STELLANTIS

Sustainable materials in automotive
Today and tomorrow strategies

November 10, 11 2021

8th edition
Smart PLASTICS

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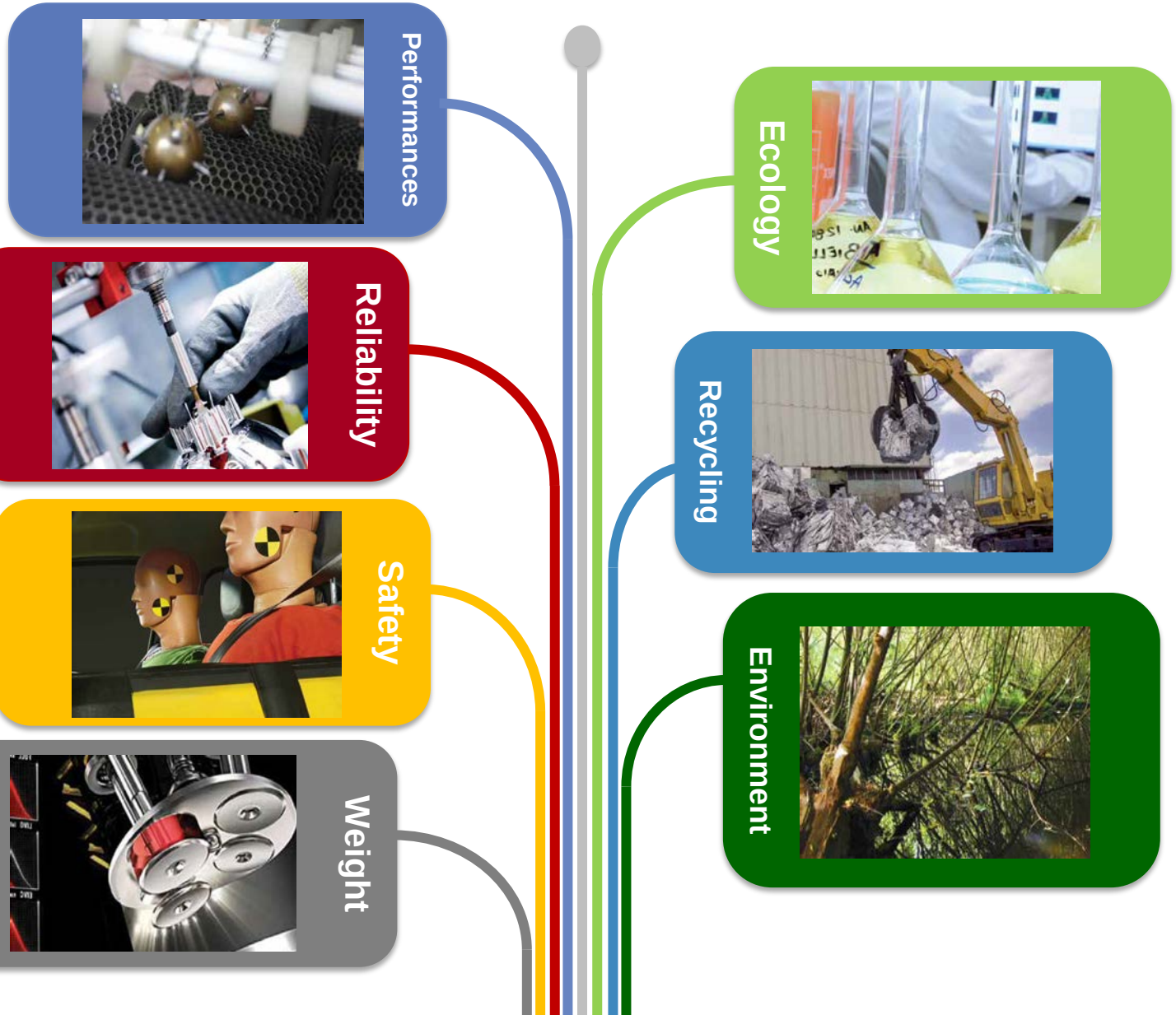
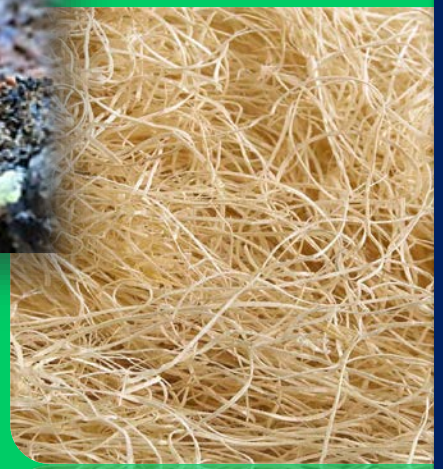
Sustainability drivers for materials selection



Strategies for sustainable polymers development

Use of bio-polymers and bio-fillers



Increase use of recycled materials

Bio-based materials

- Sustainability drivers for materials selection
- **Bio-based materials**
- Recycled materials
- Conclusions

Bio-based materials: Bio-composites and Bio-polymers

Bio-composites

- Fibers:
hemp, kenaf, flax

- Wood sources
or crop residues

- Leaf fibers: sisal
and banana fibers

Bio-polymers

- Feedstock scraps: soybean, castor bean, corn, and sugar cane.

- Fermented
- Conversion processes

The use of renewable resources to produce material is the key for:

- a **reduction of the carbon footprint** and GHG emissions of products;
- **saving fossil resources**, and for substituting them step by step;
- vehicles **weight reduction**;
- potential **cost reduction**.

Bio-based materials: Bio-fillers and Bio-polymers

- Sustainability drivers for materials selection
- **Bio-based materials: Current application**
- Recycled materials
- Conclusions

Current applications

Bio-fillers structural part:

Alfa Romeo Giulia Dashboard carrier

PP reinforced with Hemp Fibers

Density 0,98 g/cm3

Compatible with current technologies

Current applications

Bio-fillers aesthetical part:

Fiat Panda Cross Dashboard fascia

PP reinforced with Wood Fibers

Aesthetic fibers

Density 0,97 g/cm3

2K injection molded

Current applications

PC bio-based (partially derived from starch)

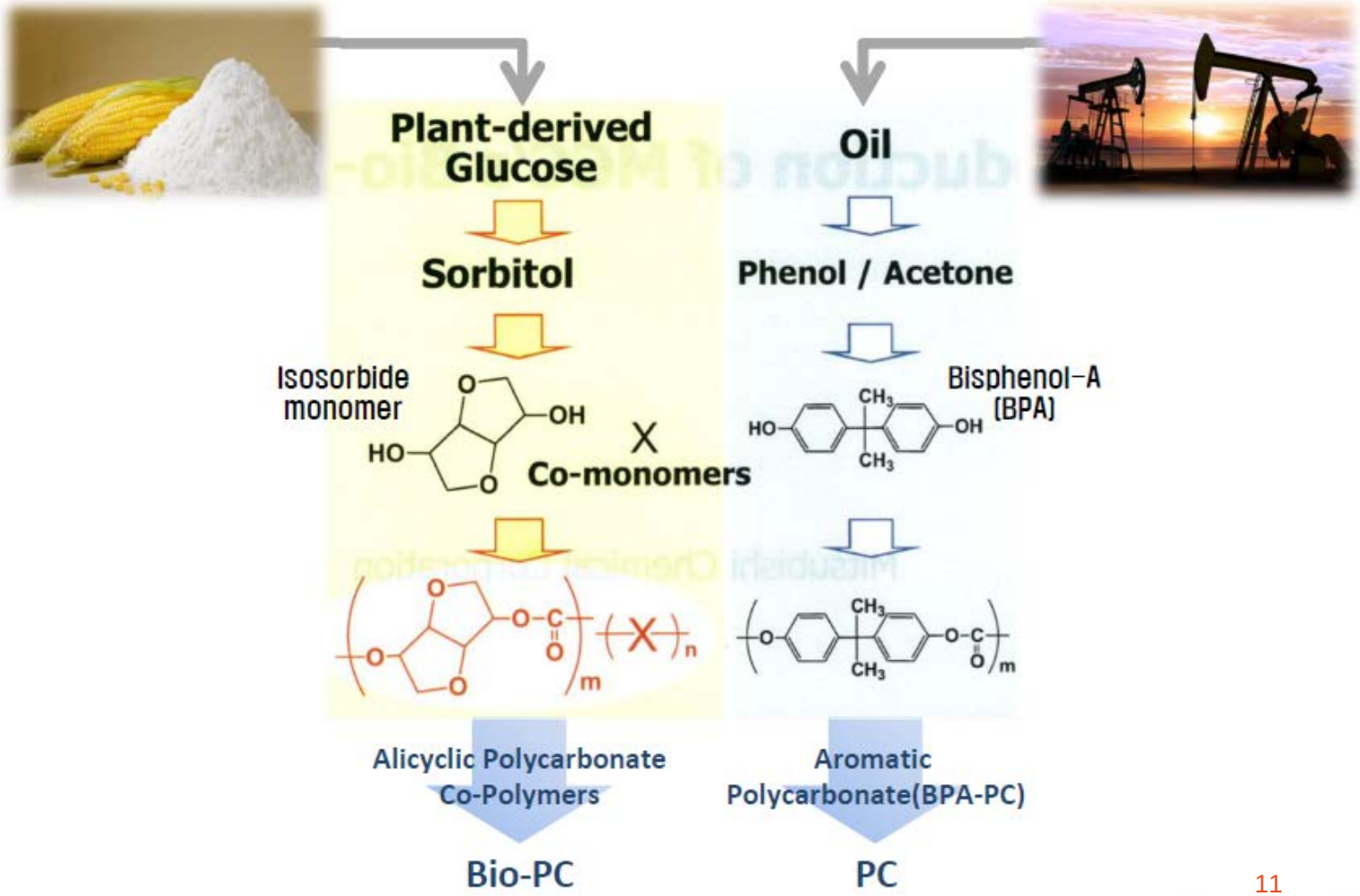
Comparable mechanical properties

Higher chemical and abrasion resistance

High aesthetic appearance

Great colorability

High UV resistance



Bio-based materials

Current applications

Bio-polymers aesthetical parts

Fiat Tipo, Fiat Professional Ducato Interior lenses

Fiat 500L radio ring

Fiat 500e key

Fiat 500e wearable key

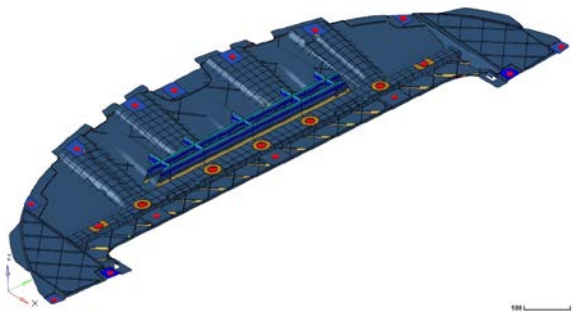
Bio-based materials

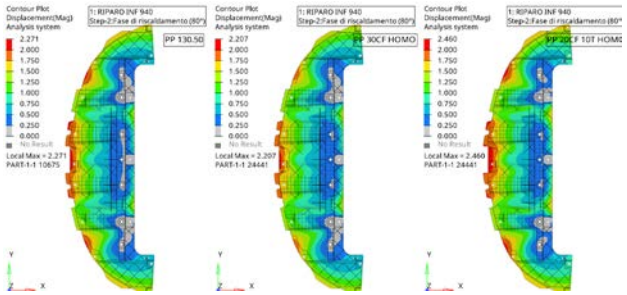
- Sustainability drivers for materials selection
- **Bio-based materials: New development**
- Recycled materials
- Conclusions

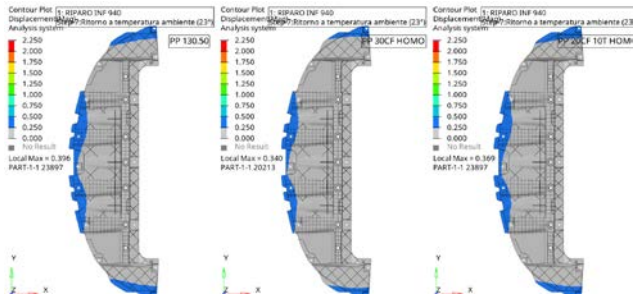
Bio-Based Materials

Aesthetic and semi-structural Cellulose based PP compounds

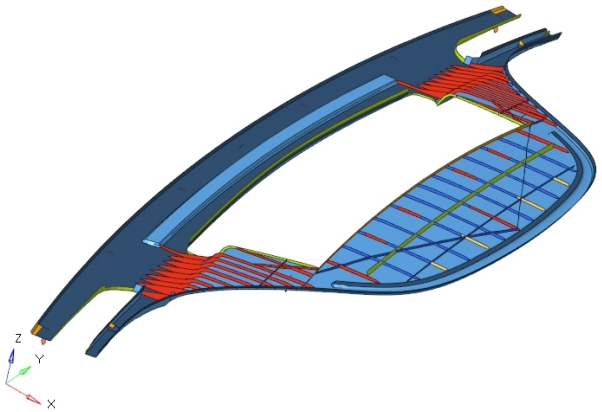
Aerodynamic central shield (Alfa Romeo Giulia)
PP H – 23% C

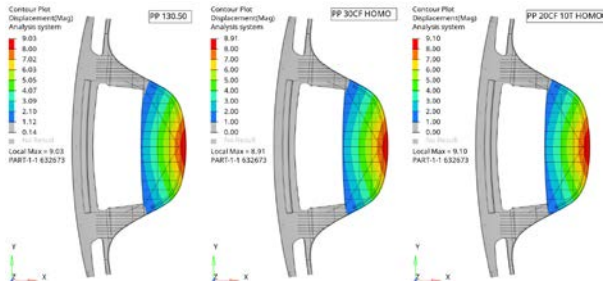


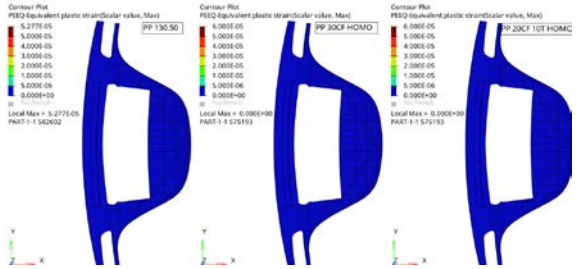




Cluster Central Instrument Panel (Lancia Y)
PP H - 20% C - 10% TD







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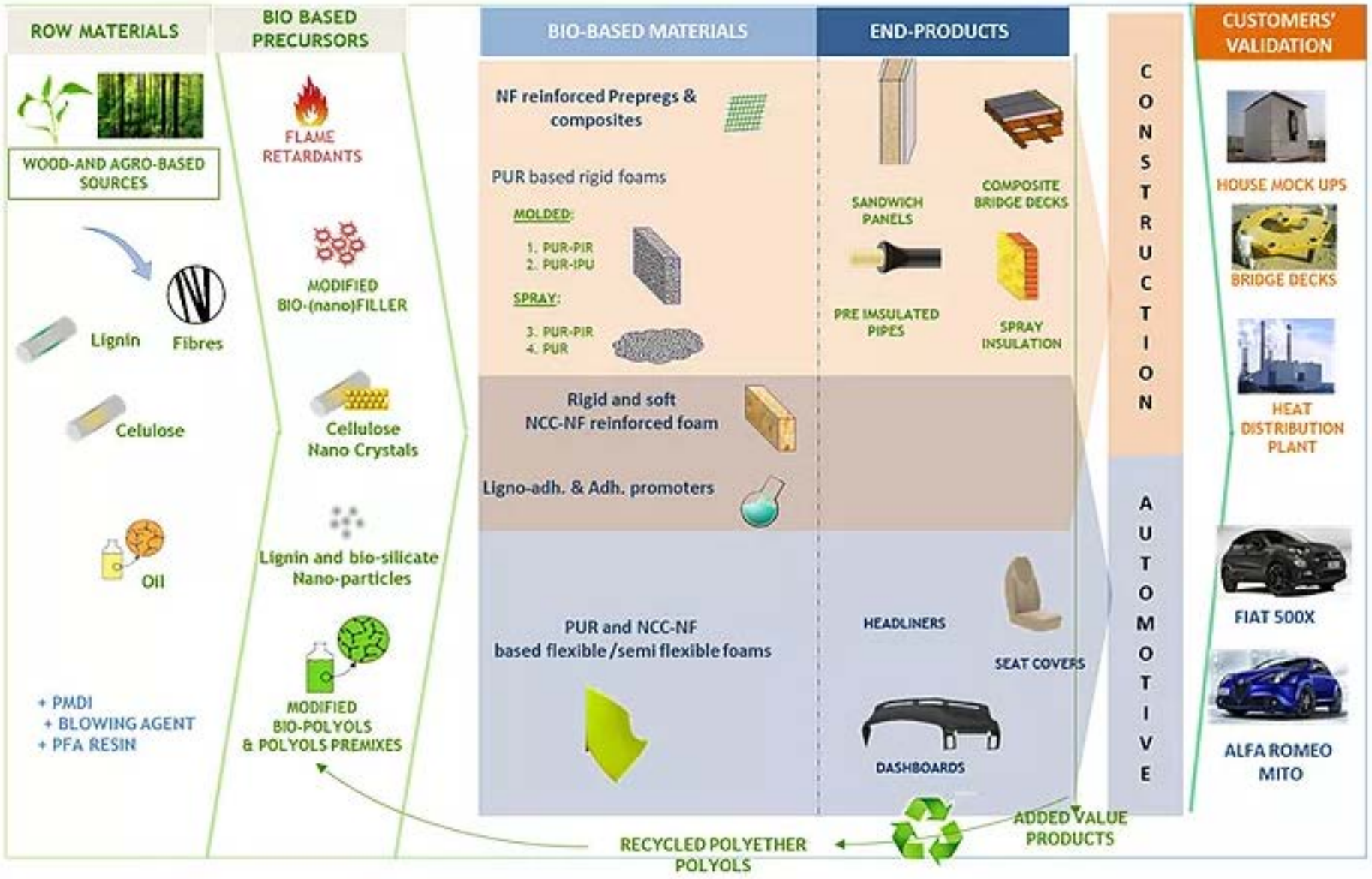
EU ReInvent Project: Bio-based PU foams



ReInvent

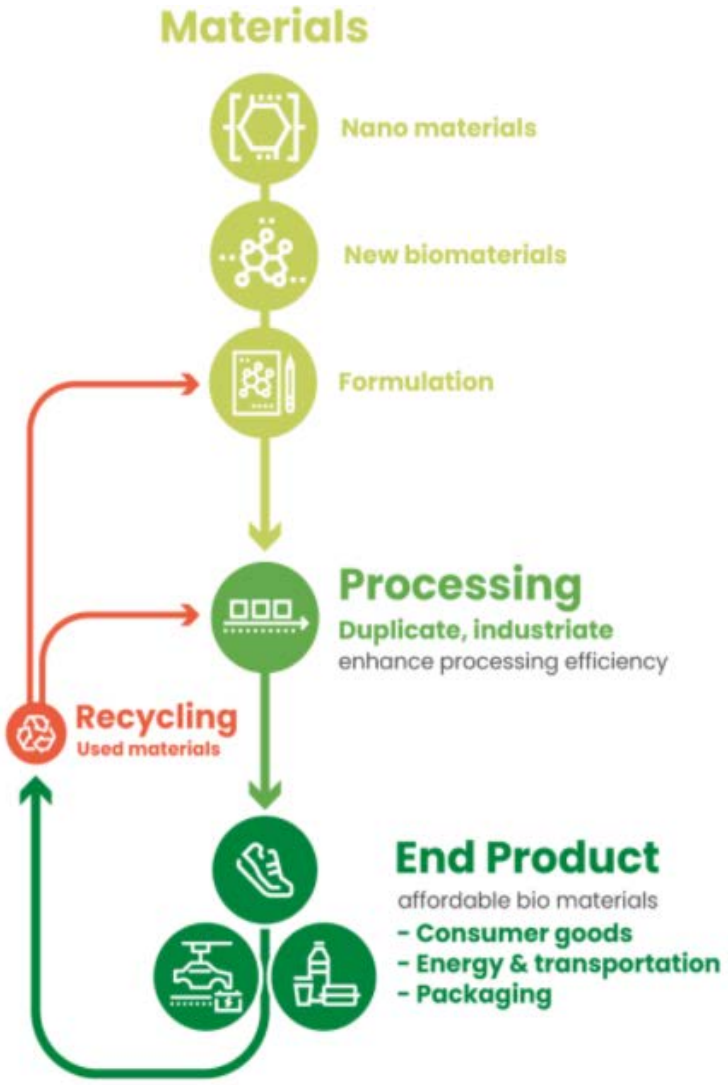
Polyols, natural cellulose fibers, nanocrystals, and bio-silica and lignin nanoparticles (NPs)

BBI JU

Bio-based Industries Consortium

Horizon 2020 European Union Funding for Research & Innovation

EU INN-PRESSME Project: Bio-based plastic for 3D printing and injection molding



Fiat 500 Dashboard fascia
Produced during BARBARA Project

Recycled materials

- Sustainability drivers for materials selection
- Bio-based materials
- **Recycled materials**
- Conclusions

Plastics recycling chains

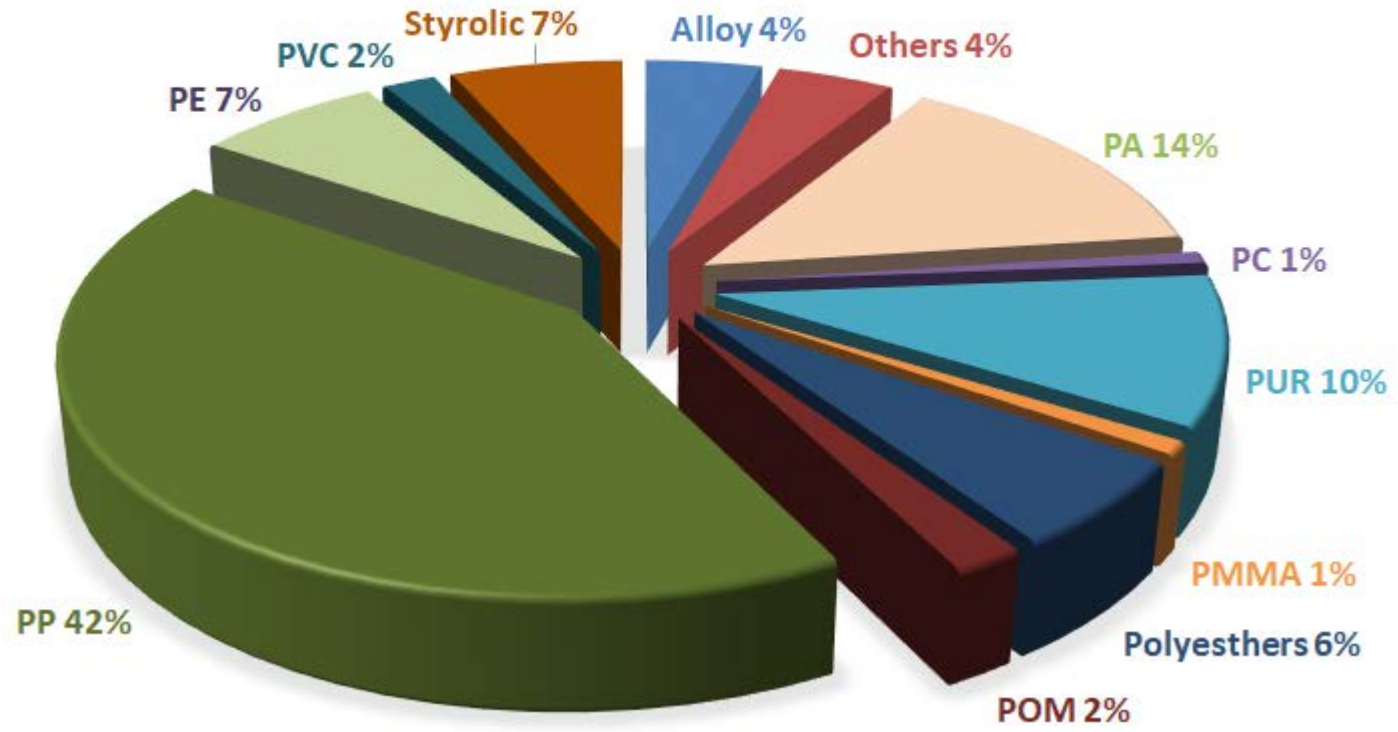
Post Industrial scraps

Post Consumer scraps

Internal scraps

End of Life plastic parts

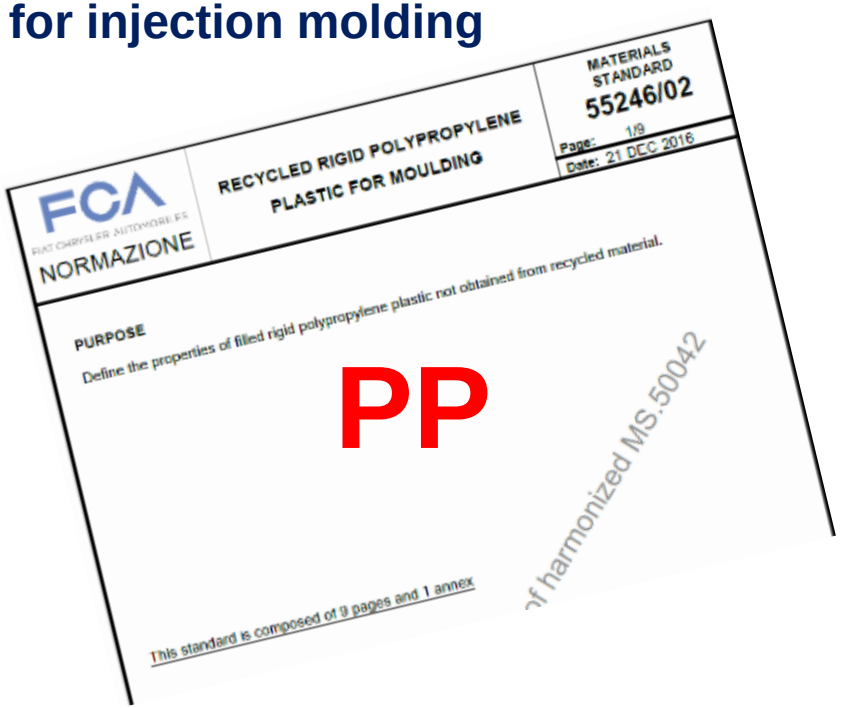
Plastics in automotive



Total weight of plastics:
150-180 kg per vehicles

Use of Recycled PP – Stellantis Italy standard

PP for injection molding


FCA
FIAT CHRYSLER AUTOMOBILES
NORMAZIONE

RECYCLED RIGID POLYPROPYLENE PLASTIC FOR MOULDING

MATERIALS STANDARD
55246/02

Page: 1/9
Date: 21 DEC 2016

PURPOSE
Define the properties of filled rigid polypropylene plastic not obtained from recycled material.

PP

This standard is composed of 9 pages and 1 annex

Improvement needs to increase application:

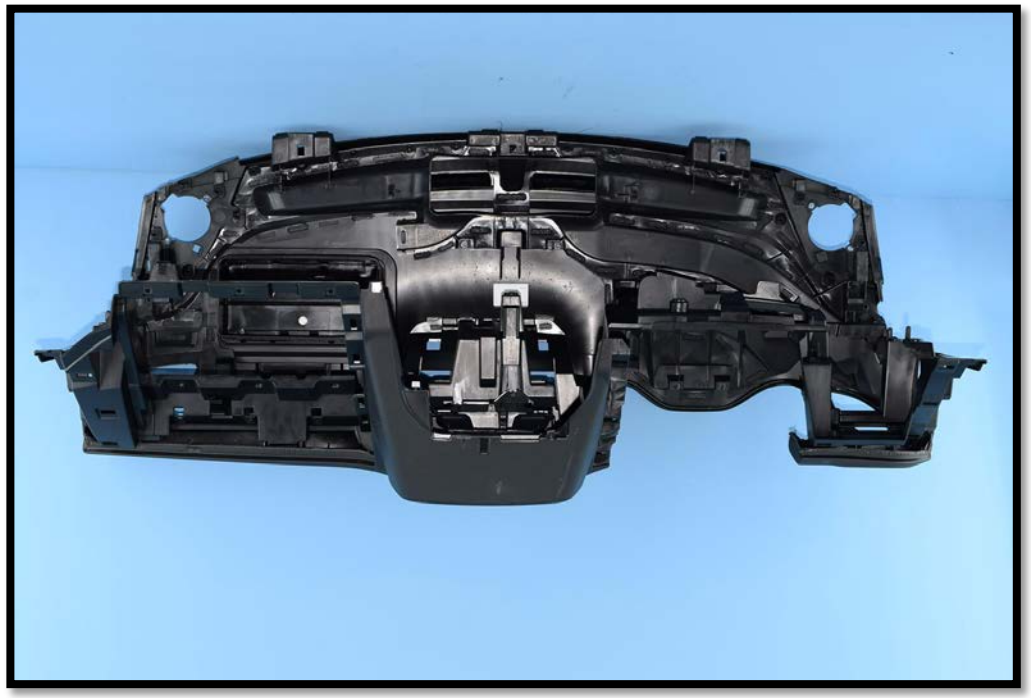
- **Stable performances**
- Increase **efficiency of recycling**
- **New Materials Specification**
- **New specific design** to better exploit materials properties

Current potential applications:

DENOMINATION			APPLICATION EXAMPLES
FIAT		ISO	
BECOMES	WAS		
PP 50.20 R	–	PP-TD20	Kickplate under dashboard air duct
PP 45.300 R	PP 45.400 R	PP	Wheel arch guard
PP 47.60 R	PP 47.70 R		
PP 50.280 R	–	PP-TD10	Aerodynamic and underbody guards

Use of Recycled PP

PP for injection molded parts on Jeep Renegade

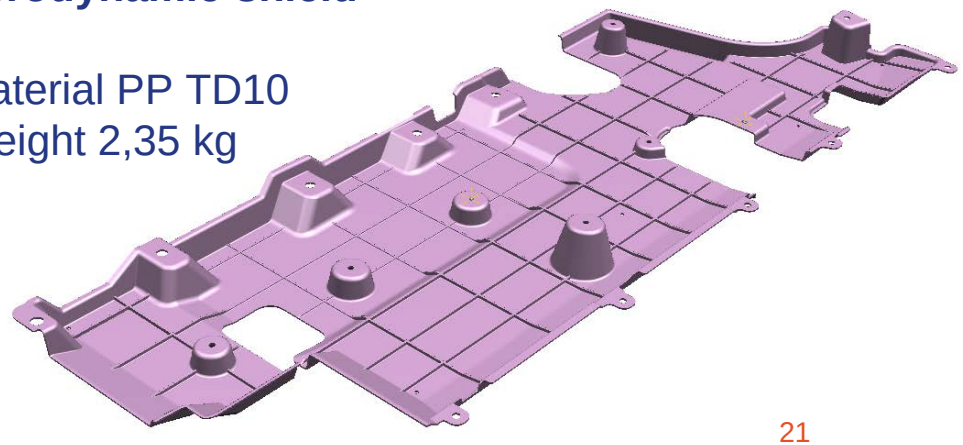


Air duct defroster

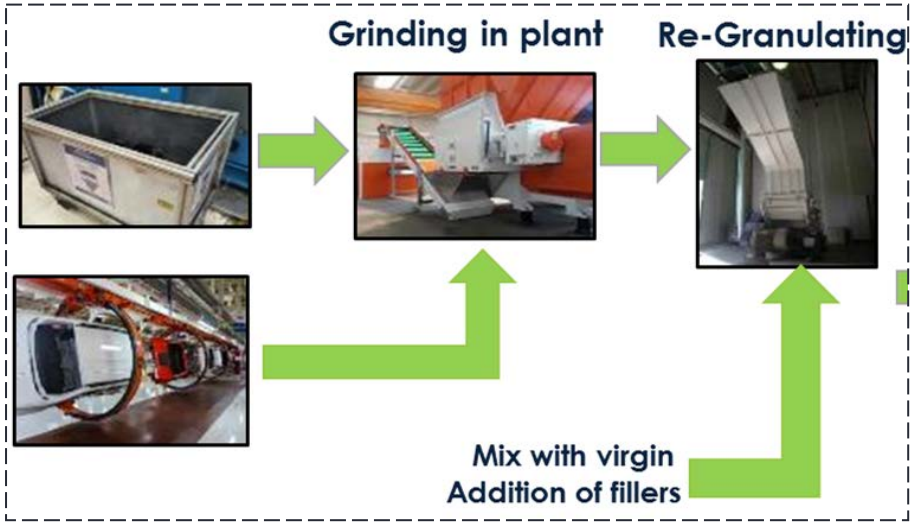
Material PP TD20
Weight 1,100 kg

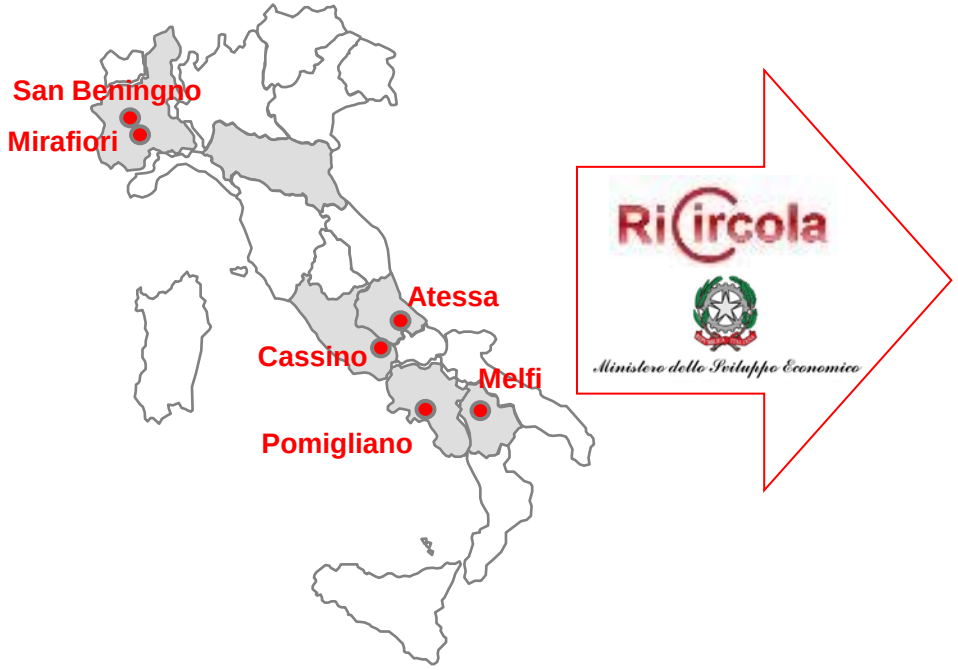
Aerodynamic shield

Material PP TD10
Weight 2,35 kg



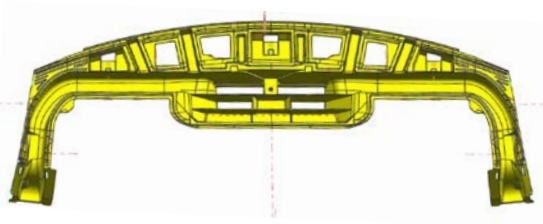
Use of Recycled PP from process scraps – Stellantis Italy standard



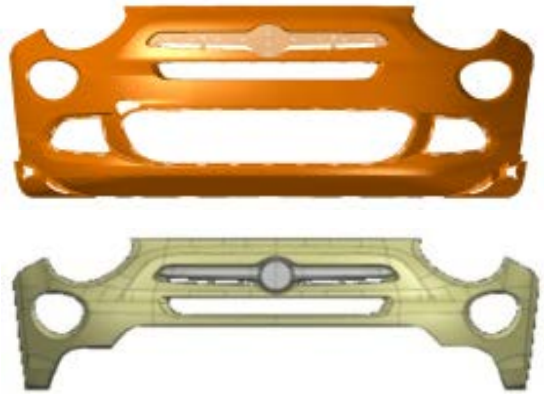


Plastic Units Italy Plants internal recycling

Air Duct
100% PP RECYCLED
(generic scraps)



Bumpers
10% PP RECYCLED
(bumper scraps)



Use of Recycled PA

PA for injection molded parts on Fiat 500

Radiator Fan

Material PA6.6 GF30
Weight 0,518 kg

Front cooling module

Material PA6.6 GF30
Weight 0,947 kg

Use of Recycled PC+ABS

Components for air vents housing on Jeep Renegade

Air diffusion bezel (structural part)

Material PC+ABS
Weight 0,208 kg

Cluster bezel (structural part)

Material PC+ABS
Weight 0,483 kg

Recycled materials - Activities

Plastic family	Global standard	R standard	ISO nomenclature
PP	PP-H.TD20.2500F.2I.HS		PP Homo-TD20
	PP-H.TD40.3800F.2I		PP-TD40
	PP-C.TD25.2500F.7I		PP-TD25
	PP-C.TD25.2500F.7I		PP-TD25
	PP-H.GF30.4500F.6I		PP-GF30
	PP-H.GF30.5500F.8I.HS		PP-GF30
	PP-H.GF15-TD15.3900F.5I		PP-(GF15+TD15)
	PP-C.GF30.5000F.12I		PP-GF30
	PP-H.GF20.4100F.9I		PP-GF20
	PP-H.GF40.8900F.11I		PP-GF40
	TPO.TD17.1450F.40I.-30DE		PP-TD17
	TPO.TD28.2200F.27I		PP-TD28
	PP-C.TD20.2200F.3I	PP 50.20 R	PP Copo-TD20
	TPO.1200F.35I	PP 45.300 R	PP Copo+EPDM
	PP-C.1000F.6I	PP 47.60 R	PP Copo
	TPO.TD10.1300F.38I.-30DE	PP 50.280 R	PP Copo+EPDM-TD10
	PP-C.TD30.2300F.9I	PP 58.80 R	PP Copo-TD30
PA	PA66.GF30.7300F.8I		PA66-GF30
	PA66.GF15.4600F.5I		PA66-GF15
	PA66-EPDM.1600F.20I.HS		PA66+EPDM
	PA6.GF30.7300F.10I		PA6-GF30
	PA66 coppe ruota		PA66-xxx
	PA aesthetic engine cover		PA-xxx
PC+ABS	PC-ABS.1900F.35I.CP		PC+ABS
	PC-ABS.1900F.45I.MT		PC+ABS
	PC-ABS.2000F.45I.HT		PC+ABS
	PC-ABS.GF10.3300F.8I.HT		PC+ABS-GF10
	PC-ABS.GF20.5500F.7I.HT		PC+ABS-GF20

Increase number of **PP** available grades in Stellantis Italy standards

Introduce new standards for recycled **PA** and **PC-ABS**

More than 170 grades are under investigation

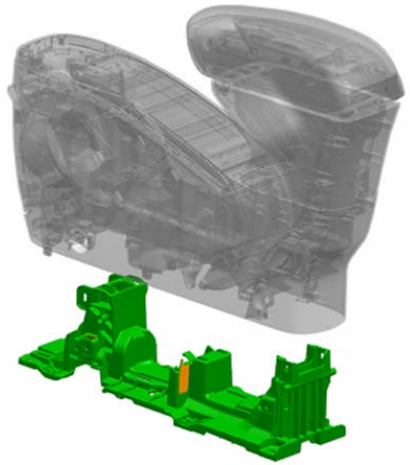
The work done, the numbers …

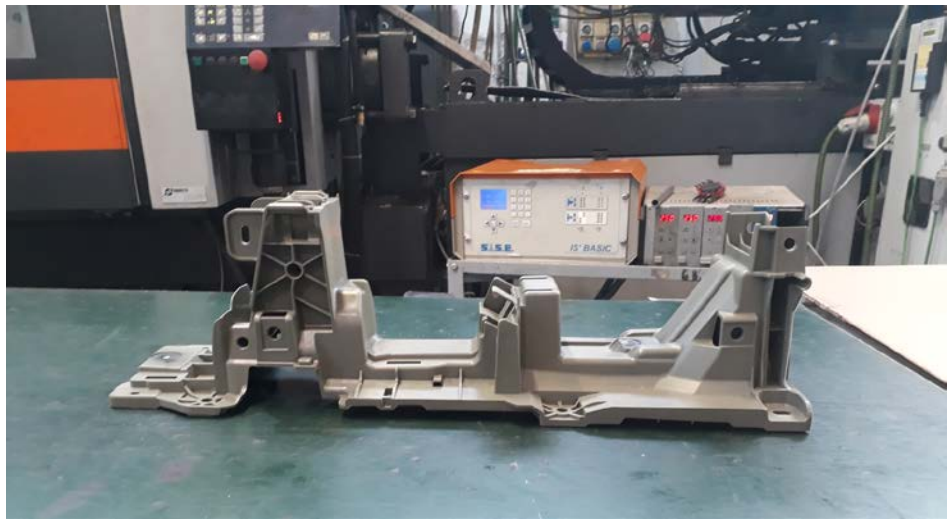
	FCA Specification	Old FCAr Code	New FCA Code	Sigla ISO
Polypropylene	PP 65.25		MS.50042 PP-H-R.TD20.2300F.2I	PP Homo-TD20
	PP 75.20		MS.50042 PP-H-R.TD40.3400F.2I	PP Homo-TD40
	PP 65.40		MS.50042 PP-C-R.TD27.2250F.4I	PP Copo-TD27
	PP 140.80		MS.50042 PP-H-R.GF30.4700F.6I	PP Homo-GF30
	PP 130.50		MS.50042 PP-C-R.GF15+MD15.3500F.4I	PP Copo-(GF15+TD15)
	PP 140.120		MS.50042 PP-C-R.GF30.5000F.10I	PP Copo-GF30
	PP 135.90		MS.50042 PP-H-R.GF20.3200F.6I	PP Homo-GF20
	PP 145.110		MS.50042 PP-H-R.GF40.7000F.8I	PP Homo-GF40
	PP 50.400 LCE SR AF		MS.50042 TPO-R.TD17.1350F.30I	TPO Copo-TD17
	PP 58.270 LCE SR AF		MS.50042 TPO-R.TD27.1900F.27I	TPO Copo-TD27
		PP 50.20 R	MS.50042 PP-C-R.TD20.2000F.2I	TPO Copo-TD20
		PP 45.300 R	MS.50042 TPO-R.800F.30I	TPO Copo
		PP 47.60 R	MS.50042 PP-C-R.1000F.6I	PP Copo
		PP 50.280 R	MS.50042 TPO-R.TD10.1200F.28I	TPO Copo-TD10
		PP 58.80 R	MS.50042 PP-R.TD30.2100F.7I	PP Copo-TD30
Polyamide	PA 240.80		MS.50017 PA66-R.GF30.6500F.7I	PA66-GF30
	PA 210.50		In progress	PA66-GF15
	PA 65.200		In progress	PA66+EPDM
	PA 200.100		MS.50017 PA6-R.GF30.6000F.6I	PA6-GF30
	PA wheel cover		In progress	PA-xxx
	PA engine cover		In progress	PA-xxx
PC+ABS blend	PC+ABS 95.350		MS.50089 PC+ABS-R.1900F.30I.NT	PC+ABS
	PC+ABS 100.450		MS.50089 PC+ABS-R.1800F.40I.MT	PC+ABS
	PC+ABS 105.450		MS.50089 PC+ABS-R.2000F.40I.HT	PC+ABS
	PC+ABS 110.80		MS.50089 PC+ABS-R.GF10.3000F.8I.HT	PC+ABS-GF10
	PC+ABS 115.70		MS.50089 PC+ABS-R.GF20.5000F.7I.HT	PC+ABS-GF20

EU PlastiCircle Project

Recycled materials	New compound	Application	Standard material
PET	**r-PET GF30**	Bracket	PA6.6-GF30
PP	**r-PP GF15-TD15**	Interior sub frame	PP-GF15-TD15

Selected bracket example for PET – General bracket suitable for engine compartment





Thermal tests conducted according to the specifications with positive results.

Recycling from End of Life

Sorting, recovering and value-added recycling of high quality secondary thermoplastics coming ELV waste stream

25 Mt post consumer plastic waste ends up in the official waste streams

7.4 Mt of plastic waste is recycled but more than 67% of this amount is downgraded

The HIPPO project will demonstrate at TRL7 a novel process for the separation of ABS, PS and FPP, enabling a real closed loop plastic value chain

Running

In development

SERI PLAST
POLYPROPYLENE COMPOUNDS

comet traitements

More than 7.5 Mt of plastic waste is currently landfilled in Europe

The HIPPO project will validate at TRL7 a novel process for the separation of bromine from plastic waste

Campine

LIFE PlasPLUS

Recycled materials

- Sustainability drivers for materials selection
- Bio-based materials
- Recycled materials
- **Conclusions**

Conclusions

- ✓ Major drivers for recycling development are: **Regulations for Homologation** and new EU **Strategy for Plastics** in a circular economy
- ✓ **Stellantis** is making a policy of green materials that involves materials, manufacturing and the entire production chain - soon there will be an **Official Communication.**
- ✓ Next generation models will introduce most of innovative materials; **Collaborative approach** is crucial to exploit the new materials potential in the automotive domain
- ✓ Green materials are **Already present** in vehicles and several **Innovation projects** are running to improve our products sustainability
- ✓ To assure an innovation output **Reliable application** are necessary: stable performances (stable source), recycling efficiency (efficient collection network), reliable transformation processes, new product design to exploit materials properties
- ✓ Collaborative research and innovation activities are crucial to speed up the readiness of sustainable materials strengthening **Value chain**

Thank you !

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