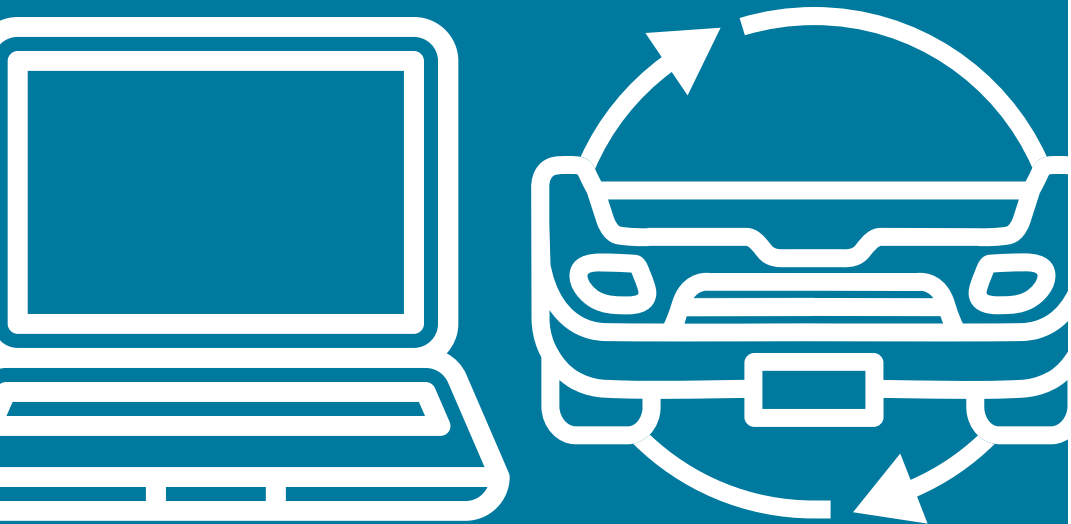


RecyClass Unwrapped

How to boost recyclability for
Automotive and Electrical &
Electronic appliances?

12 February 2025



RecyClass

Meet our speakers



Augusto Bruno, Technical Manager
Plastics Recyclers Europe



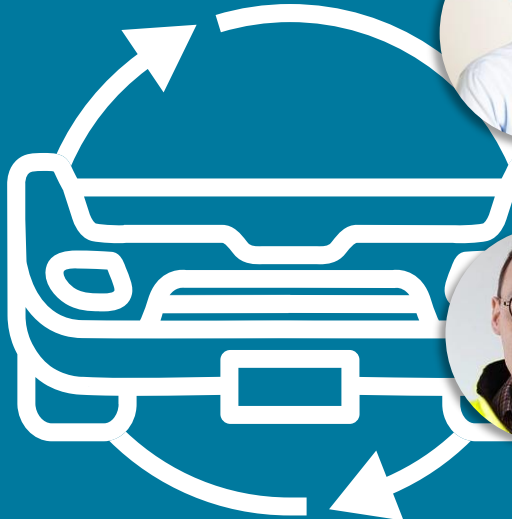
Leonardo Forner, Group Marketing & Sustainability
Coordinator
Sirmax



Ignacio Buezas Sierra, Business Development Manager
Elix Polymers

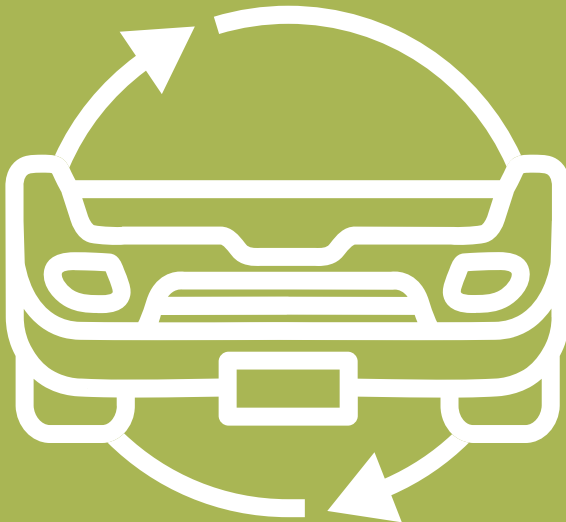
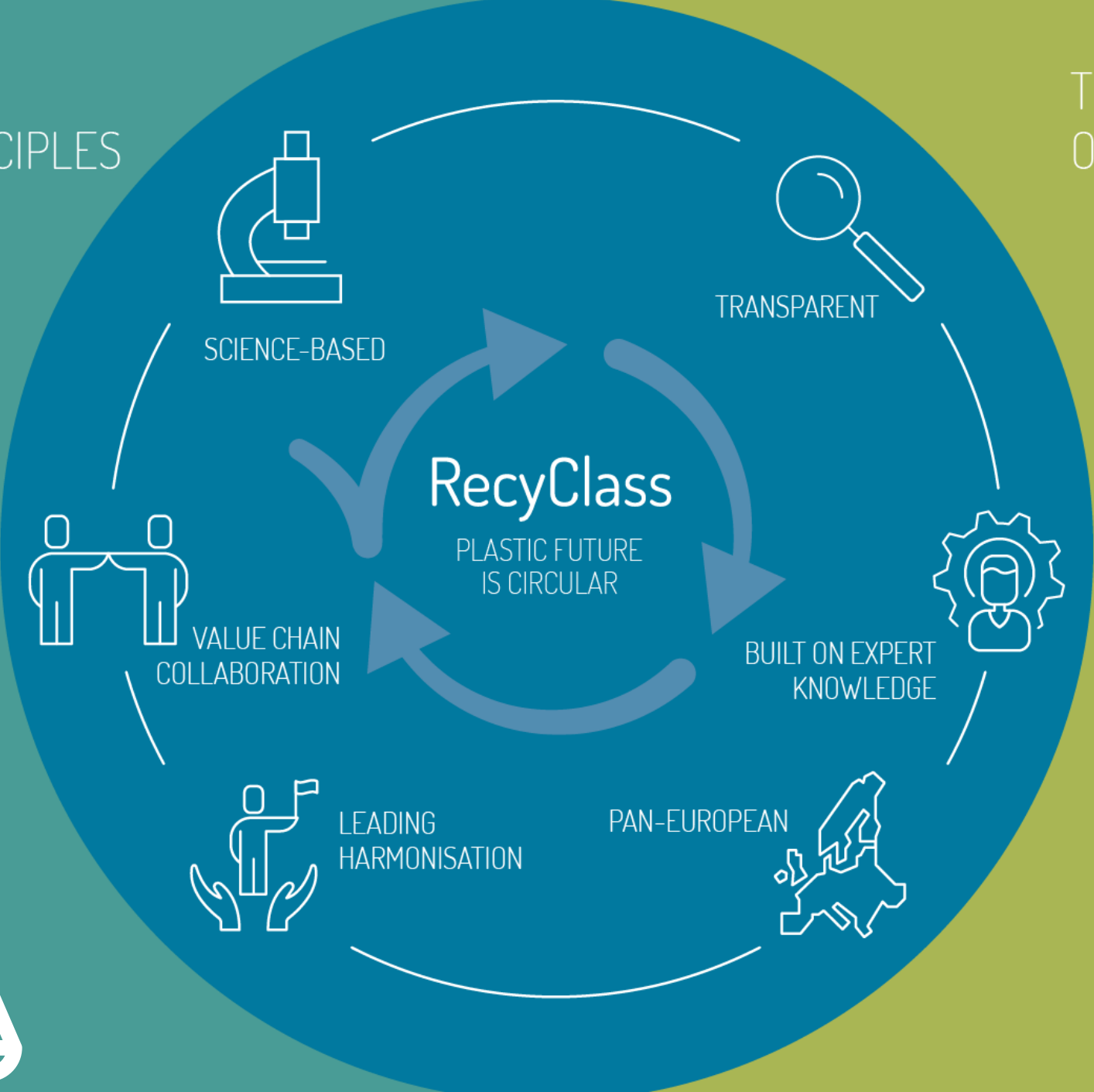


The session is moderated by
Tom Caris, Manager Engineering and
Business Development
Coolrec BV



HARMONISATION OF
RECYCLABILITY PRINCIPLES

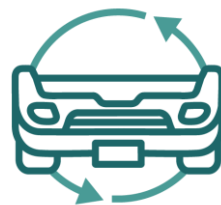
TRANSPARENT USE
OF RECYCLED CONTENT



RecyClass | AUTOMOTIVE & EEE TECHNICAL COMMITTEE

RECYCLASS MEMBERS ADVANCING CIRCULAR SOLUTIONS FOR TECHNICAL PLASTICS

VALUE CHAIN COLLABORATION



RecyClass | HOW DOES RECYCLASS WORK?

TESTING PROTOCOLS



= ?



- **Lab testing** of innovative plastic products vs control material
- Comparison of properties
- **Outcome: Recyclability Approval**

DESIGN FOR RECYCLING GUIDELINES

RecyClass Coloured HDPE Containers and Tubes

TEST	TEST METHOD	TEST RESULT	TEST METHOD	TEST RESULT
1.1	1.1.1	1.1.1.1	1.1.2	1.1.2.1
1.2	1.2.1	1.2.1.1	1.2.2	1.2.2.1
1.3	1.3.1	1.3.1.1	1.3.2	1.3.2.1
1.4	1.4.1	1.4.1.1	1.4.2	1.4.2.1
1.5	1.5.1	1.5.1.1	1.5.2	1.5.2.1
1.6	1.6.1	1.6.1.1	1.6.2	1.6.2.1
1.7	1.7.1	1.7.1.1	1.7.2	1.7.2.1
1.8	1.8.1	1.8.1.1	1.8.2	1.8.2.1
1.9	1.9.1	1.9.1.1	1.9.2	1.9.2.1
1.10	1.10.1	1.10.1.1	1.10.2	1.10.2.1
1.11	1.11.1	1.11.1.1	1.11.2	1.11.2.1
1.12	1.12.1	1.12.1.1	1.12.2	1.12.2.1
1.13	1.13.1	1.13.1.1	1.13.2	1.13.2.1
1.14	1.14.1	1.14.1.1	1.14.2	1.14.2.1
1.15	1.15.1	1.15.1.1	1.15.2	1.15.2.1
1.16	1.16.1	1.16.1.1	1.16.2	1.16.2.1
1.17	1.17.1	1.17.1.1	1.17.2	1.17.2.1
1.18	1.18.1	1.18.1.1	1.18.2	1.18.2.1
1.19	1.19.1	1.19.1.1	1.19.2	1.19.2.1
1.20	1.20.1	1.20.1.1	1.20.2	1.20.2.1

- Design guide & recommendations for plastic products
- Design for Recycling (DfR) Guidelines transposed in the Online Tool

RECYCLABILITY METHODOLOGY



- Recyclability Self-Assessment with the **RecyClass Online Tool**
- Assessing **overall recyclability** of a finished product
- RecyClass Team support
- **Recyclability Certification**

RecyClass | HOW DOES RECYCLASS WORK?

TESTING PROTOCOLS



= ?



- **Lab testing** of innovative plastic products vs control material
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DESIGN FOR RECYCLING GUIDELINES

[illegible]

- Design guide & recommendations for plastic products
- Design for Recycling (DfR) Guidelines transposed in the Online Tool
- Assessing **overall recyclability** of a finished product

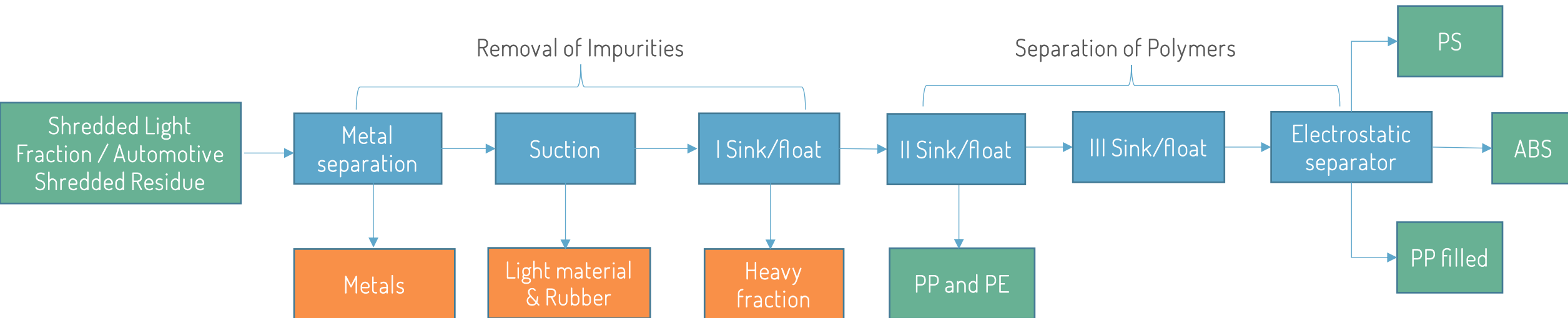
RECYCLABILITY METHODOLOGY



- Recyclability Self-Assessment with the **RecyClass Online Tool**
- RecyClass Team support
- **Recyclability Certification**

The plastic recycling process for ELV and WEEE consists of two major phases:

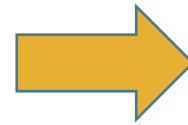
- ▶ Removal of impurities (metals, light materials, and rubbers)
- ▶ Plastics are separated into different polymer categories: PP, PP+filler, PE, ABS, and PS



RecyClass | PLASTICS RECYCLED TODAY



Automotive Shredded
Residue



PP filled

PP

PP+TPE

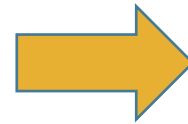
ABS

PE

PC



Shredded Light
Fraction EEE



PP
filled

PS

ABS

PC-
ABS

PE

PP

PC

RecyClass | PROTOCOL DEFINITION

TESTING PROTOCOLS



= ?



- **Lab testing** of innovative plastic products vs control material
- Comparison of properties
- **Outcome: Recyclability Approval**

OBJECTIVES AUTOMOTIVE :

Develop Recyclability Protocol:

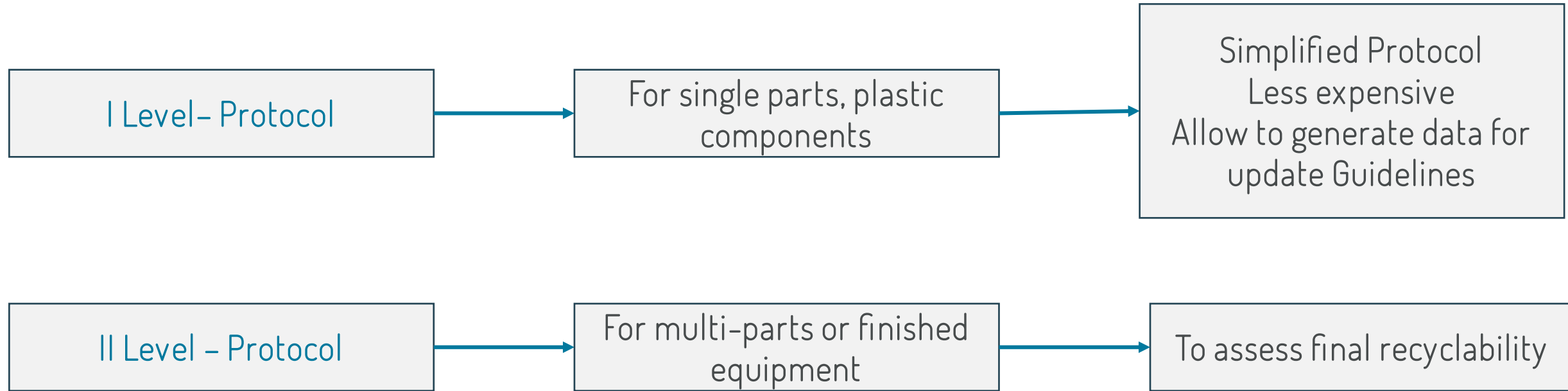
- ☐ Polypropylene
- ☐ Polypropylene + Fillers
- ☐ ABS
- ☐ PE
- ☐ PC-ABS
- ☐ PC

OBJECTIVES EEE :

Develop Recyclability Protocol:

- ☐ Polystyrene (PS)
- ☐ ABS
- ☐ Polypropylene
- ☐ Polypropylene + Fillers
- ☐ PE
- ☐ PC-ABS
- ☐ PC

RecyClass | PROTOCOL DEFINITION



Protocols are expected to be released in the second semester of 2025

RecyClass | HOW DOES RECYCLASS WORK?

TESTING PROTOCOLS



= ?



- **Lab testing** of innovative plastic products vs control material
- Comparison of properties
- **Outcome: Recyclability Approval**

DESIGN FOR RECYCLING GUIDELINES

[illegible]

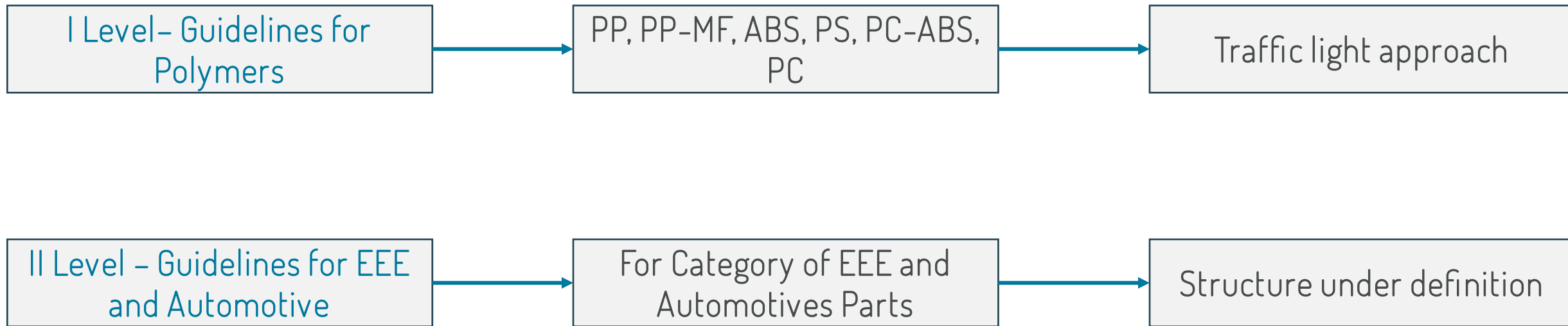
- Design guide & recommendations for plastic products
- Design for Recycling (DfR) Guidelines transposed in the Online Tool
- Assessing **overall recyclability** of a finished product

RECYCLABILITY METHODOLOGY



- Recyclability Self-Assessment with the **RecyClass Online Tool**
- RecyClass Team support
- **Recyclability Certification**

RecyClass | DfR GUIDELINES PROPOSAL



First DfR Guidelines are expected to be released in Q4 2025

A graphic consisting of four thick, light blue curved arrows arranged in a circle, pointing clockwise. The arrows are positioned around the central text, with one at the top, one on the right, one at the bottom, and one on the left.

RecyClass

PLASTICS FUTURE IS CIRCULAR

RecyClass Unwrapped

How to boost recyclability for Automotive and Electrical & Electronic appliances?

12/02/2025

Leonardo Forner – Group Marketing & Sustainability Coordinator

Agenda

- ☐ **Company overview**
- ☐ **Sirmax Circular strategy on PCR and RecyClass role**
- ☐ **Application development in automotive & home appliance markets**

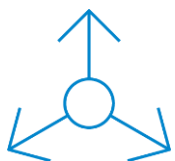
Facts and figures



Among the first 5 independent
polypropylene compounders
in the world.



Among the largest **engineering
plastics compounders**
in Europe.



3 new sustainable business lines:

Thermoplastic elastomers
Post-consumer circular polymers
Biocompounds



Sirmax around the world

EUROPE



Sirmax S.p.A. Headquarters
Cittadella, PD

PP and rPP Compounds,
R&D

50 kton/yr

ITALY



Sirmax S.p.A.
San Vito al Tagliamento, PN

EPC and rEPC Compounds,
R&D

23 kton/yr

ITALY



Sirmax S.p.A.
Isola Vicentina, VI

Logistics Hub

ITALY



Sirmax S.p.A.
Tombolo, PD

EPC and rEPC Compounds

35 kton/yr

ITALY



Sirmax New Life S.r.l.
Salsomaggiore Terme, PR

rPP rHDPE Polymers,
R&D

35 kton/yr

ITALY



Sirmax S.p.A.
Mellaredo di Pianiga, VE

Biocompounds,
R&D

24 kton/yr

ITALY



Sirmax Polska Sp. z o.o.
Kutno 1, Łódź

PP and rPP Compounds

85 kton/yr

POLAND



Sirmax Polska Sp. z o.o.
Kutno 2, Łódź

PP, TPE, EPC
and rTPE Compounds, R&D

30 kton/yr

POLAND

AMERICAS



Sirmax North America Inc.
Anderson, IN

PP and rPP Compounds,
R&D

48 kton/yr

USA



Sirmax North America Inc.
Anderson, IN

rPP Polymers

18 kton/yr

USA



Sirmax do Brasil Ltda
São Paulo, Jundiaí

PP Compounds

15 kton/yr

BRASIL

ASIA

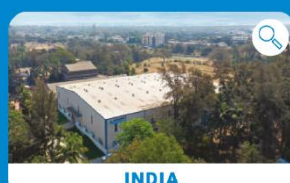


Autotech-Sirmax India Pvt Ltd
Palwal, Haryana

PP Compounds,

27 kton/yr

INDIA



Autotech-Sirmax India Pvt Ltd
Valsad, Gujarat

PP, EPC Compounds,
R&D

20 kton/yr

INDIA



Autotech-Sirmax India Pvt Ltd
Hosur, Tamil Nadu

New plant by 2026

INDIA

Green Materials
Production Plant

Research &
Development Centers

Production
capacity

A broad and sustainable product portfolio

Assets



61 production and
13 R&D extruders

Partners



6 universities

Global presence



2000+ customers in
52 Countries

R&D Laboratories



7 R&D Centers



Core Business

Polyolefin
Compounds



Engineering and
Styrenic Compounds



Growth options

Thermoplastic
Elastomers



Circular
Solutions



Bio
Solutions



Fields of application



Automotive



Home
Appliance



Electrical &
Electronics



Building &
Construction



Furniture



Sport &
Leisure



Power
Tools



Packaging



Gardening
& Agriculture



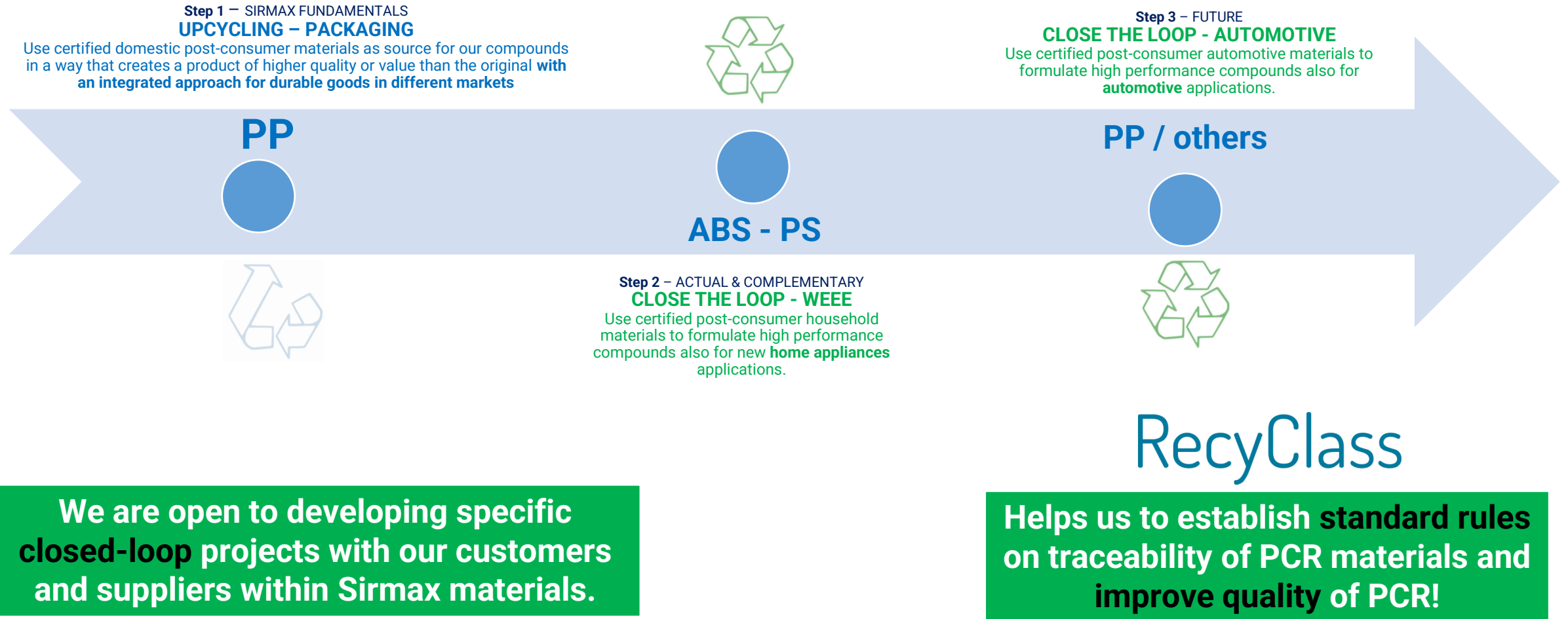
SIRMAX GROUP CIRCULAR PRODUCTS STRATEGY

Circular Product Strategy: our vertical integration ensures certified quality and traceability












Our annual capacity of green compound (with 30% recycled material) is around 150kton.

Sirmax strategy on PCR materials



How Sirmax is enhancing its capabilities on PCR with “Aurora Project”

Initiatives	Status / Challenge	Goal	C.O.E.
<div>1</div> <div>SORTING</div> 	<div>From critical separation of films...</div> <ul style="list-style-type: none"> • Ineffective direct separation of flexible film. 	<div>...to accurate sorting</div> <ul style="list-style-type: none"> • Hyperspectral analysis and deep learning algorithms. 	
<div>2</div> <div>WASHING</div> 	<div>From perceptible odor...</div> <ul style="list-style-type: none"> • High contamination of volatile organic compounds (VOC), ink, adhesives. 	<div>...to partner supporting its selection</div> <ul style="list-style-type: none"> • Optimized washing with new technologies including deinking. 	
<div>3</div> <div>COMPOUNDING</div> 	<div>From «basic» rPP...</div> <ul style="list-style-type: none"> • Limited mechanical properties and critical emissions. 	<div>...to high quality PP compound</div> <ul style="list-style-type: none"> • New technologies on compatibilization and compounding. 	
<div>4</div> <div>MOLDING</div> 	<div>From the difficulty of molding rPP...</div> <ul style="list-style-type: none"> • Frequent setups of the process due to rPP properties variations. 	<div>...to an efficient and robust molding</div> <ul style="list-style-type: none"> • Robust design of parts and molds. • Part quality insensitive to material properties variations. 	 

How RecyClass can help us boosting our strategy on PCR materials

TOOL

RecyClass

PURPOSE



BENEFITS FOR INDUSTRY PLAYERS

SIRMAX®

Guidelines for materials traceability



Improve transparency and prevent frauds



Ensure transparency to customers and end users

Guidelines for recyclability on packaging (ex. PPWR)



Improve recycling rate and quality of output



Quality constancy, improved performances, less costs

Guidelines for recyclability on WEEE and Automotive



Improve recycling rate and quality of output



Increase market availability, improved performances



Evaluation of new recycling technologies



On the other hand, the role of EU legislation remains strategic to stimulate demand and investment in new technologies.



MARKET APPLICATIONS EXAMPLES

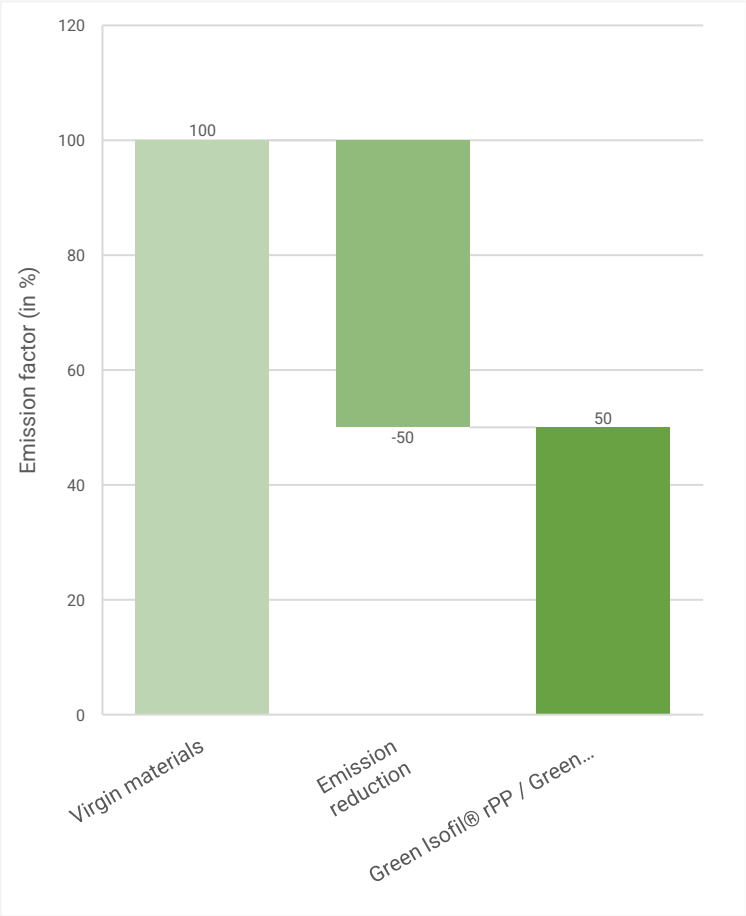
Coffee Machine Chassis & Aesthetical parts – rPP and rABS compounds

How to replace virgin material to green – including closed loop

NAME	GREEN ISOFIL® CUSTOM GRADE	GREEN ISOTER® CUSTOM GRADE
DESCRIPTION	Talc filled polypropylene. Heat stabilized. Black colour.	ABS Compound. UV stabilized. Black colour.
RECYCLED CONTENT	45% of total formula	70% of total formula
SOURCE	Post-consumer from municipal waste	Post-consumer from WEEE – Closed Loop



Emissions Reduction*



*LCA study based on ISO 14040 conducted with University of Padua [2019]. Single data available on customer request.

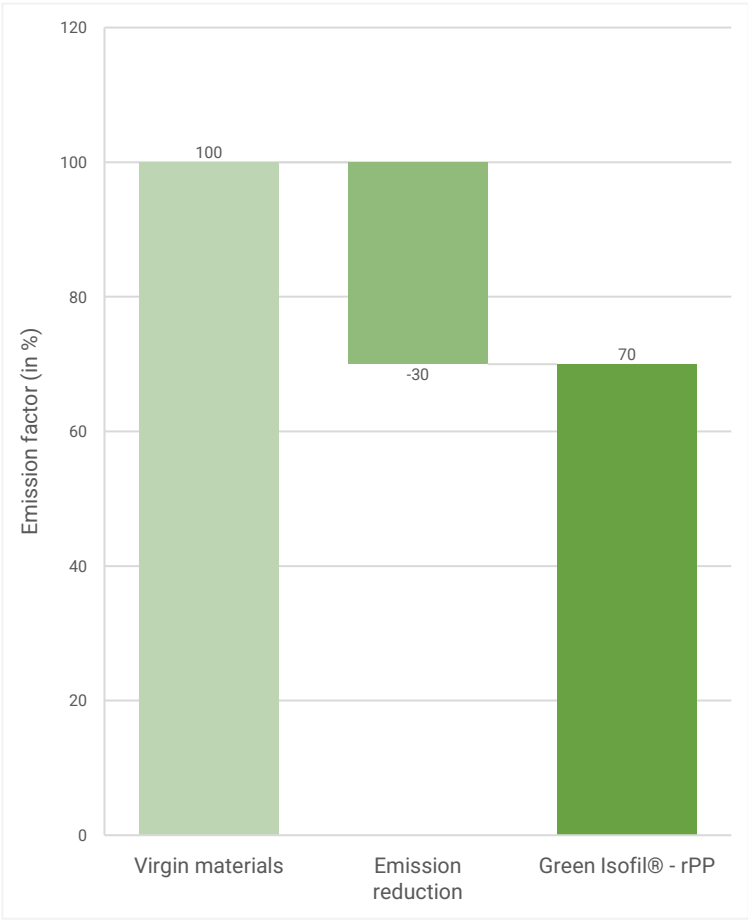
Automotive Door Panel – rPP

How to replace virgin material to green

NAME	GREEN ISOFIL® CUSTOM OEM GRADE
DESCRIPTION	Talc filled copolymer polypropylene. UV stabilized. Scratch Resistant. Black colour.
RECYCLED CONTENT	30% on total formula
SOURCE	Post-consumer from municipal waste



Emissions Reduction*



*LCA study based on ISO 14040 conducted with University of Padua [2019]. Single CFP data available on customer request.

Sirmax has certified UL YC HB green compounds

Component - Plastics **GREEN ISOFIL HK (ff) (tt)(g)(g)(k)** Yellow Card™

GREEN ISOFIL HK (ff) (tt)(g)(g)(k)

Polypropylene (PP), Recycled, furnished as pellets [contains mechanically recycled content]

Color	Min. Thk (mm)	Flame Class	HWI	HAI	RTI Elec (°C)	RTI Imp (°C)	RTI Str (°C)
ALL	1.2	HB	-	-	65	65	65
	3.0	HB	-	-	65	65	65

Comparative Tracking Index (CTI): -
Dielectric Strength (kV/mm): -
High-Voltage Arc Tracking Rate (HVTR): -
Dimensional Change (%): -
Inclined Plane Tracking (IPT) kV: -
Volume Resistivity (10^x ohm-cm): -
Surface Resistivity (10^x ohms/square): -
High Volt, Low Current Arc Resis (D495): -

(ff) - Represents two digit numbers denoting total mineral filler content (talc or calcium carbonate) from 1% to 50% by weight, except grade GREEN ISOFIL HK 20 T (g)(g)(k) on a separate Yellow card

(g) - one letter or digit denoting manufacturing process

(k) - represents one digit number 0, 1 or 2

(tt) - represents one Letter T or C denoting the type of mineral filler

Component - Plastics **GREEN ISOGLASS H (nn)(g) (rr)(g)(k)** Yellow Card™

GREEN ISOGLASS H (nn)(g) (rr)(g)(k)

Polypropylene (PP), Recycled, furnished as pellets [contains mechanically recycled content]

Color	Min. Thk (mm)	Flame Class	HWI	HAI	RTI Elec (°C)	RTI Imp (°C)	RTI Str (°C)
ALL	1.2	HB	-	-	65	65	65
	3.0	HB	-	-	65	65	65

Comparative Tracking Index (CTI): -
Dielectric Strength (kV/mm): -
High-Voltage Arc Tracking Rate (HVTR): -
Dimensional Change (%): -
Inclined Plane Tracking (IPT) kV: -
Volume Resistivity (10^x ohm-cm): -
Surface Resistivity (10^x ohms/square): -
High Volt, Low Current Arc Resis (D495): -

(g) - one letter or digit denoting manufacturing process

(k) - represents one digit number 0, 1 or 2

(nn) - one digit number or letter denoting the ratio between glass fiber and talc

(rr) - two digit number from 01 to 10 denoting total glass-fiber and talc content from 5% to 50% by weight

✓ **Recycled content: 10-99%** ✓ **Fillers:**

✓ **All colors**

Unfilled;
Talc (max 50%);
Carbonate (max 50%);
Glass fiber (max 50%);
Mixed glass fiber/talc (max 50%)

Component - Plastics **GREEN ISOTER (p) (b)** Yellow Card™

GREEN ISOTER (p) (b)

Acrylonitrile Butadiene Styrene (ABS), furnished as pellets [contains mechanically recycled content]

Color	Min. Thk (mm)	Flame Class	HWI	HAI	RTI Elec (°C)	RTI Imp (°C)	RTI Str (°C)
ALL	1.5	HB	-	-	60	60	60
	3.0	HB	-	-	60	60	60

Comparative Tracking Index (CTI): -
Dielectric Strength (kV/mm): -
High-Voltage Arc Tracking Rate (HVTR): -
Dimensional Change (%): -
Inclined Plane Tracking (IPT) kV: -
Volume Resistivity (10^x ohm-cm): -
Surface Resistivity (10^x ohms/square): -
High Volt, Low Current Arc Resis (D495): -

(b) - denotes color code of product

(p) - optional marking consisting of a code from 1 to 4 letters or numbers or alphanumeric referring to manufacturing process information

✓ **Recycled PCR & PIR (Pre-consumer) content: 10-99%**

✓ **HB at 1.5 mm and 3.0 mm**

✓ **All colors**



Closing remarks

Looking ahead, we recognize that the future of recycled materials depends on **regulatory frameworks, technological advancements, and industry-wide cooperation.**

EU regulations on recycled content will further drive demand and **investments in new recycling technologies.**

We at Sirmax are **continuously expanding** our green material portfolio, ensuring we stay ahead of evolving **sustainability goals.**

By working with partners like **RecyClass**, we are building a **circular future** where PCR materials are the standard, not the exception.

Let's work together!



THANK YOU

For more information
lforner@sirmax.com
Sirmax.com



How to boost recyclability for Automotive and Electrical & Electronic appliances?

Ignacio Buezas

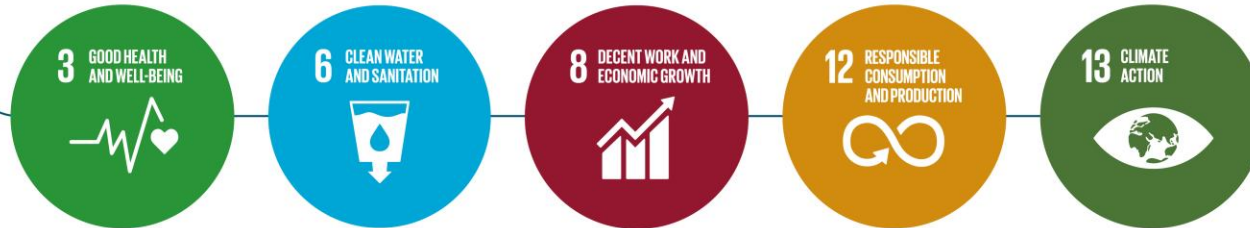
ELIX POLYMERS:

CIRCULAR ECONOMY STRATEGY

Committed to a sustainable future

Our sustainability strategy contributes to the achievement of the sustainable development goals included in the **United Nations 2030 agenda**.

KEY SDGS FOR ELIX



RELEVANT SDGS FOR ELIX & SECTOR



3 AREAS OF OPERATIONAL ACTION



E-LOOP

Circular plastics
Responsible innovation



SUSTAINABLE OPERATIONS

Climate care
Sustainable supply chain



SOCIAL RESPONSIBILITY

Employee development
Governance and ethics
Support for the local community

ELIX Circular Plastics Strategy



MISSION

- / To offer top-of-the-line sustainable solutions in our markets, promoting the transformation of the value chain towards a circular economy model.



VISION

- / To be a driving force of the new plastics economy, participating in the redefinition of plastic waste as raw material.
- / To support an ecosystem of collaboration with companies who have common goals.



COMMITMENT

- / To establish collaborations for developing new business models, including opportunities stemming from our membership of Styrenics Circular Solutions
- / To offer innovative up-cycling solutions which preserve functionality in final customer applications in our ABS markets.



E-LOOP

Let's close the loop

Identical as virgin

Equivalent properties



ELIX ABS CR
Chemically Recycled
/ Biobased ABS



Auto Injection
Devices



Respiratory
Devices



Infusion
Systems

E-LOOP CR

E-LOOP MR



ELIX ABS blends MR
Mechanically Recycled



ISCC+ CR sustainable ABS

E.g. Bio-circular P2H-AT CR50,
Biocompatible ABS M203FC CR50,
FOOD CONTACT GRADES, ABS/PC CR, PC/ABS CR etc..

Mechanical recycled grades:

E.g. ELIX ABS/PC H801 MR
ELIX PC/ABS 5120 MR,
ELIX PC/ABS 5130 MR,
ELIX P2H-AT MR black etc..

RECYCLASS:

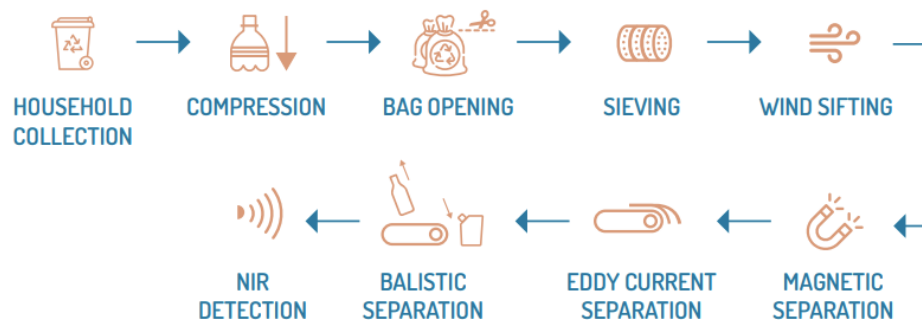
CERTIFICATION SCHEME & BENEFITS

RECYCLASS SCHEMES

RECYCLABILITY

- DESIGN FOR RECYCLING GUIDELINES
- RECYCLABILITY EVALUATION PROTOCOLS

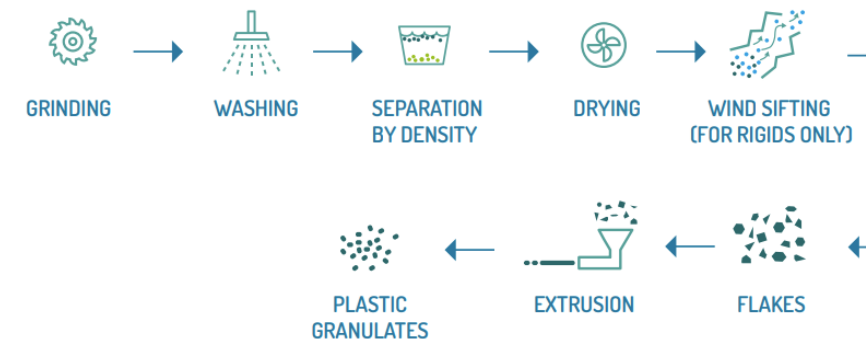
SORTING PROCESS



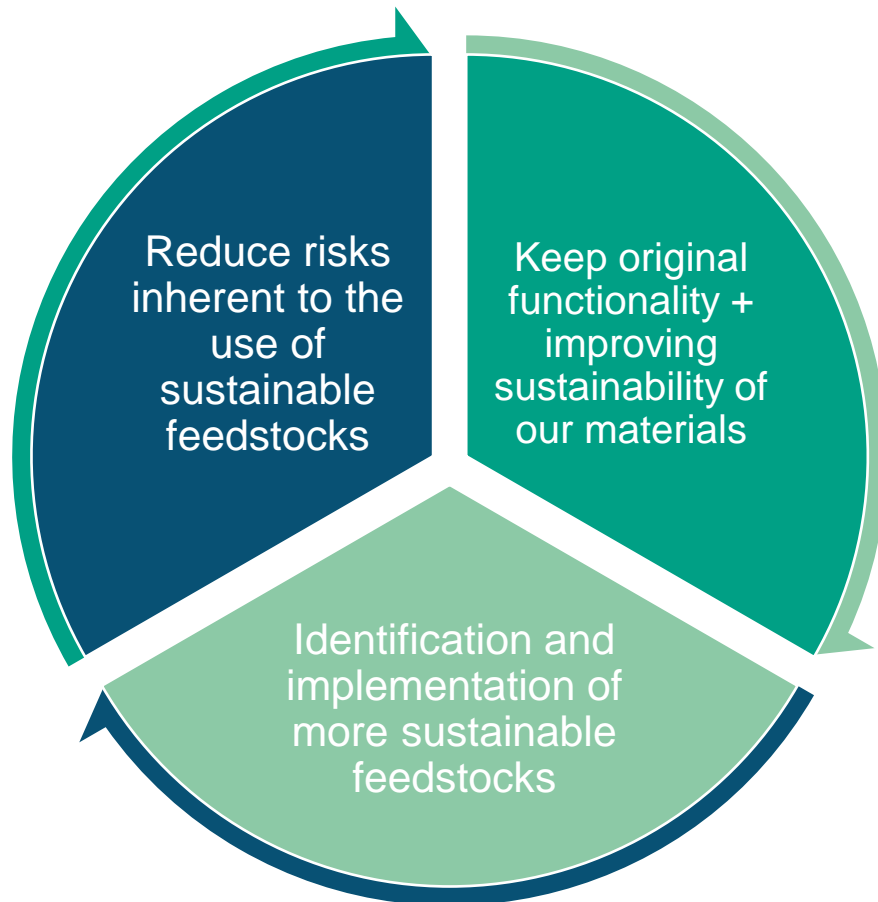
RECYCLED PLASTICS

- RECYCLING PROCESS CERTIFICATION
- RECYCLED PLASTICS TRACEABILITY CERTIFICATION

RECYCLING PROCESS



RECYCLASS BENEFITS IN CIRCULAR PLASTICS IMPLEMENTATION



RECYCLASS BENEFITS

- CONSOLIDATED EXPERIENCE FROM PACKAGING INDUSTRY.
- STATE OF THE ART RECYCLING PROCESSES.
- DEDICATED RULES FOR EACH POLYMER.
- HARMONIZATION OF STANDARDS & PROCESSES.

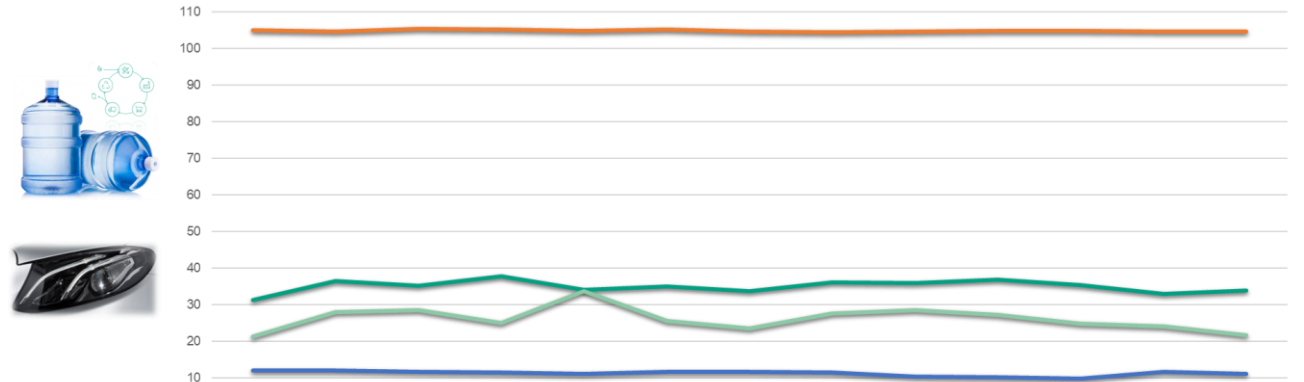
RECYCLASS SCHEME BENEFITS IN CIRCULAR ECONOMY

RECYCLED PLASTICS STRATEGY IMPLEMENTATION KEY POINTS

- SELECTION OF RAW MATERIALS.
- QUALITY OF RAW MATERIALS.
- CUSTOMER & CONSUMERS CONFIDENCE IN RECYCLED PLASTICS.
- COMPLIANCE WITH REGULATIONS & GOOD PRACTICES.



E-LOOP MR LOT-TO-LOT PROPERTY STABILITY





ELIX
POLYMERS

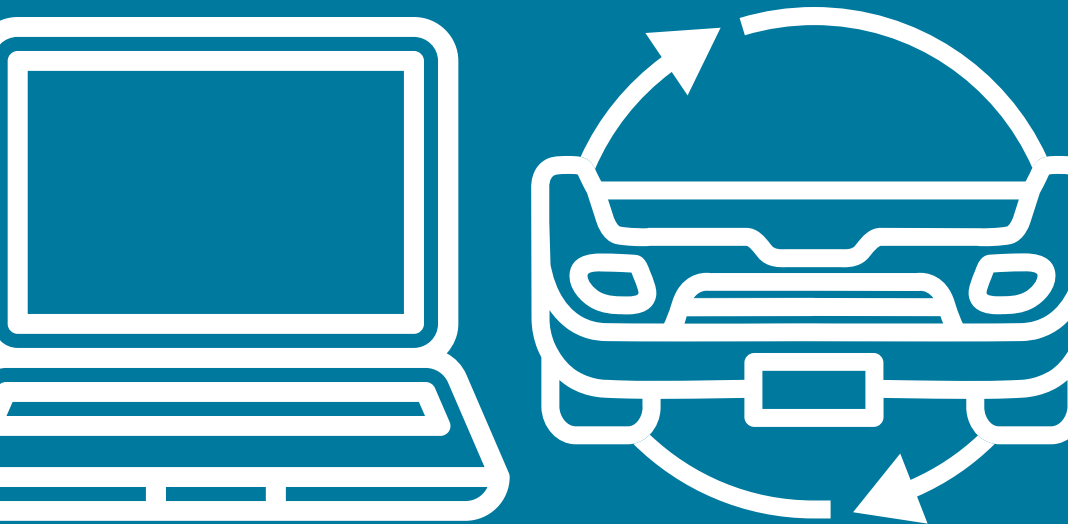
A member of
Sinochem
International

elix-polymers.com



Questions & Answers

Use the Q&A box at the top-right corner of your screen



RecyClass

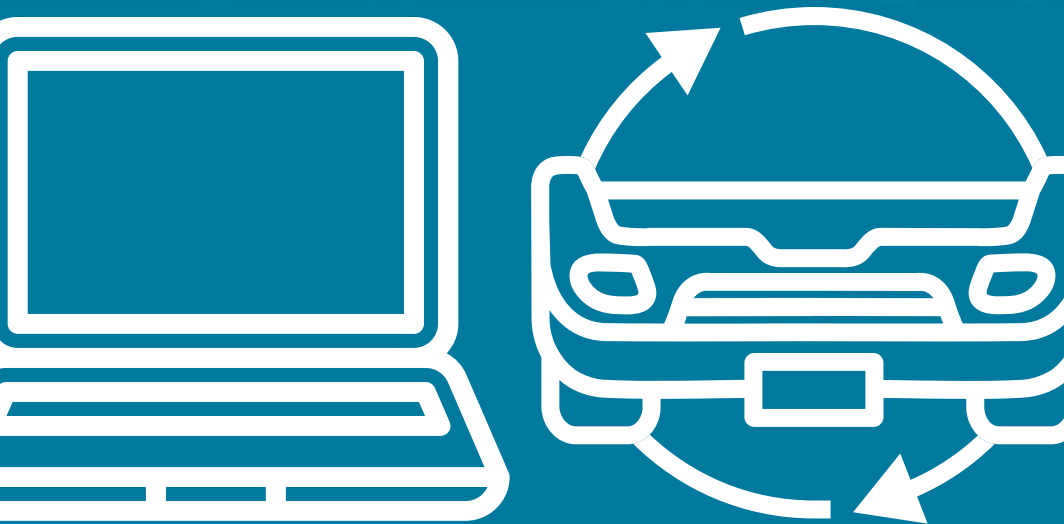


DO YOU WANT TO
CONTRIBUTE TO PLASTICS
CIRCULARITY FOR
AUTOMOTIVE AND EEE?

JOIN RECYCLASS NEW BRANCH!



RecyClass



Thank you for participating!

Save the date for the next webinar:

**29 April | RecyClass for Beginners:
Staying ahead of PPWR with RecyClass Methodology**



LEARN MORE!

Registrations will open soon

RecyClass

