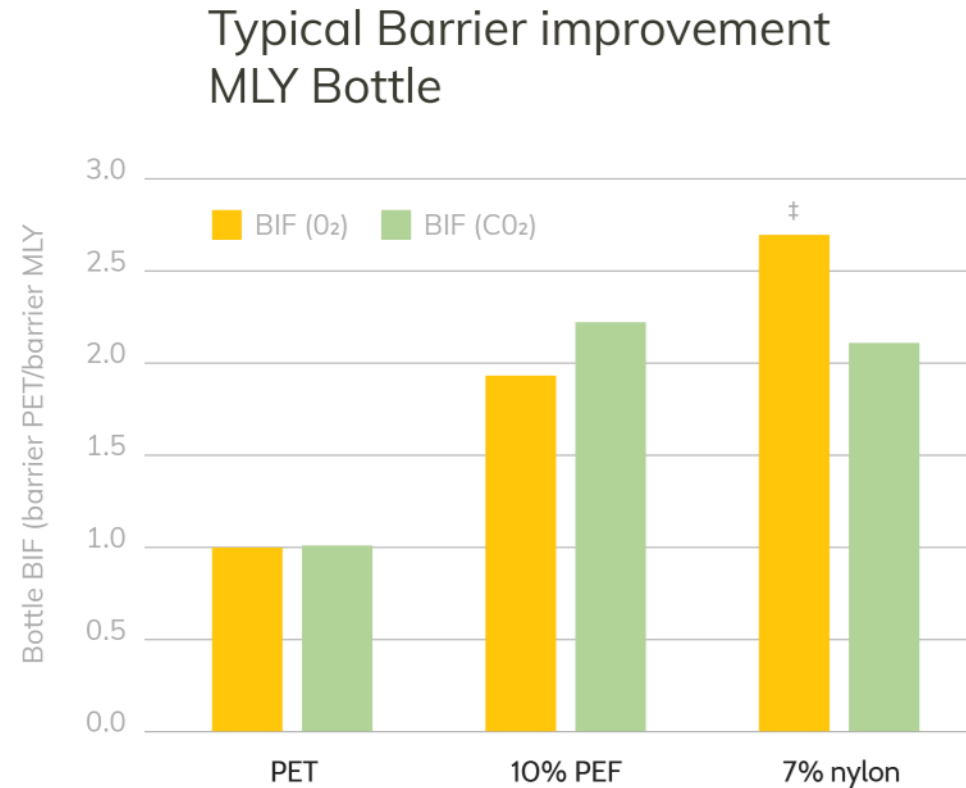
22 October 2024: A historic moment!  
Official opening of Avantium's 5 ktpa Flagship Plant by Her Majesty Queen Máxima of the Netherlands

# ALPLA collaborates with Avantium to further boost PET/PEF multilayer bottle performance.



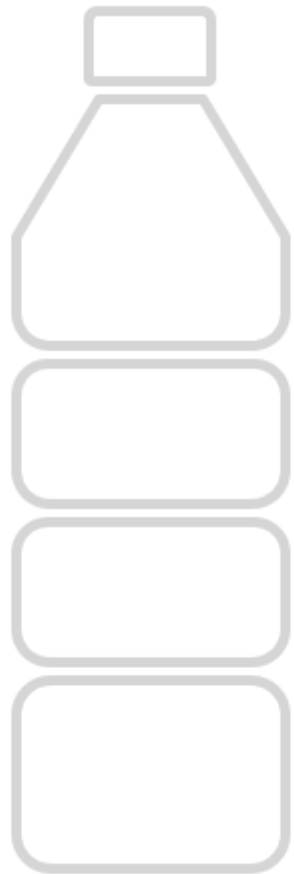
PET or rPET+ PEF


(interim) recycling endorsements: [EPBP](#) & [APR](#)



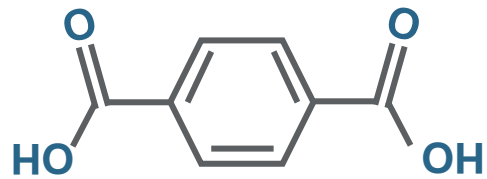
‡ Based on validated prediction

# PEF has several advantages compared to Polyamide, EVOH and other barrier solutions.



-  100% Plant-Based
-  Improved recyclability
-  Shelf-Life extension vs 100% PET bottle
-  Better adhesion, higher freedom of design

# PEF chemistry and structure very similar to PET

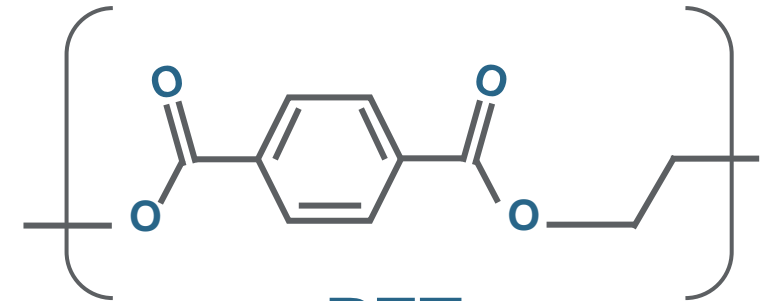


terephthalic acid

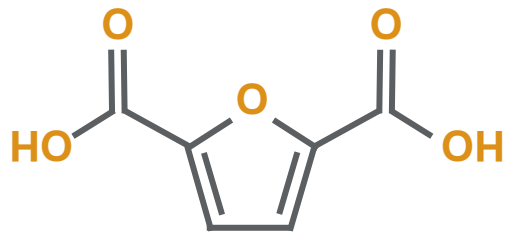
+



mono-ethylene glycol



PET

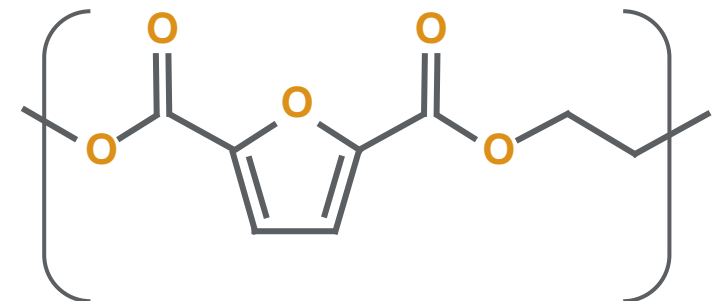


2,5-furandicarboxylic acid

+



mono-ethylene glycol



PEF

# Discoloration is important for us but the loss off transparency in the rPET is important as well



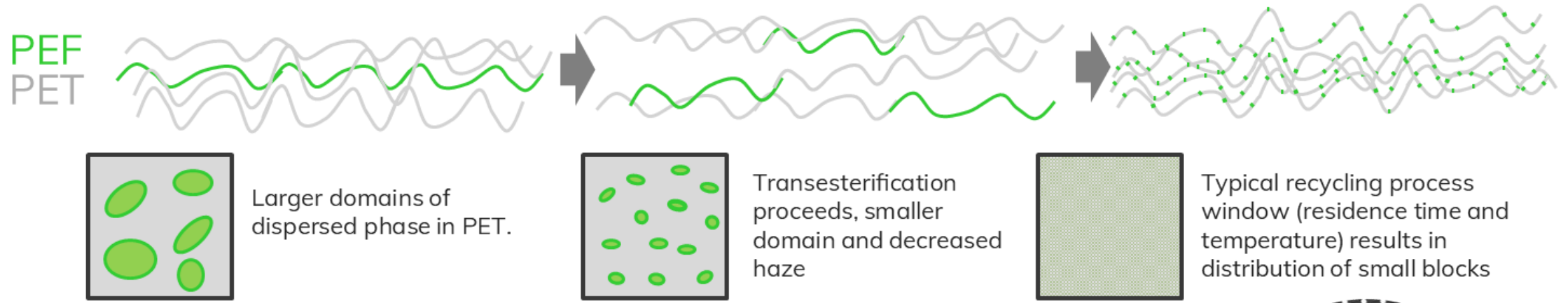
PET+5%PA    PET+10%PA    100% PET    PET+5%PEF  
PET+10%PEF

- Haze caused by **impurities**
- Haze caused by **crystallization**
- Haze caused by impurities **nucleating** crystallinity
- Haze caused by bubbles or **voids**

Polyamide as a barrier material adds more haze to the rPET compared to PEF.  
PEF is helping us to get the recycling stream less hazy.



# PEF is built into the PET chain and therefore gets invisible



**PEF** is a polyester with the same type of end groups as **PET** and will react towards a homogeneous copolyester upon recycling, with **FDCA** as a co-monomer → haze reduced, performant bottles are made with the resulting recycled material.



# rPET is known to crystallize faster and form haze

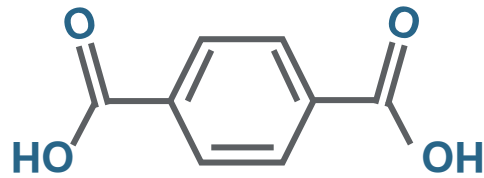
Bad transparency is a challenge for converters and brand-owners:

- Most (bottle grade) rPET resin crystallizes faster than virgin PET (bottle grades); contaminations can act as nucleation site
- There is more variation in crystallization behavior between batches in rPET
- Crystals and impurities in preforms lead to bottles with haze.

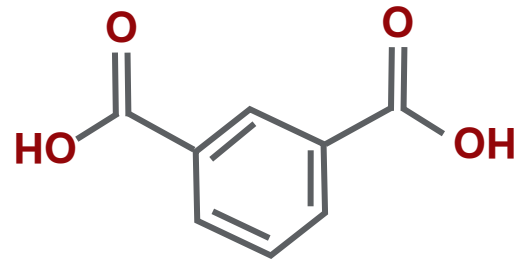
**Some rPET applications will need a clarifier similar to virgin PET with different concentrations of IPA to avoid crystallinity and haze.**



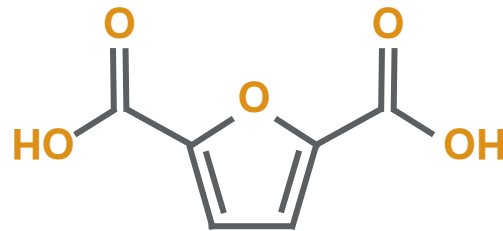
# PEF acts as a clarifier for rPET instead of IPA



terephthalic acid



isophthalic acid



2,5-furandicarboxylic acid

- Bottle grade PET contains IPA to reduce crystallinity
  - Refillable PET bottles need 2-5 % IPA
  - rPET typically has ~2 % IPA
  - IPA can not easily be added to rPET
  - No sustainable source of IPA
- 
- FDCA has a similar clarifying effect
  - FDCA can be built in rPET with PEF
  - Allows 100% sustainable solutions

# Opportunities of the PEF clarifying agent

- PEF can be applied as a clarifying agent to allow for high rPET content in haze free thick-walled bottles
- Regulations are being shaped on a maximum amount of haze in (r)PET bottles for recycling considerations. Bottles made with rPET from yellow bag (/curbside) collection will have difficulties to pass without clarifying agents.
- Further tests ongoing with various input streams at Alpla.



100% rPET

rPET + 2%PEF

rPET + 5%PEF

# Refillable bottle 100% rPET with and without clarifier



# PEF's opportunities in mechanical recycling



PEF is sortable from (PET) waste streams and leakages do not affect the rPET quality



PEF to PEF recycling has been validated on pilot scale PET recycling assets.



Increase the overall volume of recyclable feedstock by changing multilayer barrier in mono material solutions



Enhanced recyclability as a replacement for polymers which affect rPET quality (e.g. polyamides, EVOH, PVDC and oxygen scavengers)



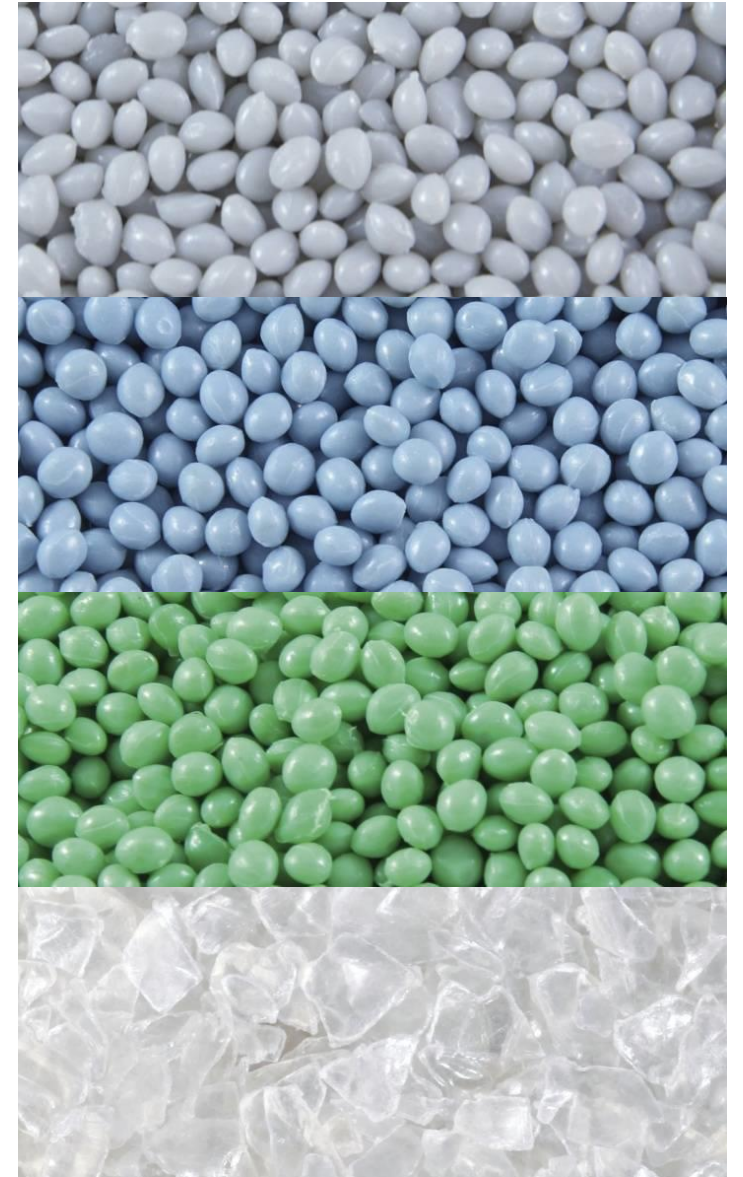
Adding PEF to the rPET stream can improve the haze of the resulting rPET, acting as a clarifier, we recommend further tests including EPBP and APR endorsement.

# New rPET options from ALPLA

- PET recycling materials with different viscosities
- PET recycling as a granulate or flake
- PET recycling with different colors
- PET recycling color compensated
- PET recycling from different sources, yellow bag, deposit return, separate collection
- PET recycling food grade, cosmetic and non-food applications



**New !** PET recycling with “clarifiers“ based on FDCA (PEF)



Thank You, Vielen Dank,  
Merci Beaucoup, Muito Obrigado,  
Muchas Gracias, Grazie Mille,  
谢谢, Спасибо, Dziękuję, شكرا,  
धन्यवाद, Ευχαριστώ, Teşekkürler





Popip



Rijksdienst voor Ondernemend  
Nederland

*This project receives funding from DEI+ Circular  
Economy.*

**Ingrid Goumans**

*Director Public Affairs - ESG*

[Ingrid.Goumans@avantium.com](mailto:Ingrid.Goumans@avantium.com)



**PEference**

The Renewable Innovation

Bio-based Industries  
Consortium



Horizon 2020  
European Union Funding  
for Research & Innovation

This project receives funding from the Bio-based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 744409. The JU receives support from the European Union's Horizon 2020 research and innovation programme and the Bio-based Industries Consortium.

14:45 - 15:05

# Ensuring Plastic Safety and Standards Compliance with Quantum Software by Melania Gómez (Cadel Recycling Lab)

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## Melania Gómez

### R&D Project Manager at Cadel Recycling Lab

Melania Gómez-Martínez was born in 1989 in Elche (Alicante, Spain). After studying Chemistry, she obtained her Master's degree in Medicinal Chemistry (2014) and completed her international PhD in Organic Chemistry (2017) at the University of Alicante.

Following postdoctoral work at the University of Münster (Germany), focusing on asymmetric and supramolecular catalysis, she joined CADEL in September 2021 as R&D Project Manager.

She oversees projects focused on sustainable technologies for the production of high-quality recycled plastics and collaborates in the plastics quality control automation team to ensure the safety of industrial applications such as hygiene, cosmetics and food.

# WEBINAR: “Innovation Projects & European Funding”

Ensuring Plastic Safety and Standards Compliance with **QUANTUM SOFTWARE**

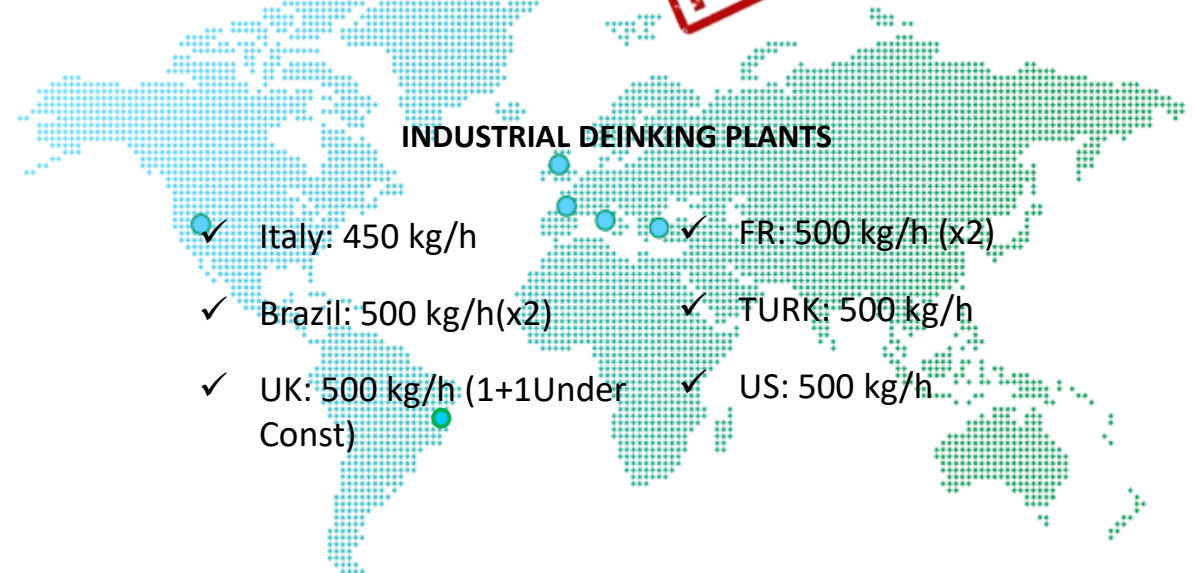
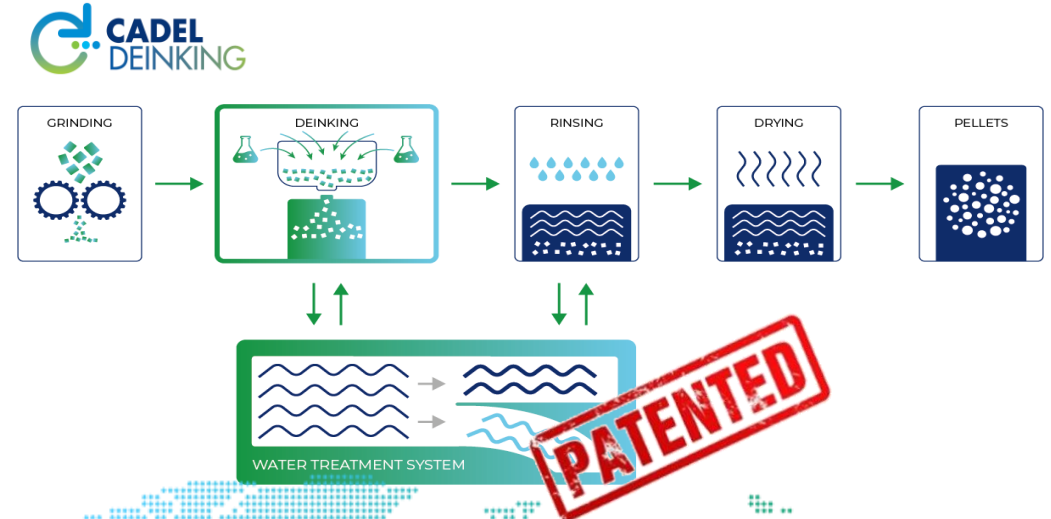
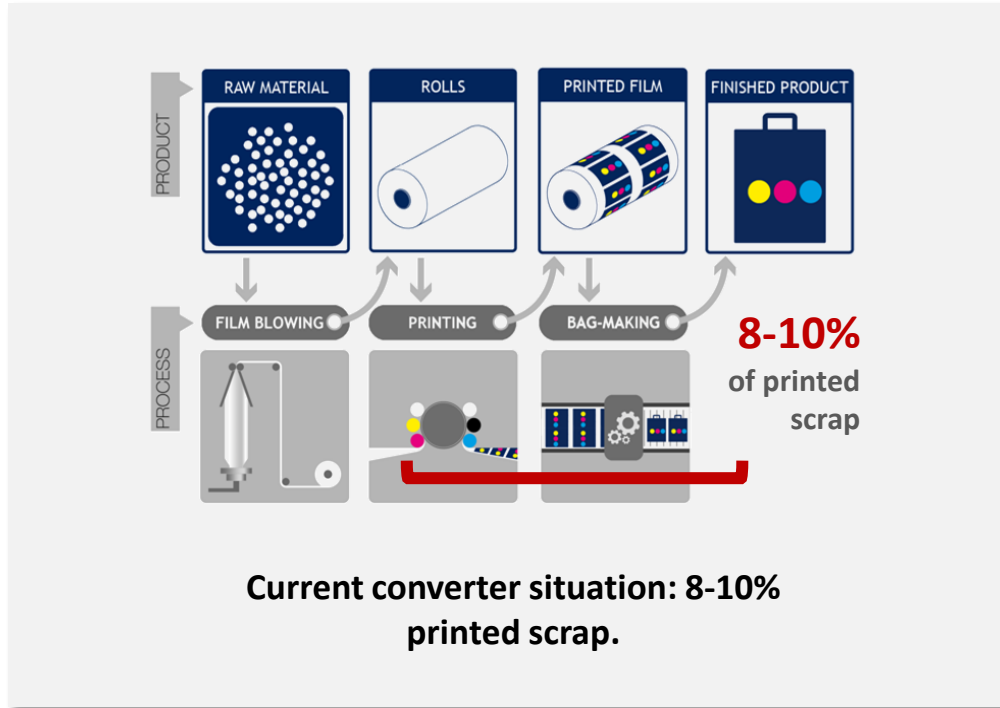


March 27, 2025

Dr. Melania Gómez Martínez  
R&D Project Manager  
CADEL RECYCLING LAB S.L.



# OUR COMPANY HISTORY: From CADEL DEINKING to CADEL RECYCLING LAB



**2021** Erema owns the technology



**\*\* Cadel Engineering Busines Unit: design and engineering service for Recycling and Deinking Industrial Plants**

# AN INDUSTRIAL SUCCESS

## PRINTED PET FILM



## POSINDUSTRIAL PRINTED LDPE



## PRINTED PP CUPS



## SILICONIZED PET



## RIGID HDPE- UV INK



## PP, CAR BUMPERS



AFTER

# THE DEINKING TECHNOLOGY

DEINKING **PILOT LINE** in Alicante

**EREMA**<sup>®</sup>  
PLASTIC RECYCLING SYSTEMS

**KEYCYCLE**<sup>®</sup>  
TURNKEY SOLUTIONS | EREMA GROUP

Deinking Technology owned by EREMA/KEYCYCLE since 2021



**Adding value** to the recycled material

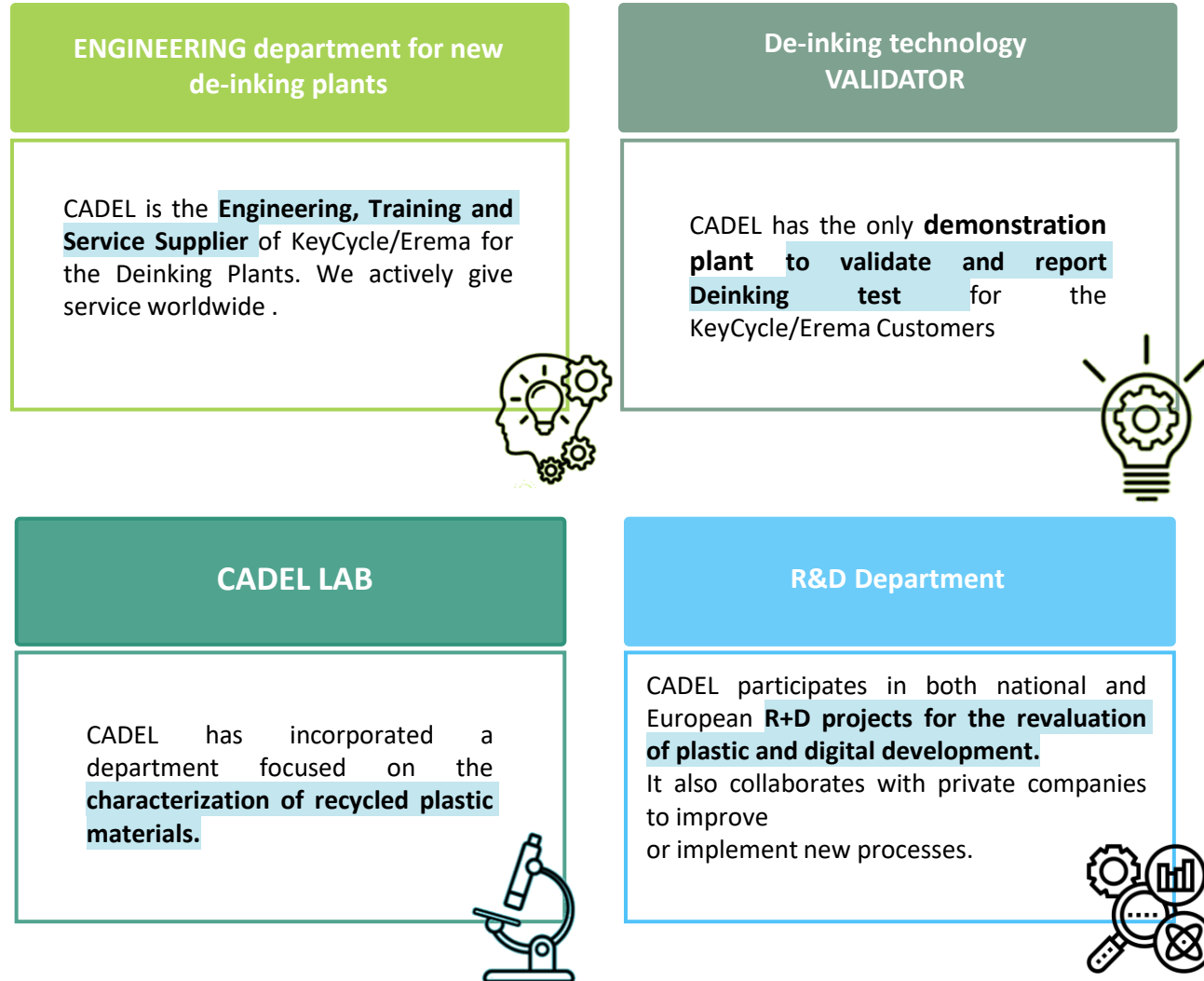


**Sustainable** process



**Promoting** circular economy

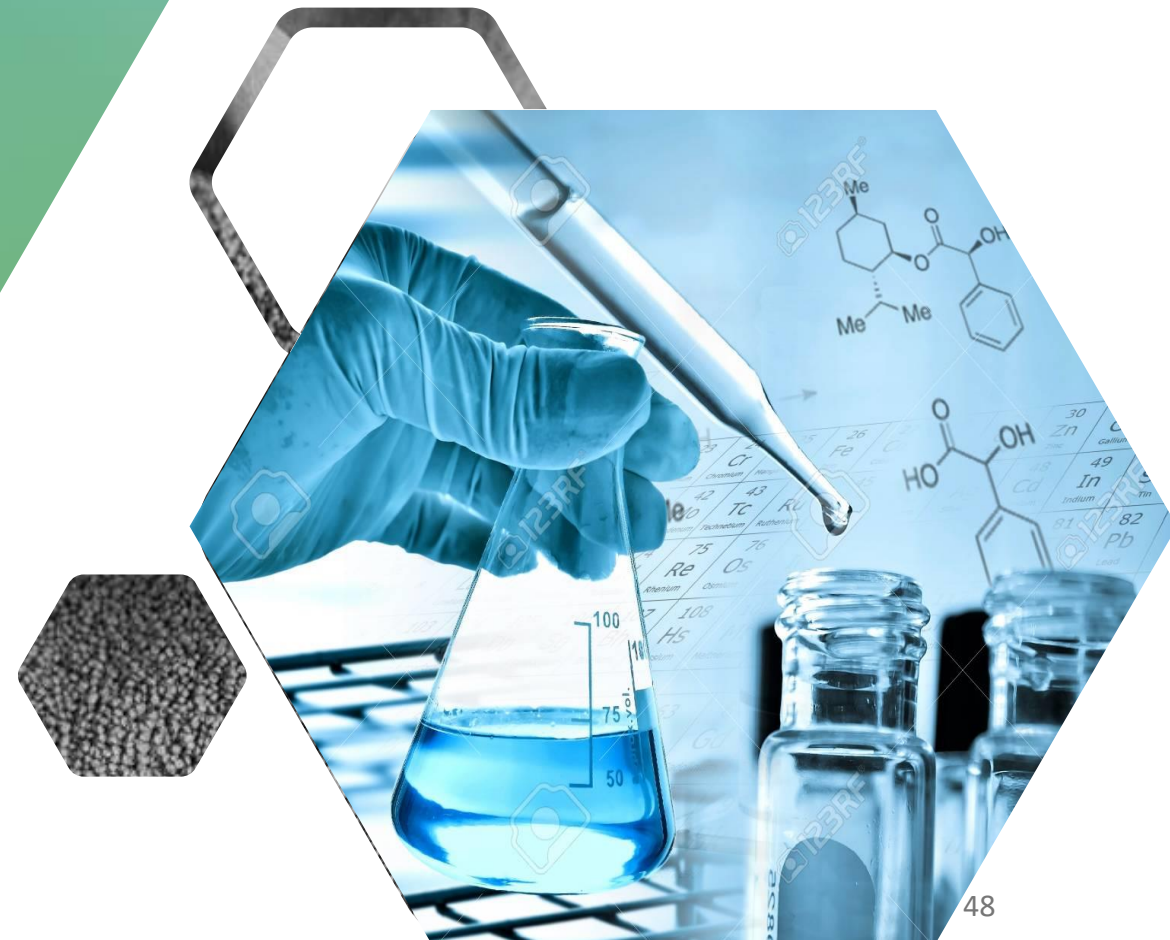
# OUR BUSINESS MODEL



As a **technology company**, CADEL has 4 subdivisions that range from **engineering** for the design of industrial plants to an **R+D** department to improve procedures and a **laboratory** for the quality control of plastics.

# CADEL QUANTUM SOFTWARE

*The story behind the idea*





# DECISIONS ARE DRIVEN BY DATA

Should I buy a house?



What's the shortest route?



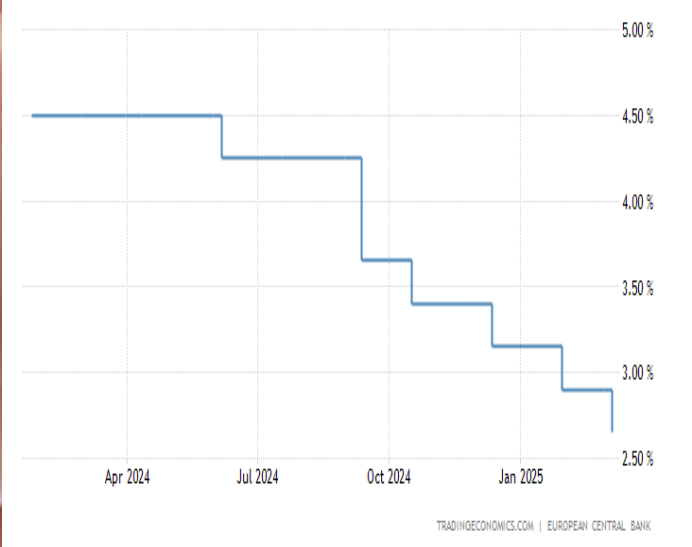
Will it rain today?



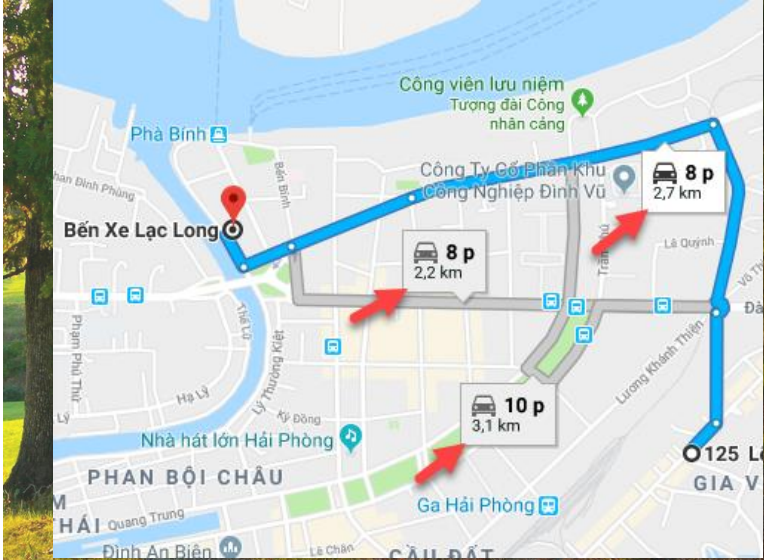
All these questions have one thing in **common**....

# DECISIONS ARE DRIVEN BY DATA

Should I buy a house?



What's the shortest route?



Will it rain today?



All these questions have one thing in **common**....



**#1. Data & Information is needed to carry out a decision making**

**#2. We need tools to collect and interpret data**



What about **plastics**?

What about decision making  
in **recycling industry**?

# CADEL's SOFTWARE TO STREAMLINE DECISION-MAKING IN PLASTIC QUALITY MANAGEMENT



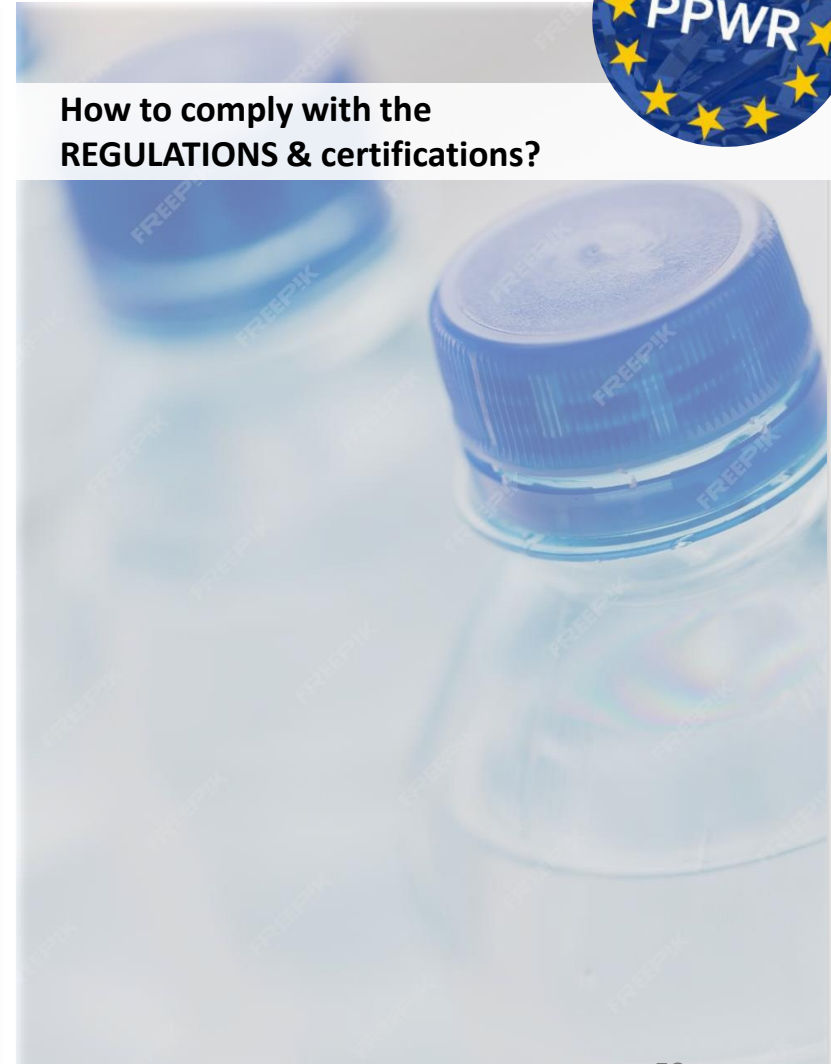
**What is the VALUE of your PCR?**



**How to sort PCR QUALITY?**



**How to comply with the REGULATIONS & certifications?**



# CADEL's SOFTWARE TO STREAMLINE DECISION-MAKING IN PLASTIC QUALITY MANAGEMENT



What is the VALUE of your PCR?

How to sort PCR QUALITY?

How to comply with the REGULATIONS & certifications?



# CADEL'S SOFTWARE TO STREAMLINE DECISION-MAKING IN PLASTIC QUALITY MANAGEMENT



## COMMITMENT TO A MINIMUM RECYCLED CONTENT IN PLASTIC PACKAGING BY 2030

### Minimum recycled content:

- 30% PET packaging.
- 10% other plastic packaging.
- 30% for single use plastic drinks packaging.
- 35% for other plastic packaging.

### Recyclability of packaging:

- All packaging recyclable by 2030.



### THE FACT

- With new PPWR, it will be **MANDATORY** to put **recycled material in ALL packaging**.

### HANDICAP


- RECYCLED plastic is **NOT HOMOGENEOUS**, and, in most cases, traceability cannot be assured.

### CONSEQUENCE

- To ensure safety, it will be necessary to carry out more routine **QUALITY contamination CONTROL** of the material. And to carry out routine monitoring, DATA is needed.

### THE SOLUTION

- A **tool** for **INTERPRETING** or **MANAGING** the **data**.

 **Quantum** is the option/answer for all these needs

# CADEL's SOFTWARE TO STREAMLINE DECISION-MAKING IN PLASTIC QUALITY MANAGEMENT

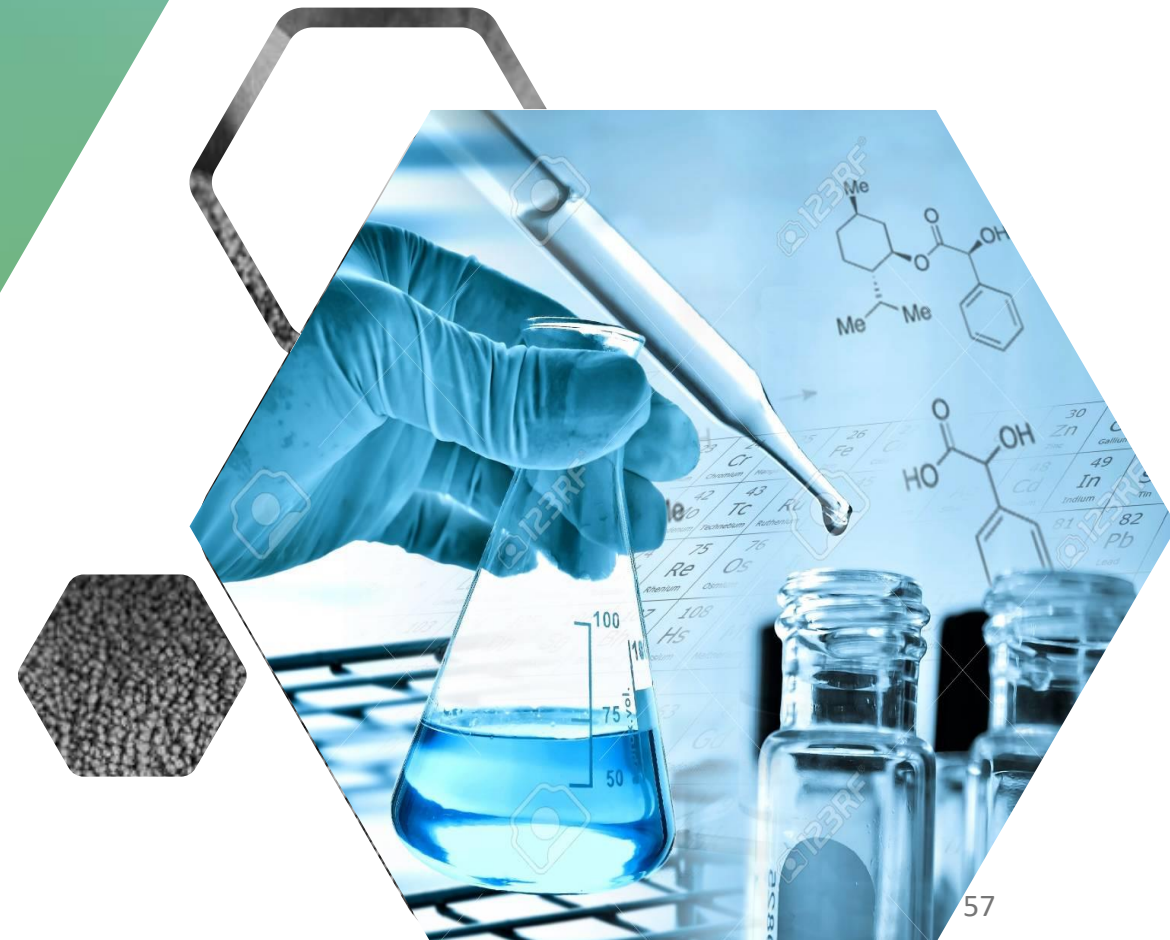
- #1. Conduct **risk assessment** in line with production requirements.
- #2. **Interpret regulations** and stay **abreast of updates**, ensuring regulatory compliance while optimizing safety without compromising profitability.
- #3. Ensure safety without sacrificing profit, analyzing the maximum **recycled content** allowed in packaging and its impact on quality.
- #4. Establish a protocol for your **quality standard**, ensuring that materials meet processing standards to avoid production losses.
- #5. Create a record to **track quality fluctuations** in the market, allowing continuous monitoring of market variations and optimizing efficiency in the production chain.



# CADEL QUANTUM SOFTWARE

## BUSINESS CASE

*Solution in Action: A Business Case  
Perspective*



## IMPLEMENTATION OF AN EFFICIENT QUALITY CONTROL IN HIGIENE INDUSTRY



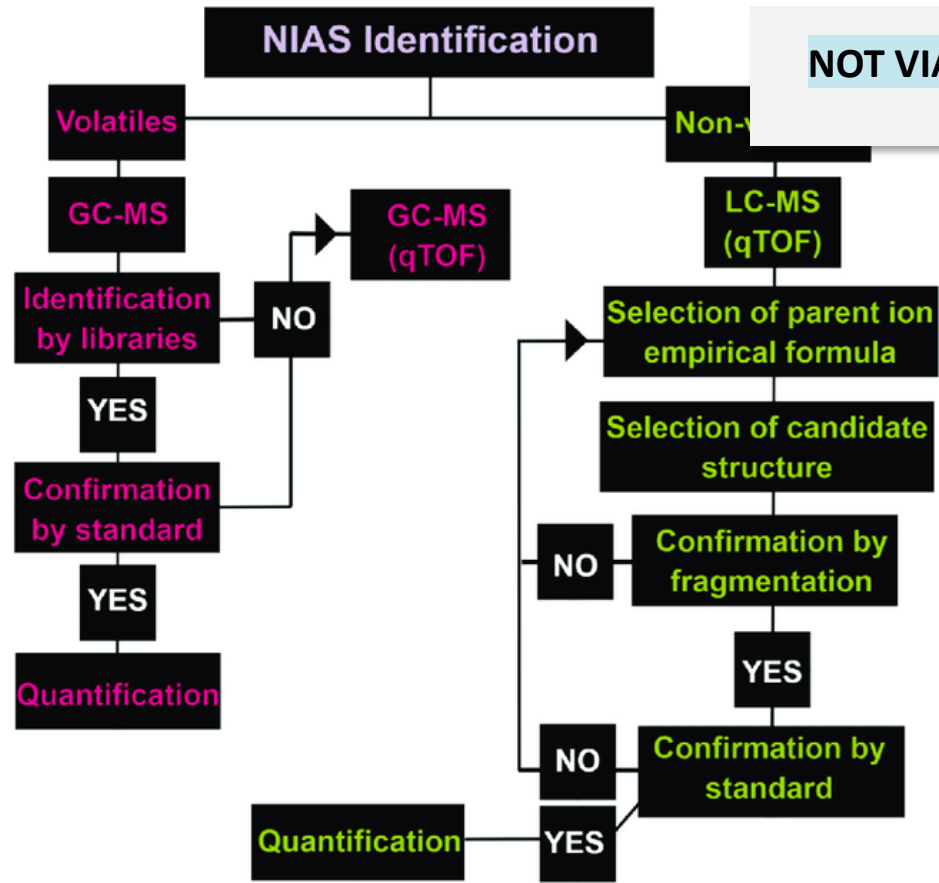
In addition to the food industry, other industries such as cosmetics and hygiene are working to introduce recycled material in their packaging and be able to comply with **PPWR by 2030**



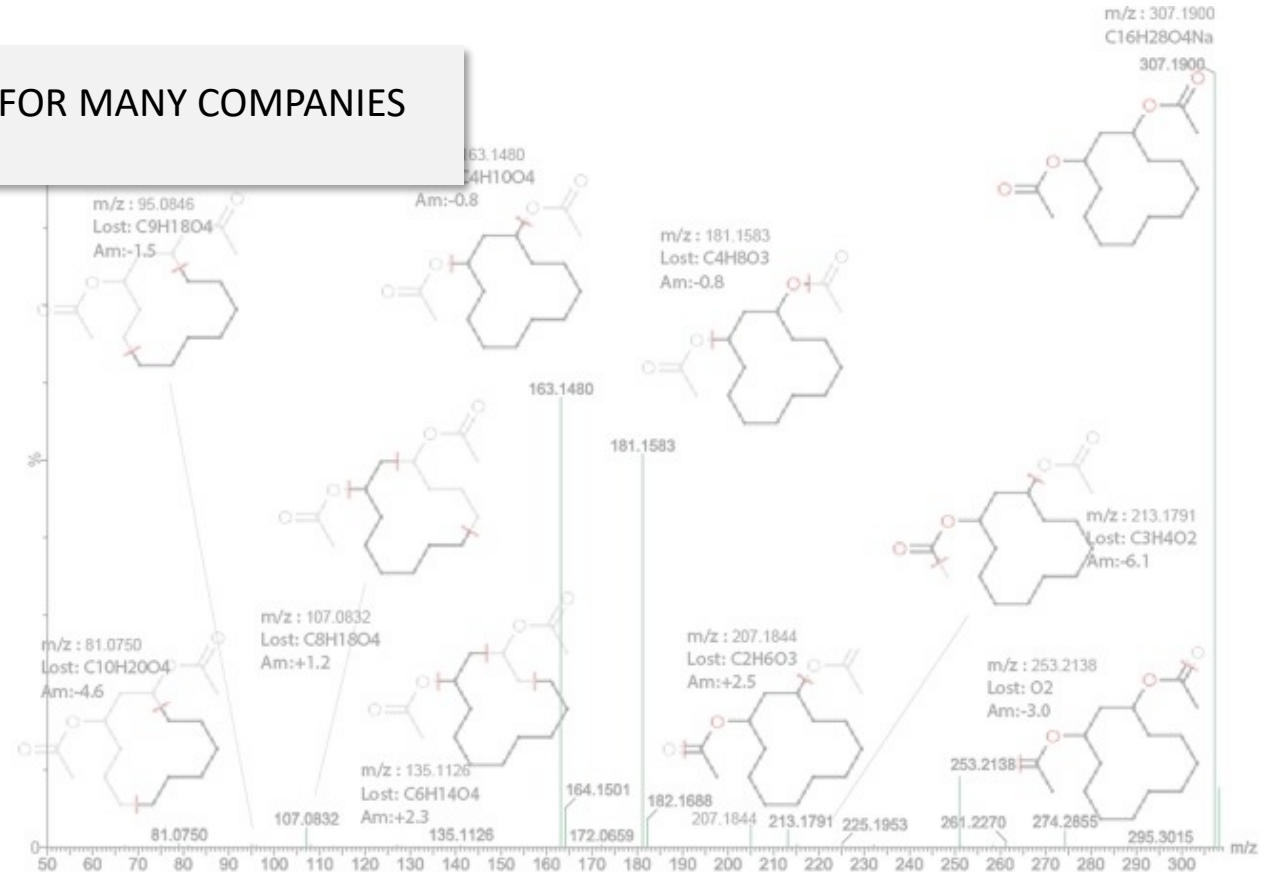
- ! **Fluctuation** recycles the quality of plastic
- ! **Availability** of feedstock
- ! **Premium Pricing**



## FOR (EU) 10/2011 COMPLIANCE

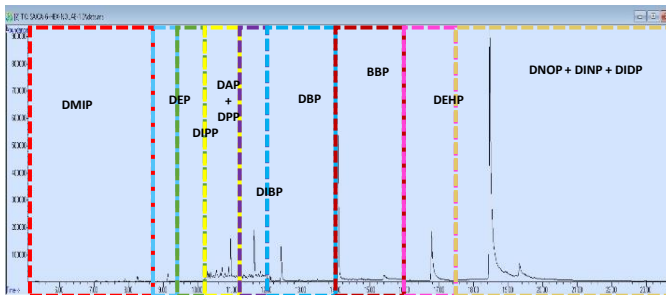


**NOT VIABLE FOR MANY COMPANIES**



## PROTOCOL FOR CONTINUOUS QUALITY ASSURANCE

### CADEL Lab



*Injection GC-MS economically feasible*

### CADEL Selection

List of **Substances of Interest** most representative in recycled plastics.

- Phthalates
- Bisphenols,
- Others...

*More than 20 substances*

- ✓ Fast
- ✓ Economical
- ✓ Useful information
- ✓ Complementary to regulatory requirements
- ✓ Gives value to the company.

  
**REPORT**

*Compare the contamination content with the legislation*

  
**VECTOR**

*Ai tool to measure contamination content of a big range of parameters*

# QUANTUM REPORT FOR RISK ASSESMENT

## Quantum Report

Method: GC-MS

SML: specific migration limit, RD 10/2011 labulated limit, ND = Not Detectable

CMR: carcinogenic, mutagen, reprotoic

For substances present in RD 10/2011 the criteria applied is according to 10/2011

For substances not present in RD 10/2011 a generic limit of 10 mg/kg is applied



Sample: [Redacted]

Date: 11/14/2024

Type: FSPC: Commercial

Format: Pellets

Laboratory: Cadef

CAS	Compound	Concentration [mg substance /kg plastic]	Migration [mg substance/kg Food]	SML [mg substance/kg Food]	Cramer	C	M	R	RD 10/2011	Criteria applied [mg substance/kg Food]
1000		4.000E-03	0.05	0.05	3					0.05
2150		9.870E-06			3					0.05
401		0.000E+00	0.05	0.05	1					0.05
ND		0.000E+00			1					0.05
2150		9.704E-06			1					0.05
ND		0.000E+00	ND	ND	2					0.05
01-01		1.110E-05			1					0.05
230		7.810E-04			1					0.05
139		6.501E-04	00	00	1					00
1256		1.741E-02	1.5	1.5	1					1.5
84		2.782E-04			1					0.05
1907		1.954E-02			1					00
1013		9.870E-03			1					0.05
ND		0.000E+00			1					0.05
463		1.110E-05			3					0.05
107		3.544E-04			3					0.05
ND		0.000E+00			1					0.05
27		9.842E-05			3					0.05
29		9.805E-05			3					0.05
ND		0.000E+00	0.05	0.05	1					0.05

Total substances: 21

### Configuration used

Polymer Density [g/cm<sup>3</sup>]: 0.92  
 Packaging Surface [cm<sup>2</sup>]: 600  
 Packaging Thickness [cm]: 0.05  
 Weight of Food [g]: 1000

### SML groups

CAS	Concentration	Units	Migration	Group SML [mg/kg]	Group number
28553-12-0	1907	µg/kg plastic	1.954E-02	00	12
117-81-7	1256	µg/kg plastic	1.741E-02	00	12
85-48-7	139	µg/kg plastic	6.501E-04	00	12
			1.741E-02	00	

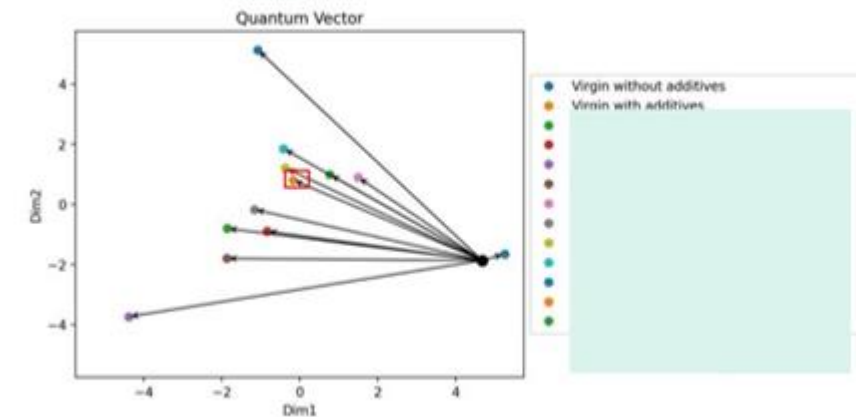
This report was generated automatically and is valid without a signature. The procedure documents related to the testing process.

RECOMMENDED PCR AMOUNT\* (%) = 100.00 %

\*Considering the most restrictive substance

Distances to Virgin with additives

Label	Distance
1 Virgin with additives	0.0000
0 Virgin without additives	0.6139
6	4.2258
12	4.9432
11	5.5267
3	5.5369
8	5.9328
7	6.0817
9	6.3055
5	6.6476
2	6.8250
10	8.0650
4	9.2579



# QUANTUM REPORT FOR RISK ASSESMENT

## Quantum Report



Method: GC-MS

SML: specific migration limit, RD 10/2011 tabulated limit, ND = Not Detectable

CMR: carcinogenic, mutagen, reprotoxic

For substances present in RD 10/2011 the criteria applied is according to 10/2011

For substances not present in RD 10/2011 a generic limit of 10 ppb is applied

Sample:

Date: 11/11/2024

Type: FSPC: Comercial

Format: Pellets

Laboratory: Cadell



CAS	Compound	Concentration [mg substance /kg plastic]	Migration [mg substance/kg Food]	SML [mg substance/kg Food]	Cramer	C	M	R	RD 10/2011	Criteria applied [mg substance/kg food]
80-05-7	2,2-bis[4-(4-hydroxyphenyl)propane	1394	4.617E-03	0,05	3					0,05
620-92-8	BFF	3,93	1.302E-05		3					0,01
1459-93-4	isophthalic acid, dimethyl ester	ND	0.000E+00	0,05	1					0,05
84-66-2	Dethyl Phthalate	ND	0.000E+00		1					0,01
605-45-8	Diisopropyl Phthalate	2,34	7.750E-06		1					0,01
131-17-9	phthalic acid, diallyl ester	ND	0.000E+00	ND	2					0,01
135-16-8	Dipropyl Phthalate	1,55	5.134E-06		1					0,01
84-69-5	Diisobutyl phthalate	2635	8.727E-03		1					0,01
85-68-7	phthalic acid, benzyl butyl ester	533	1.765E-03	30	1					30
117-81-7	phthalic acid, bis(2-ethylhexyl) ester	8249	2.732E-02	1,5	1					1,5
117-84-0	Di-n-octyl Phthalate	20,1	6.657E-05		1					0,01
28553-12-0	Deconyl phthalate	3755	1.244E-02		1					60
53306-54-0	Di-2-propylheptyl phthalate	1754	5.609E-03							0,01
26761-40-0	Dioodecyl phthalate	ND	0.000E+00		1					0,01

Total substances: 23

SML groups

Configuration used

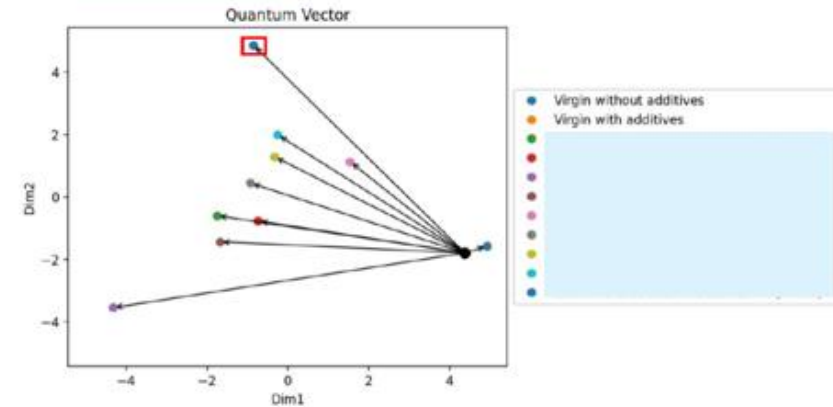
206-44-0	Polymer Density [g/cm³]	0.92
129-00-0	Packaging Surface [cm²]	600
98-54-4	Packaging Thickness [cm]	0.006
140-66-9	Weight of Food [g]	1000
104-40-5		

CAS	Concentration	Units	Migration	Group SML (mg/kg)	Group number
28553-12-0	3755	µg/Kg plastic	1.244E-02	60	32
117-81-7	8249	µg/Kg plastic	2.732E-02	60	32
85-68-7	533	µg/Kg plastic	1.765E-03	60	32
			4.152E-02	60	
					3

Sample references selected in: Virgin with additives

Distance to Virgin with additives

Label	Distance
Virgin with additives	0.0000
Virgin without additives	0.5907
	4.0700
	5.2123
	5.6194
	5.7640
	5.9779
	6.0002
	6.2330
	1.4695
	8.8743



This report was issued electronically and is valid without a signature. The results are exclusively related to the tested sample.

Recommended Recycled content for LDPE bread bag\* (%) = 32.30 %

\*Considering the most restrictive substance

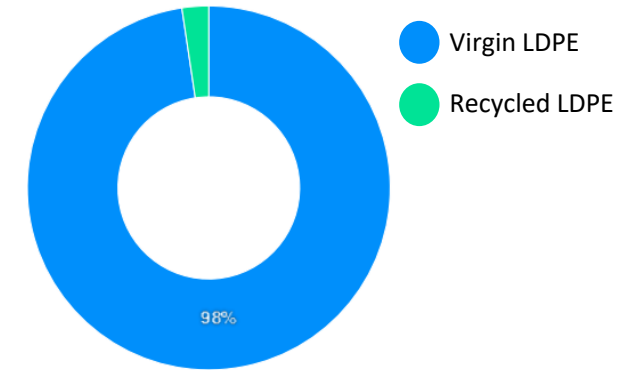
# QUANTUM REPORT FOR RISK ASSESMENT

Polymer density	Packaging Surface	Packaging Thickness	Weight of food	Recycled content
0.92mg/cm³	600.0cm²	0.006cm	100.0g	0.9 %



CAS	Name	Cramer <sup>1</sup>	C <sup>2</sup>	M <sup>3</sup>	R <sup>4</sup>	ED <sup>5</sup>	PBT <sup>6</sup>	SVHC <sup>7</sup>	Concentration (mg/kg plastic)	Migration (mg/kg food)	SML (mg/kg food) <sup>8</sup>	Group <sup>9</sup>	Pass
			-	-	-	-	-	-	-	-	0.05		✓
		III	-	-	-	✓	-	✓	0.86	0.03	0.05		✓
			-	-	-	✓	-	✓	2.79	0.09	6.0	32,36	✓
			-	-	-	✓	-	✓	-	-	0.05		✓
			-	-	-	✓	-	✓	0.37	0.01	0.6	32,36	✓
		..	-	-	-	-	-	-	-	-	0.01		✓
		III	-	-	-	-	-	-	0.02	5.40e-4	0.01		✓
		-	-	-	-	-	-	-	0.16	5.23e-3	0.01		✓
			-	-	✓	✓	-	✓	12.73	0.42	0.01		X
			-	-	-	-	-	✓	-	-	0.01		✓
			-	-	-	-	-	✓	0.15	4.93e-3	0.01		✓
		III	-	-	-	-	-	✓	-	-	0.01		✓
		III	-	-	-	-	-	-	0.20	6.62e-3	0.01		✓
		III	✓	-	-	-	-	-	0.48	0.02	0.01		X
		III	-	-	-	-	-	✓	-	-	0.01		✓
		III	-	-	-	-	-	✓	0.04	1.19e-3	0.01		✓
			-	-	-	-	-	-	-	-	0.01		✓
			✓	-	-	-	-	-	0.06	1.86e-3	0.01		✓
			✓	-	✓	-	-	-	-	-	0.01		✓
			-	-	-	-	-	-	0.03	1.09e-3	0.01		✓
		II	-	-	-	-	-	✓	-	-	0.01		✓
			-	-	-	-	-	-	-	-	60.0	26,32	✓
			-	-	-	-	-	-	3.47	0.12	60.0	26,32	✓

## RECOMMENDED PCR CONTENT



FAST



CONFIGURABLE



USER FRIENDLY

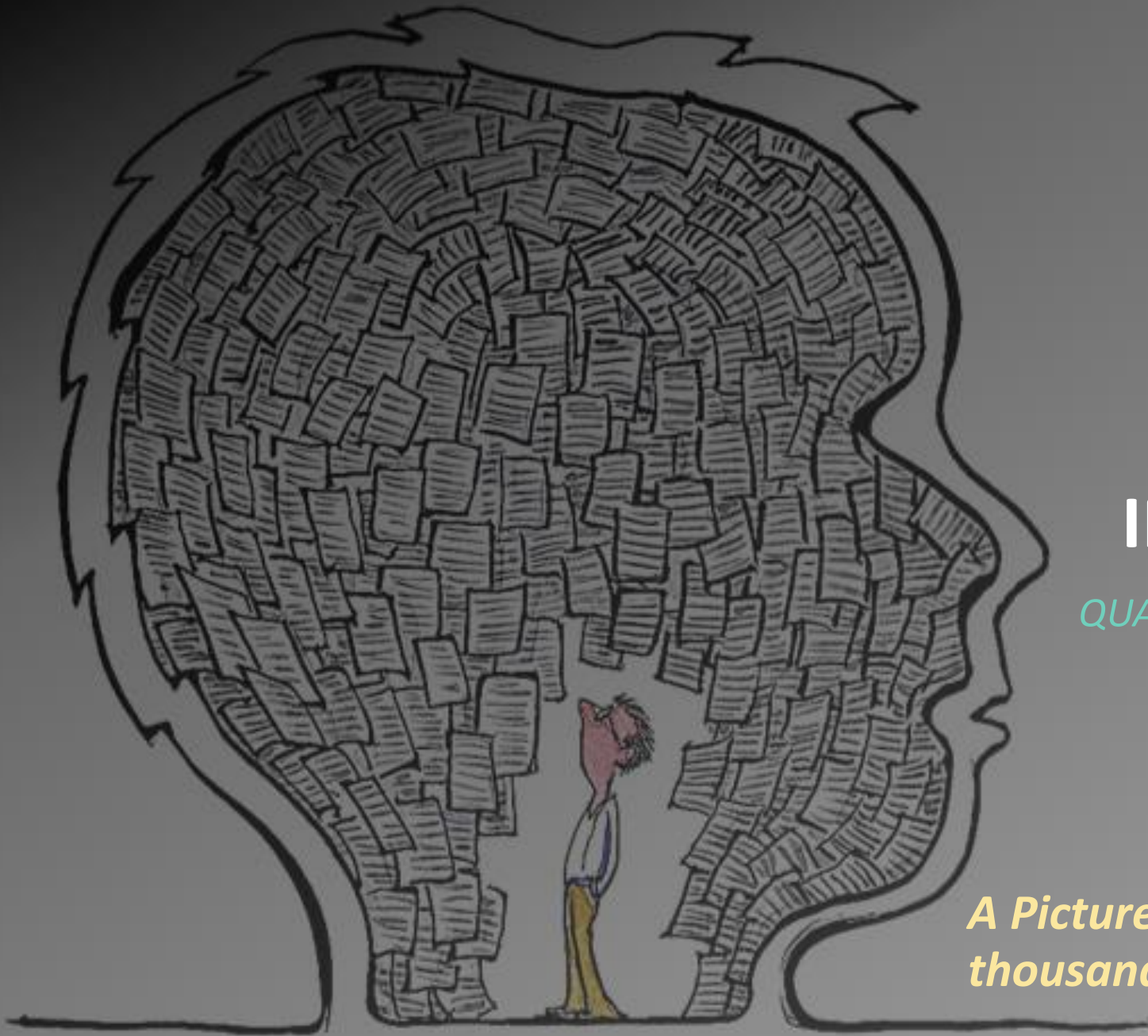


*[WORK IN PROGRESS ...]*

# IMAGE RECOGNITION

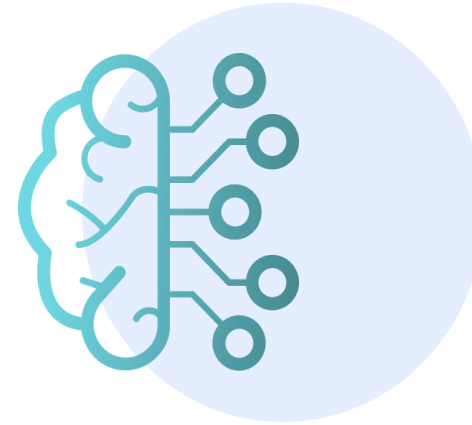
*QUANTUM Image for Material Classification*

*A Picture is worth a  
thousand words*  
Data

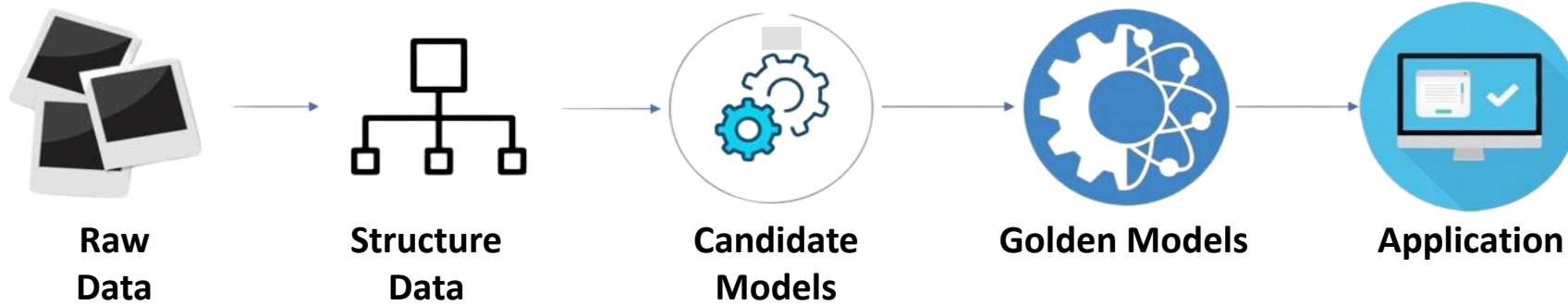




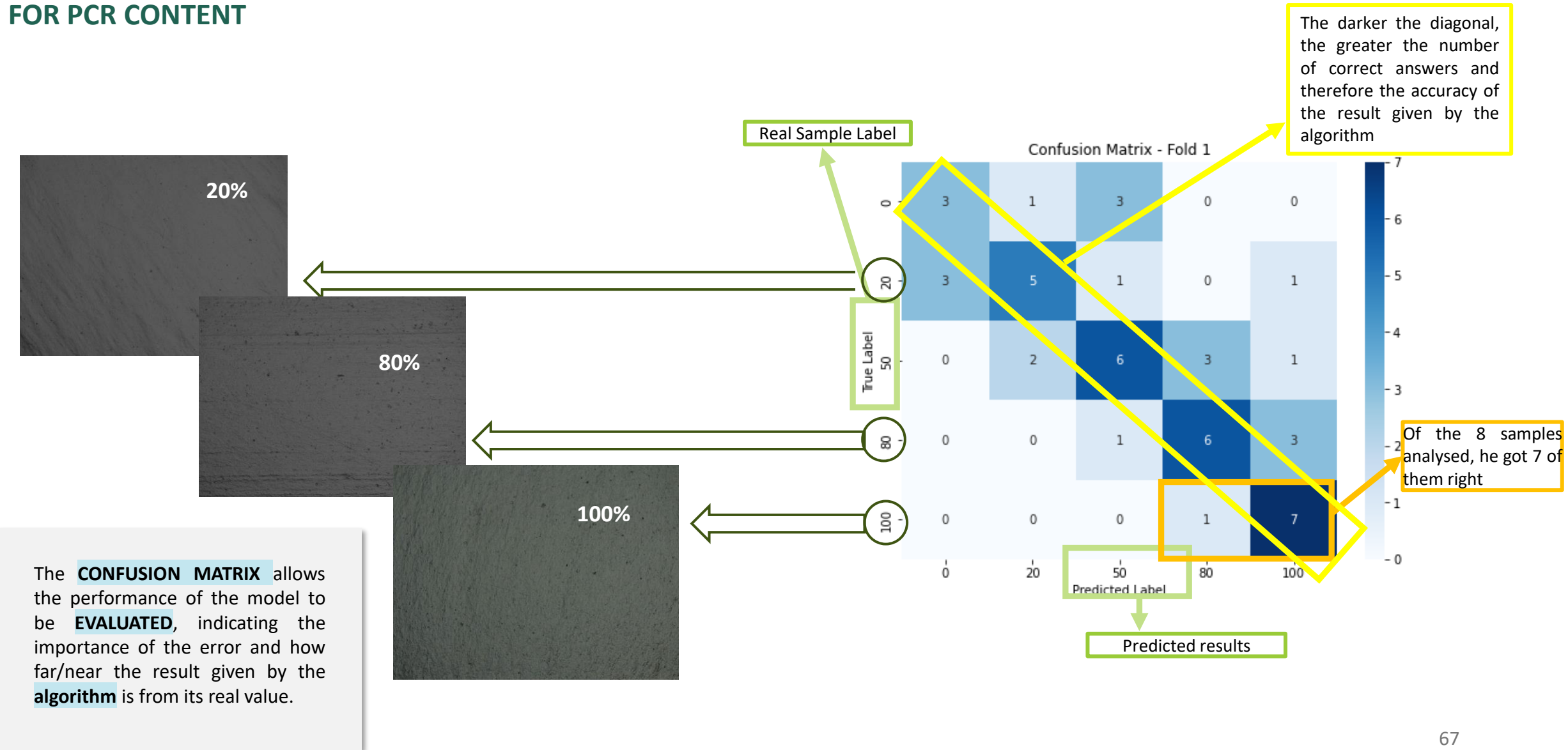
How to **classify** recycled plastic?



The use of **artificial intelligence** to predict the global quality of recycled plastic



## FOR PCR CONTENT

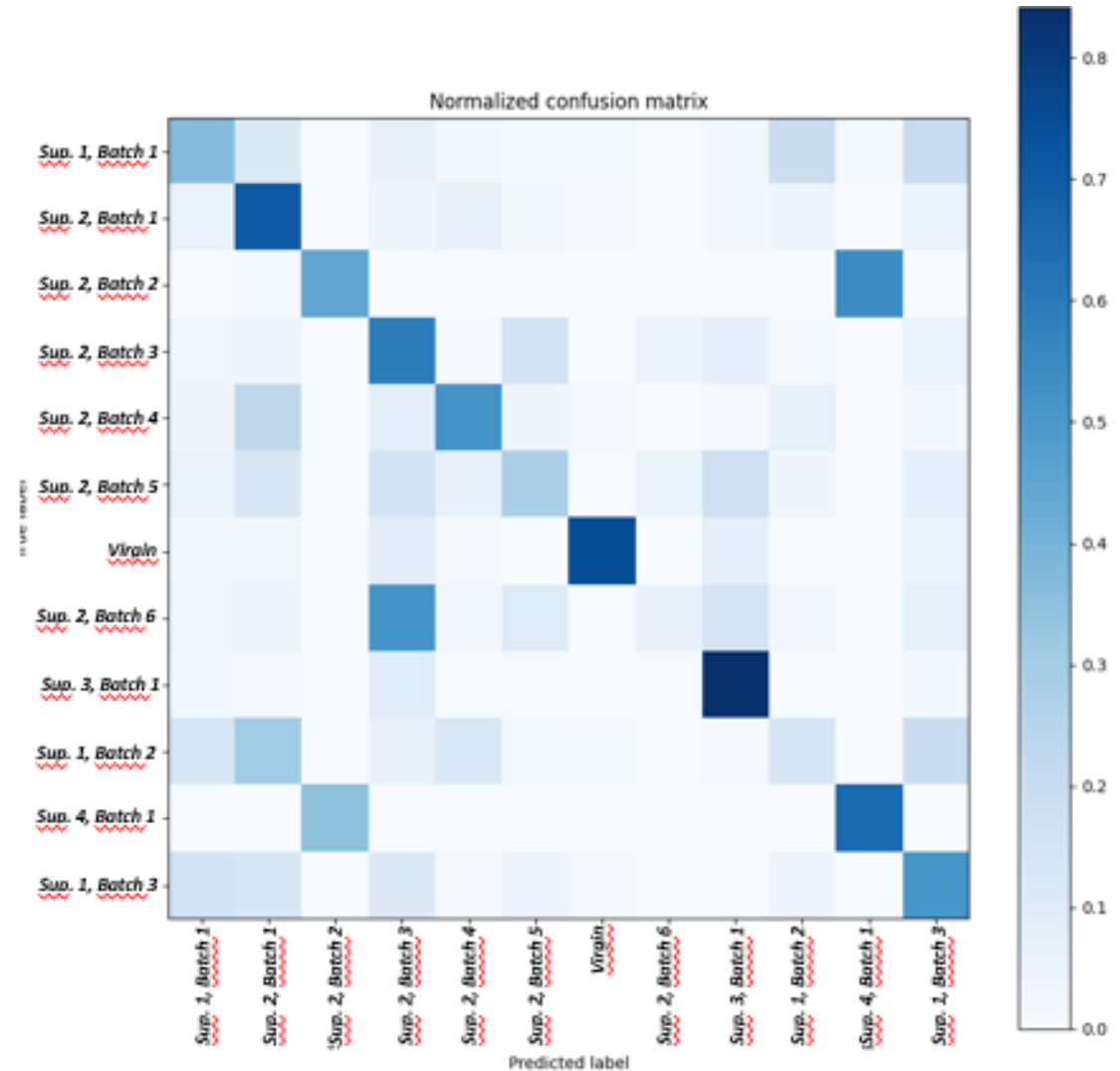


## FOR PCR CLASSIFICATION

Through AI, we have studied the possibility to differentiate plastic qualities from recycled LDPE.

So far 30-32% of the rates have been reached.

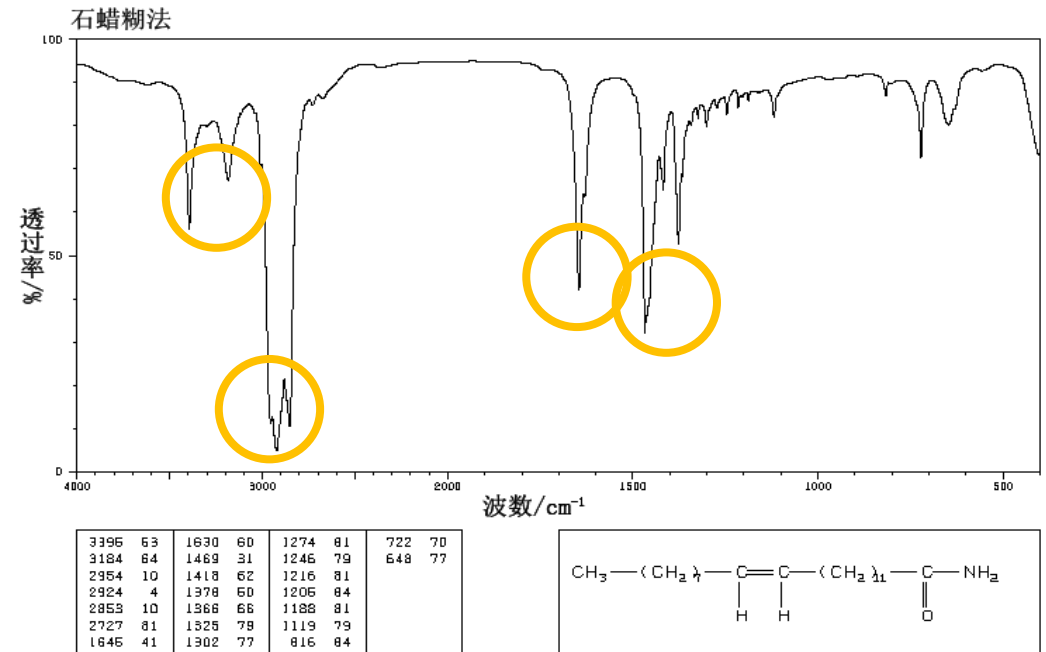
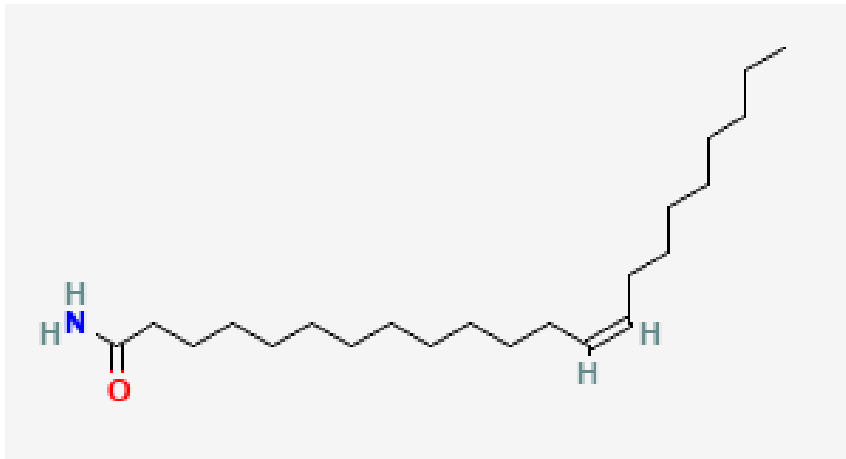
One of the main challenges encountered is the **generation of enough data for AI to learn.**



## SOI QUANTIFICATION (*Preliminary Studies*)

### ERUCAMIDE

Common additive in LDPE/HDPE material manufacturing. It gives the material optimal properties for good processability (oxidation stability, low volatility, sliding effect, anti-blocking characteristics).



Each substance has its **fingerprint** that differentiates it from another.

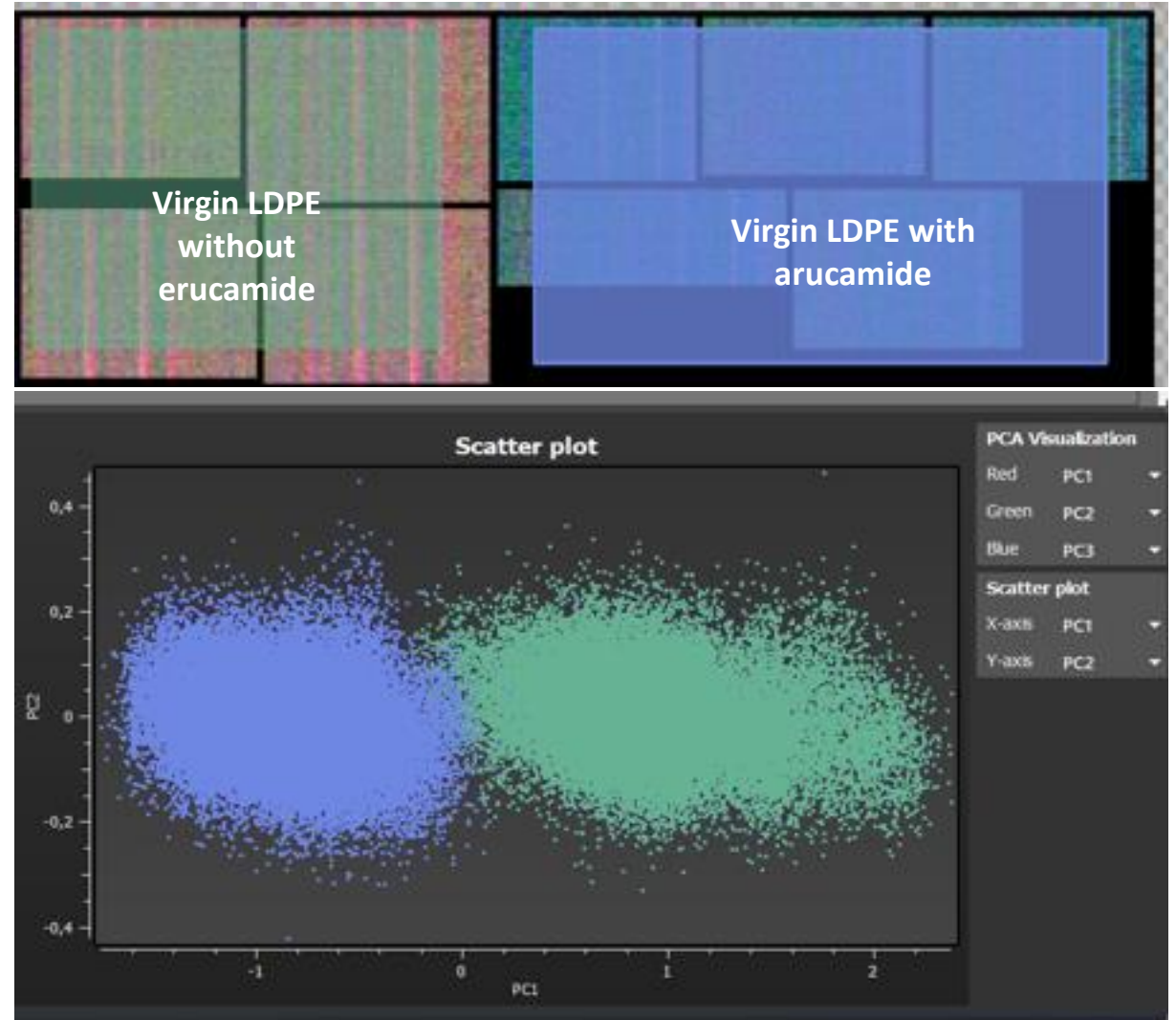


## SOI Quantification

### ERUCAMIDE

Preliminary studies confirm that it is possible to differentiate virgin LDPE materials with/without additives.

This makes it more possible to identify/quantify substances using image recognition.



- ❑ Differentiate yourself from competitors through a certificate of analysis (COA) including a Contamination Report.
- ❑ Increases sales profit according to material quality
- ❑ Increase trust of your customer.
- ❑ Generate a database that allows you to control production.
- ❑ Make sure you comply with the regulations according to the final application of the material.
- ❑ The introduction of image recognition systems could be a milestone in quality control for the recycling industry.

**COA**  
CERTIFICATES OF ANALYSIS

CERTIFICATE OF ANALYSIS

**SAMPLE INFORMATION**

Batch ID: \_\_\_\_\_ Test ID: \_\_\_\_\_  
Reported: \_\_\_\_\_ Method: \_\_\_\_\_  
Type: \_\_\_\_\_  
Test: \_\_\_\_\_

**CONTAMINATION REPORT**

Compound	LOQ (%)	Result (%)	Result (mg/g)

NOTES:  
N/A

**COMMENTS**

**Beta version will be released at the end of April**

Menu

- Chromatography data upload form
- Quantum Report
- Quantum Vector
- Substance Stats
- Annexes

Please make sure to follow the structure provided in the Excel file when uploading your data.

Download Template

## Upload data



Step 1 Step 2

Fill the migration data

Sliced bread LDPE bag

Average PET bottle

Use migration value



# Thank you for your kind attention

*Looking for partners.*

*For further information please contact*

[info@cadelrecyclinglab.com](mailto:info@cadelrecyclinglab.com)

[melania.gomez@cadelrecyclinglab.com](mailto:melania.gomez@cadelrecyclinglab.com)



*With the support of:*



*Actuación financiada por la unión europea a través del programa Fondo Europeo de Desarrollo Regional (FEDER) de la Comunitat Valenciana 2021-2027".*





# 15:05-15:25 Q and A session



**Feel free to use our dedicated channel for the Q and A so that we can be sure to answer as many questions as we can.**



We will be back after a  
short coffee break

15:25-15:40

15:40 - 16:00

# Revolutionizing Packaging with UPM BioPET by Nicko Reuter (UPM Biochemicals Sales GmbH)

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**Nicko Reuter**

## **Business Development Manager**

Nicko Reuter is a Business Development Manager and “BioPET Advocate” at UPM Biochemicals. He develops the European market for PET packaging by introducing innovative, eco-friendly solutions. With his commitment to BioPET, he significantly contributes to reducing the carbon footprint of food packaging and supports companies in achieving their environmental goals.

# UPM Biofore – Beyond fossils



Nicko Reuter – Business Development  
Revolutionizing Packaging  
with UPM BioPET

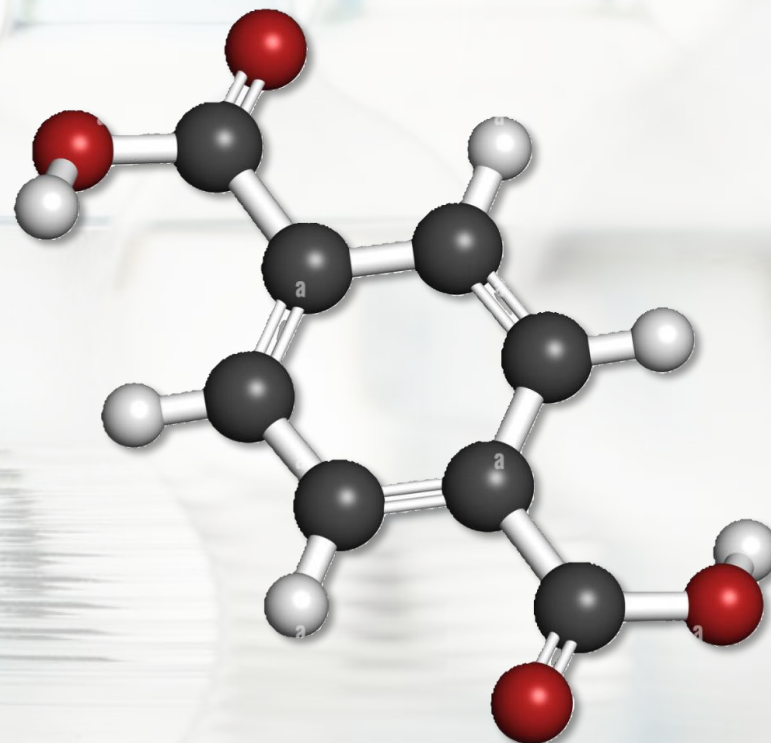
March 2025



Wood-based and recyclable:  
**UPM BioPET**

## Quick re-cap: What is PET?

- **PET = Polyethylene Terephthalate**
- PET is widely used in beverage bottles, food trays, beauty cream jars, liquid soap containers and pharmaceutical blister packaging
- It consists of **two monomers**:
  - Monoethylene Glycol (**MEG**)
  - Purified Terephthalic Acid (**PTA**)
- **We can create both from wood!**



## In a nutshell: Why BioPET in packaging?

- **Sustainability:** Made from **local**, renewable **wood**, reducing reliance on fossil fuels and with a best-in-class **net-zero footprint!**
- **Recyclability:** BioPET is 100% **plug and play** and can be recycled in the **same stream** as traditional PET.
- **Performance:** Same high-quality properties as traditional PET, such as **durability**, clarity, and **barrier** protection.
- **Consumer Appeal:** Using BioPET enhances **brand image** and meets **market expectations** for eco-friendly, **plant-based** packaging.
- **Regulatory Compliance:** BioPET helps companies comply with increasing regulations and policies aimed at **reducing Scope 3 emissions** and promoting **sustainable packaging** solutions. **Pharma and Food** compliance tested!



# I use recycled PET already. Why add BioPET?



Typical  
rPET grey  
colour



## Better mechanical properties

BioPET is as good as virgin fossil PET, with no compromise in quality. Using more than 50% recycled PET (rPET) can lead to quality issues, but BioPET maintains high standards.



## Better colour

BioPET keeps your bottles/trays clear and transparent. No risk of grey or yellow discoloration.



25%



30%



50%



75%



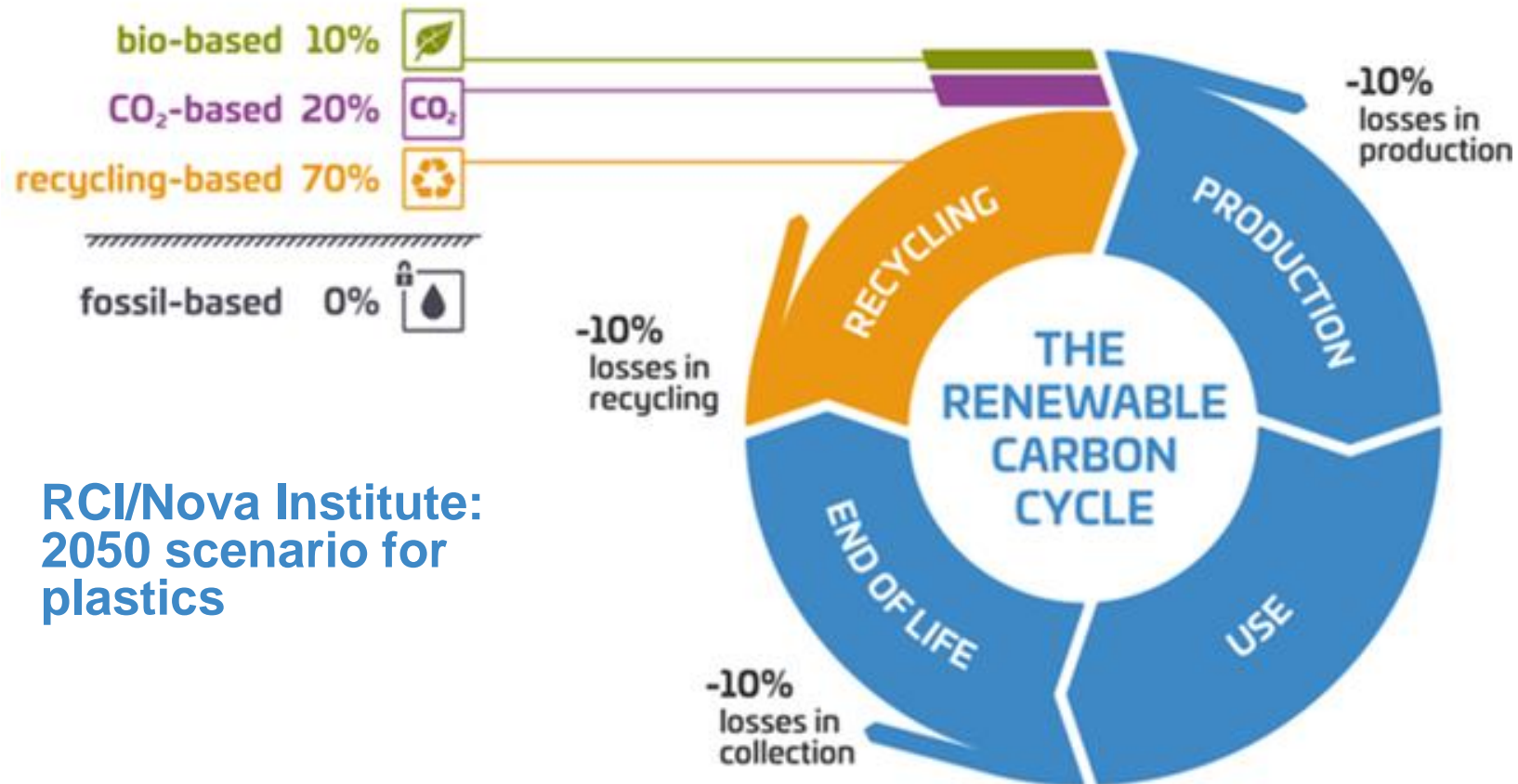
100%



## Availability and “Story”

High-quality recycled PET is hard to find and can be expensive. BioPET is an alternative with a great story, like capturing CO<sub>2</sub> from the atmosphere.

# The future of plastics in 2050: 70% rPET maximum. We need sustainable alternatives!



RCI/Nova Institute:  
2050 scenario for  
plastics

# UPM BEYOND FOSSILS

## Leader in sustainability & responsibility



Member of  
**Dow Jones  
Sustainability Indices**

Powered by the S&P Global CSA

**MSCI**  
ESG RATINGS

AAA

CCC B BB BBB A AA AAA

UPM-Kymmene Corporation  
Paper and Pulp Products

**Top 1%**  
S&P Global ESG Score 2022

**83** / 100

S&P Global Sustainable 1

**CDP**  
DISCLOSURE INSIGHT ACTION

**A LIST  
2023**

CLIMATE FORESTS

PLATINUM Top 1%

**ecovadis**  
Sustainability Rating

AUG 2024

**Bloomberg**  
Gender-Equality  
Index  
2023  
Member

# In UPM BIOREFINING, we team up to make this happen!



## UPM BIOREFINING



### UPM FIBRES

**UPM Pulp**  
pulp for tissue, specialty and packaging papers.



### UPM RAFLATAC

self-adhesive label materials for branding and information labelling.



### UPM Biofuels

renewable diesel for engines and **renewable naphtha** for petrochemical industry.



### UPM Timber

certified sawn timber for joinery, packaging, furniture and construction.



### UPM SPECIALITY PAPERS

labelling and packaging materials and fine papers for packaging and printing.



### UPM Biochemicals

wood-based biochemicals offer renewable alternatives to fossil raw materials.

**BioPura™ BioMEG**



### UPM Forest

competitive wood for businesses and management of privately-owned forests.



### UPM COMMUNICATION PAPERS

graphic papers for advertising and publishing and home and office uses.



### UPM Biomedicals

wood-based biomedical products for a variety of uses.



### UPM ENERGY

cost-competitive, zero-carbon electricity.



### UPM PLYWOOD

WISA® plywood for construction, vehicle flooring and LNG shipbuilding.



UPM

# UPM Biochemicals: LEUNA

UPM BIOFORE-BEYOND FOSSILS

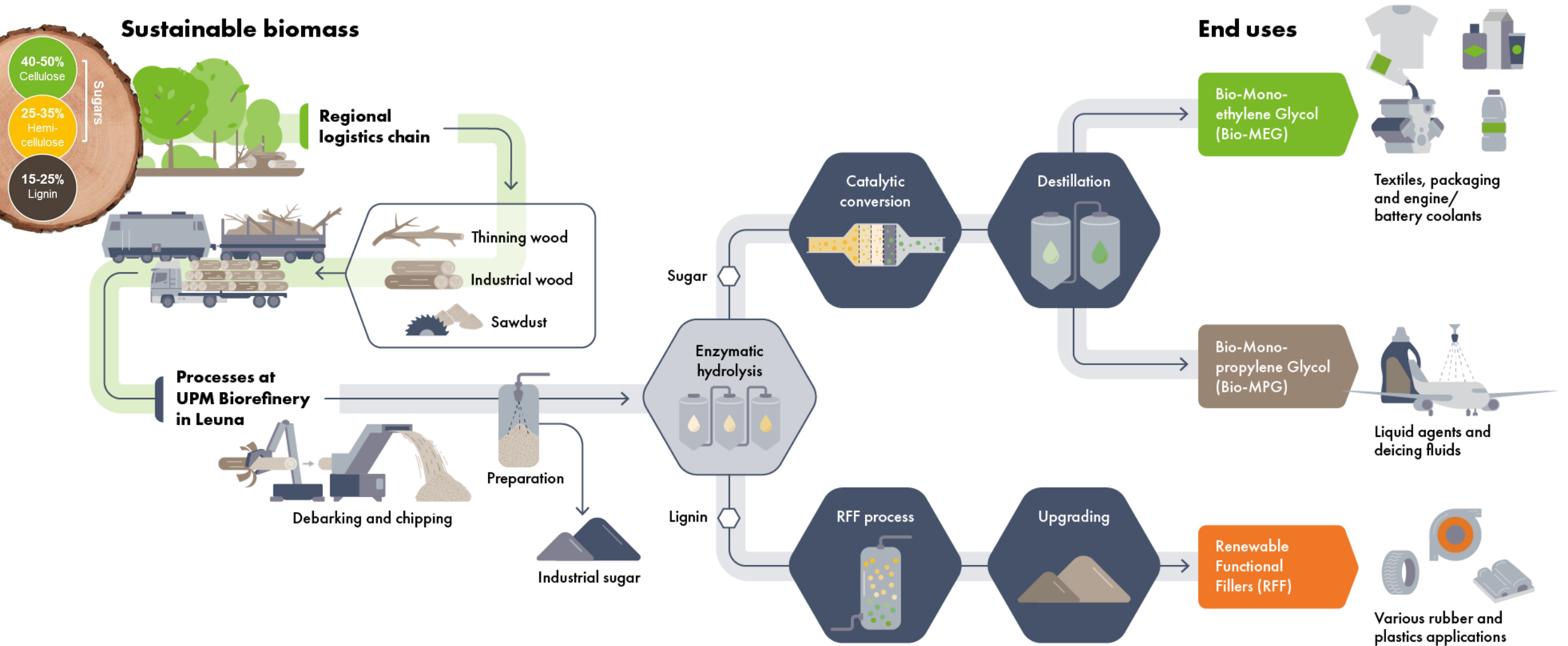
# UPM invests EUR 1.28 billion in industrial scale biorefinery at Leuna, Germany



- 100% **wood-based** chemicals to replace fossil-based materials in diverse applications.
- **Key Products:**
  - **BioPura™ MEG: A bio-based monoethylene glycol**
  - BioPura MPG, Industrial Sugars, and Renewable Functional Fillers (RFF).
- **Facility Highlights**
  - **Annual Capacity:** 220,000 tonnes.
  - **Ramp-Up Start:** Sequentially, since January 2025.



# UPM Biorefinery in Leuna VALUE CHAINS



# Our Biorefinery is starting up!












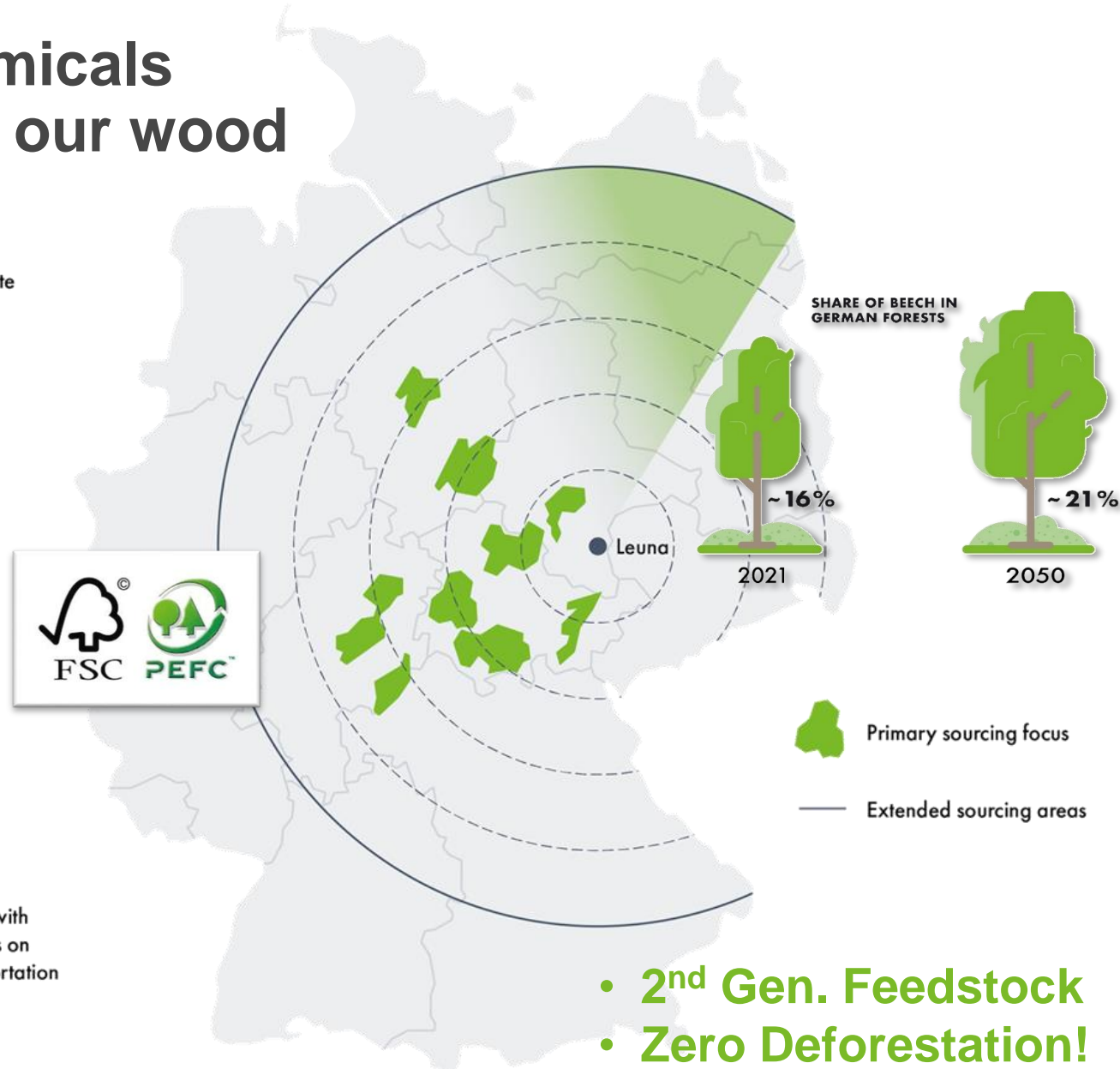
# Our Raw Material: Wood

# UPM Biochemicals

## The origin of our wood



-  Beechwood from forest management in federal, state and private forests
-  Residues from sawmills and other wood producers
-  100% of the wood is FSC® and PEFC certified
-  Regionally sourced from local forests, full traceability
-  Transparent supply chains with regional partners and focus on emission-optimized transportation modes

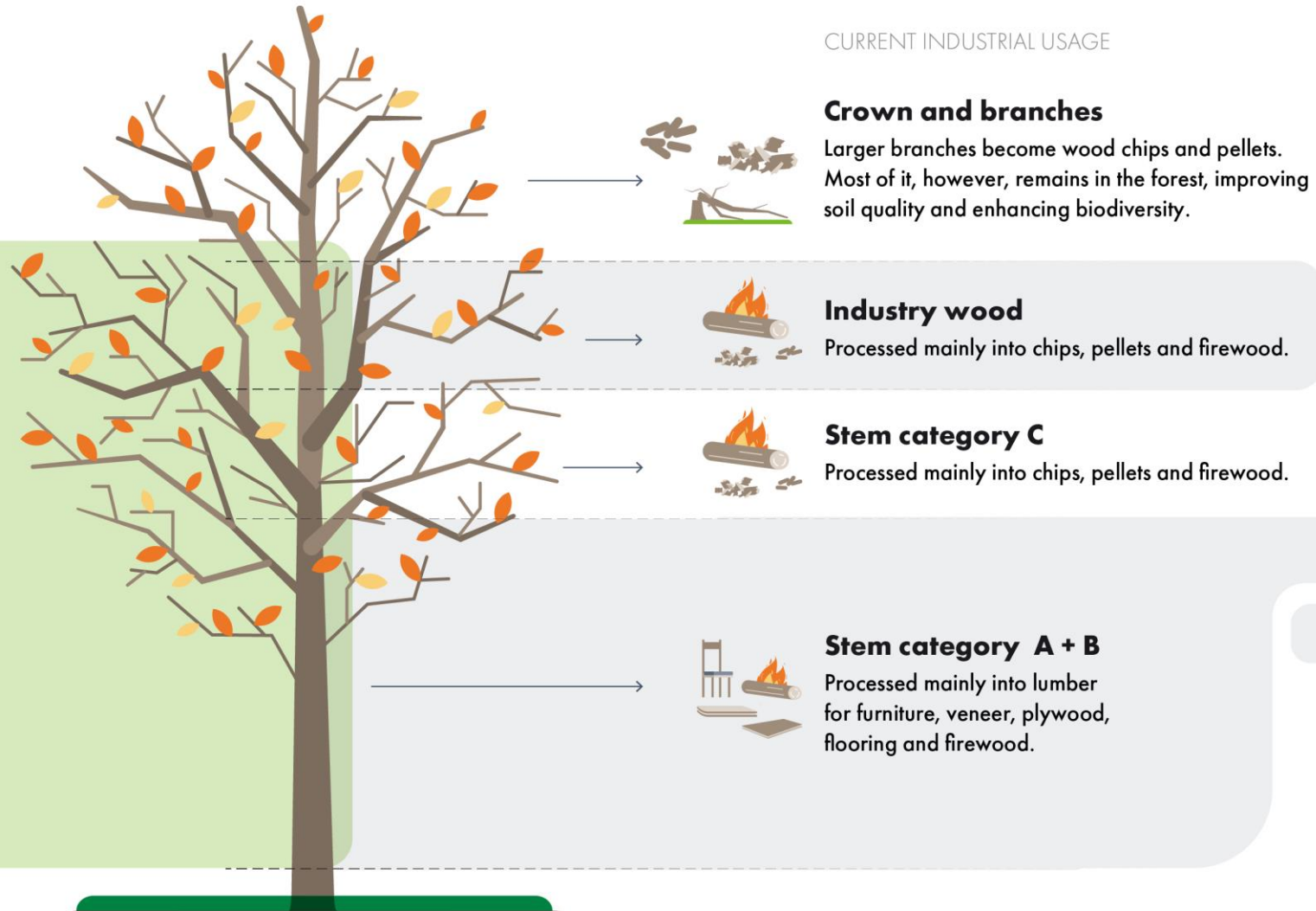


- 2<sup>nd</sup> Gen. Feedstock
- Zero Deforestation!



# WHICH PARTS ARE USED FOR WHAT?

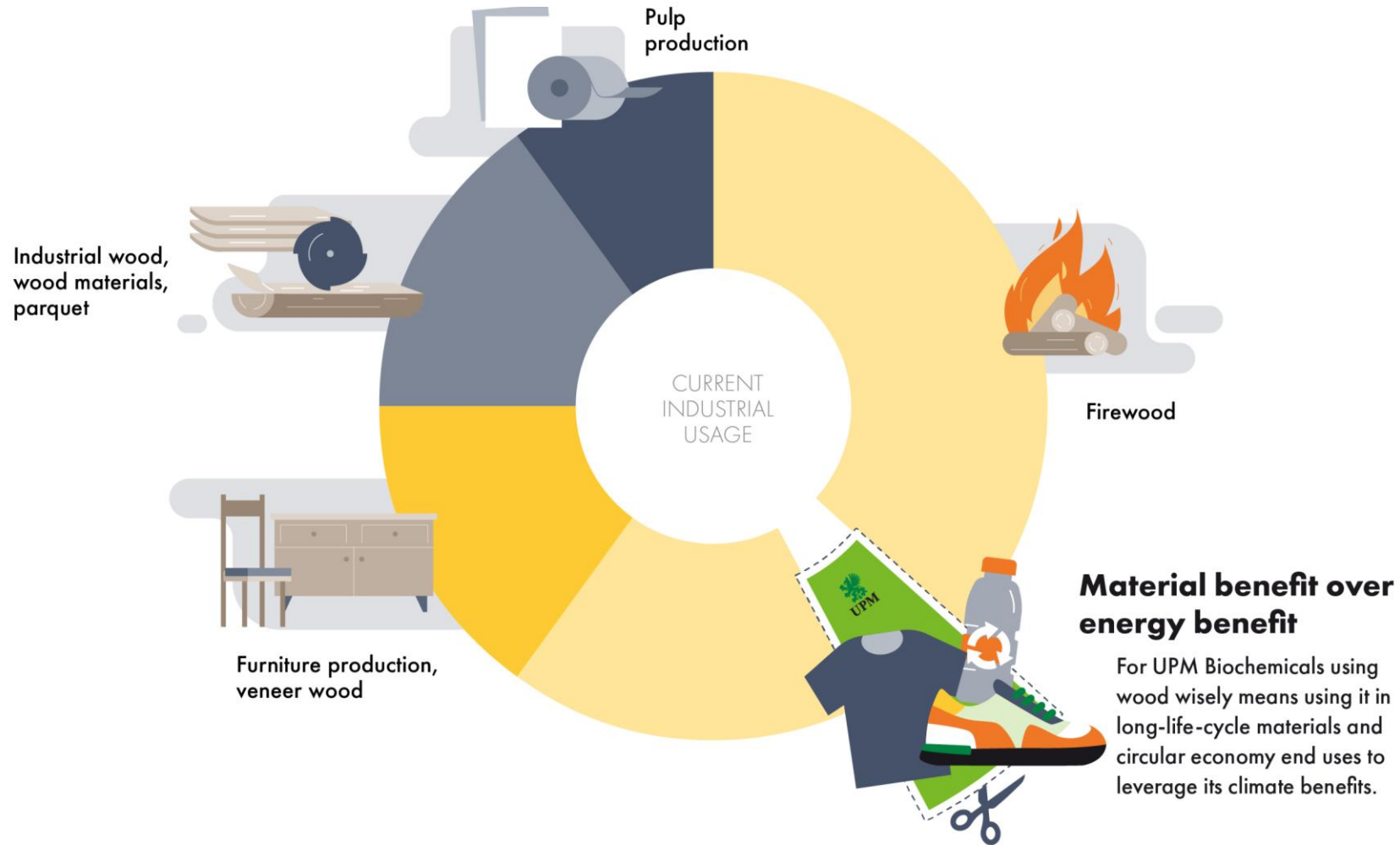
## CURRENT INDUSTRIAL USAGE



At UPM Biochemicals we use sawmilling residues and wood that is currently burned.

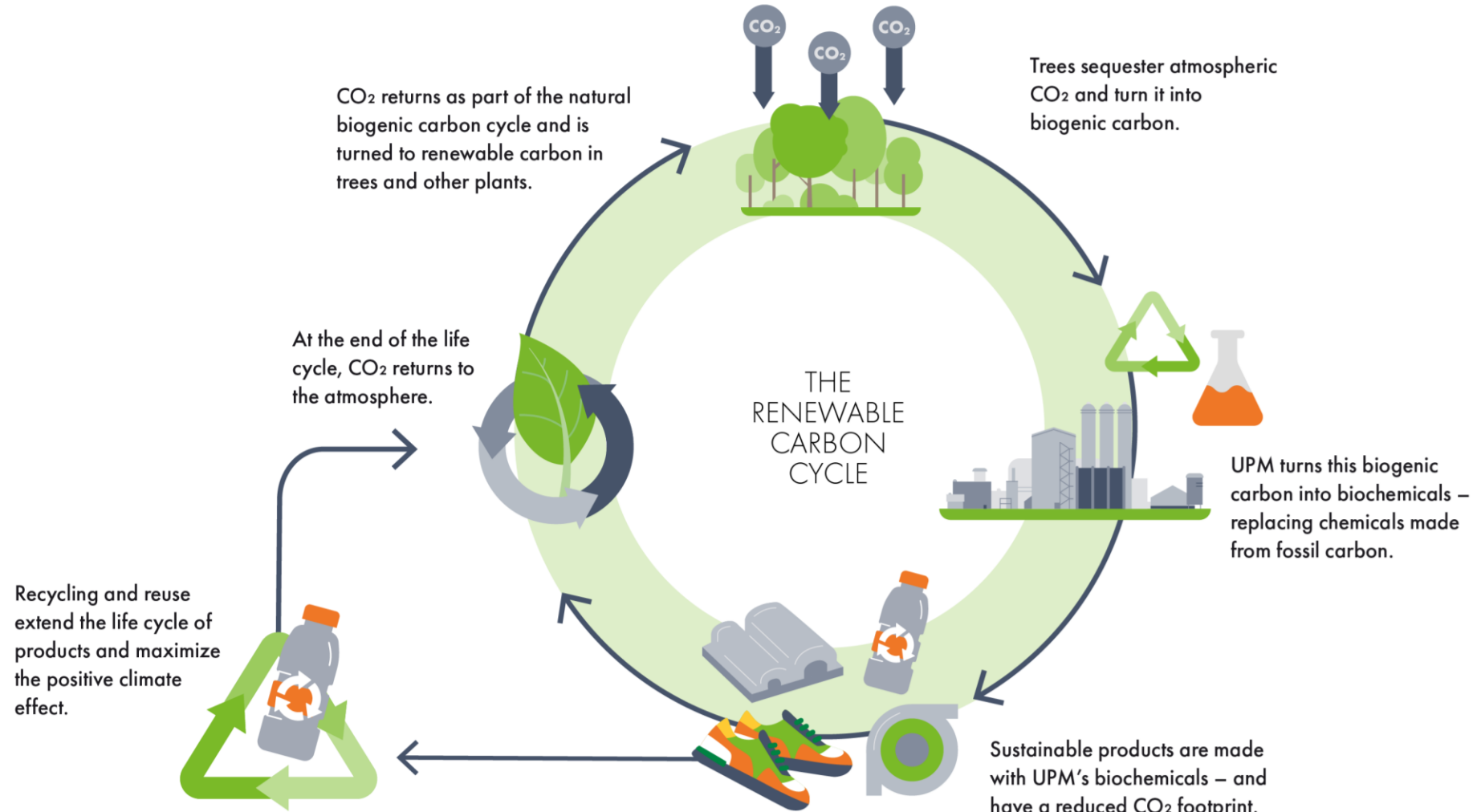
# UPM Biochemicals

## Valuing renewable carbon



# Making best use of atmospheric CO<sub>2</sub>

## The renewable carbon cycle



# 100% BioPET for Packaging or Textiles

# UPM working on 100% BioPET – available 2025



## Option 1 Partial BioPET/Polyester

30% bioMEG

70% fossil PTA (terephthalic acid)

Marketing example:



up to 30% plant-based  
100% recyclable bottle  
redesigned plastic,  
recyclable as ever.



## Option 2 100% BioPET with NET ZERO (!) Footprint

30% bioMEG

70% mass-balanced bioPTA (with ISCCplus certification)

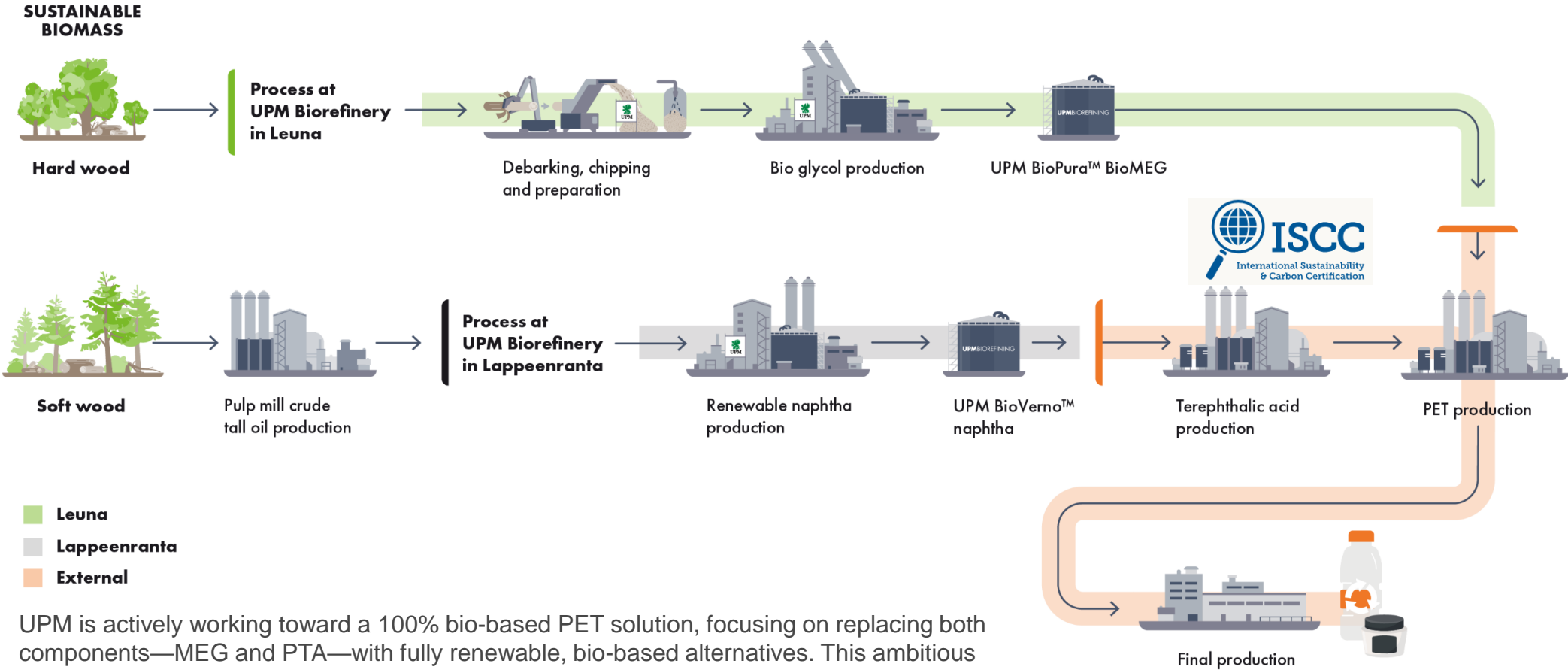
→ By joining forces with UPM BIOFUELS in Finland!

Marketing example:

100%  
PLANT-BASED



# UPM working on 100% BioPET – available 2025



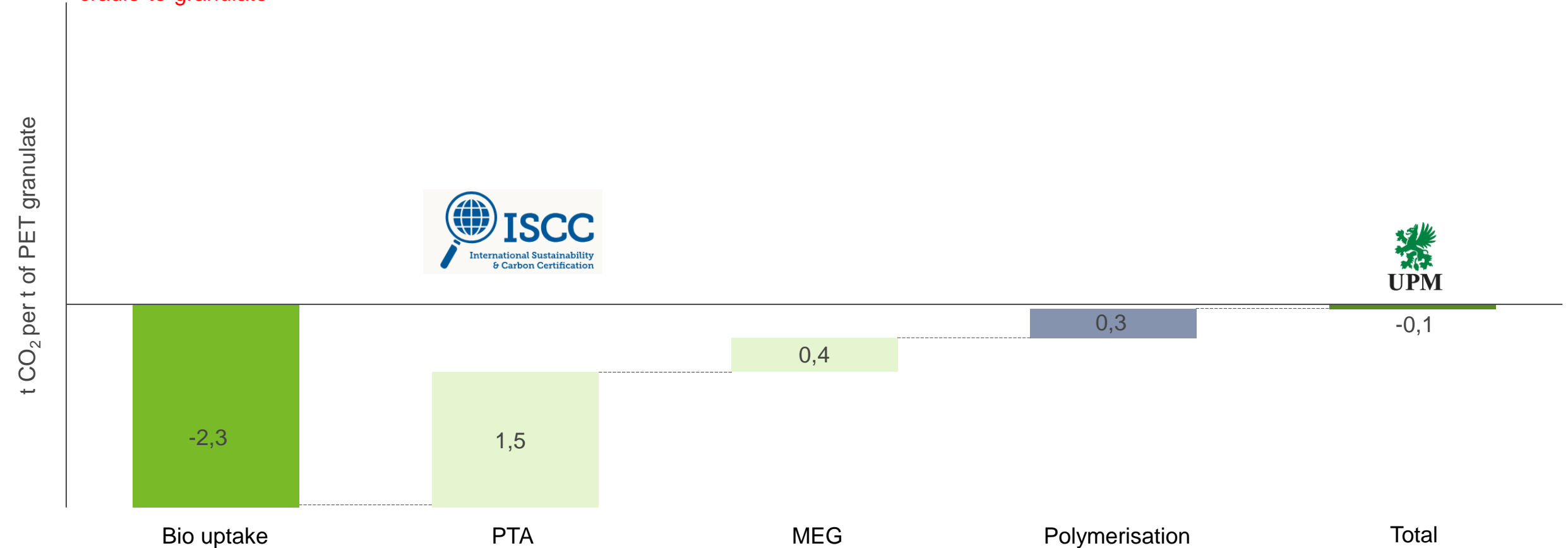
UPM is actively working toward a 100% bio-based PET solution, focusing on replacing both components—MEG and PTA—with fully renewable, bio-based alternatives. This ambitious project aligns with our vision of a fossil-free future for plastics.



# UPM provides a unique solution for PET applications



cradle-to-granulate



Impacts for 1 t of PET granulate, excluding processing, use and end-of-life. Biogenic emissions need to be taken into account for end-of-life.

# Why Mass Balance is a good Choice



- **What is Mass Balance?**

A method where renewable and fossil materials are mixed during production, with the renewable portion allocated to products through a **verified accounting system**. It's like green electricity – you may not receive renewable energy directly, but **your choice supports sustainable** production.

- **How It Ensures Transparency:**

The process is **independently audited** by certifications like ISCC PLUS, ensuring that renewable content is **accurately tracked and allocated**, making it a trustworthy and transparent approach.

- **Benefits for Consumers and the Environment:**

BioPET offers the same high quality as traditional materials while **reducing fossil fuel use** and CO<sub>2</sub> emissions. Supporting Mass Balance **contributes to a sustainable transition** without requiring entirely new production infrastructure.

- **A Positive Impact:**

Every bio-based product you choose helps **drive demand for renewable materials** and supports the shift toward a more circular economy. Look for certified labels (like ISCC) to **trust your choices!**

# Let's Work Together!

# Value chain towards sustainable PET packaging



Your existing supply chain!

# Successful Trials: 100% Drop-in Solution



# Don't miss the sustainability train!




# Excited to lead your company towards sustainable solutions?

LinkedIn



Please contact:  
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 [nicko.reuter@upm.com](mailto:nicko.reuter@upm.com)

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UPM **BIOFORE**  
**BEYOND** FOSSILS





16:00 - 16:20

# Testing Methods and Risk Assessment of NIAS in Food Contact and Cosmetic Applications by Lisa Filindassi (Food Contact Center Srl)

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## Lisa Filindassi

Born in Florence, graduated in Biotechnology, she began her career as a microbiological laboratory technician in a pharmaceutical company and then, after years spent in quality control laboratories analyzing the most disparate matrices, she devoted herself to the study of MOCA legislation and over time becoming a reference figure for companies in the panorama of experts in materials and objects in contact with food, matching regulatory and technical requirements on a global basis.

She obtained the qualification of Food Contact Expert in 2011 and participates in working groups, European associations and technical commissions.

**Speaker:** Lisa Filindassi

**Topic:** Testing Methods and Risk Assessment of NIAS  
in Food Contact and Cosmetic Applications

**Event & Date:** PETCORE 27/03/2025



**FOOD CONTACT  
SERVICES**



**FOOD CONTACT  
CENTER**

*Through our research, we go beyond  
standards. Our innovations are your  
success.*





Specialized center for food contact materials.



Headquarters: 1200 sqm



R&D pilot plant



Laboratory: 600 sqm



27 food contact experts



Microbiology Department

"Our innovations are your success. Through research, we go beyond standards."



[www.foodcontactcenter.com](http://www.foodcontactcenter.com)



Laboratory expert in the field of FCM. Chemical, microbiological, and physical testing.

Italy



[www.foodcontactservices.com](http://www.foodcontactservices.com)



Business consulting on processes and materials/objects in contact with food

"They work in synergy to provide a complete service to the customer."



# The speaker

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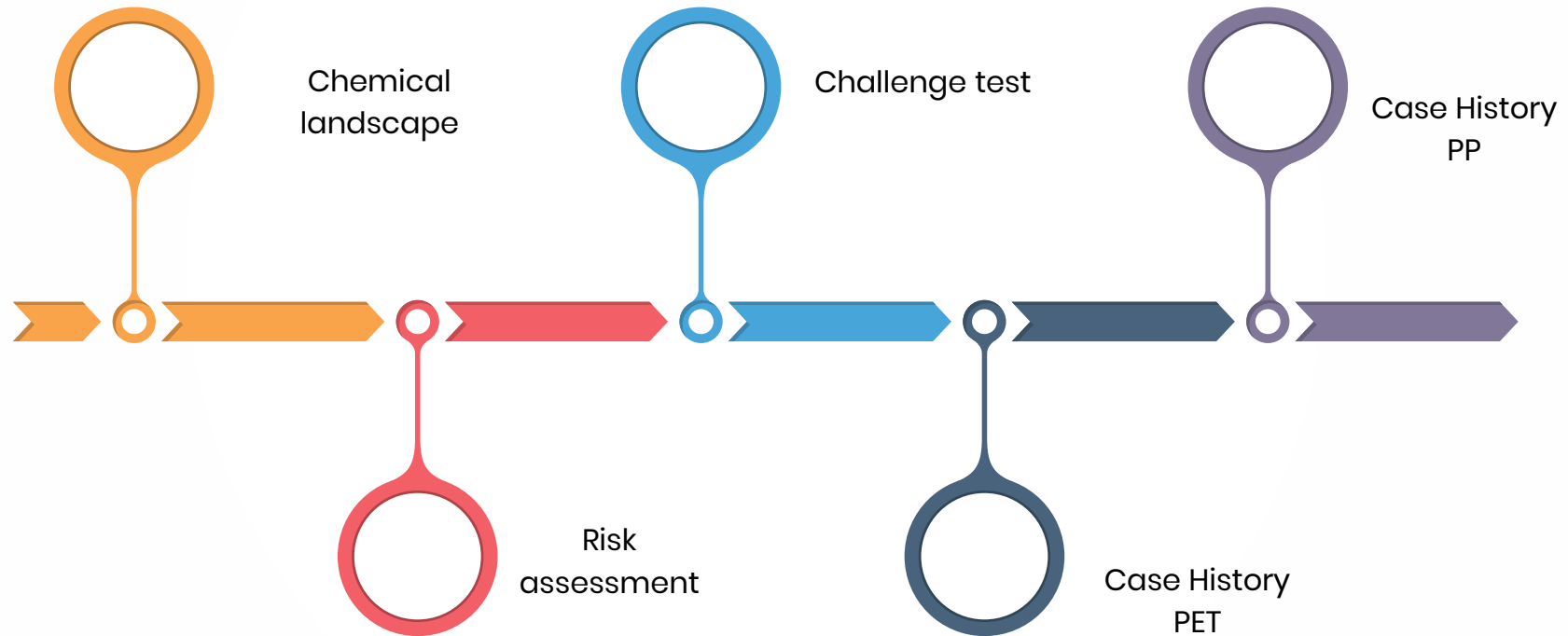
**Lisa Filindassi** – [l.filindassi@foodcontactservices.com](mailto:l.filindassi@foodcontactservices.com)

Senior Food Contact Specialist, **Food Contact Services srl**

- degree in Biotechnology
- more than 10 years seniority in FCM
- specialist sales manager also for multinational companies
- key point in Western Europe for enterprises wanting to enhance their Quality Systems
- technical background
- member of the technical table CFREP from 2015



# AGENDA





# Background

- FCMs are materials and objects that are intended to come into direct or indirect contact with food. This includes items such as containers, packaging, utensils, and equipment used in the production, storage.
- Food Contact Center has been involved for years in verifying the compliance of materials in contact with food.
- Recently, cosmetic packaging has become a kind of target for the manufacturing companies and cosmetic companies are asked more and more to comply with the regulations.



# The Chemical Landscape: Millions of Substances



5M

Known Chemicals

80K

Chemicals in Use

It is estimated that there are over five million known man-made chemicals, with approximately 80,000 currently in use. This vast number of chemicals highlights the potential for exposure to various substances through food contact materials. While many of these chemicals are considered safe for their intended use, a significant number can potentially migrate into food, leading to potential health risks.

# Chemical Migration

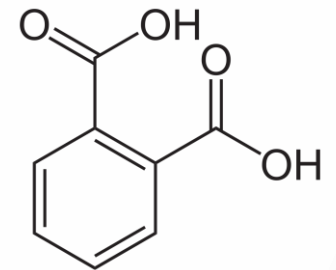
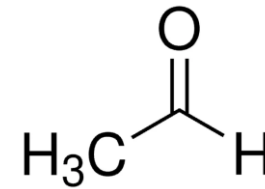
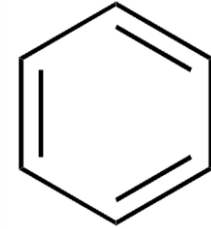
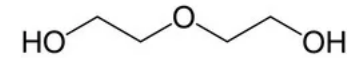


## From Material to Food or cosmetic

Chemical migration occurs when substances from packaging transfer into the food or the cosmetic they contain. This migration can happen through various mechanisms, including leaching, permeation, or volatilization. The extent of migration depends on factors such as the type of material, the chemical composition, the temperature, and the duration of contact.

## Factors Influencing Migration

The migration process is influenced by a variety of factors. The type of material used in the FCM, the specific chemical composition of the material, the temperature at which the food and material are in contact, and the duration of contact can all impact the extent of migration.



1

2



# Types of Migration in Food Contact Materials



1

## **Direct Contact**

Substances move directly from the packaging material into the food or the cosmetic when they are in direct physical contact.

2

## **Gas-phase Migration**

Substances can transfer through the air (gas phase) from the outer side of the packaging to the inner side, eventually migrating into the food.

3

## **Penetration Migration**

Chemicals from the outer layer of the packaging can penetrate through the material, reaching the inner side, where they may migrate into the packaging content through direct contact or gas-phase migration.

# Regulations for Food Contact Materials



1

Before materials intended for food contact application can be placed on the market, it is necessary to ensure that the FCMs are sufficiently inert to exclude the transfer of substances to food products in quantities capable of endangering human health or to lead to an unacceptable change in the composition of food products or a deterioration of their organoleptic characteristics.

**IAS**

2

Therefore, all FCMs placed on the market should comply with the requirements of Regulation 1935/2004 and to all European and national regulation.

**NIAS**

3

For any packaging material, potential contaminants can be classified into two main categories, which are called IAS and NIAS.

# Intentionally Added Substances (IAS)

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IAS: English acronym for "intentionally added substance", which indicates those substances intentionally added during the production process. These substances are essential in the production or use of material intended for food contact as they improve the production process, the stability of the article, the mechanical properties, and the shelf life of packaging.

EU Regulation 10/2011 contains approximately 1000 substances (IAS), which include monomers, other starting substances, and additives.

# Not Intentionally Added Substances (NIAS)



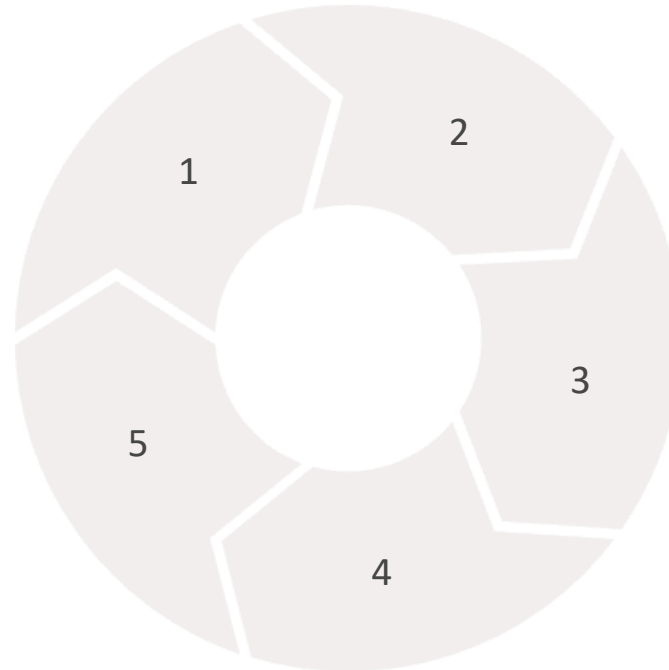
NIAS, or "not intentionally added substances," refers to substances that are not deliberately added during the production process but are formed as a result of various factors.

## Impurities

Another source of NIAS can stem from impurities inherent in the raw materials or authorized additives utilized in production processes. These impurities are not detailed in the information sheets of the starting substances, making it difficult to identify them beforehand.

## Newly Formed Products

Newly formed products, also known as reaction products, are substances that either originate during the production process or result from the interactions between different components of the material or additives.



Recycled materials used

## Degradation Processes

Degradation processes represent one of the primary sources of NIAS contamination. The main factors contributing to degradation include exposure of the material to elevated temperatures or high-energy irradiation, which can occur during production or through exposure to radiation with high energy content.

## Degradation of Additives

Certain additives like antioxidants or stabilizers are incorporated into materials to enhance their properties. However, these additives themselves can undergo degradation processes, leading to the formation of new potential migrants that may end up in packaging materials.

# Risk Assessment

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Risk assessment evaluates the potential harm from exposure to a chemical substance. It involves identifying the hazard, assessing exposure, and determining the likelihood of harm.

## 1 Hazard Identification and Characterization

This phase involves identifying the potential of a substance to cause harm, based on its intrinsic properties and the characteristics of the target system.

## 2 Exposure Assessment

This phase determines the amount of the substance a person is exposed to, considering routes of exposure, frequency, and duration.

## 3 Risk Characterization

This phase combines hazard and exposure information to estimate the likelihood of harm occurring.

# Untargeted Screening for Product Safety

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## Why Untargeted Screening?

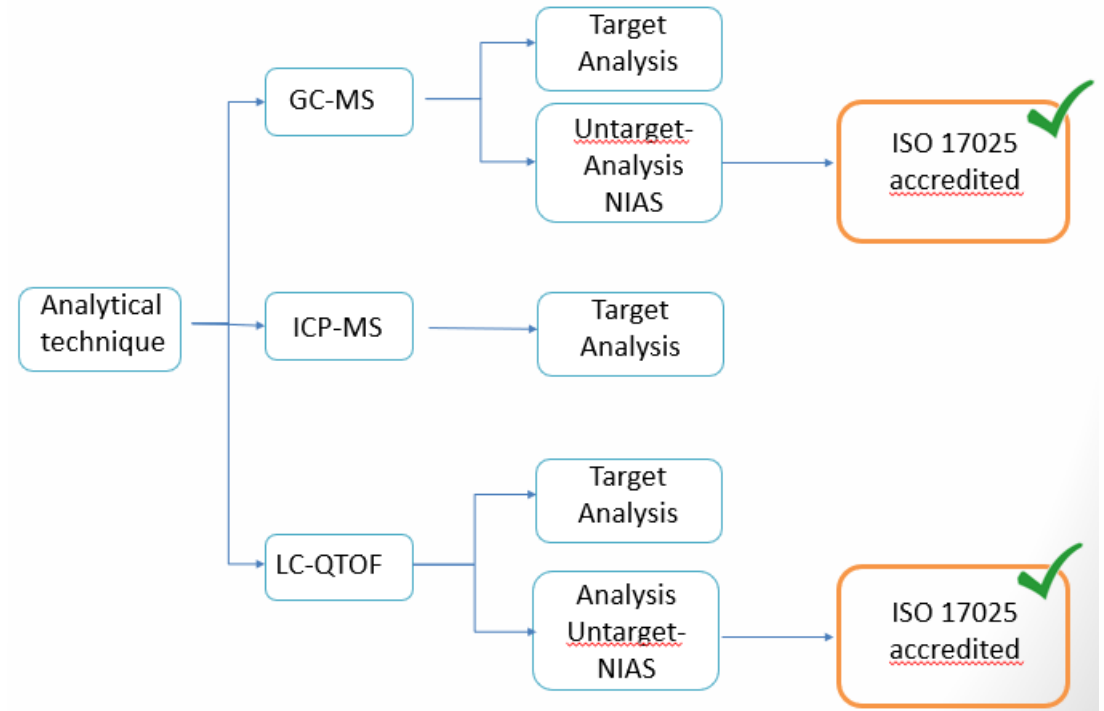
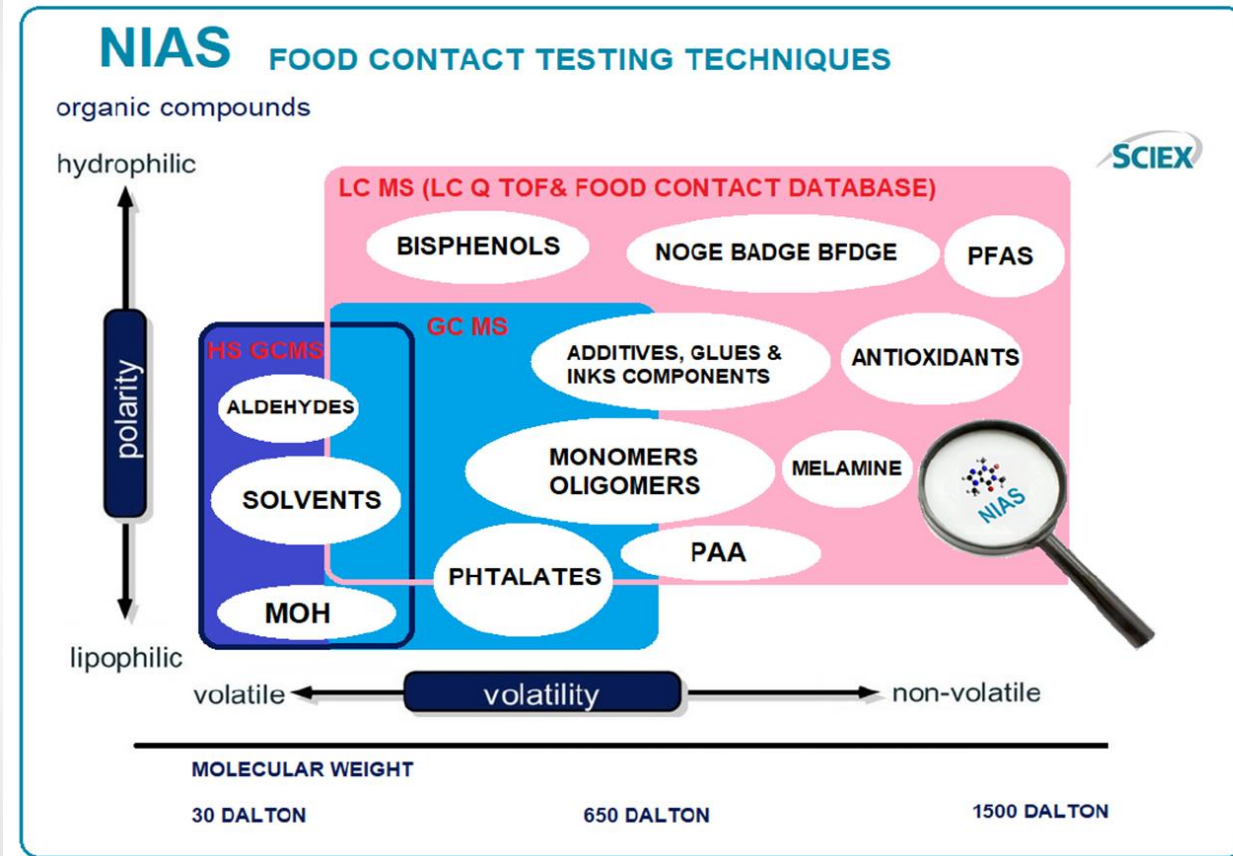
Traditional targeted analyses focus on specific known contaminants, leaving unknown substances undetected.

Untargeted screening offers a broader perspective, identifying potential risks not covered by existing regulations.

## Benefits of Untargeted Screening

It allows for the identification of unknown migrants, helps monitor emerging contaminants, and provides comprehensive food safety assessments, safeguarding consumer health.

# NIAS Testing



# Identification of analytes



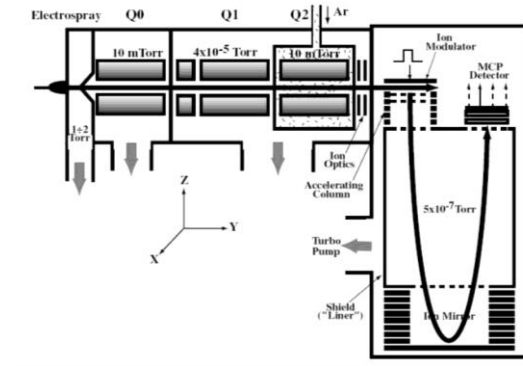
## Identification of analytes

Volatiles –  
Semi volatiles  
Compounds

GC-EI-MS



- NIST Library (National Institute of Standards and Technology) 213.000 compounds.



Polar and non  
volatile  
Compounds

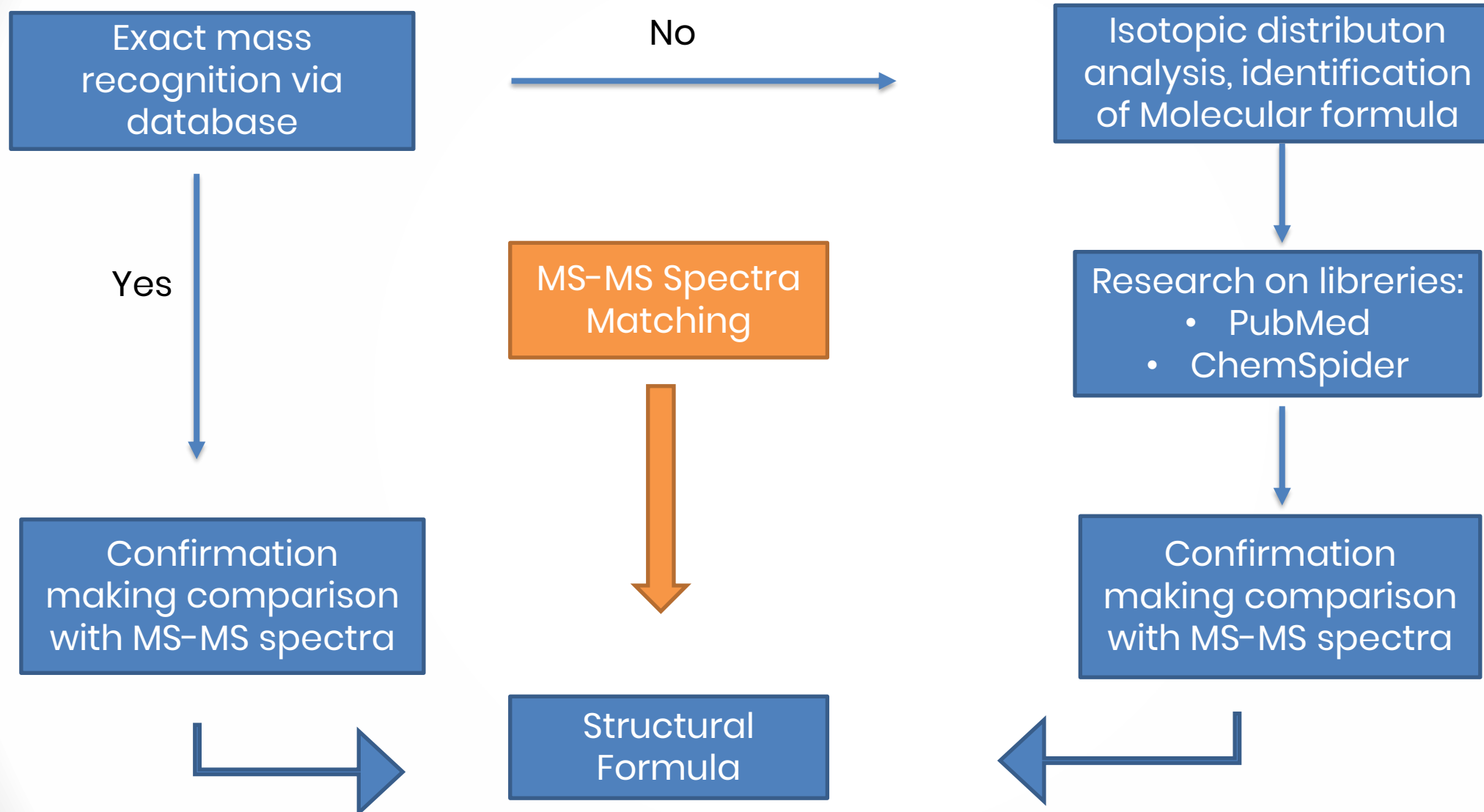
LC-ESI-QTOF

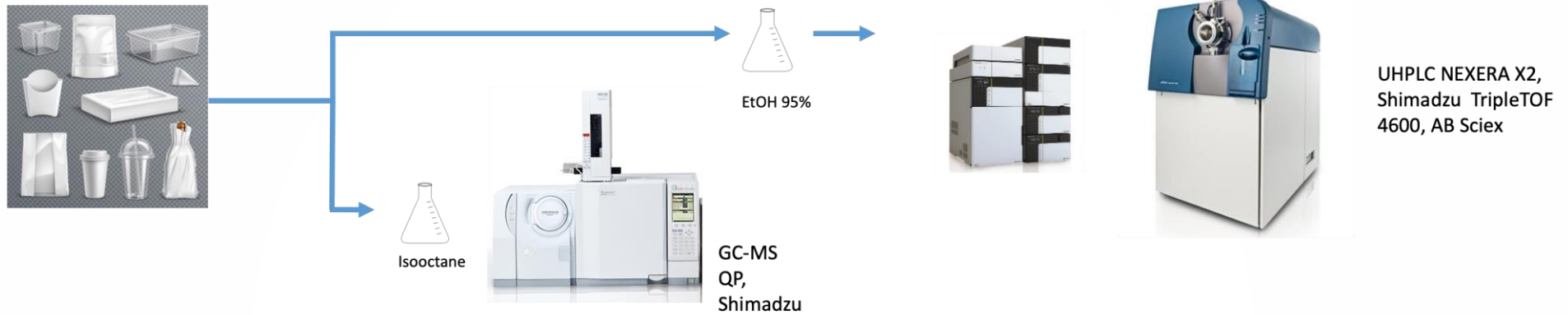


- MS-MS spectra depend on instrument and collision energy.
- Development of MS/MS internal libraries.



# Flowchart LC-HRMS NIAS Screening





## Plastic

hundreds samples of plastic materials were analyzed, representing the largest category of materials tested.

## Paper and Cardboard

Tens of cellulosic samples materials were included in the analysis, representing a significant portion of the total samples.

# Compounds Detected – Our NIAS Database

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688

Total Compounds

A total of 688 unique compounds were detected across all materials.

510

Plastic

The majority of compounds, 510, were found in plastic materials.

233

Paper and Board

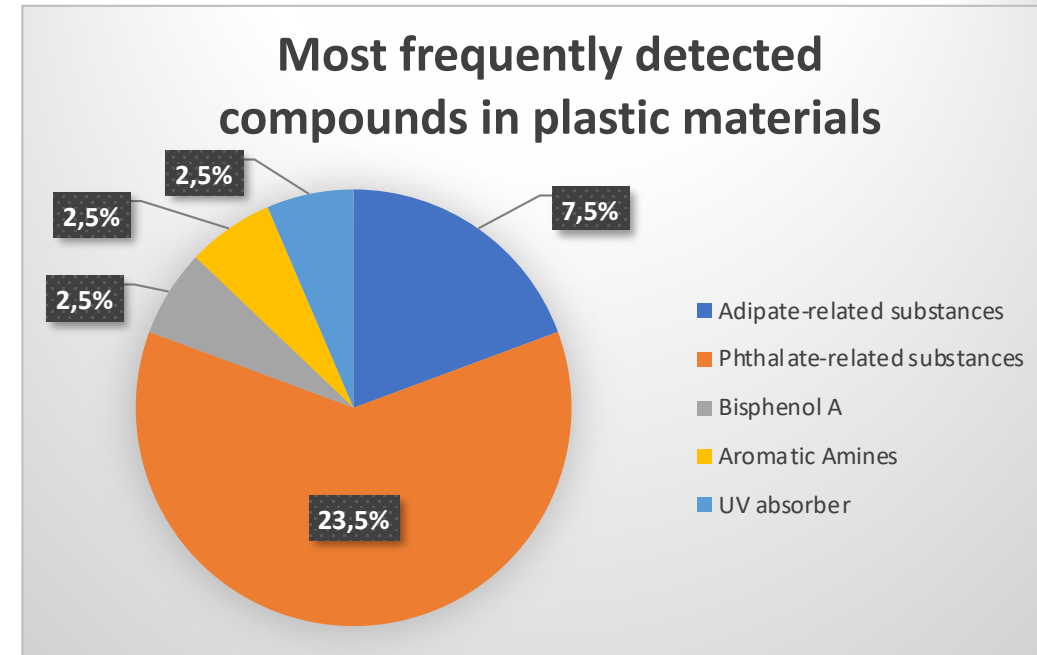
Paper and board samples contained 233 unique compounds.

# Migration of Compounds from Plastic Materials



The most abundant compounds detected in plastic materials were phthalate-related substances, identified in 23.5% of the samples. These phthalates include **Bis(2-hydroxyethyl) phthalate**, Dioctyl terephthalate, Diethyl Phthalate, Di-n-butyl phthalate, Di-n-octyl phthalate, Diisononyl phthalate, and Bis(2-hydroxyethyl) terephthalate.

In addition to phthalates, other compounds detected in plastic samples included adipate-related substances, **Bisphenol A**, aromatic amine 4,4'-methylenedianiline, and UV absorber molecules Bumetrizole and Octabenzone.



## CHALLENGE TEST – RECYCLED POLYOLEFINS

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- As examples of our flexibility, we validate a challenge test procedure for non-PET material
- As post-consumer recycled plastics may be contaminated with chemical substances, their use for packaging may raise safety issues.
- Recycling technologies should efficiently remove contaminants of concern.
- Abundant data available for recycled PET are often extrapolated to polyolefins, though differences exist in basic properties:



## CHALLENGE TEST – RECYCLED POLYOLEFINS

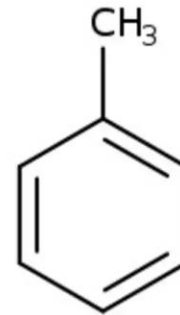
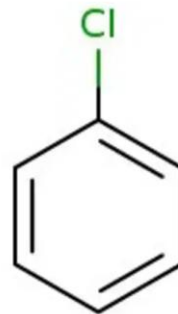
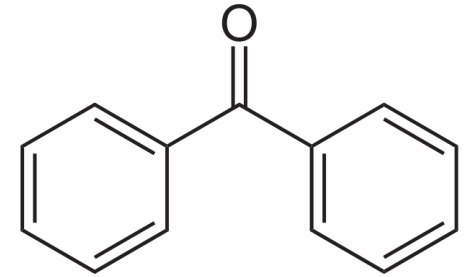
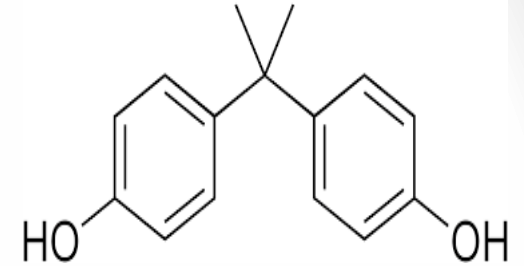
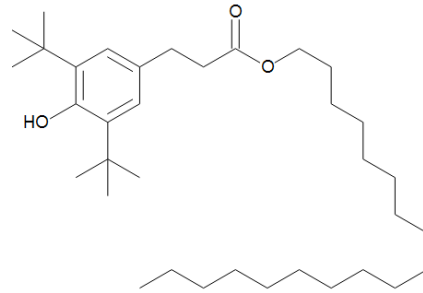
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- Decontamination yield of a recycling process is measured through "challenge tests," simulating the recycling process with spiked contaminants.
- Surrogates used in challenge tests should mimic possible contaminants of concern.
- Polyolefins' affinity to apolar substances and low solubility of polar molecules impact cleaning efficiency.
- Analytical protocols assessing food safety of recycled polyolefins are complex, requiring strategies with GC-MS analysis and Food Contact Center's proposed approach also with liquid chromatography analysis.
- Surrogate selection and testing methodologies for polyolefins require careful scientific studies.



# CHALLENGE TEST - RECYCLED POLYOLEFINS - Surrogate selection

- Irganox 1076 (CAS NUMBER 2082-79-3)
- Bisphenol A (CAS NUMBER 80-05-7)
- Benzophenone (CAS NUMBER 119-61-9)
- Chlorobenzene (CAS NUMBER 108-90-7)
- Toluene (CAS NUMBER 108-88-3)
- Hexane (CAS NUMBER 110-54-3)



# CHALLENGE TEST

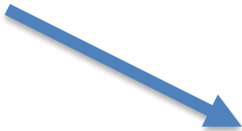
## First tests on a small scale in laboratory settings



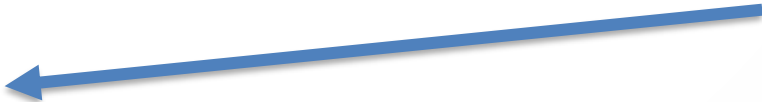
Spike with surrogate  
contaminants



Extraction of flakes and quantification of  
residue content



Instrumental  
analysis and check  
of the  
contamination





# CHALLENGE TEST

Large scale in laboratory settings



# CHALLENGE TEST – RECYCLED POLYOLEFINS – Surrogate selection

Large scale in laboratory settings

CONTAMINANTE	MEDIA (mg/Kg)	DEV STD	Err%	% Resa
Benzofenone	829.3	132.7	16%	17%
Methyl Stearate	974.9	264.0	27%	19%
BpA	2882.6	541.0	19%	58%
Irganox 1076	1044.7	353.3	34%	21%
Toluene	43.1	19.0	44%	1%
Esano	122.0	115.3	94%	

Levels of surrogate contamination in PE

# Case History RPET – Analytical and Instrumental approach LC QTOF

## Goal

To evaluate

- Recycling process efficiency
- Quality of starting materials

- 1 g Sample
- 20 mL EtOH 10%
- 2 days, 70 °C

**PET flakes (beginning of process)**



**PET granules after recycling process**

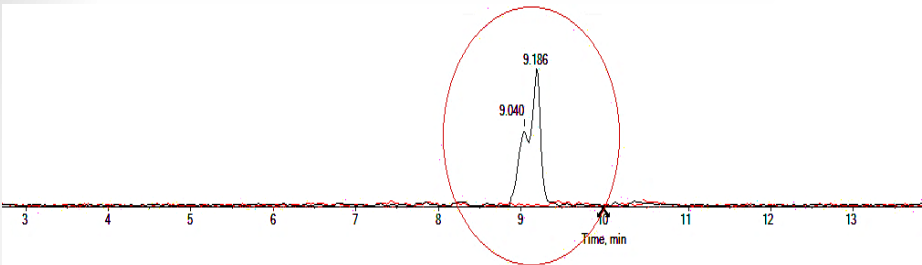


# Case History RPET – Analytical and Instrumental approach LC QTOF



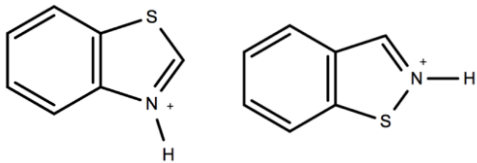
# Case History RPET – Analytical and Instrumental approach LC QTOF

XIC ion 222.0696

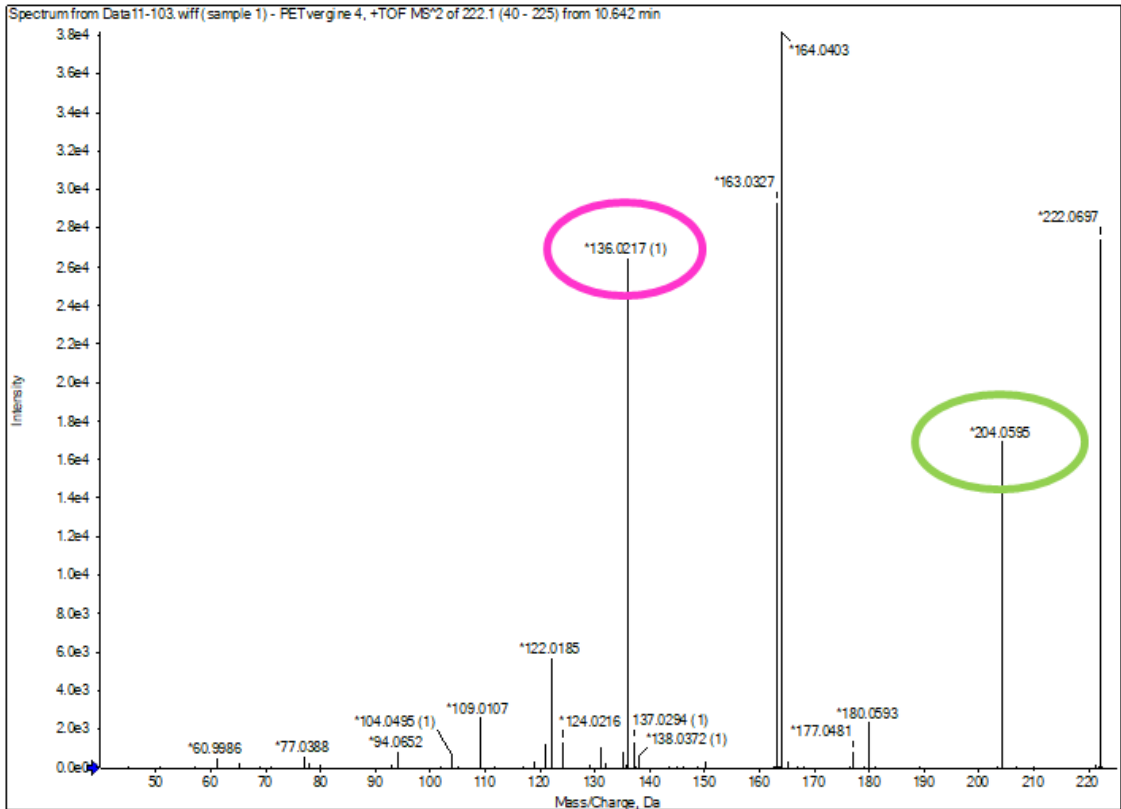


- present in the PET flake sample – beginning of recycle
- absent in the final PET granule

The presence of the fragment 136.0217 can be linked to the presence of a structure 1-3 or 1-2 benzothiazolic  $C_7H_6NS^+$  (136.0216)

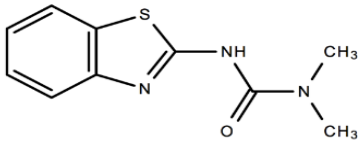


Fragment 204.0599 differs from the molecular ion 18.0106 u, which may indicate the loss of a water molecule

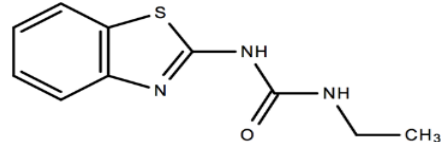


## Case History RPET - Analytical and Instrumental approach LC QTOF

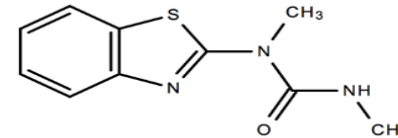
Phenylurea derivatives tend to lose a water molecule



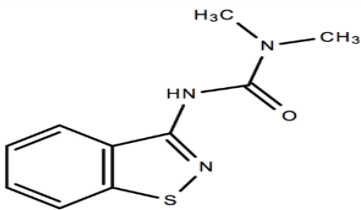
N-(2-Benzothiazolyl)  
N,N-Dimethylurea



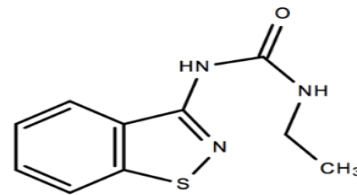
1-(1,3-Benzothiazol-2-yl)-3-ethylurea



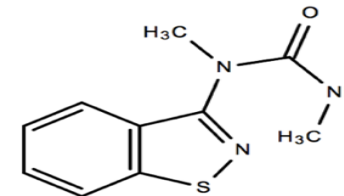
1-(1,3-Benzothiazol-2-yl)-1,3-dimethylurea



3-(1,2-Benzothiazol-3-yl)-1,1-dimethylurea



1-(1,2-Benzothiazol-3-yl)-3-ethylurea

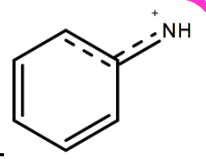


1-(1,3-Benzothiazol-2-yl)-1,3-dimethylurea

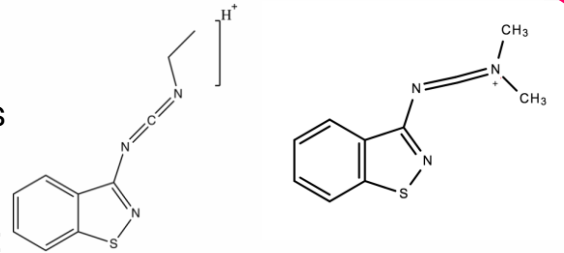


# Case History RPET - Analytical and Instrumental approach LC QTOF

Differences **1,2-benzothiazole**/1,3-benzothiazole:  
mass fragment 92.0495, present in 1,3-benzothiazole but absent in the spectra



Considering all hypothesis, to the fragment 204,0599 is assigned formula **C<sub>10</sub>H<sub>9</sub>N<sub>3</sub>S<sup>+</sup>** with structures:



Chromatogram: two peaks

C1=CC=C2N=C(N1)S2.CN(C)C=OC1=CC=C2N=C(N1)S2.CCCNC=O

(1,2-Benzothiazol-3-yl)-**1,1 dimethylurea**      (1,2-Benzothiazol-3-yl)-**3-ethylurea**



## Case History: II – PP Sample

To evaluate

- Recycling process efficiency
- Quality of final product

### *PP Sample*



- 10 g ground Sample (using liquid nitrogen)
- Solvent Extraction

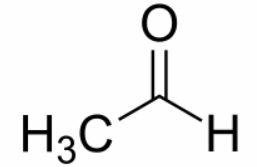
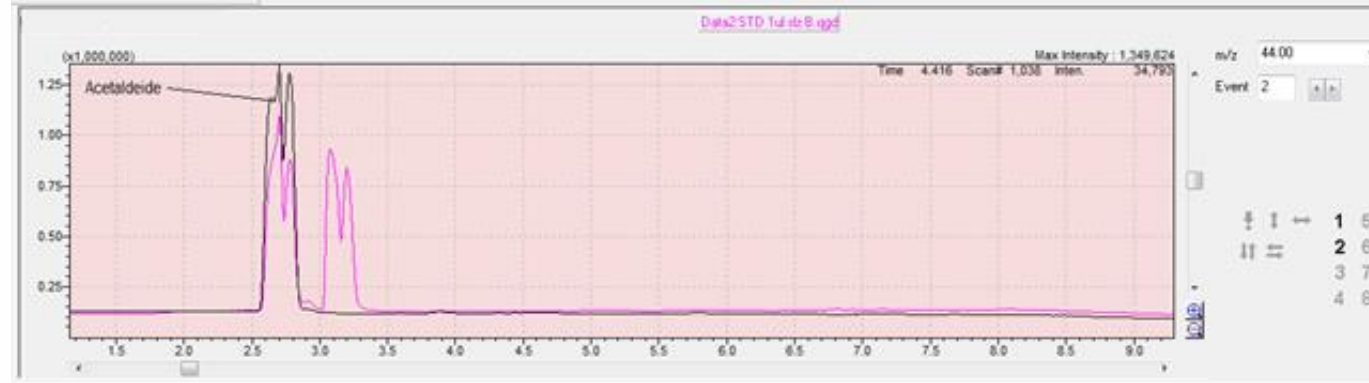
### *Soxhlet extraction*



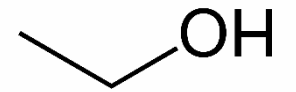
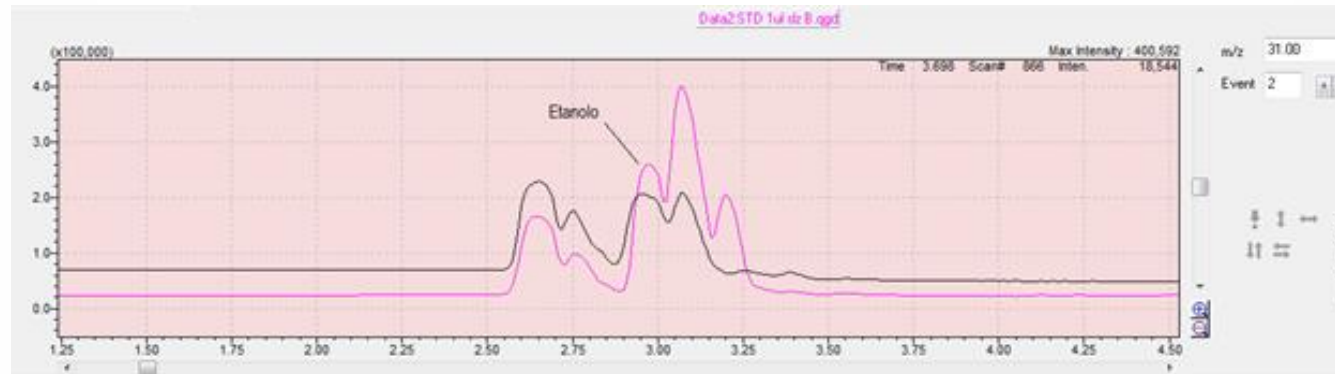


# Case History: II

# HS GC-MS for volatile substances



Acetaldehyde:  
5.8 mg/Kg

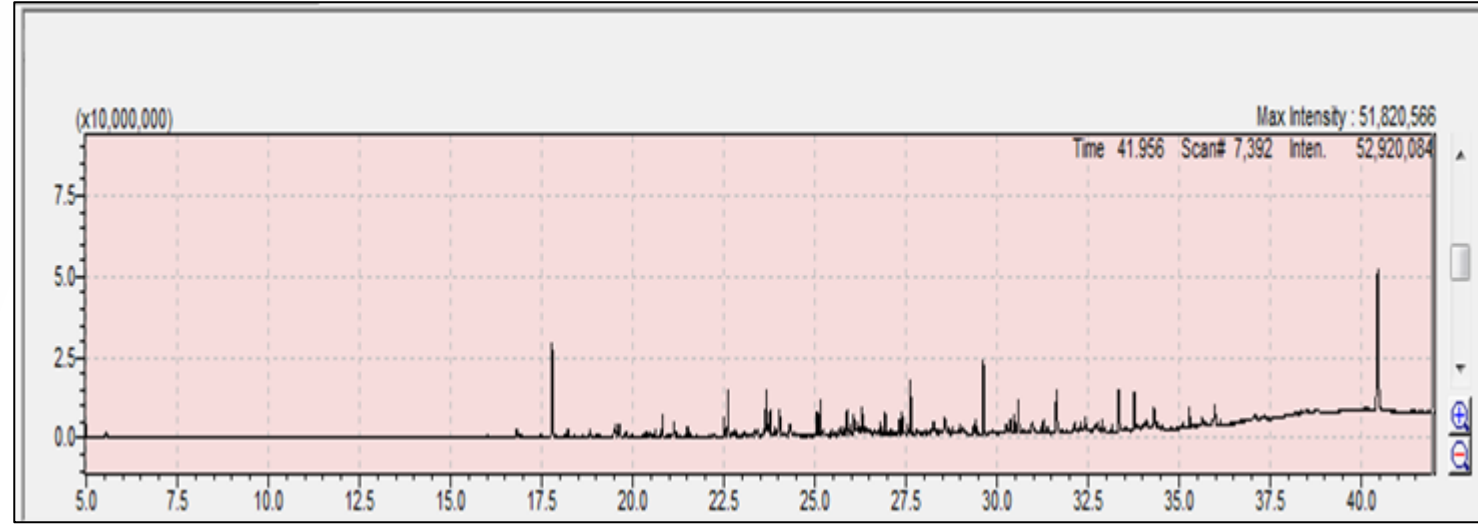


Ethanol: 4 mg/Kg



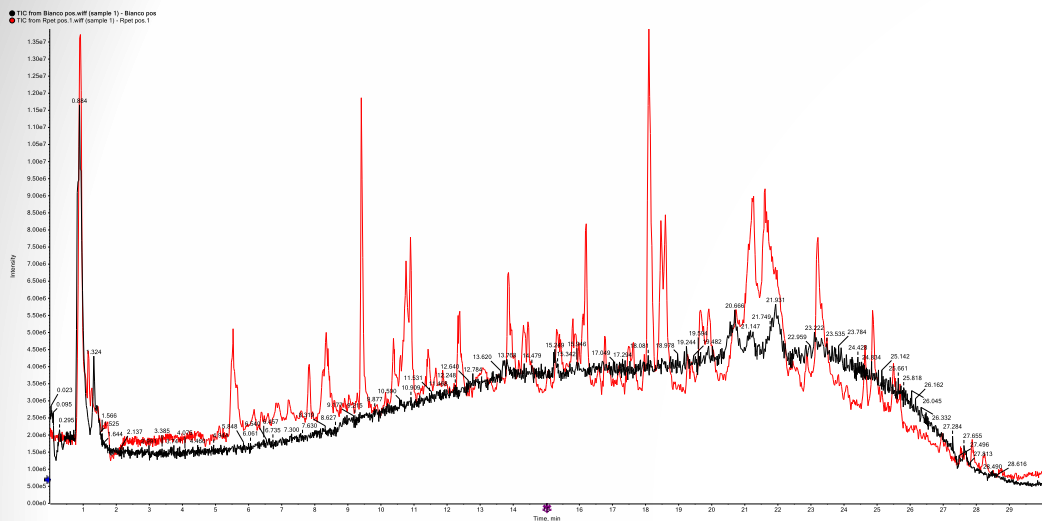
# Case History: II

# HS GC-MS for volatile substances

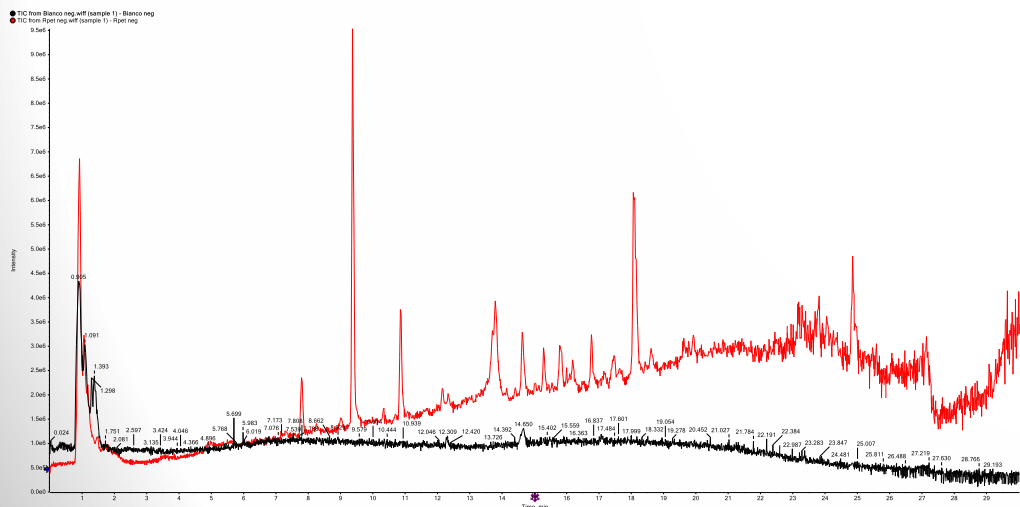


Retention time(min)	Compound	Match (%)	semiquantitative mg/kg (ppm)	CAS	Classe Cramer
8.9	3-Phenylpentane (standard interno)	82	0.1	538-68-1	
19.6 – 26.3	Linear- hydrocarbons	83	0.13		
24.0	2,4-Di-tert-butylphenol	87	0,02	96-76-4	I
27.6	Isopropyl myristate	95	0,04	110-27-0	I
29.6	Isopropyl palmitate	94	0,06	142-91-6	I
31.6	Eicosanoic acid, 2-hydroxyethyl ester	88	0,04	26158-80-5	I
33.3	Ethylene glycol monostearate	92	0,04	111-60-4	I
33.7	2-Ethylhexyl decanoate	84	0,03	73947-30-5	I
40.4	Phenol, 2,4-bis(1,1-dimethylethyl)-, phosphite (3:1)	89	0,20	31570-04-4	III

## Positive ionization



## Negative ionization



ION [M-H] <sup>+</sup>	CHEMICAL FORMULA	NAME	TR	AREA	SEMIQUANT (mg/kg)
150.11235	C <sub>6</sub> H <sub>15</sub> NO <sub>3</sub>	Trietanolamine	0.97	6999	0.002
79.0215	C <sub>2</sub> H <sub>6</sub> OS	Dimethyl sulfoxide	1.14	2625	0.002
274.27434	C <sub>16</sub> H <sub>35</sub> NO <sub>2</sub>	N,N-Bis(2-hydroxyethyl)dodecylamine	10.78	588590	0.090
259.19023	C <sub>14</sub> H <sub>26</sub> O <sub>4</sub>	Diisobutyl adipate	19.57	1532	0.047
371.31569	C <sub>22</sub> H <sub>42</sub> O <sub>4</sub>	Bis(2-ethylhexyl) adipate	27.54	3883	0.120
679.51222	C <sub>36</sub> H <sub>66</sub> N <sub>6</sub> O <sub>6</sub>	<b>1,8,15,22,29,36-Hexaazacyclodotetracontane-</b>	9.41	573276	0.066
ION [M-H] <sup>-</sup>	CHEMICAL FORMULA	NAME	TR	AREA	Semiquant mg/kg
89.0259	C <sub>3</sub> H <sub>6</sub> O <sub>3</sub>	DL-Lactic acid	1.48	9221	1.380
205.1600	C <sub>14</sub> H <sub>22</sub> O	2,4 diterbutylphenol	20.27	44894	0.530
227.2022	C <sub>14</sub> H <sub>28</sub> O <sub>2</sub>	Myristic acid	22.42	31396	0.110
255.2333	C <sub>16</sub> H <sub>32</sub> O <sub>2</sub>	Palmitic acid	24.58	68080	0.410
279.2333	C <sub>18</sub> H <sub>32</sub> O <sub>2</sub>	Linoleic acid	23.87	6290	0.500
299.2594	C <sub>18</sub> H <sub>36</sub> O <sub>3</sub>	12-Hydroxyoctadecanoic acid	20.50	9819	0.015

Analytical and Bioanalytical Chemistry (2021) 413:1091–1098  
<https://doi.org/10.1007/s00216-020-03071-z>

### RESEARCH PAPER

## Development of an LC-MS method for the semiquantitative determination of polyamide 6 contaminations in polyolefin recyclates

Andrea Schweighuber<sup>1</sup> · Markus Gall<sup>2</sup> · Jörg Fischer<sup>2</sup> · Yi Liu<sup>3</sup> · Hermann Braun<sup>3</sup> · Wolfgang Buchberger<sup>1</sup>  
 Received: 23 September 2020 / Revised: 9 November 2020 / Accepted: 13 November 2020 / Published online: 26 November 2020

# Thank you for your attention!



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CENTER



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16:20 - 16:40

# Materials efficiency as a pathway towards price competitive sustainability by Tangui Van der Elst (Keiryopackaging)

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**Tangui Van der Elst**

## **Co-Founder at Keiryopackaging**

Tangui is a co-founder of Keiryopackaging, a deep-tech start-up that leverages materials efficiency to develop a scalable and cost-efficient solution for reducing the environmental footprint of plastic packaging.

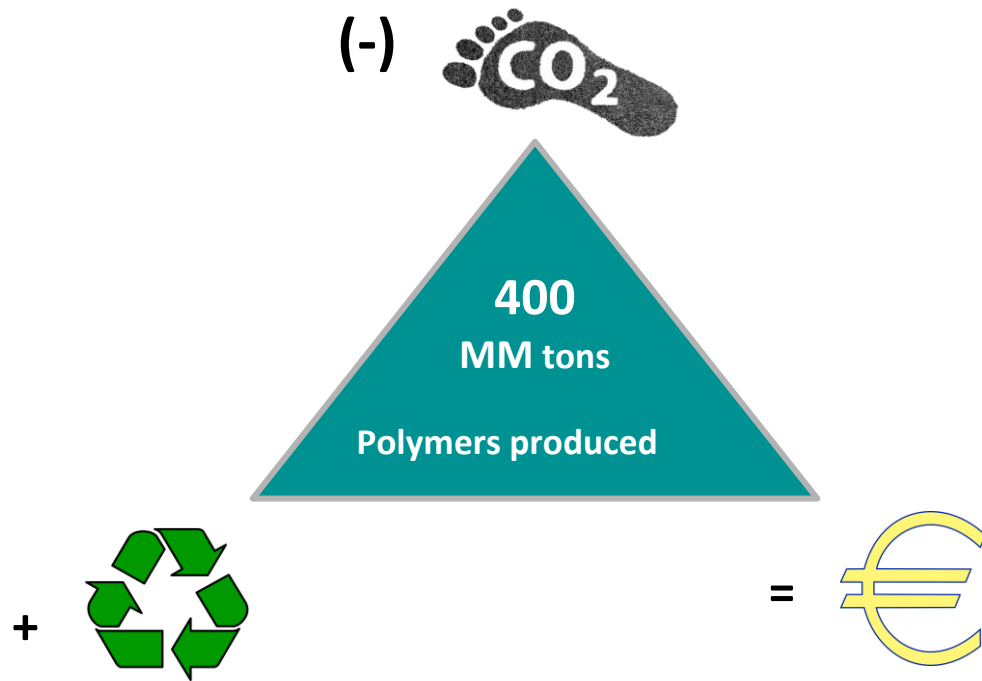
He is a lawyer by training. Prior to embarking on the Keiryopackaging journey, Tangui worked as a Public Affairs executive for world-leading FMCGs and packaging groups in Brussels and Geneva. His focus in these positions was on sustainability and packaging regulations.

Tangui is based in Belgium with his wife and son.



**Reducing the environmental footprint and  
manufacturing cost of plastic packaging**

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## IMPACT AT SCALE REQUIRES:

- ✓ Leverage existing infrastructure
- ✓ Be mindful of the technological complexity
- ✓ Apply to multiple polymer categories  
(polyesters, polyolefins, etc.)

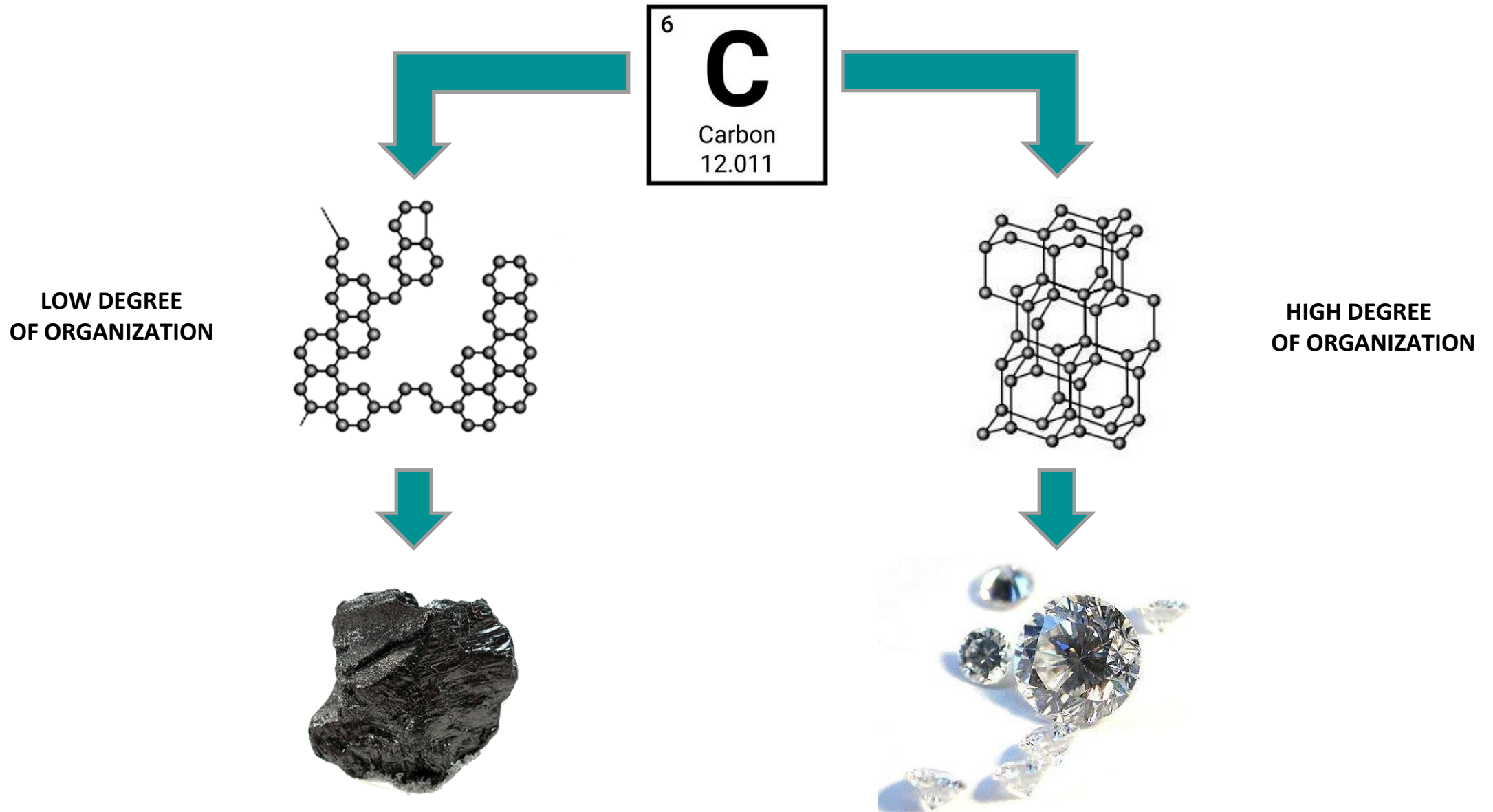
## What if...

there was a process that allowed us to **extract more performance** from the existing polymers?



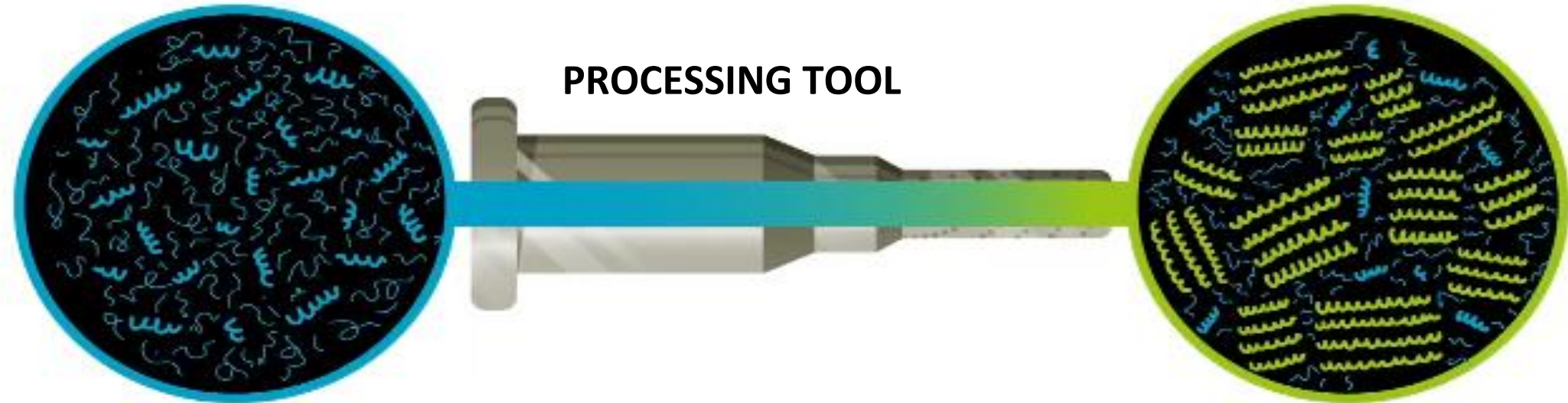
**'performance follows morphology'**

# Nature already shows the importance of the morphology



LOW ORGANIZATION

HIGH ORGANIZATION



PROCESSING TOOL

The technology is underpinned by the science of **Flow Enhanced Nucleation and Induced Crystallization**

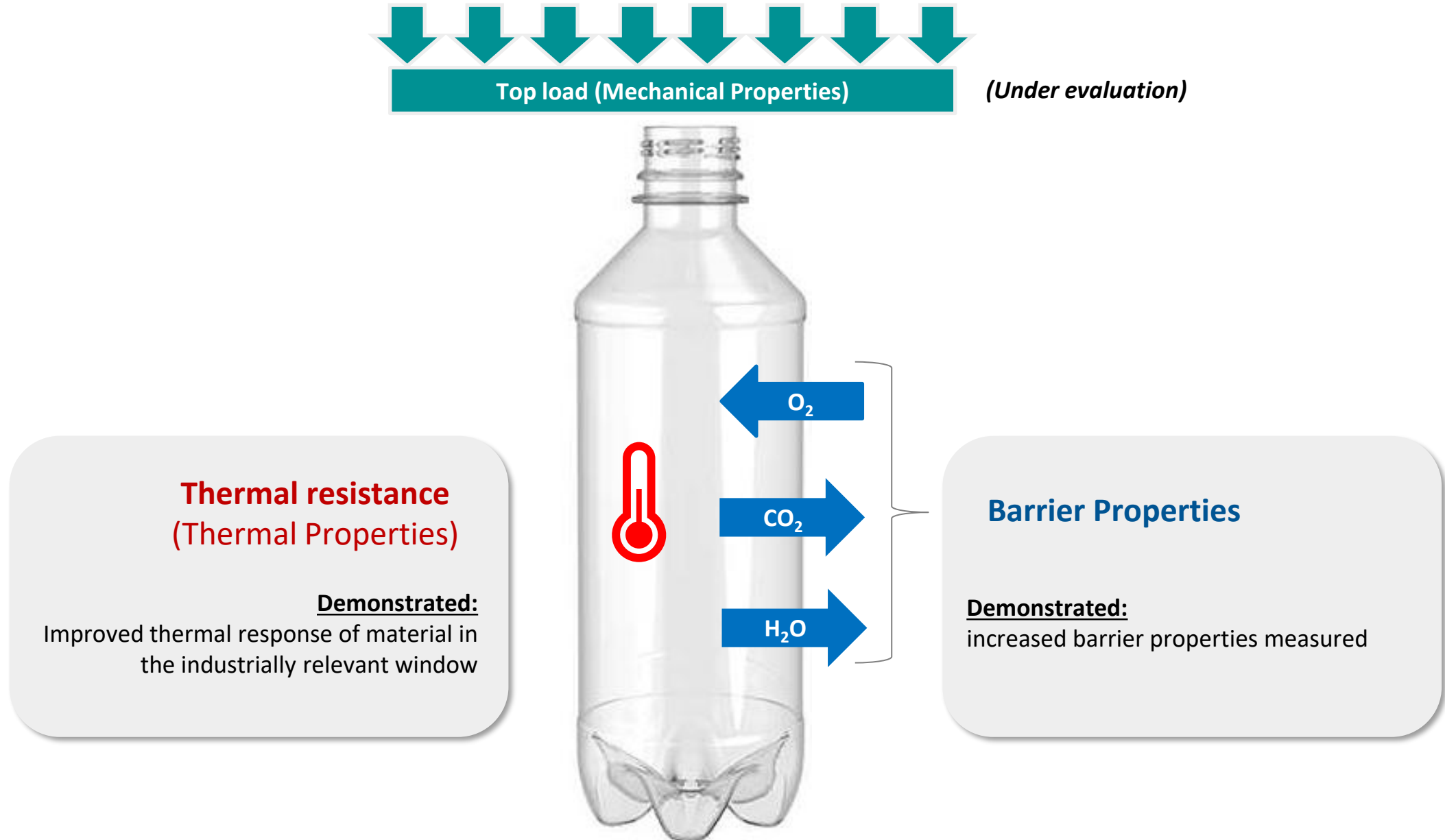
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The ability of any semi-crystallizable polymer to alter its crystallisation kinetics and resulting morphological microstructure when subjected to deformational flows.

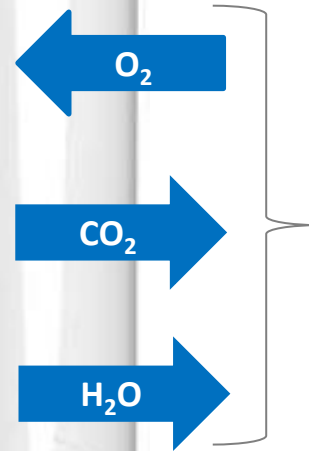
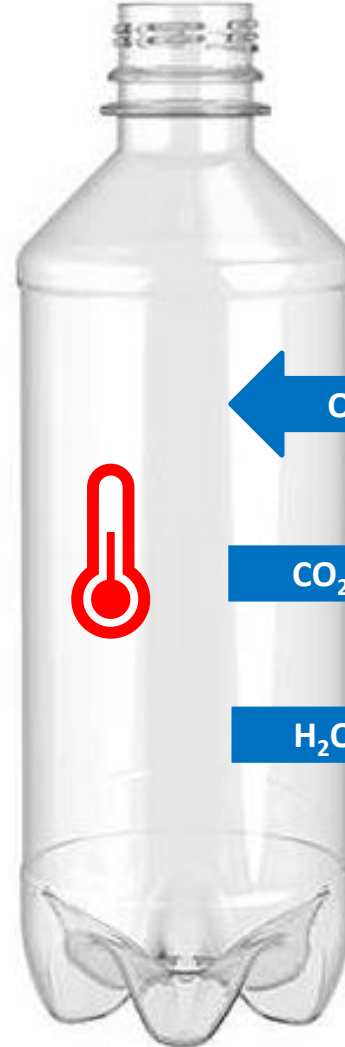
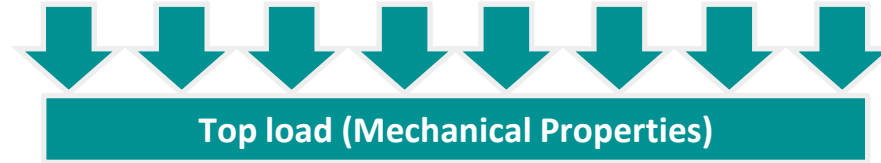


**KP demonstrated the applicability of the process in the field of PET ISBM.**

# 'performance follows morphology' – PET platform



# 'performance follows morphology' – PET platform



✓ **Thermal resistance**  
(Thermal Properties)

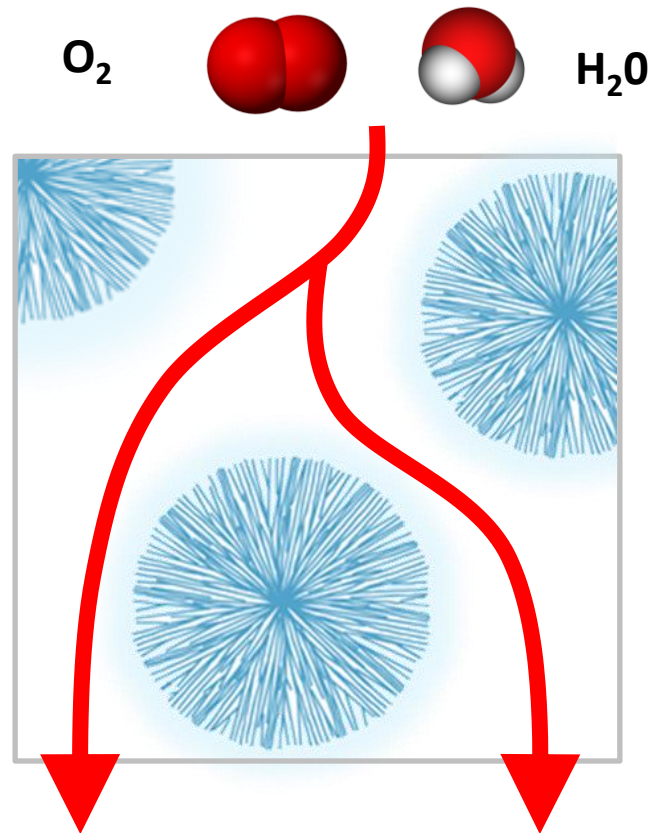
**Demonstrated:**  
Improved thermal response of material in the industrially relevant window

**Barrier Properties** ✓

**Demonstrated:**  
increased barrier properties measured

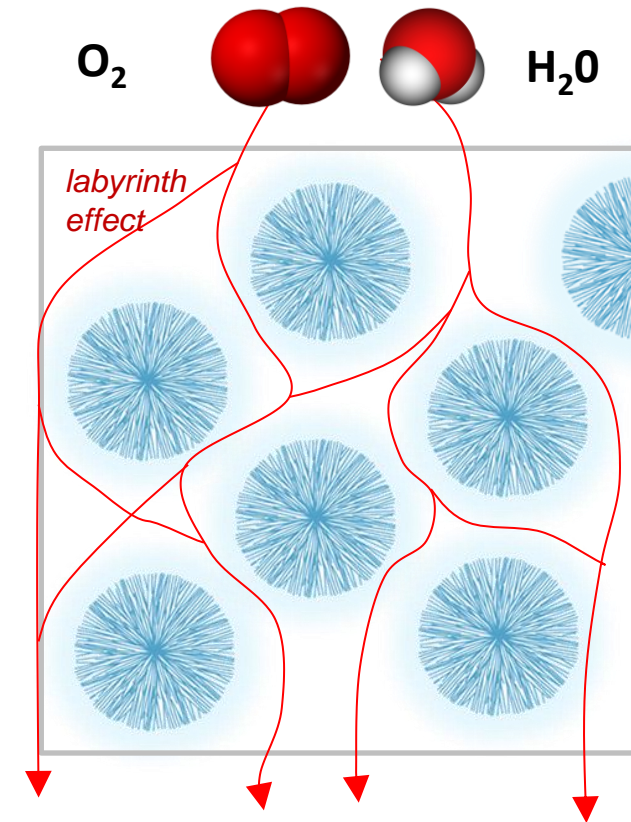
The smaller morphologies present inside the KP bottles lead to the creation of a *labyrinth effect* which increases the barrier functionality of the final packaging

### CURRENT PROCESS



Easy passage

### KEIRYO



Difficult passage

## MORPHOLOGY QUANTITY



**Optical**  
(IR and Raman)



**Thermal**  
(DSC - Differential Scanning  
Calorimetry)

## MORPHOLOGY SIZE



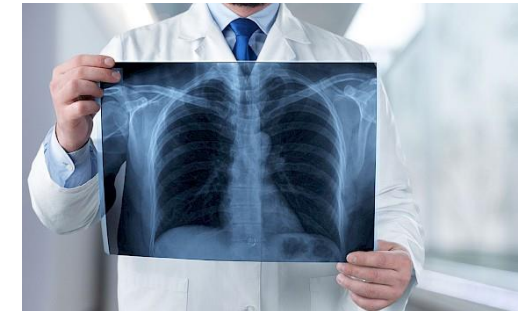
**Magnetic**  
(NMR –  
Nuclear Magnetic Resonance)

## MORPHOLOGY ORIENTATION



**X-Ray**  
(WAXS / SAXS - Wide and Small  
Angle X-Ray Scattering)

currently executed by prof. Christian Pellerin



*Approach endorsed by:*



*prof. Noelle Billon*

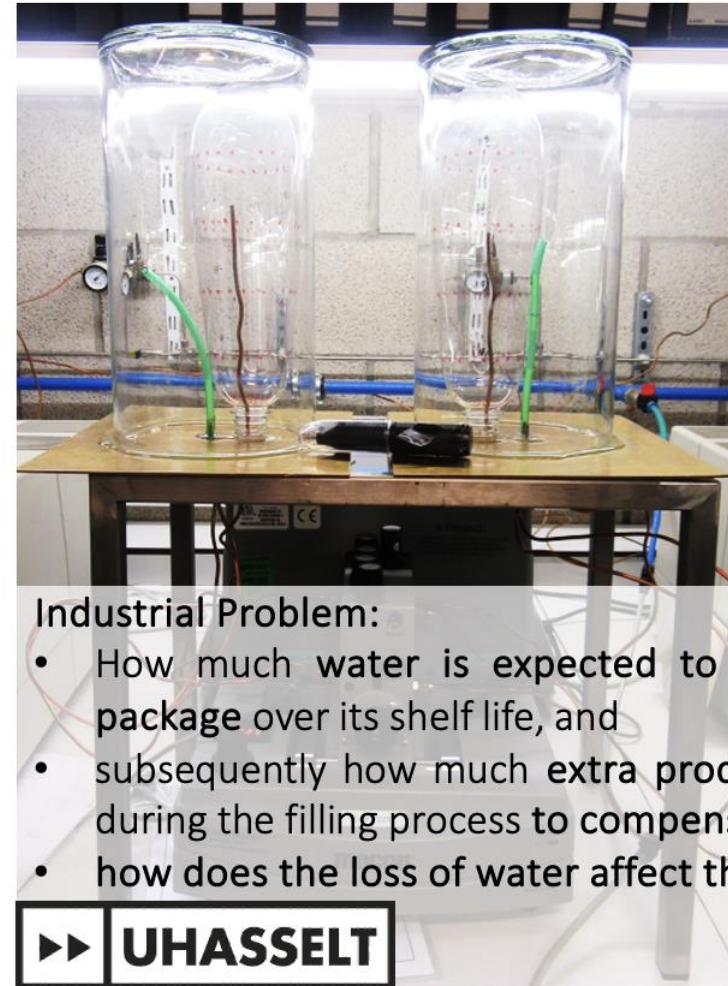
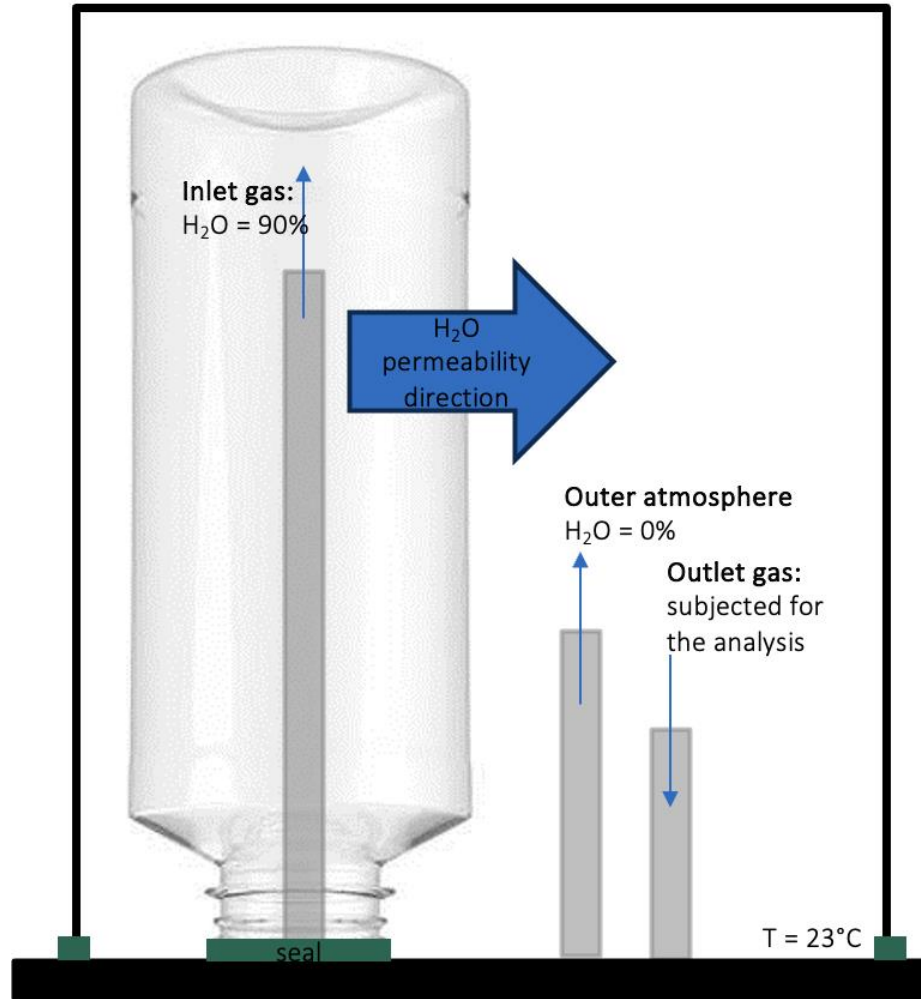


*prof. Christian Pellerin*



# Performance Platform – Water Vapour Transmission Rate (WVTR)

## H<sub>2</sub>O permeability

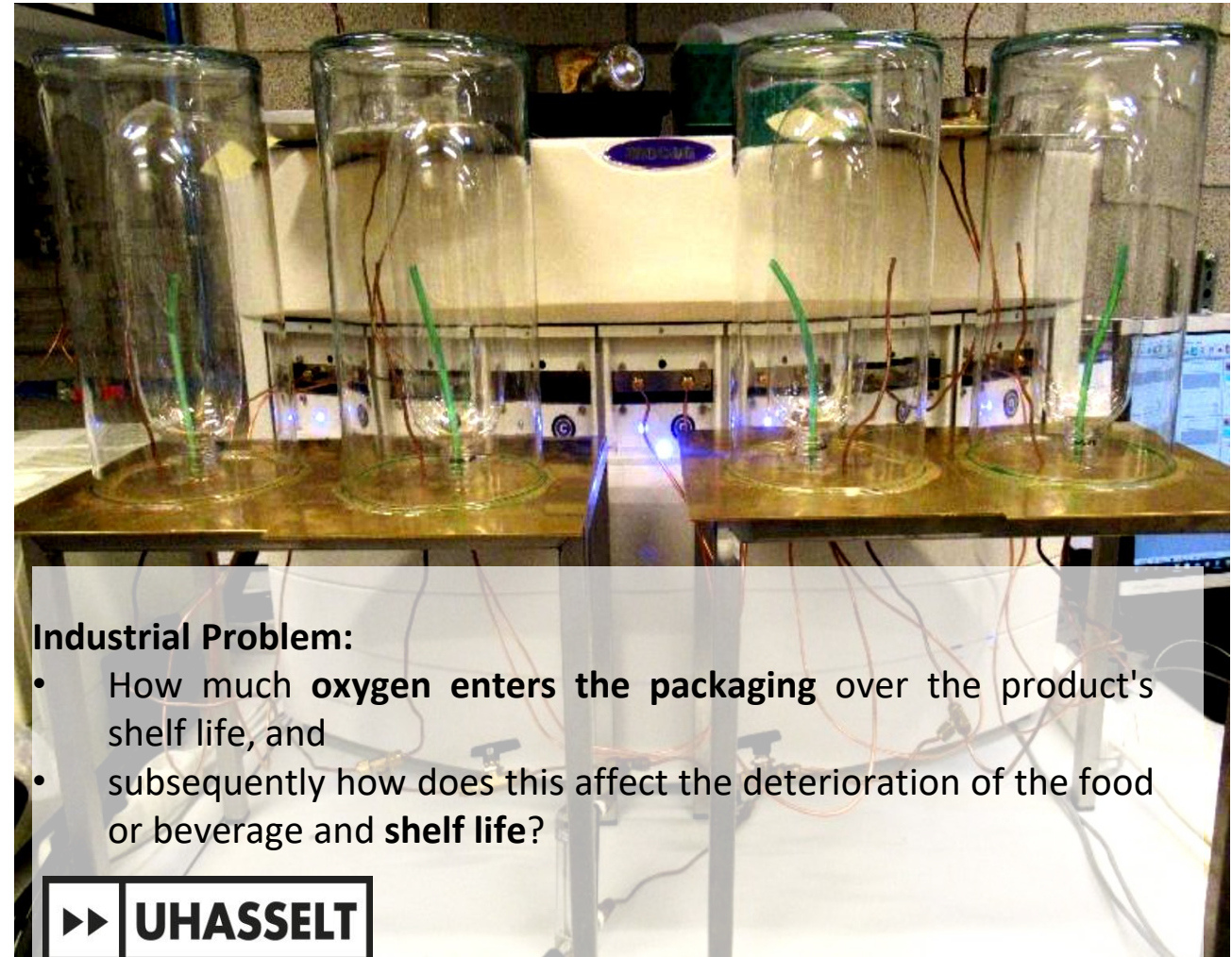
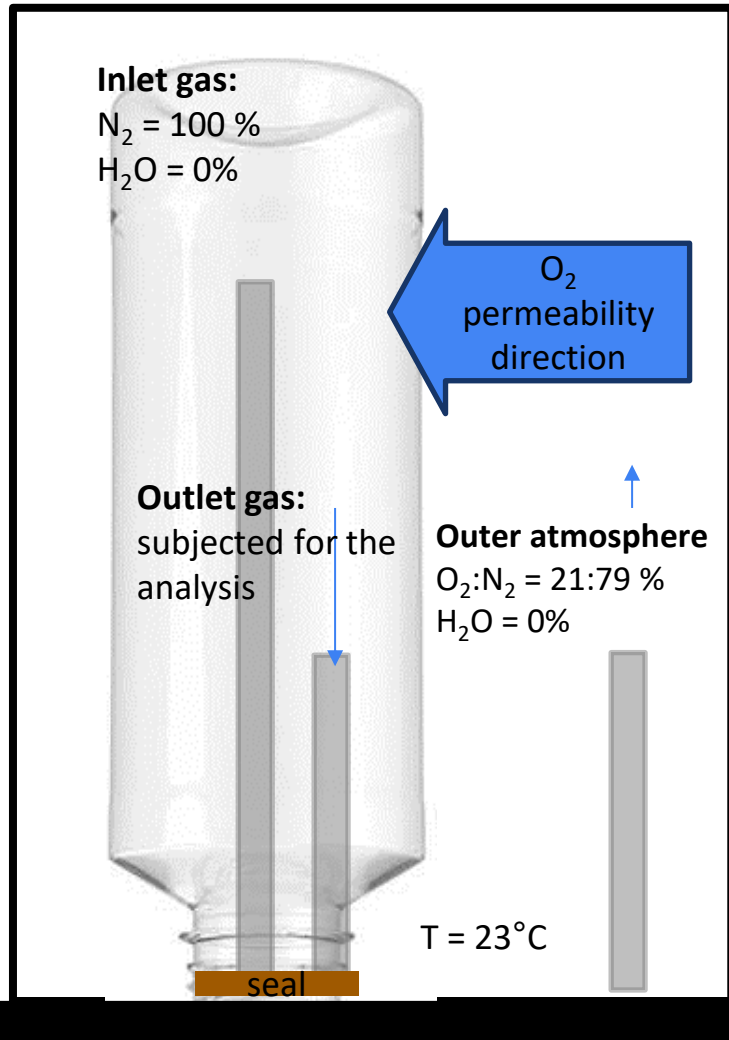


### Industrial Problem:

- How much water is expected to evaporate from the package over its shelf life, and
- subsequently how much extra product should be added during the filling process to compensate for this loss
- how does the loss of water affect the product quality ?

▶▶ UHASSELT

## O<sub>2</sub> permeability – dry method

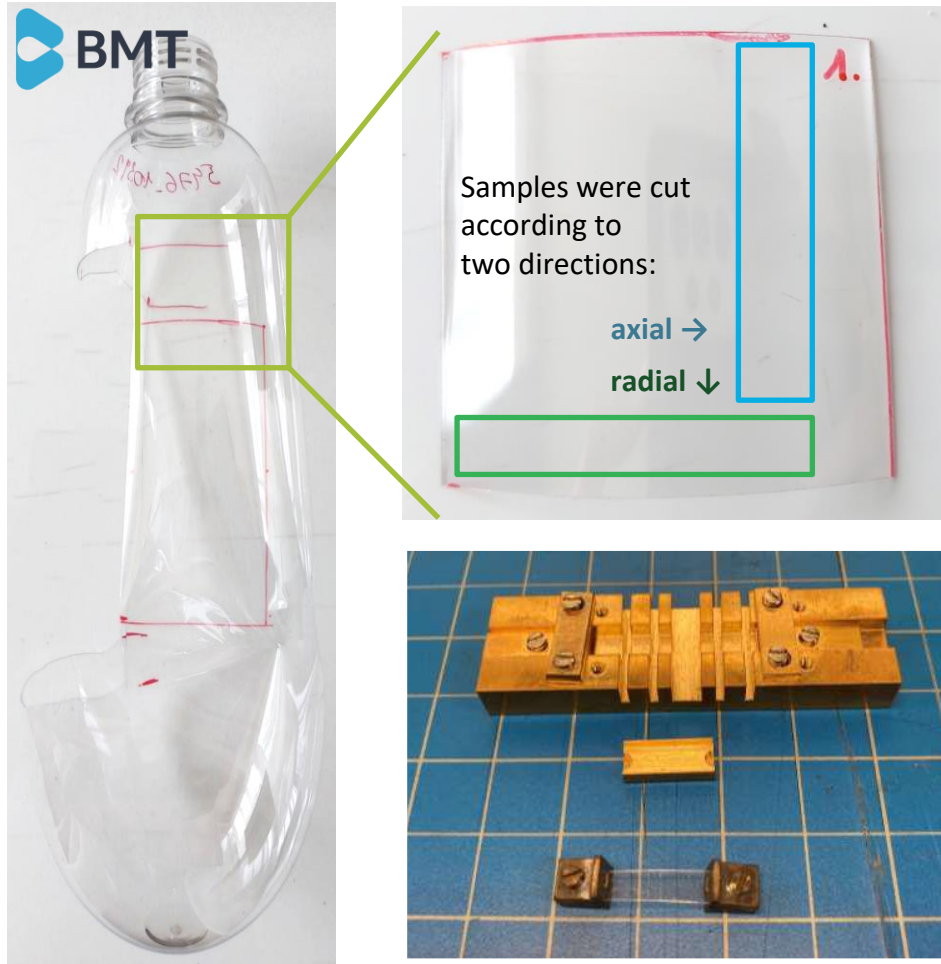


### Industrial Problem:

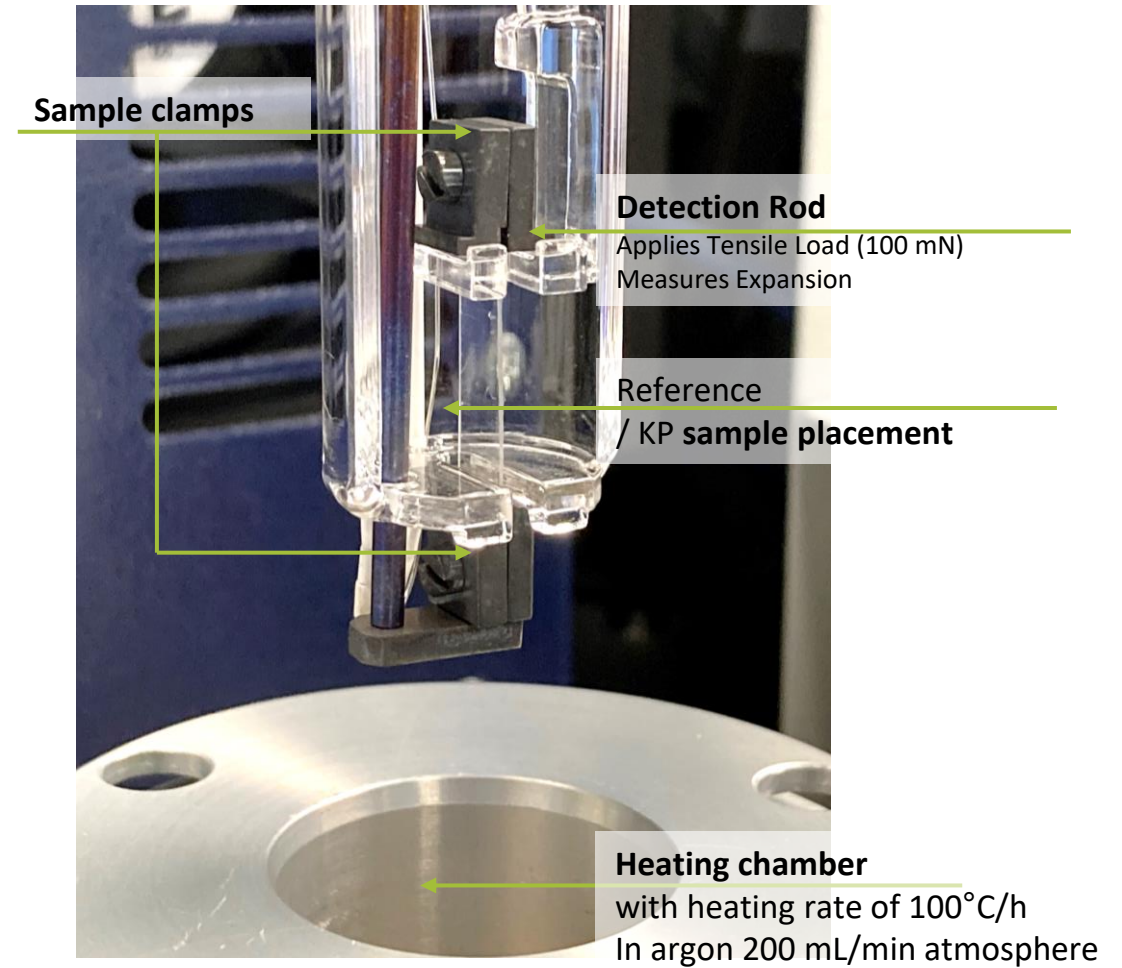
- How much **oxygen enters the packaging** over the product's shelf life, and
- subsequently how does this affect the deterioration of the food or beverage and **shelf life?**



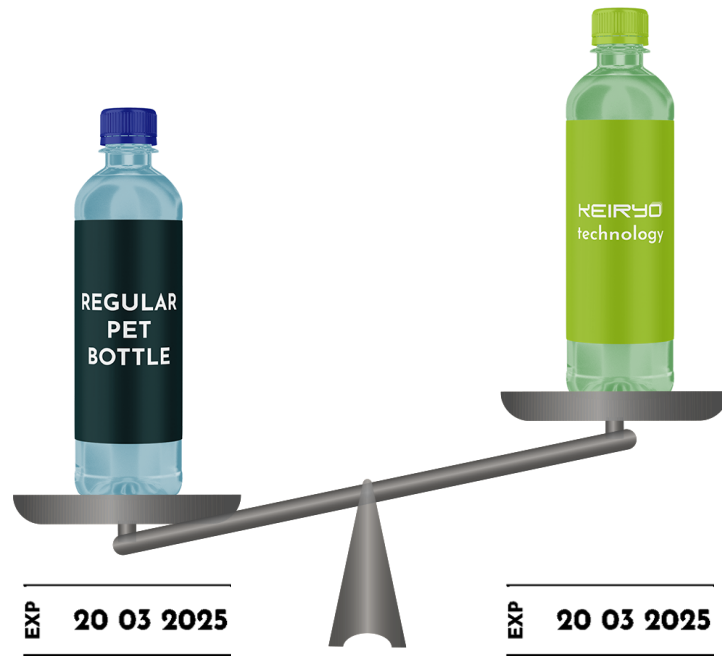
### SAMPLE PREPARATION



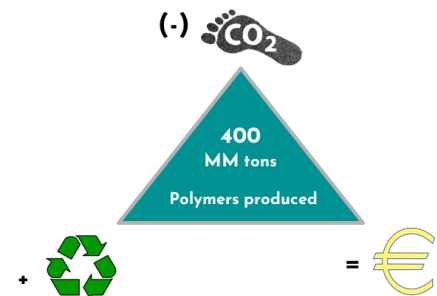
### MEASUREMENT METHODOLOGY



**SAME PERFORMANCE WITH LESS WEIGHT**  
(reduce weight and maintain the properties)



**MORE PERFORMANCE WITH THE SAME WEIGHT**  
(maintain the weight and increase the properties)



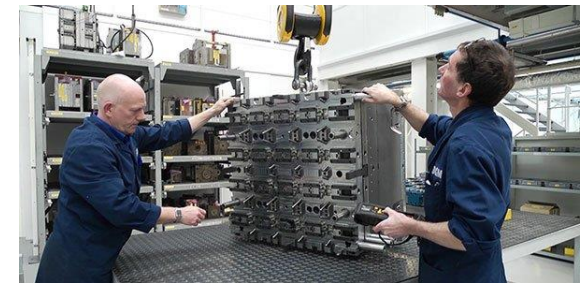
# The development is done in an industrial environment



Conventional resin  
(virgin and R-PET)



Conventional IM machinery



Industrial equipment

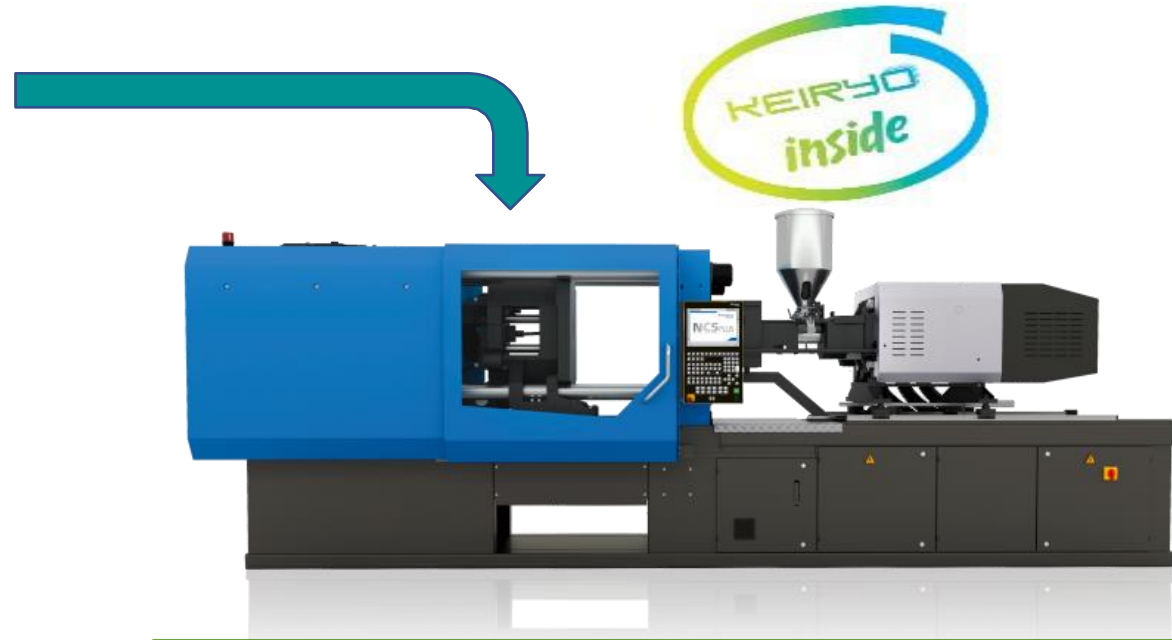
# 3D metal printing enables the integration of the KP technology into existing industrial production assets

3D PRINTED INSERTS ARE INTRODUCED AS SPARE PARTS TO EXISTING INDUSTRIAL MACHINERY

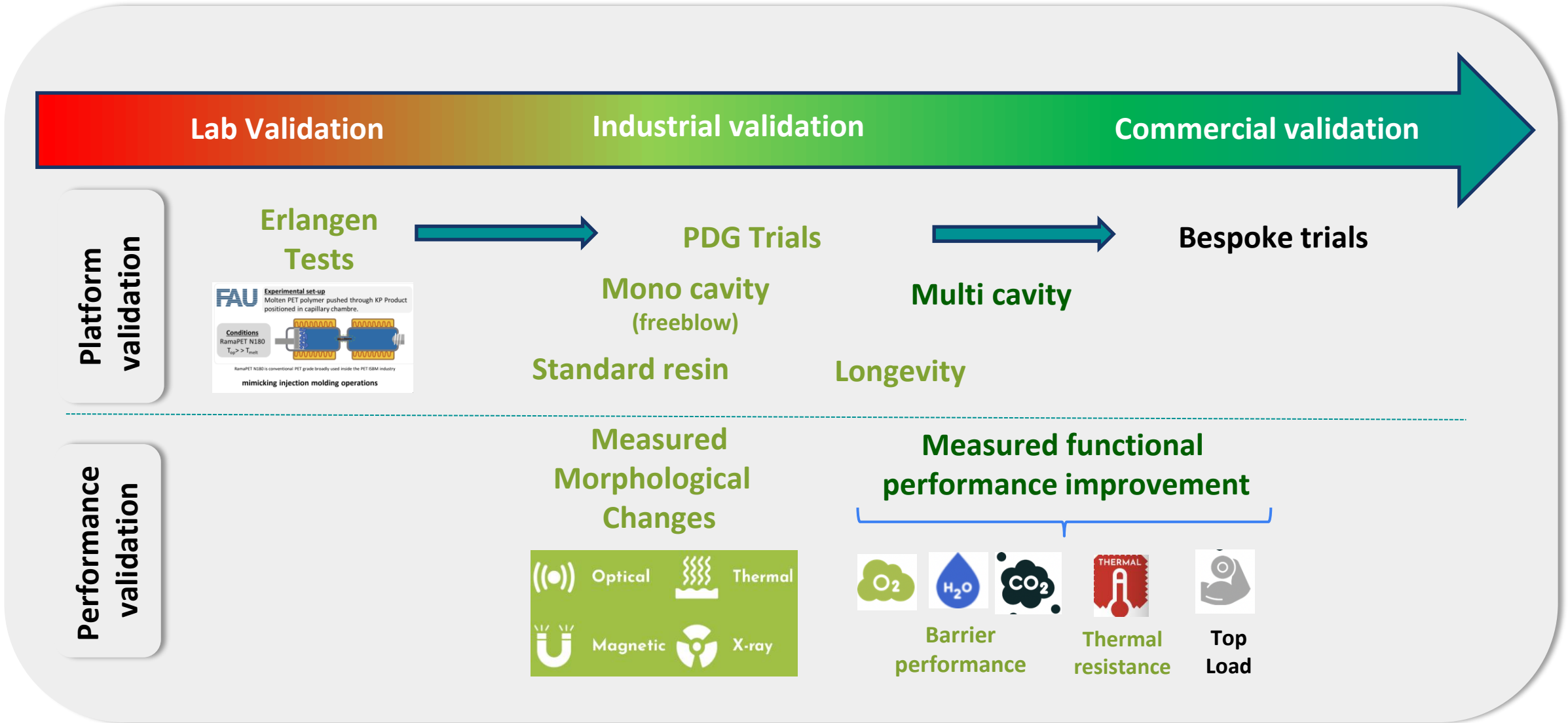
3D printing enables low-cost manufacturing & global technology roll-out



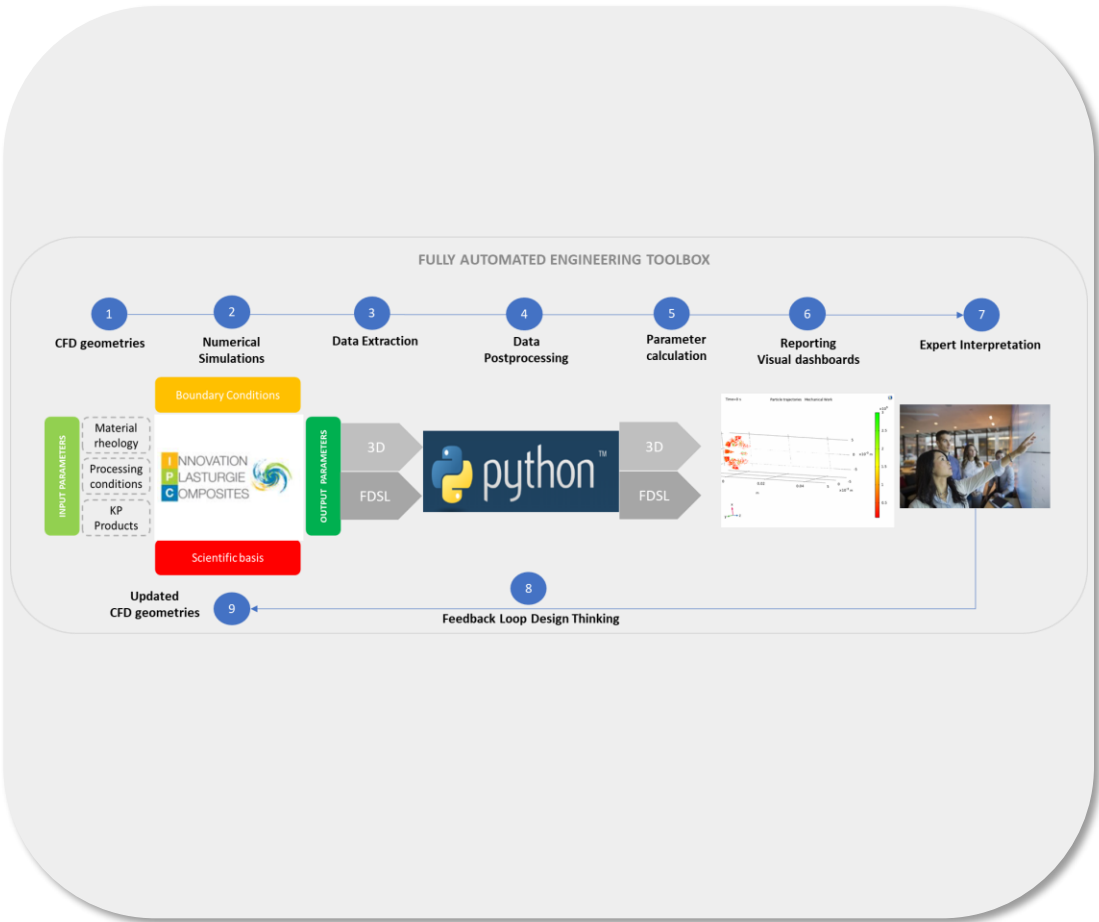
Keiryo Packaging Technologies patented 3D printed metal insert



Standard PET Injection machinery



## KP PROPRIETARY KNOW-HOW



## KP PROPRIETARY PATENT PORTFOLIO (113 national patents 70% granted)

**WO 2008/145746**  
MODIFIED HOT RUNNER SYSTEMS FOR INJECTION BLOW MOULDING

**WO 2017/005935**  
A METHOD FOR MANUFACTURING A POLYMER ARTICLE

**WO2017/005937**  
A METHOD FOR MANUFACTURING A POLYESTER BASED POLYMER ARTICLE



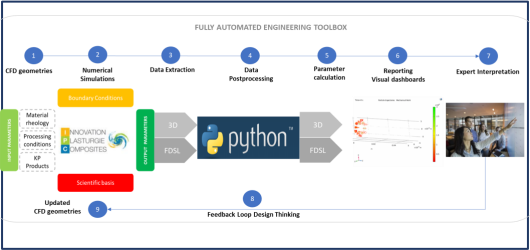
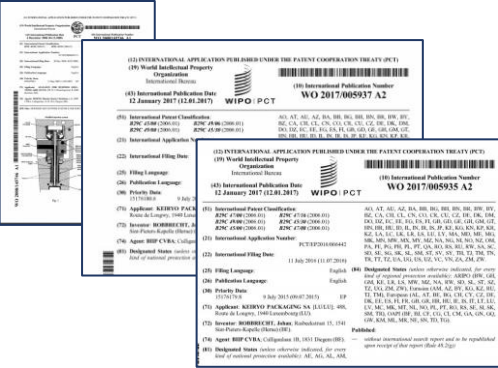
# Pay-as-you-benefit KP Commercial Model

## For PET ISBM

LICENSING OF IP & KNOW-HOW BASE



SALE OF KP PRODUCTS



# TEAM: Consolidates different skills and backgrounds

## Day to day management



Johan Robbrecht MSc, MBA  
Managing Director



Dr. Edyta Niemczyk, PhD  
Engineering Team Lead



Tangui van der Elst  
Chief Evangelist



Dr. Alban Agazzi Ph.D  
Computational modeling Lead



Dr. Tamineh Adili Ph.D  
Mechanical Product Design Engineer



Hans Vermeulen  
IT Lead



Ed Sisson  
Attorney at Law



Marnix Moens Msc, Ir  
Patent Management.

## Engineering

## IP Lead

## Scientific Lead



Prof. Sawas.G.Hatzikiriakos Ph.D  
Scientific adviser



Prof. Martin L. Sentmanat. PhD  
Scientific adviser



University of Montreal  
Morphological characterization



FA University of  
Erlangen



Innovation Plasturgie  
Composites – I PC

## R&D Network

Consolidates different skill sets and backgrounds

- Strong scientific credentials and R&D expertise
- Deep FMCG expertise
- Coherent management culture and values
- Driven towards a common goal
- Passionate about the project

# Our shareholders have a broad FMCG experience



**Stefan Descheemaeker, Investor**

*As CEO and Board Member of large FMCGs, I know how business-critical it is to improve the resource sustainability of the operations. However, sustainability solutions will only be widely implemented when they make business sense and address all aspects relevant to their adoption. Keiryo Packaging fits that bill*

- CEO Nomad Foods
- Ex-Board Member AB InBev
- Chairman of the Board Verlinvest



**Christophe d'Ansembourg, Investor**

*As a professional investor, I have a growing interest in projects that not only generate financial return but also create a positive environmental and/or societal impact. KP's mission, strategy and execution therefore strongly resonate with my objectives. I firmly believe KP will create value for its customers and the wider community by improving the sustainability profile of polymer-based packaging.*

- Reference family shareholder AB InBev
- Board member Cobepa
- Board member Verlinvest



## PET PROGRAM

### 1. GENERIC DATA ACCESS

#### Data Access Flow Enhanced Nucleation Induced-Crystallization (FENIC) PET ISBM

currently includes 7 distinct reports for a total of 278 pages.

REPORT <b>01</b>	<b>FENIC Science and its Fundamental Parameters</b> Consolidation of FENIC scientific background relevant to all semi-crystallizable polymers like PET. This report contains 30 pages.
REPORT <b>02</b>	<b>Viscosity and its central role in FENIC</b> Analysis of factors that can influence viscosity and consequently impact FENIC during PET melt processing. - Emphasis on the significance of the main factors driving the PET melt viscosity. This report contains 13 pages.
REPORT <b>03</b>	<b>Reduction to practice</b> - Transferring FENIC to PET from a laboratory to an industrially relevant environment. - Documenting the relevance of applying the KP Technology to PET under industrially relevant processing conditions. - Establishing the Processing Window Mapping for subsequent PET injection molding trials. This report contains 19 pages.
REPORT <b>04</b>	<b>Injection platform validation</b> - Validation of the industrial Injection Molding Platform utilized including an overview of the pre and post-injection control check points. - Quality Control assessment of Reference and KP performance against conventional industrial standards. This report contains 36 pages.
REPORT <b>05</b>	<b>A summary of the learnings from the controlled industrial injection trial</b> - Learnings extracted from the controlled industrial platform injection molding trial with KP Technology. - Details on the initial morphological characterisation of both Reference and KP products. This report contains 58 pages.
REPORT <b>06</b>	<b>Validation of the reheat and stretch freeblow platform</b> - Validation of the controlled reheat stretch freeblow platform utilized to process Reference and KP products. - Assessment of machine behavior under the same controlled processing conditions. - KP preparatory data on Oxygen Transmission Rate (OTR) for Reference and KP samples. This report contains 68 pages.
REPORT <b>07</b>	<b>A summary of the learnings extracted from the execution of a full Engineering Workflow Cycle</b> - Covering a complete Engineering Workflow Cycle from preform injection molding over reheat/stretch freeblow trials and functional performance assessments. - KP preparatory data on Oxygen Transmission Rate (OTR), Water Vapor Transmission Rate (WVTR) and thermal resistance for Reference and KP samples. This report contains 68 pages.

<https://www.keiryopackaging.lu/solutions/pet>

2a)

**GENERIC DATA ACCESS  
&  
OPTION AGREEMENT**



2b)

**TECHNOLOGY LICENSING  
&  
BESPOKE COLLABORATION**

**AGREEMENT**

**'performance follows morphology'**

**No Capex, highly scalable, margin-positive  
sustainability solution**

KP develops a **processing technology** which **improves the performance of polymers**, enabling **reduced manufacturing cost** and **environmental footprint** of plastic packaging.

## Key features of the Keiryo technology:

- Retrofits a 3D printed insert in existing manufacturing assets, enabling **high scalability at low cost.** (for ISBM PET bottles)
- **Broad IP and proprietary know-how** ensure **barriers to competition.**
- Generates a significant **margin pool for customers** and revenues for Keiryo.
- Ongoing **trials on standard industrial assets demonstrate improved functional performance** of blown PET bottles.



# Q and A session



**Feel free to use our dedicated channel for the Q and A so that we can be sure to answer as many questions as we can.**

16:55 - 17:00

## Wrap-up & closure by Roberto Bertaglia (PETCORE EUROPE)

---

**Roberto Bertaglia**

**Executive Director at PETCORE EUROPE**

Roberto Bertaglia spent over 30 years of his career in managing both complex contractual sales and coordination roles. Roberto has dedicated his line of work to the PET industry: recycling technologies, regulatory and business development. Moreover, he was PETCORE EUROPE'S Past President back in 2017.







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Annual Conference 2024

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Communications Campaign

[www.recycletheone.com](http://www.recycletheone.com)

Recording and  
other materials will  
be sent by 7th of  
April 2025