
REDUCING
PLASTIC WASTE
IN CANADA
Funded by
the European Union
May 18, 11:00 – 12:30 EST
Advances in the collection and sorting technologies for flexible packaging


REDUCING
PLASTIC WASTE
IN CANADA
Funded by
the European Union
Presentations by
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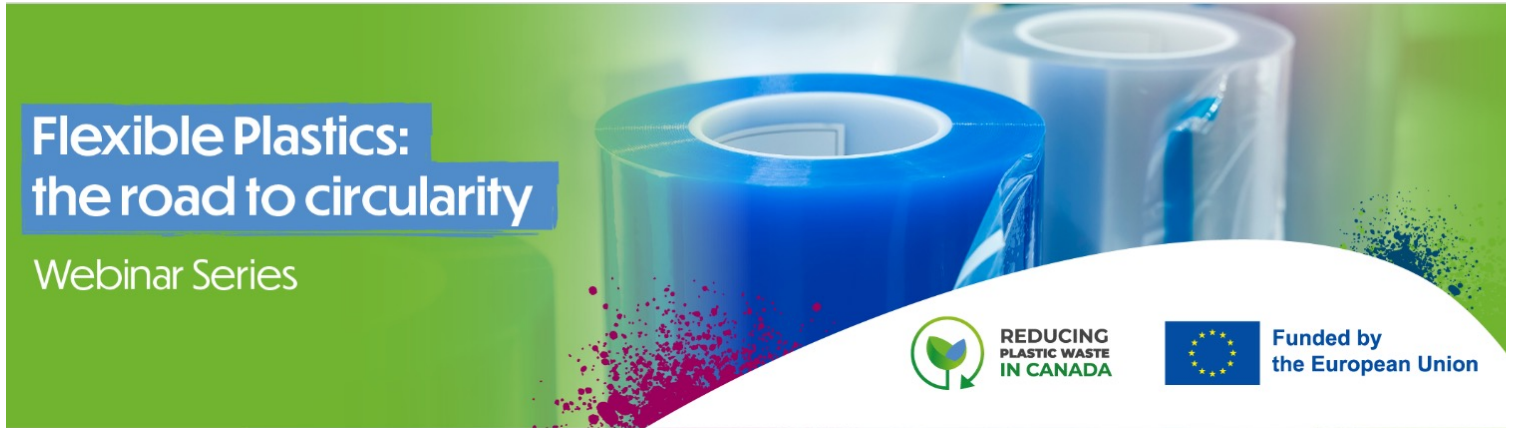
Expra
Extended Producer Responsibility Alliance

EPR as tool to make (flexible plastic) packaging circular – The EXPRA experience

Joachim QUODEN
Managing Director of EXPRA



Expra
Extended Producer Responsibility Alliance

EXPRA in a nutshell

Founded in 2013

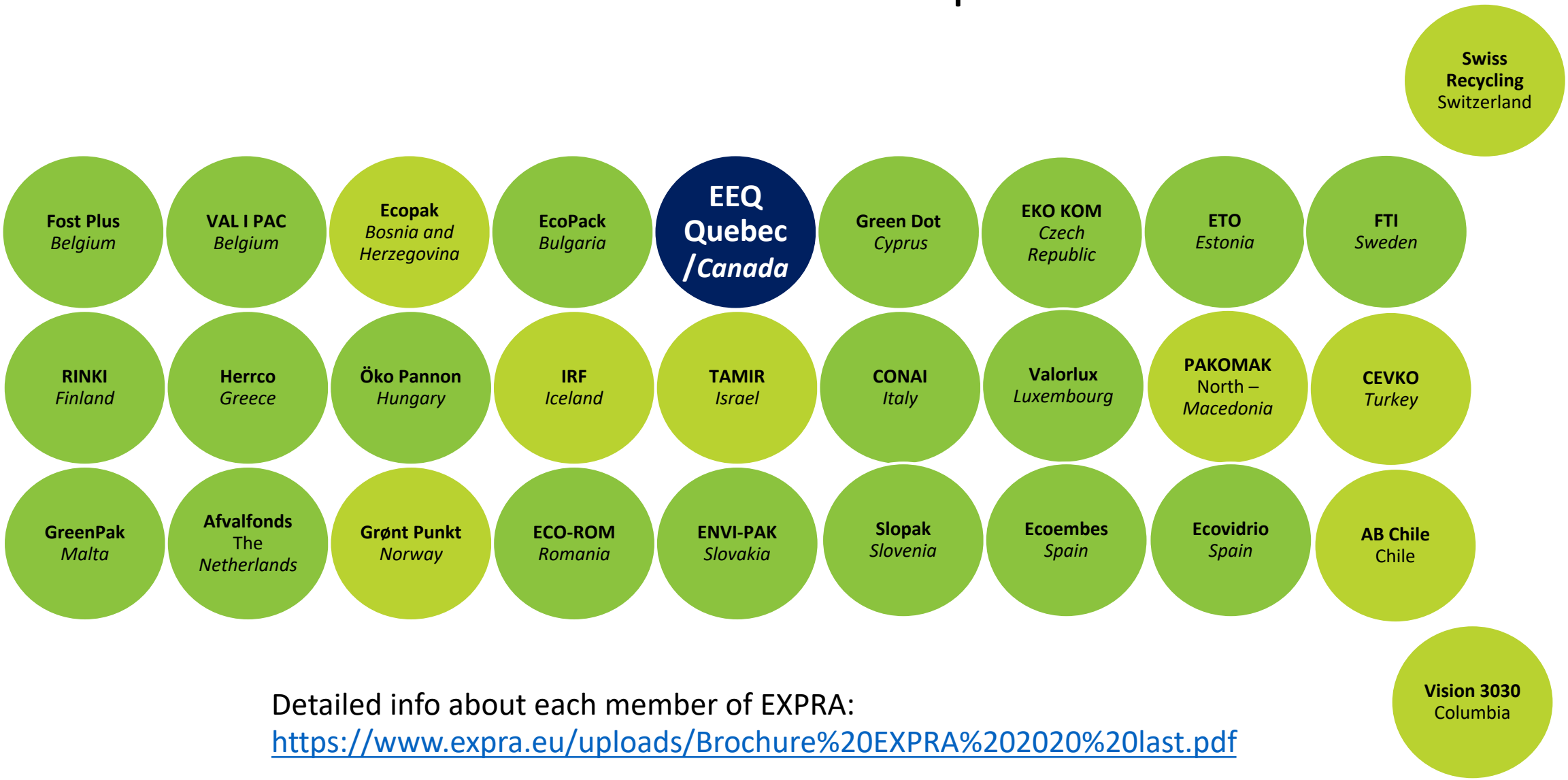
29 MEMBERS & Partners all industry-owned, non-profit

HAVE over **30** YEARS of experience and expertise in the waste management field

PROVIDE over **200** MILLION PEOPLE with packaging collection, sorting and recycling infrastructure

ENSURE RECYCLING AND RECOVERY of over **21** MILLION TONNES of packaging every year at the moment

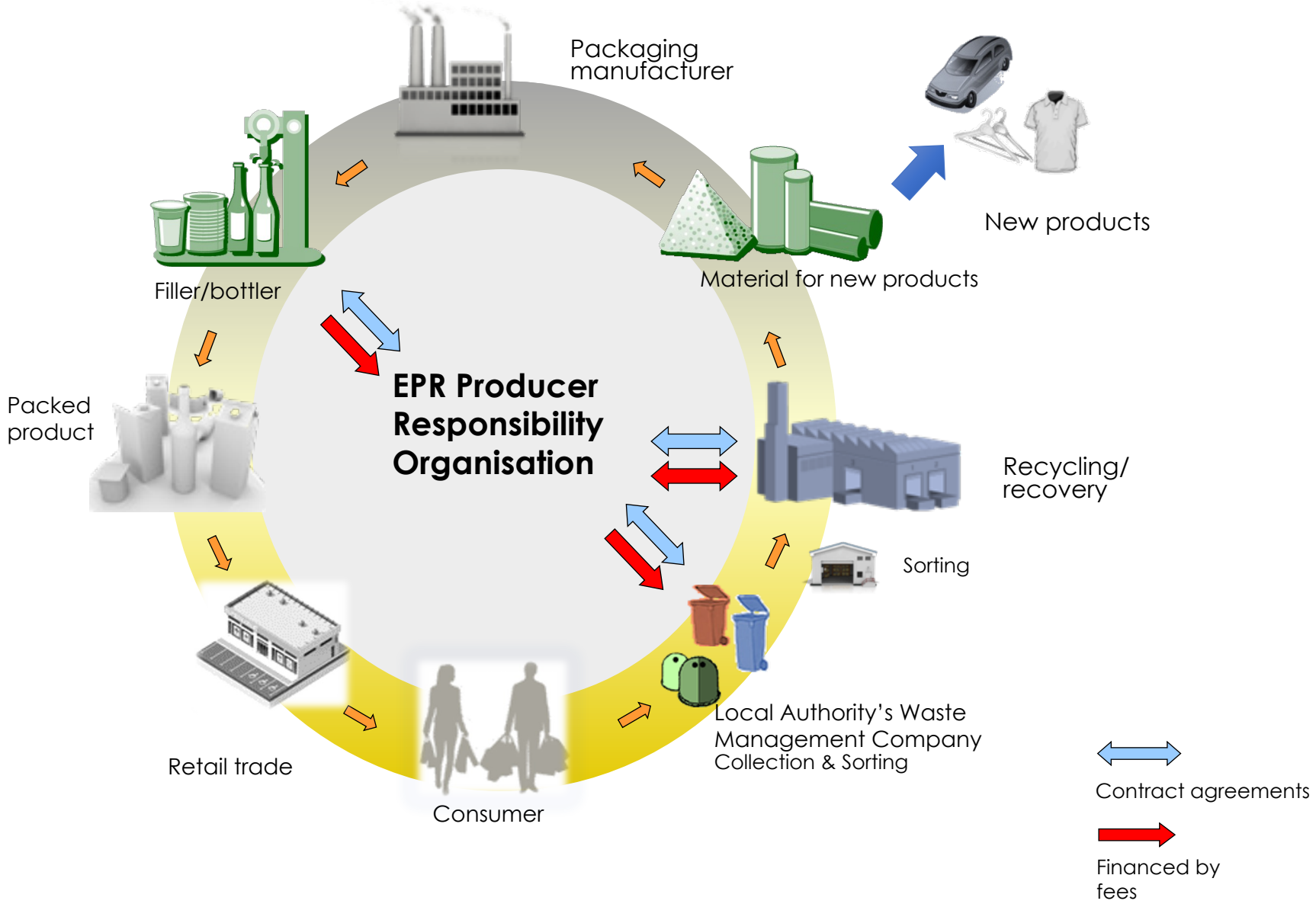
Our Members – 29 non-profit PROs



Detailed info about each member of EXPRA:
https://www.expra.eu/uploads/Brochure%20EXPRA%202020%20last.pdf

EPR's role in a circular carbon neutral economy

Operational **AND** financial responsibility



EPR System / PRO

- **EPR is a concept but neither a business plan nor a franchise!**
- The design of each national EPR System and each PRO is determined by
  - (The EU legislation (WFD / PPWD / SUP)) / OECD Guidelines etc
  - The respective **national** implementation
  - Obliged **industry** in a respective country if and when owning the PRO respective the third partly owning the PRO's
  - **Local authorities** who usually decide about the concrete collection (and sorting) system in their district

Complimentary EPR activities[1]

C4C focus area: end markets for recycled polymer

EPR complimentary activities:

- Incentivise recycled content use

C4C focus area: design for recycling

EPR complimentary activities:

- Eco-modulation of fees

C4C focus area: recycling

EPR complimentary activities:

- Defining input specifications
- Better design for recycling (driven by fee modulation)
- Contracting of feedstock & commercial terms
- Some direct recycling activity

C4C focus area: collection

EPR complimentary activities:

- Decisions / influence on material formats collected
- Influencing municipality decisions on collection systems
- Communication & education campaigns

C4C focus area: Sorting

EPR complimentary activities:

- Setting recovery targets for sorting centers. Better design for sorting (driven by eco-modulation)
- Bale specifications
- Design advice to sorting centers / R&D / direct investment

[1] Recognising that there are differences between EPR schemes

EPR Criteria for Circularity

(Flexible) packaging is collected, sorted and reprocessed to produce a commodity recycled polymer suitable for use as a replacement for virgin polymer.

Operational
requirements related to collection, sorting & recycling

Financial
supply chain sustainability, fees, eco-modulation.

Communication
reporting, consumer awareness, consistent design messaging

Governance
access to expertise and flexible packaging representation

All (flexible) packaging is collected for recycling.

Operational

Collection, sorting and recycling

- All flexible packaging is targeted for collection and sorting including on the go packaging.
- Separate collection used. Where possible plastic is collected separate from fibres and glass.
- Sorting of flexible packaging from residual waste for that not captured by the separate collection system.
- Sorting centres focused on quantity (capture rate) and quality.
- Standardised bale specifications.
- Recycled polymer suitable for use as a commodity replacement for virgin polymer meeting downstream demand.
- Chemical recycling required in addition to mechanical recycling to align with end market demand.

Financial

- Full net costs.
- A sustainable supply chain.
- Fee modulation.

- Financial support to make both recycling of flexibles and use of recycled polymer financially sustainable. Contracts with recyclers allow for volatile market conditions.
- Support for infrastructure development and investment through long term feedstock supply contracts.
- Funding of R&D and communication programs (including where multiple PROs).
- No cross subsidy between materials / formats. Financial transparency.
- Full net costs centred around formats.
- Sum of modulated fees for format = full net costs.
- Eco-modulation based on recognised design guidelines e.g. CEFLEX Designing for a Circular Economy Guidelines for flexible packaging.
- ∑ eco-modulated fees for format = full net costs for format.
- Fee revenue on packaging formats with no current recycling options used to support innovation and remove barriers to their recycling.

Why relevant for obligated industry?

- **Countries are implementing the legislation unique.** Not following best practices; very unique solutions are endangering the internal market; no real monitoring of the implementation by the Member States, not to talk about enforcement.
- **The costs that obligated industry have to pay might drastically increase. Only in Europe, i**ncrease from currently around 7 to 8 billion for EPR + DRS to 20 billion possible, especially without real cost management in some areas as “necessary costs” for municipalities are not defined (litter clean up costs as current hot topic)
- **New legislation might restrict the packaging choice for industry.** Especially as the term “recyclability” will not only depend the packaging design but also on the used infrastructure which often depends on municipalities and not on industry.
- **Minimum re-use targets for various sectors will also restrict the packaging choice** although currently there is limited data and information to which extend re-use is applied and will be applied in the future, not to talk about the performance of new re-use systems.
- **Carbon neutrality and carbon reduction** is becoming more and more important. Is there alignment between circularity and carbon neutrality?

THANK YOU!

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- www.expra.eu

Expra

Extended
Producer
Responsibility
Alliance

The road toward realizing the Circular Economy - potential of Digital Watermark technology

(HolyGrail 2.0 initiative

Driven by AIM – European Brands Association

Powered by AEPW - Alliance to End Plastic Waste)

Gian De Belder

P&G, Packaging R&D –Sustainability

Plastic Recyclers Europe – Recyclass Platform

Petcore Europe - Opaque and Functional Bottles

EU Plastics Recycling Ambassador 19/20

Chair of the HolyGrail 2.0 Leadership Team (AIM)

PROBLEMS TO BE SOLVED TO DRIVE A CIRCULAR ECONOMY FOR PACKAGING

-

HOW CAN INTELLIGENT PACKAGING HELP?

AMBITION 2030

Packaging Strategy for Circular Economy "closing the loop"

P&G IT'S OUR HOME

We will find solutions so no P&G packaging will find its way to the ocean

0. Design for Recycling / Circularity
(Eco-design)

RecyClass PLASTICS RECYCLERS EUROPE · APR · SPC · petcore Europe

All of our packaging will be recyclable or reusable

1. Access to Collection

THE RECYCLING PARTNERSHIP · CLOSED LOOP fund

ALLIANCE TO END PLASTIC WASTE

Need consistent approaches across and within MS (harmonized)

2. Participation / Education: DIGITIZE

How2Recycle

PENSEZ AU TRI ! ENSEMBLE RÉDUISONS L'IMPACT ENVIRONNEMENTAL DES EMBALLAGES

HolyGrail 2.0 Intelligent Sorting

AIM · ALLIANCE TO END PLASTIC WASTE

OPRL THE ON-PACK RECYCLING LABEL · BLISTER BIJ PLASTIC AFVAL

The Circular lab

Expra · Fostplus

3. Separation

CLOSED LOOP partners · THE RECYCLING PARTNERSHIP

We will advance recycling solutions (HolyGrail 2.0 …)

RecyClass PLASTICS RECYCLERS EUROPE

HolyGrail 2.0 Intelligent Sorting

AIM · ALLIANCE TO END PLASTIC WASTE

PIONEER PROJECT

CosPaTox

4. Production Innovation

SPC · RecyClass PLASTICS RECYCLERS EUROPE

We will advance recycling solutions (Verso Vita)

PURECYCLE TECHNOLOGIES

Reduce our use of virgin petroleum plastic by 50%
(~ 300kty of virgin)

- Mechanical recycling **plastics**
- Advanced recycling **plastics**
  - Dissolution recycling
  - Feedstock recycling
- **Paper/Board/LCB** recycling

Collection

RECYCLING RATE

Sorting

P&G

ALLIANCE
TO END
PLASTIC
WASTE

What is a DW and what is its value?

Intelligent Packaging Through Digital Watermarks

Artwork

- Imperceptible codes, the size of a postage stamp, covering the surface of a consumer goods packaging

- Able to carry a wide range of attributes (e.g. manufacturer, SKU, type of plastics used and composition for multilayer objects, food vs. non-food usage)

<u>… linked to a standardized database!</u>

Looks Like This

Performs Like This

Images courtesy of P&G / Digimarc (barcodes for visualization purposes only)

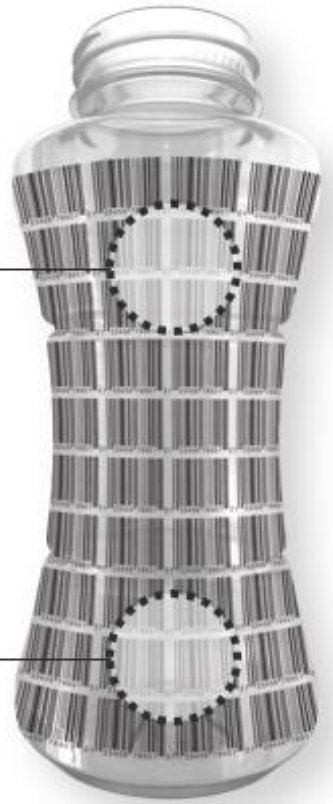
Intelligent Packaging Through Digital Watermarks

Mold embossing: ISBM

Images courtesy of P&G / Digimarc / Logoplaste

Micro-topological variations in substrate create signal tiles

Works in variety of mold types



For illustration purpose only

Logoplaste

P&G

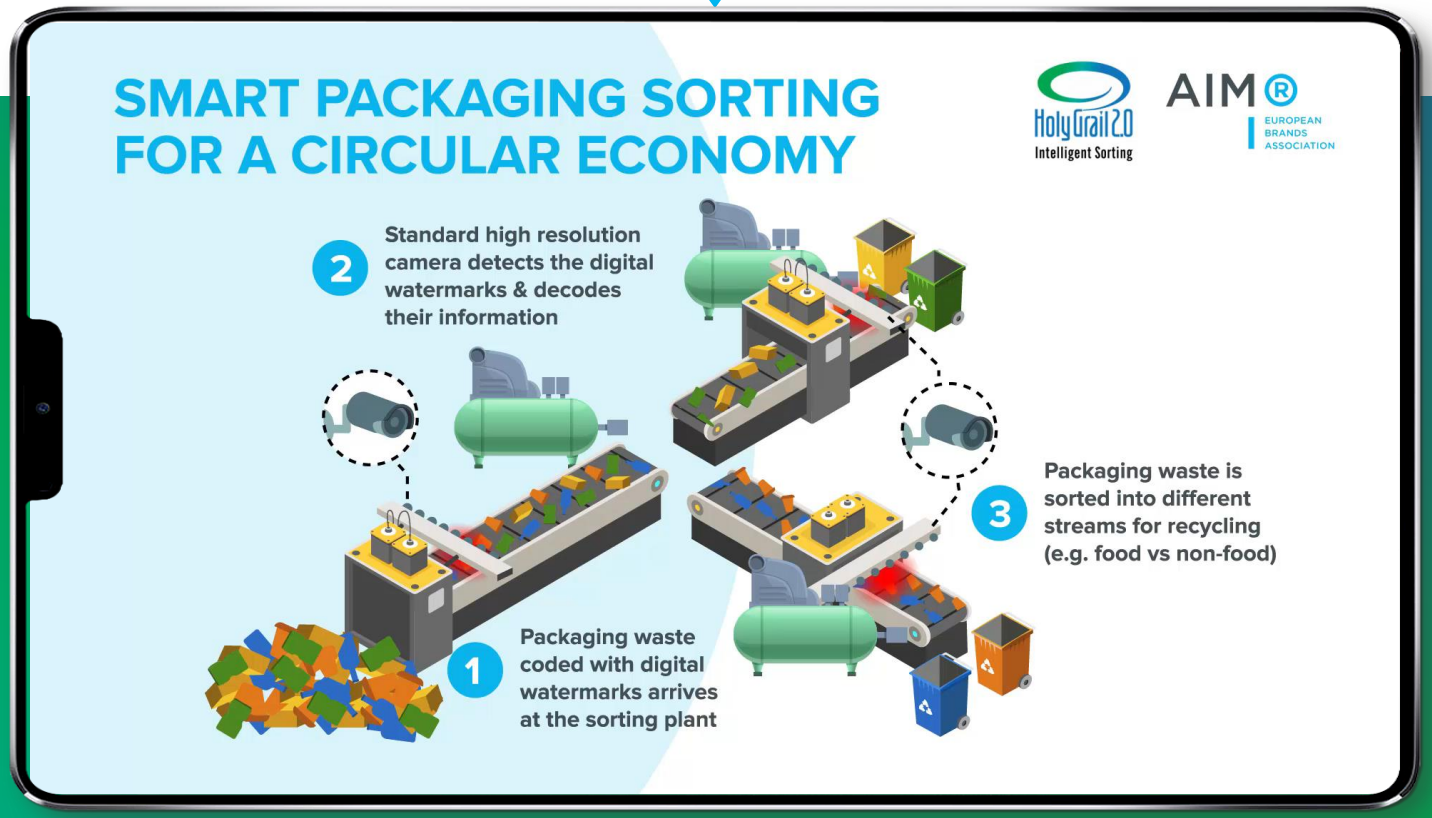
HOW DO **DIGITAL WATERMARKS** WORK ?

FOR INTELLIGENT SORTING

ADD
Increase resource efficiency by **capturing more material value through recycling**

REJECT
Remove undesirable elements in final products, as they reduce their quality

DIVIDE
Separate into two or more streams for treatment in **highly specialized recycling facilities** for a particular type of material



Revolutionising Sorting and Recycling by Intelligent Packaging containing Digital Watermarks

Digital Watermarks Initiative HolyGrail 2.0

Driven by AIM – European Brands Association

Powered by AEPW – Alliance to End Plastic Waste

AIM® EUROPEAN BRANDS ASSOCIATION

HolyGrail 2.0 Intelligent Sorting

ALLIANCE TO END PLASTIC WASTE

HOLY GRAIL 2.0

3 FOCUS AREAS

Reject
Add
Divide

AIM® EUROPEAN BRANDS ASSOCIATION | HolyGrail 2.0 Intelligent Sorting | ALLIANCE TO END PLASTIC WASTE

AIM® European Brands Association | HolyGrail 2.0 Intelligent Sorting | Alliance to End Plastic Waste

HOLYGRAIL 2.0 Membership

HOLY GRAIL 2.0

LEADERSHIP TEAM

Brand manufacturers (4/4)

Retailers (4/4)

MRFs: Materials Recovery Facilities (2/2)

Converters (2/2)

Extended Producer Responsibility Organisations (2/2)

Recyclers (2/2)

LT chair: Gian De Belder (P&G)

AIM® EUROPEAN BRANDS ASSOCIATION | HolyGrail 2.0 Intelligent Sorting | ALLIANCE TO END PLASTIC WASTE

HolyGrail 2.0 Structure

HG2.0 ADVISORY GROUP STRUCTURE BASED ON **HOLYGRAIL 2.0 ADVISORY GROUP CHARTER**:

ADVICE

- **Advisory Group:**

  Panel for dialogue, exchange and input into both the operational implementation of key activities and the overall strategy of HG2.0.

  Provides advice to HG2.0 Leadership Team, constituting the public and policy complement to the cross-value chain initiative HolyGrail 2.0.

  Comprised of key stakeholders in the Circular Economy debate, including representatives from NGOs, Media, European and national public agencies, European and national policy-makers, other key stakeholders

HolyGrail 2.0 Objective

Prove the viability of digital watermarking technologies for accurate sorting and the business case at large scale.

Proving the <u>TECHNICAL</u> viability of digital watermarking technologies (WP 1-3), through e.g.:

- Validating of the prototype in three stages: 1° in an R&D centre (Phase 1 and Phase 2.1), 2° at a test facility on a semi-industrial scale (Phase 2.2), and 3° rolled out on a wider scale during real-time test runs in a commercial sorting and/or recycling facility (Phase 3)
- Ensuring the readability of the digital watermark embedded in print or in plastic, whilst taking into account esthetical and haptic aspects (e.g. shelf apeal)

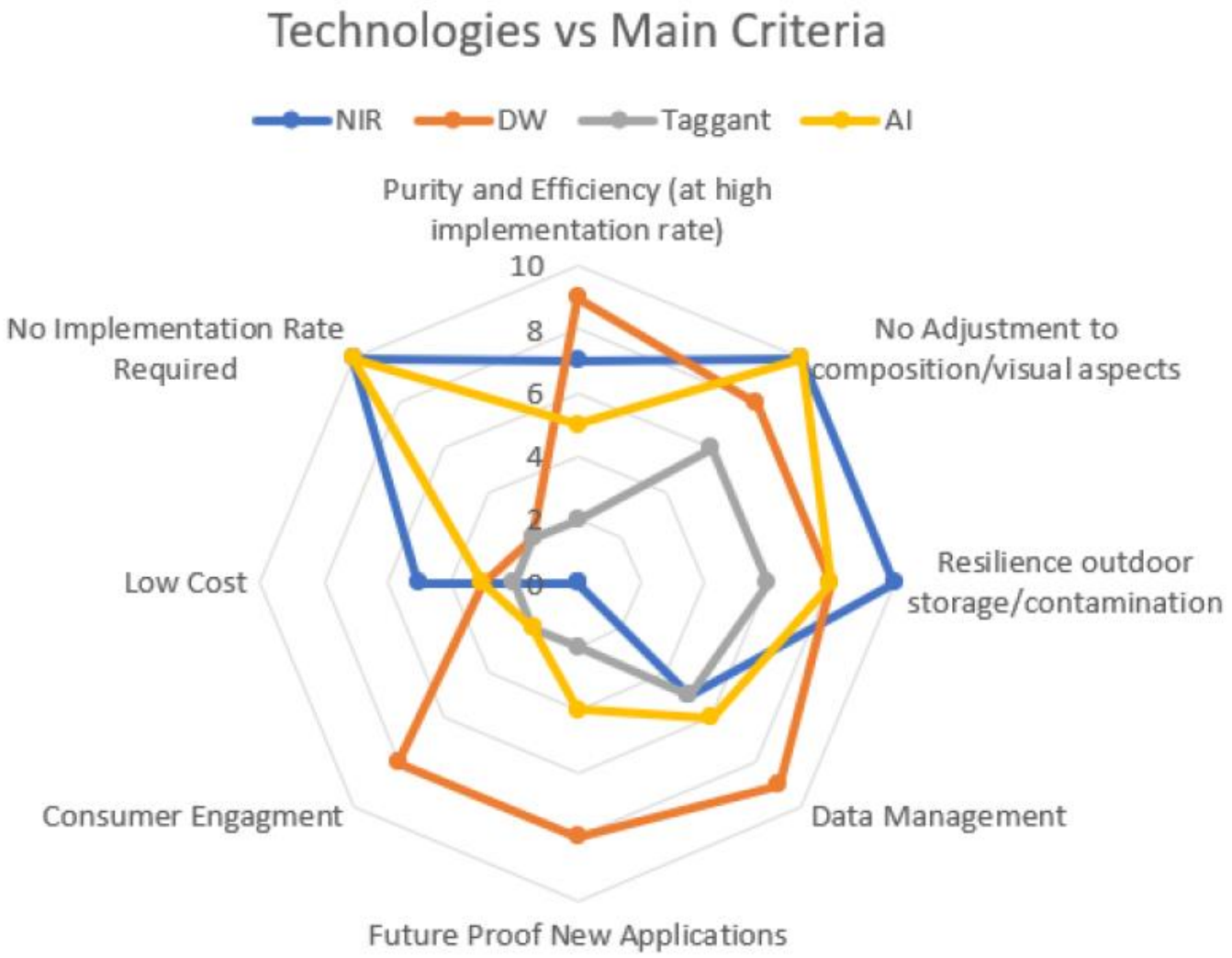
Proving the <u>ECONOMIC</u> viability of digital watermarking technologies (WP 4), through e.g.:

- Reviewing existing and new business models, in different stages, building on key learnings from each test phase
- Addressing main market barriers, and assessing similar state-of-the-art technologies
- Examining cost improvement potential of DW detection systems, as add-on, by retrofitting or new equipment
- Perform a full techno-economic analysis, incl. cost breakdown structure for the entire packaging value chain

HOLY GRAIL 2.0

WORK PACKAGES

AIM® EUROPEAN BRANDS ASSOCIATION | Holy Grail 2.0 Intelligent Sorting | ALLIANCE TO END PLASTIC WASTE



KEY TAKE-AWAYS (preliminary conclusions):

- WM: high granularity + data management
  "digital product passports"
- Highest value: DW combined with NIR and/or AI

DIFFERENT STAGES OF TESTING

Phase 1

- Develop a functional HG2.0 prototype as an add-on module to detect and separate the DW packaging from packaging waste, allowing category specific sorting.

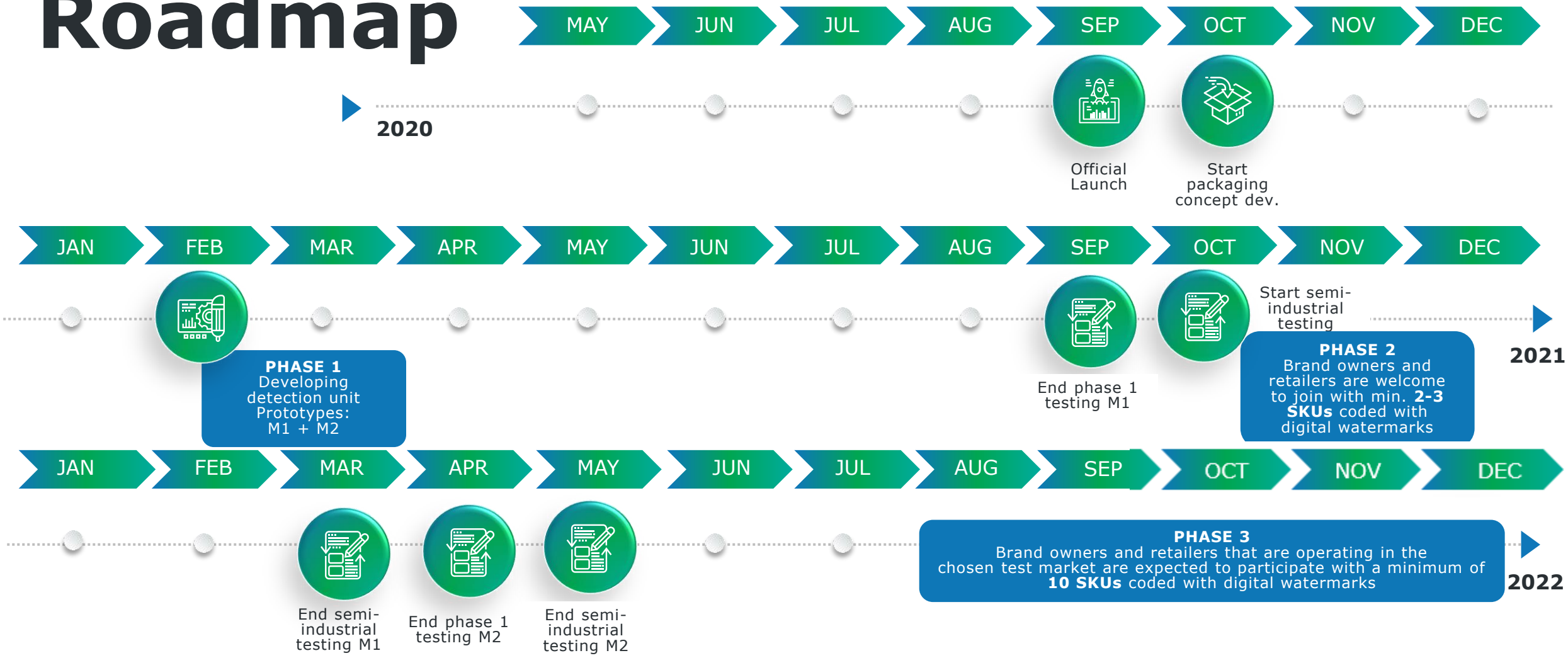
Phase 2

- HG2.0 prototype is tested for speed, accuracy and detection efficiency, and this for a category specific sorting based on DW detection – in combination with NIR and VIS.

Phase 3

- HG2.0 prototype will be deployed in a large-scale pilot in a commercial sorting and/or recycling facility, under standard operation conditions.

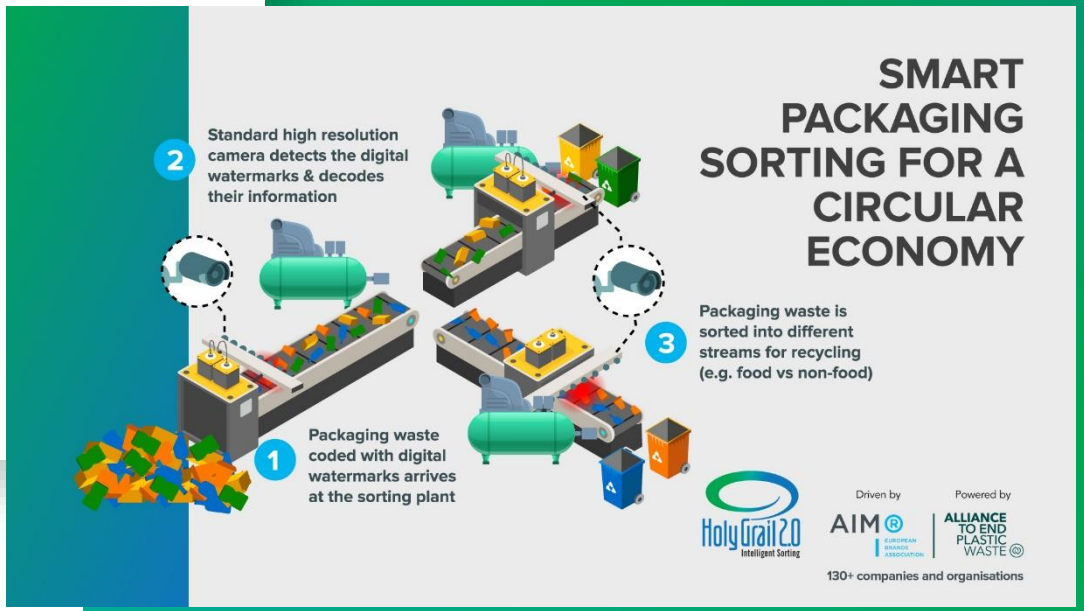
Roadmap


MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
2020
Official Launch
Start packaging concept dev.
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
Start semi-industrial testing
2021
PHASE 1
Developing detection unit Prototypes: M1 + M2
End phase 1 testing M1
PHASE 2
Brand owners and retailers are welcome to join with min. 2-3 SKUs coded with digital watermarks
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
End semi-industrial testing M1
End phase 1 testing M2
End semi-industrial testing M2
PHASE 3
Brand owners and retailers that are operating in the chosen test market are expected to participate with a minimum of 10 SKUs coded with digital watermarks
2022

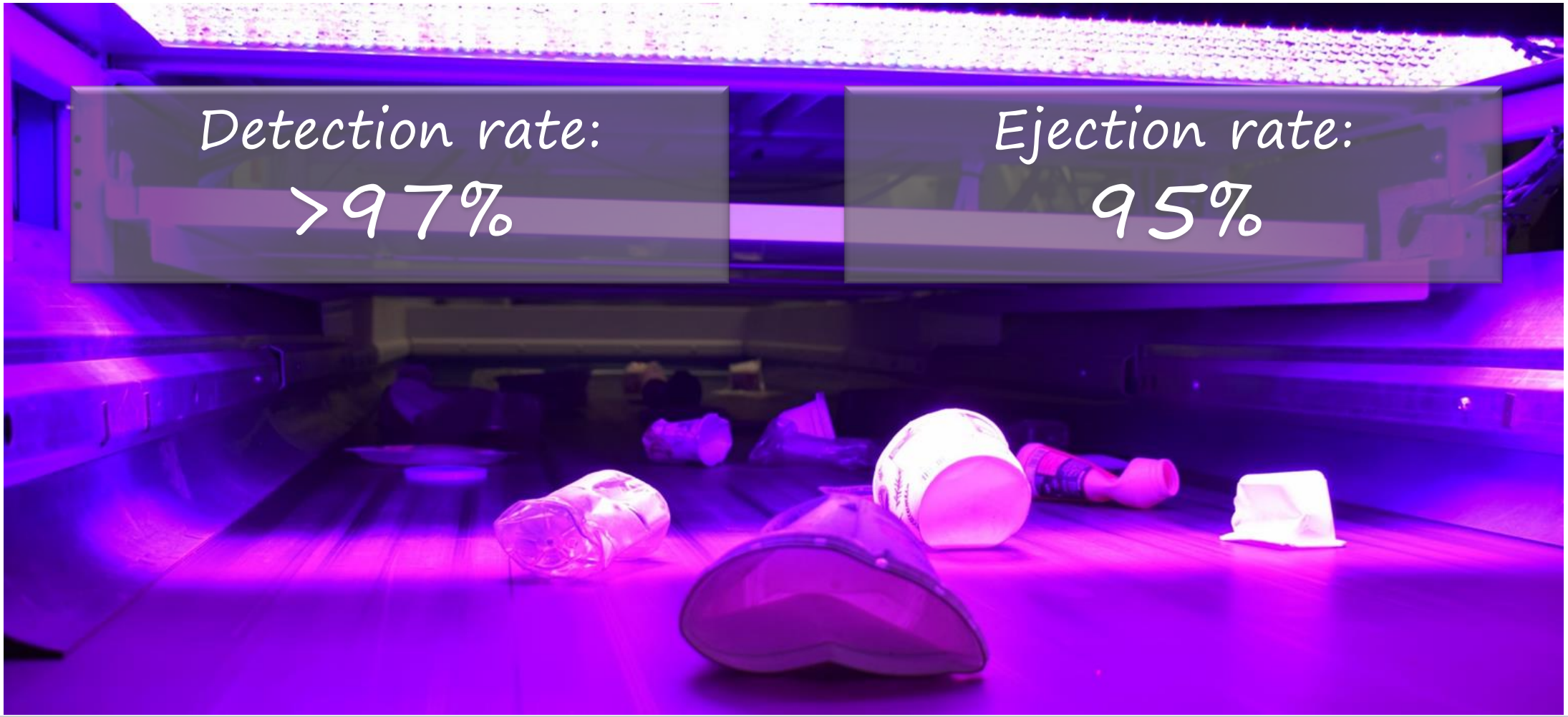
Phase I

Prototype Development
Feb – Nov 2021

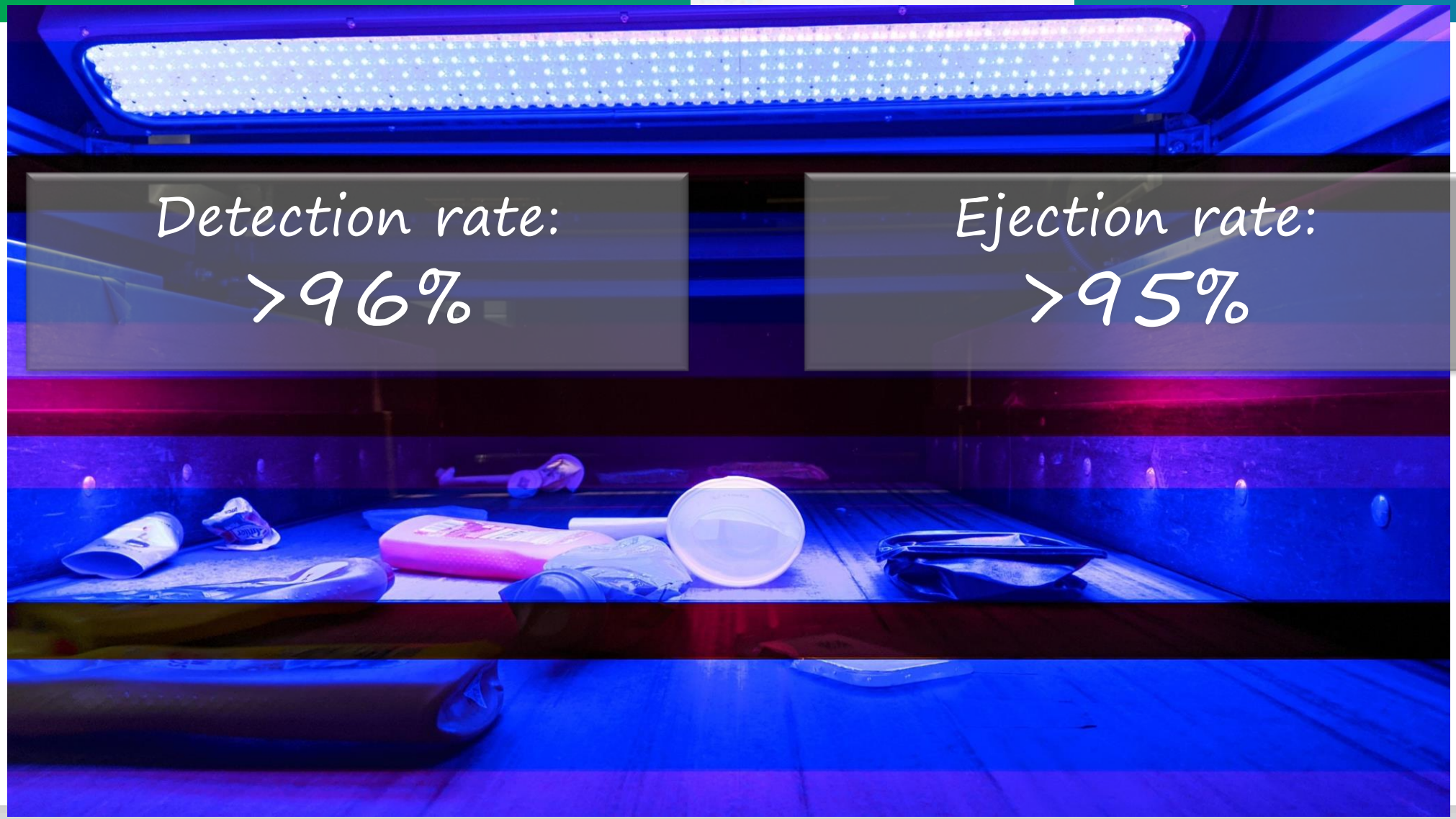
- Focus on **functional add-on module for the detection sorting unit** – combined with existing NIR sorters – developed by the machine vendors **Pellenc ST** and **Tomra**, in combination with **Digimarc** (digital watermarks technology provider).
- Success criteria: unit's ability to detect and sort digitally watermarked packaging of various sizes. The Technical Project Manager overlooks and validates the prototypes.
- The prototypes will be used for the (semi-)industrial testing phase.
- Successful completion of Phase 1 will bring the Technical Readiness Level (TRL) to TRL 6 – *technology demonstrated in relevant environment.*



1ST DETECTION ADD-ON MODULE: PELLENC ST + DIGIMARC



1ST DETECTION ADD-ON MODULE: TOMRA + DIGIMARC



Phase II

Semi-industrial testing
July 2021 – Q1 2022

- **Software model & identification parameters are developed and tested** for sorting based on digital watermarks detection.
- System is tested for speed, accuracy, and detection efficiency.
- **2 test locations for semi-industrial trials** of the detection sorting units:
  - Pellenc ST/Digimarc module: Sep - Jan 2022 at the **Amager Resource Centre, Copenhagen**
  - Tomra/Digimarc module: Q2+3 2022 in Germany
- Successful completion of Phase 2 will bring the Technical Readiness Level (TRL) to TRL 7 – *system prototype demonstration in operational environment* and TRL 8 – *system complete and qualified.*

1ST DETECTION ADD-ON MODULE: PELLENC ST + DIGIMARC

> 230 product SKUs (2D, 3D, combined)

HolyGrail 2.0 Intelligent Sorting — Driven by AIM European Brands Association — Powered by Alliance to End Plastic Waste

Digital Watermarks Initiative HolyGrail 2.0 achieves significant milestone with the successful semi-industrial validation of detection sorting unit

Press release for immediate release – ***Brussels, 30 March 2022*** – The Digital Watermarks Initiative HolyGrail 2.0, driven by AIM – European Brands Association and powered by the Alliance to End Plastic Waste, has achieved a significant milestone with the successful validation, after semi-industrial testing mimicking real-life conditions, of the prototype detection unit for digital watermarks. The results show that the digital watermark technology can achieve more granular sorting of packaging waste at scale, such as developing separate food and other new PCR streams that currently do not exist (e.g. for cosmetic or detergent applications). This would open up new recycling streams, effectively overcoming limitations of current near-infrared (NIR) sorting technologies, and drive a true circular economy for packaging. Consistent high results across all tested categories of plastic packaging material of 99% detection, 95% ejection and 95% purity rates, on average, demonstrate an impressive performance of the first prototype. Developed by the machine vendor Pellenc ST and the digital watermarks technology supplier Digimarc, the detection unit is now ready for industrial-scale pilots, which are planned to start later this year. Details on industrial partners and packaging scope will be released at upcoming conferences.

Category	Detection Rate[1] (Estimate)	Ejection Rate[2] (By weight)	Purity[3] (By weight)
Rigid PP	99%	95%	96%
Rigid PE	98%	96%	99%
Rigid PET	99%	98%	95%
Flexibles	99%	91%	90%
Average across packaging materials	**99%**	**95%**	**95%**

Table 1: Average single sort results from mixed packaging waste streams (watermarked samples + contamination (non-watermarked samples + other pack material classes)). Typical industrial process conditions have been used in these trials (belt speed of 3m/s; Loading: Rigids running at ~2.5 tonnes/hr; Flexibles at ~0.5 tonnes/hr). Success criteria (after 1st sort) for detection efficiency/ejection efficiency/purity are 95%/95%/92% for rigid packaging, 95%/87%/90% respectively for film packaging (in line with industrial specifications).

LCBs	99,95%	98,85%	

AIM European Brands Association — HolyGrail 2.0 Intelligent Sorting — Alliance to End Plastic Waste

www.packagingeurope.com/news/holygrail-20-concludes-semi-industrial-trials-with-successful-validation/8056.article

Phase III

Industrial tests 2022

- Functional prototypes now **deployed in commercial sorting and recycling facilities under normal operational conditions on a large-scale**.

  5 locations in France and Germany, including 2 MRFs, 1 PRF, 2 recycling plants.

- Brand owners and retailers bring their enhanced products commercially to market in Denmark, France and Germany.
- Consumers can buy on-shelf products with digitally watermarked packaging, which will enter the waste stream after consumption.
- Objective: test system's reliability to ensure optimum performance.
- Successful completion of Phase 3 will bring the TRL to TRL 9 – *actual system proven in operational environment*.

Virginie Helias
- Chief Sustainability Officer, P&G

"Today I'm celebrating the news that something as small as a postage stamp-sized digital watermark on a package to promote higher-quality recycling has advanced to this semi-industrial stage. P&G has helped pave the path forward and continues to support the HolyGrail 2.0 effort, with more than 100 of our products in Europe carrying digital watermarks and supporting the upcoming trials, including **Lenor, Blend-A-Med, Ariel, Fairy, Head & Shoulders, Pampers, Always, Pantene, and Unstoppables**. Now, with the support of 130+ members and driven by AIM – European Brand Associate and powered by Alliance to End Plastic Waste, HolyGrail 2.0 moves ***beyond an idea to action through trials with the City of Copenhagen***."

- September 5, 2021

Presseinformation

Semi-industrieller Test auf Verpackungen startet in Kopenhagen im Rahmen der Initiative Digitale Wasserzeichen „HolyGrail 2.0“

Erster Praxistest für eine effizientere Sortierung von Verpackungsabfällen / Procter & Gamble bereitet sich mit über 100 Produkten für den nationalen Testmarkt in Deutschland vor

LOOKS LIKE THIS

PERFORMS LIKE THIS

Innovation, sustainability and **digital** are the **3 key ingredients** we are combining with smart packaging through **digital watermarks** to achieve the objective of the **Green Deal** towards a **clean**, **circular** and **climate neutral economy**.

MICHELLE GIBBONS
DIRECTOR GENERAL, AIM

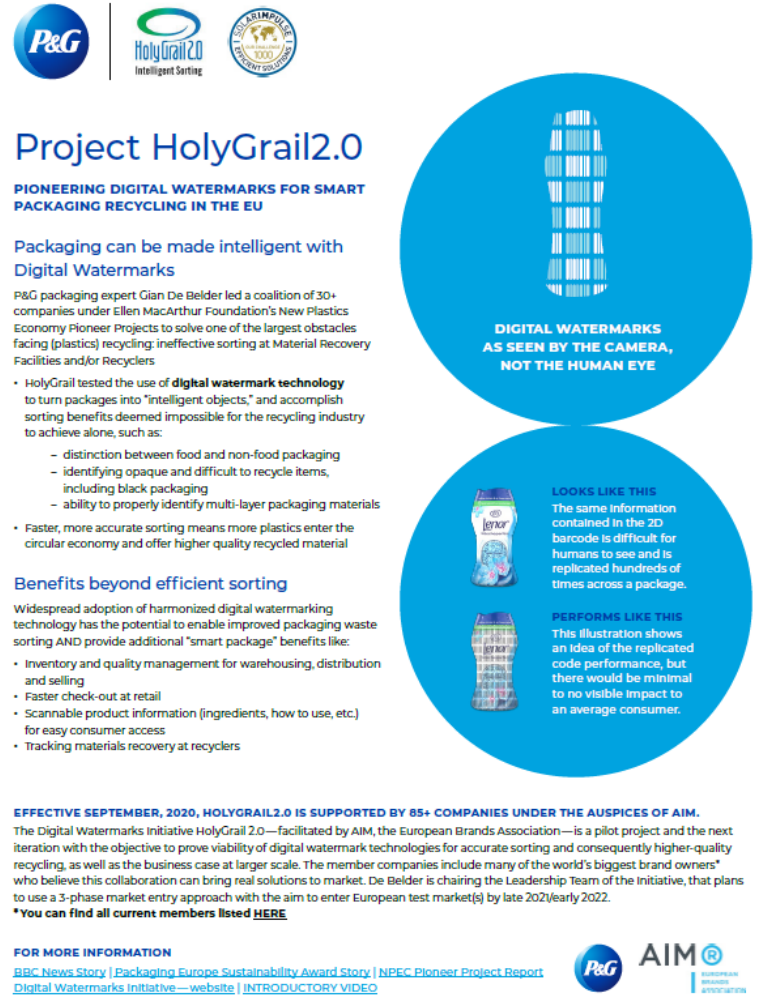
AIM EUROPEAN BRANDS ASSOCIATION
HolyGrail 2.0 Intelligent Sorting
ALLIANCE TO END PLASTIC WASTE

More reading / keep up to speed

1 https://us.pg.com/blogs/HolyGrail/

2 https://www.digitalwatermarks.eu

3 #HolyGrail2
#digitalwatermarks



Project HolyGrail2.0

PIONEERING DIGITAL WATERMARKS FOR SMART PACKAGING RECYCLING IN THE EU

Packaging can be made intelligent with Digital Watermarks

P&G packaging expert Gian De Belder led a coalition of 30+ companies under Ellen MacArthur Foundation's New Plastics Economy Pioneer Projects to solve one of the largest obstacles facing (plastics) recycling: ineffective sorting at Material Recovery Facilities and/or Recyclers

- HolyGrail tested the use of **digital watermark technology** to turn packages into "intelligent objects," and accomplish sorting benefits deemed impossible for the recycling industry to achieve alone, such as:
  - distinction between food and non-food packaging
  - identifying opaque and difficult to recycle items, including black packaging
  - ability to properly identify multi-layer packaging materials
- Faster, more accurate sorting means more plastics enter the circular economy and offer higher quality recycled material

Benefits beyond efficient sorting

Widespread adoption of harmonized digital watermarking technology has the potential to enable improved packaging waste sorting AND provide additional "smart package" benefits like:

- Inventory and quality management for warehousing, distribution and selling
- Faster check-out at retail
- Scannable product information (ingredients, how to use, etc.) for easy consumer access
- Tracking materials recovery at recyclers

DIGITAL WATERMARKS AS SEEN BY THE CAMERA, NOT THE HUMAN EYE

LOOKS LIKE THIS
The same information contained in the 2D barcode is difficult for humans to see and is replicated hundreds of times across a package.

PERFORMS LIKE THIS
This illustration shows an idea of the replicated code performance, but there would be minimal to no visible impact to an average consumer.

EFFECTIVE SEPTEMBER, 2020, HOLYGRAIL2.0 IS SUPPORTED BY 85+ COMPANIES UNDER THE AUSPICES OF AIM.
The Digital Watermarks Initiative HolyGrail 2.0—facilitated by AIM, the European Brands Association—is a pilot project and the next iteration with the objective to prove viability of digital watermark technologies for accurate sorting and consequently higher-quality recycling, as well as the business case at larger scale. The member companies include many of the world's biggest brand owners* who believe this collaboration can bring real solutions to market. De Belder is chairing the Leadership Team of the Initiative, that plans to use a 3-phase market entry approach with the aim to enter European test market(s) by late 2021/early 2022.
***You can find all current members listed HERE**

FOR MORE INFORMATION
BBC News Story | Packaging Europe Sustainability Award Story | NPEC Pioneer Project Report
Digital Watermarks Initiative—website | INTRODUCTORY VIDEO

THANK YOU!

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@giandebelder

Innovative sorting in Eitting

Europe‘s most modern sorting facility for lightweight packaging

Germany, May 2022

The Schwarz Group

Organizational structure

SCHWARZ

The Schwarz Group

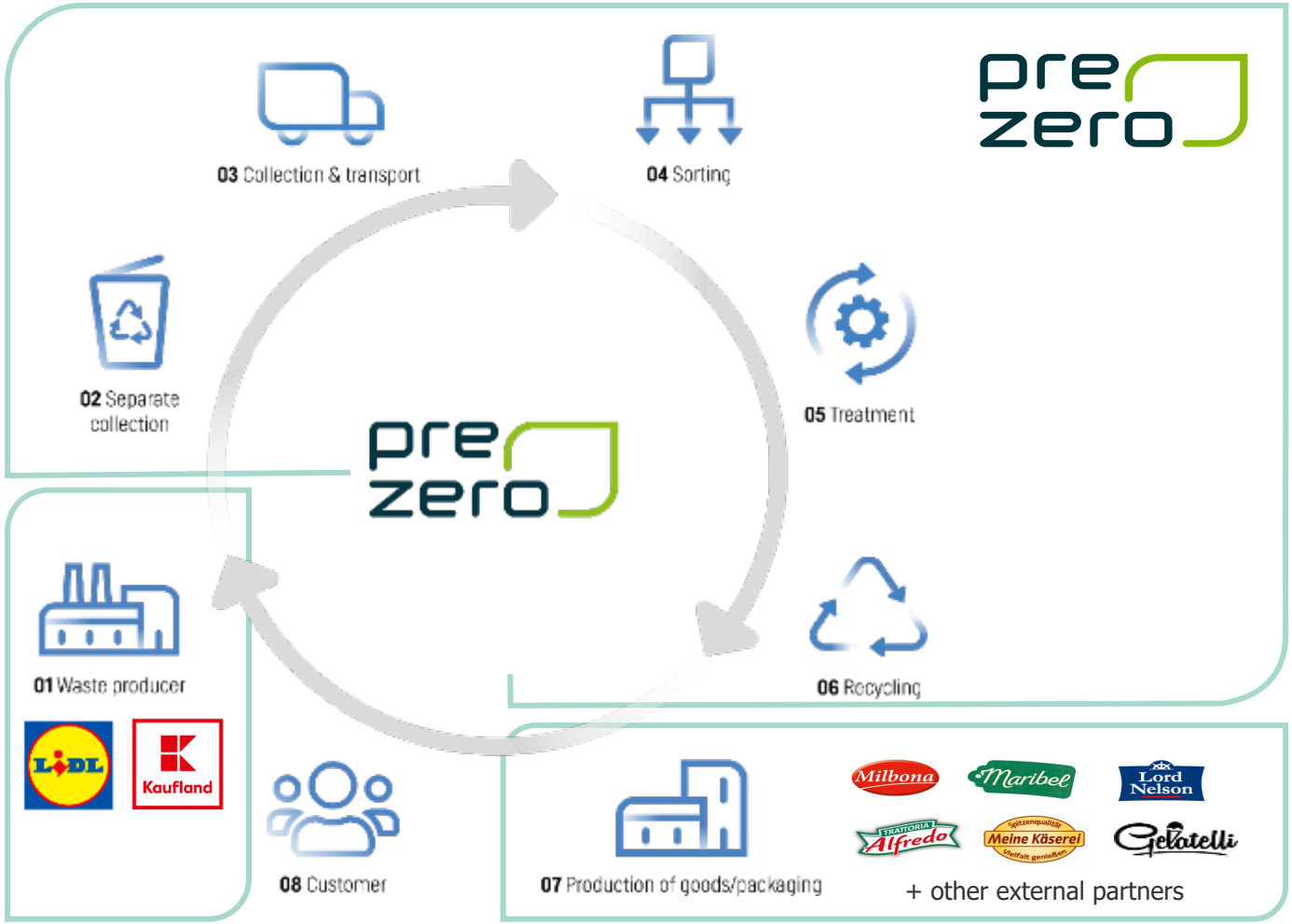
New thinking in a circular economy

...from a recyclable product

- via retail
- via collection,
- via sorting and recycling,
- via production of high quality recyclates,

- **to a new recyclable product.**

Unique within a company group



LWP sorting facility Eitting

Facts & Figures

around 10 months construction time

120k tons sorting capacity

18 different fractions

- LDPE film transparent + light
- HDPE nature/white + colored
- PP nature/white + colored
- Mixed film
- PP Flex
- MPO Flex
- Mixed PET
- PET tray
- Polysterol
- KEG (Plastics for energy recovery)
- Tin plate
- Aluminum
- Beverage carton
- Paper
- Sorting residues

LWP sorting facility Eitting

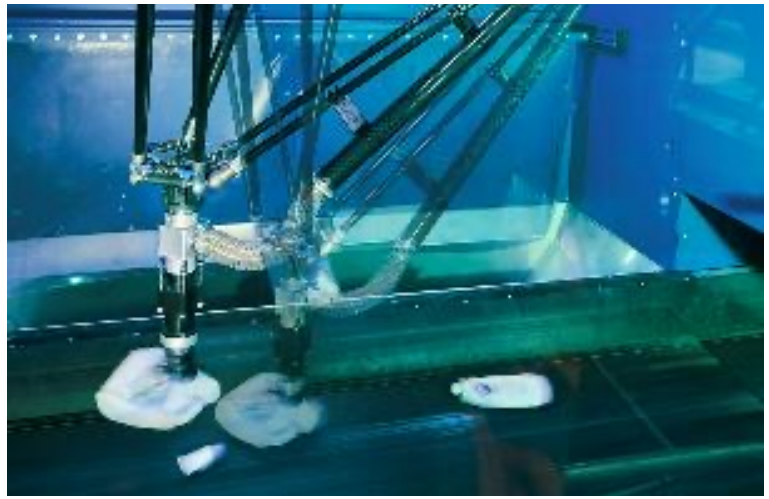
Modern sorting technology

38 NIR* separators

Black Scans

Identification of black plastics
(cannot be identified by standard NIR)

1 sorting robot



Sorting robot

of the **newest generation** based on **Artificial Intelligence**

272 conveyor belts

Innovative technology

color sorting of films and 3D-materials and mostly **abandonment of manual sorting**

*NIR = Near-infrared

New thinking for a
cleaner tomorrow.