
DESIGN FOR RECYCLING: A PRIORITY PLASTICS GUIDE FOR WEEE RECYCLING

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PolyCE

A Horizon 2020 research and innovation project



- **Topic:** Post-Consumer High-tech Recycled Polymers for a Circular Economy
- **Consortium:** 20 Partners (11 countries)
- **Duration:** 2017-2021
- **H2020 funding:** EUR 8.3 M

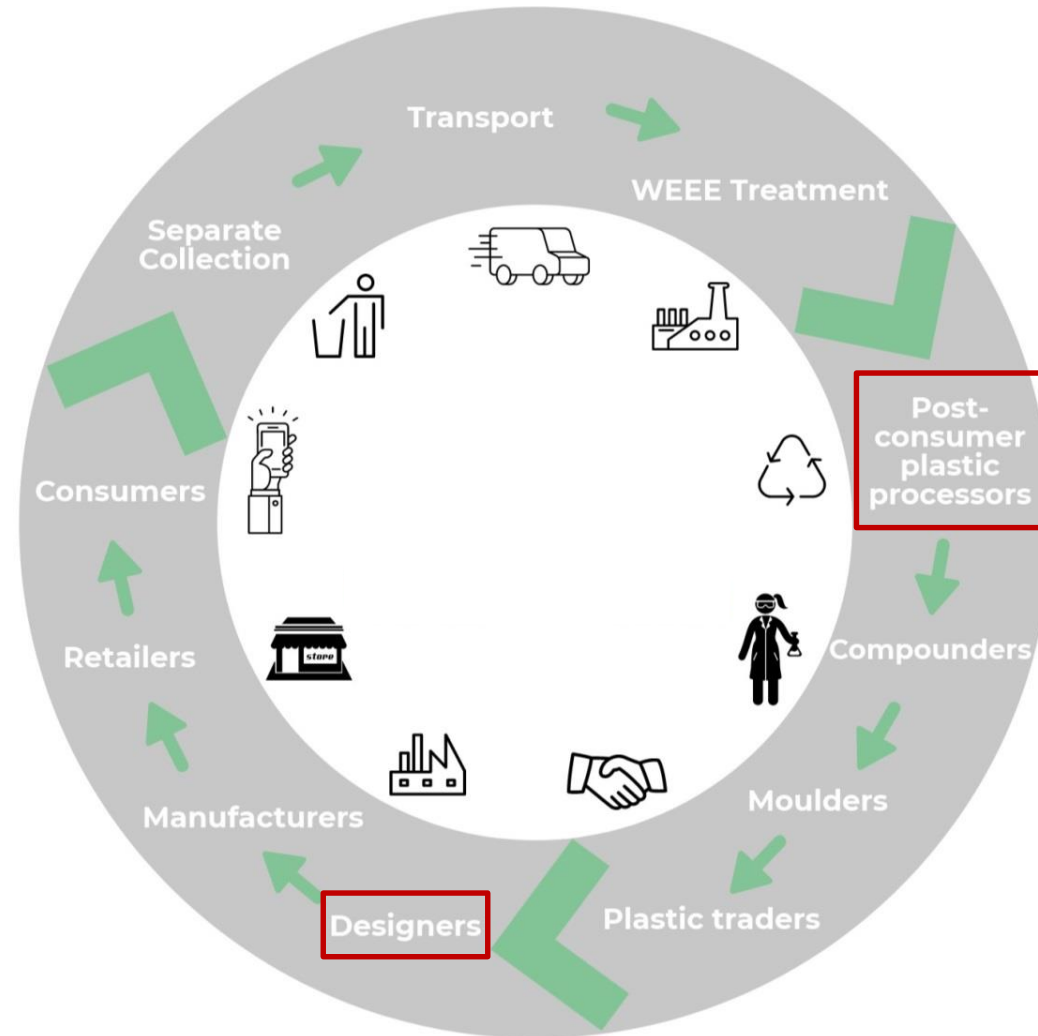


29/11/2018

Environmental and Reliability Engineering

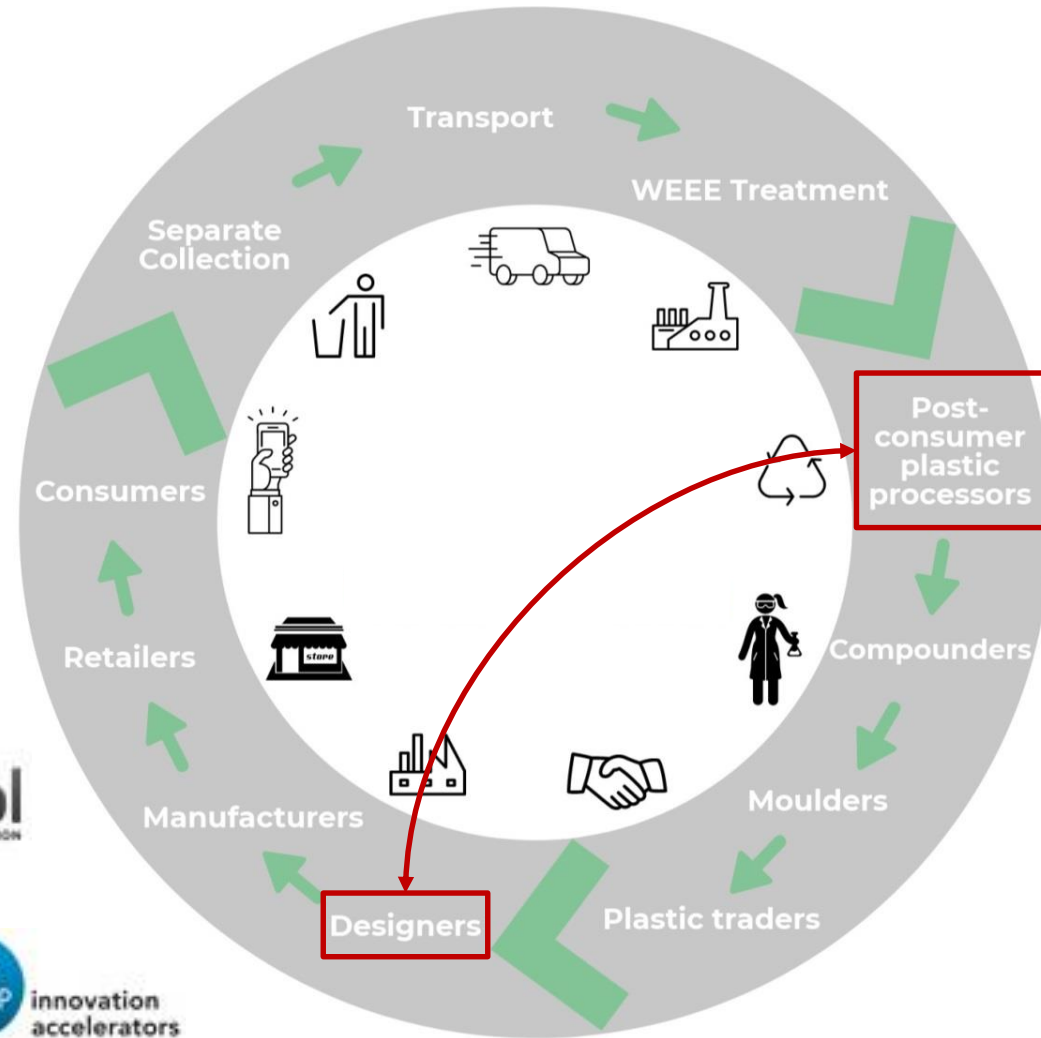
Post-consumer high-tech recycled POLYmers for a Circular Economy

Towards a circular plastics value chain



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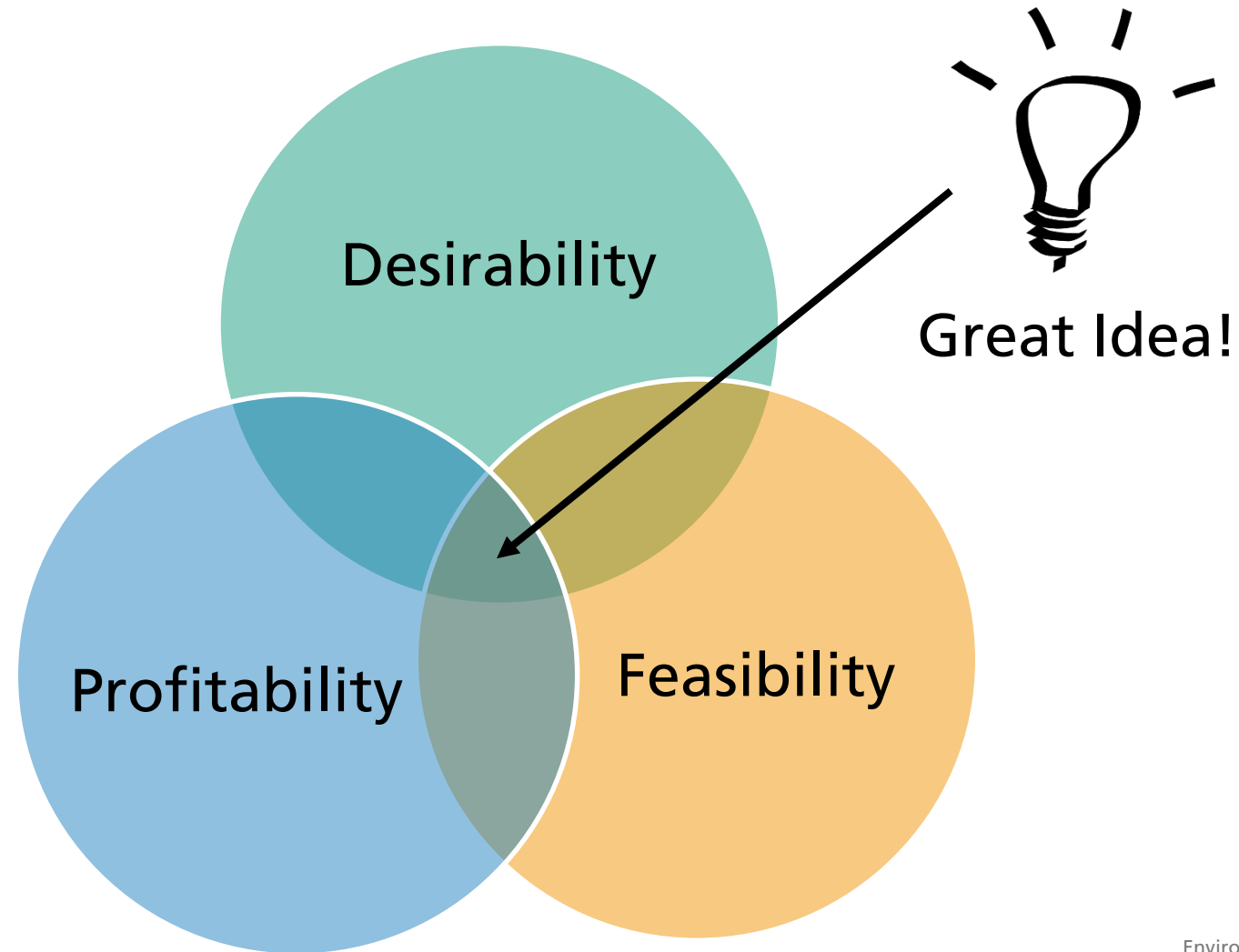


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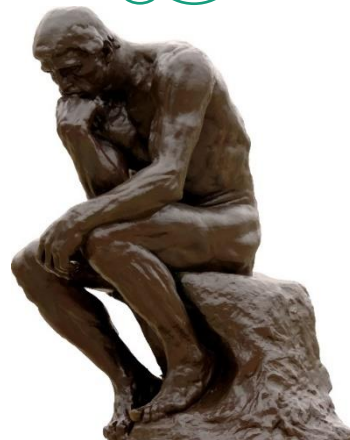
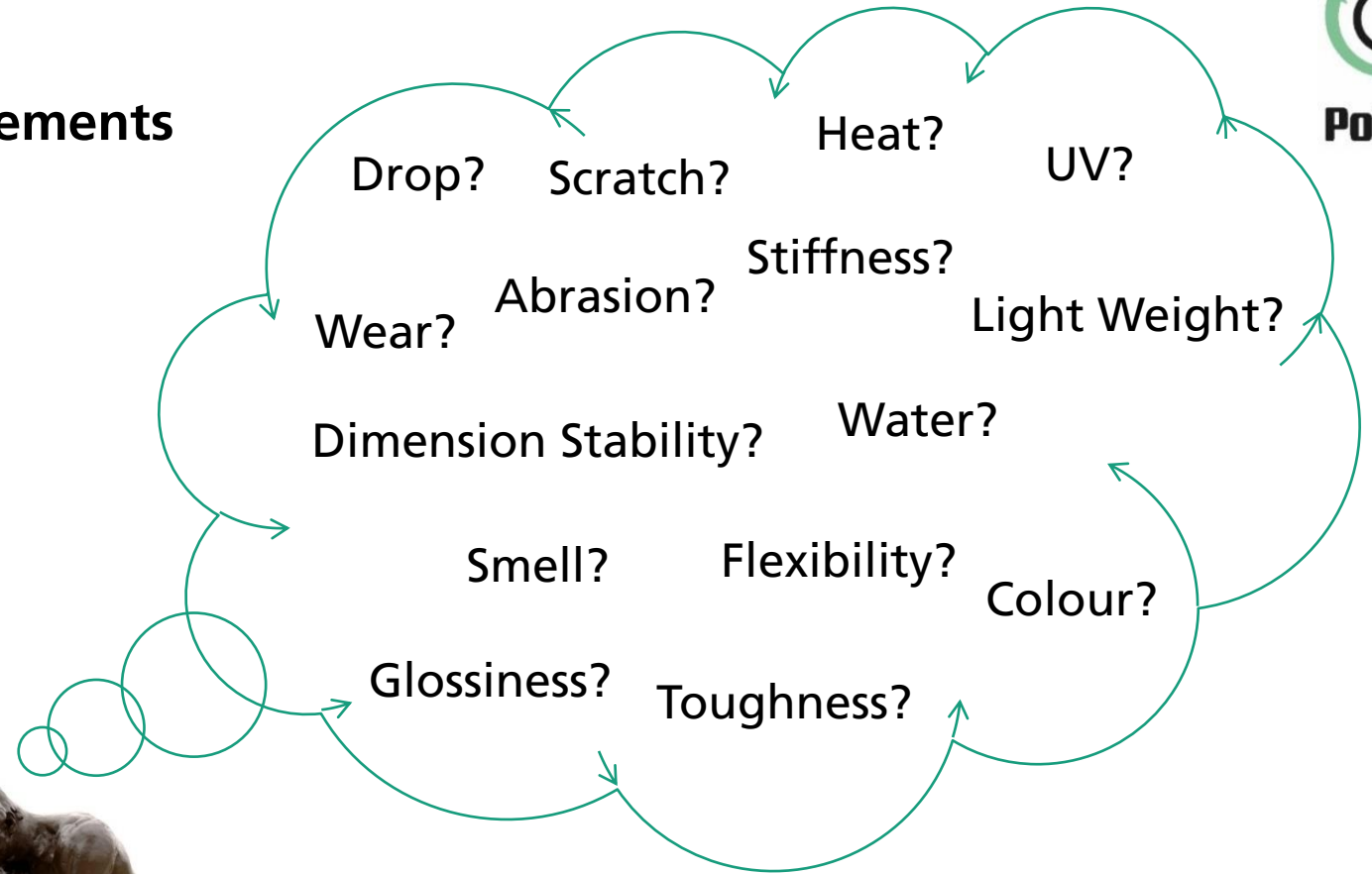
The designer's perspective

Find the perfect trade-off for the client



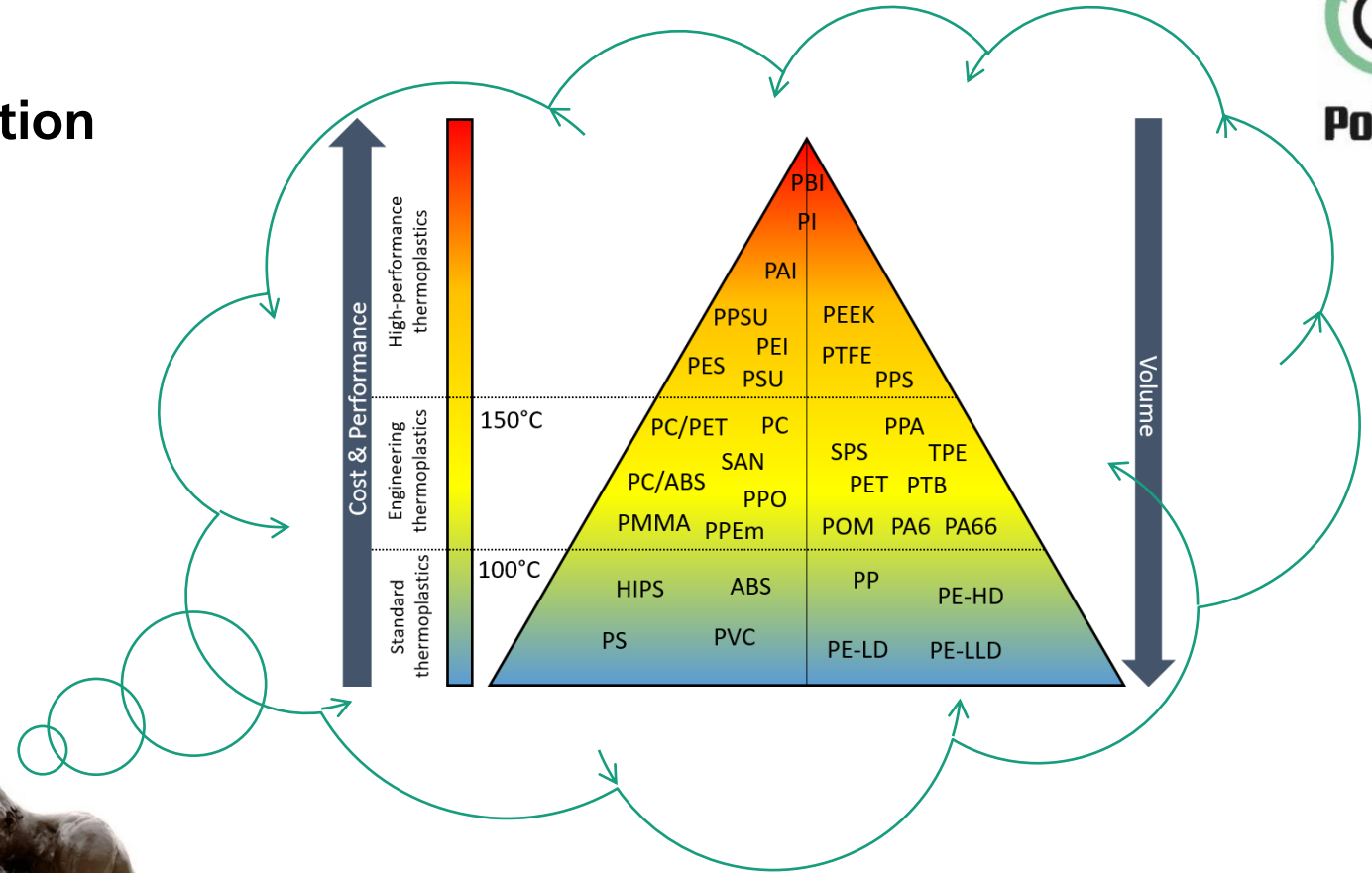
The designer's perspective

Meet challenging performance requirements



The designer's perspective

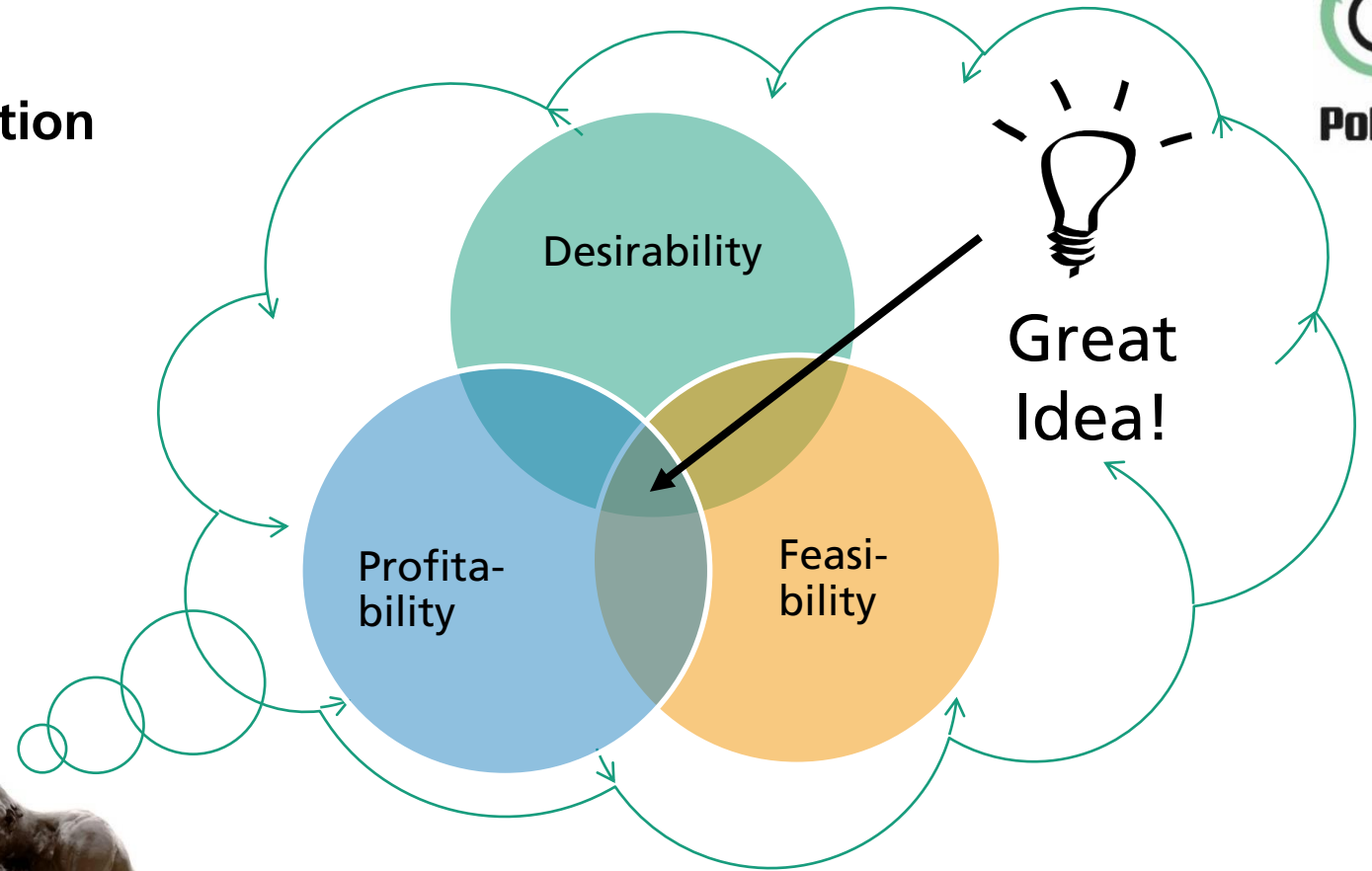
Choose the optimal material combination



The designer's perspective

Choose the optimal material combination

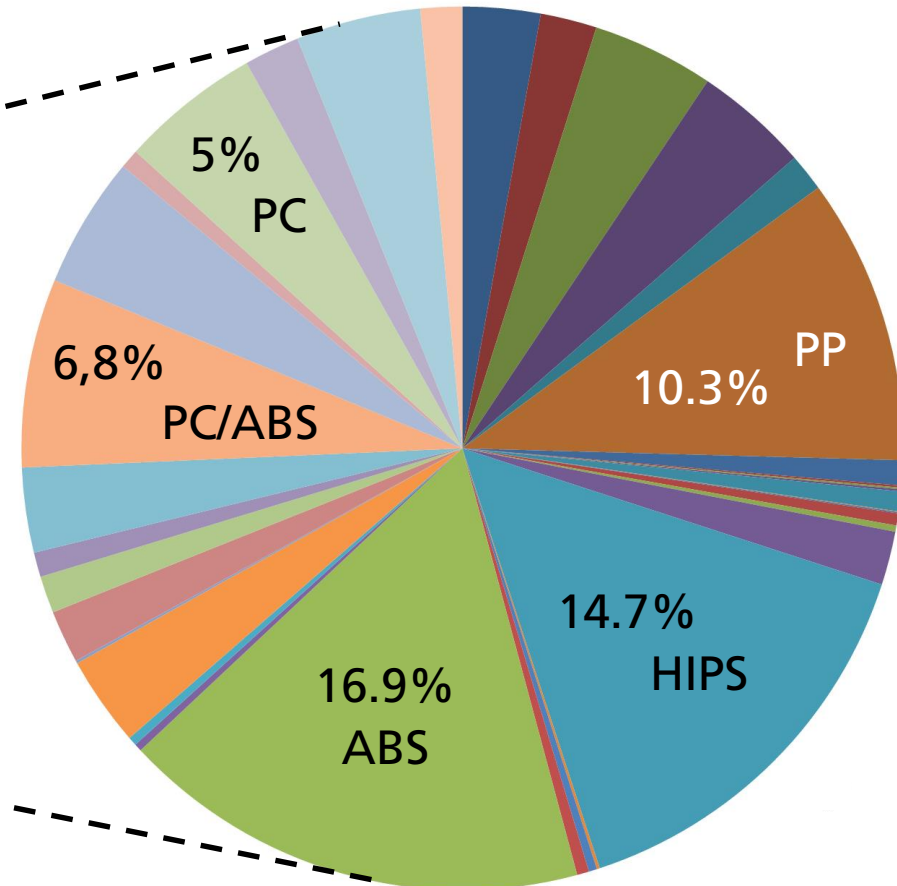
EoL?



The recycler's perspective

Upstream challenges – Input dependency

Shredder light material
from WEEE



The recycler's perspective

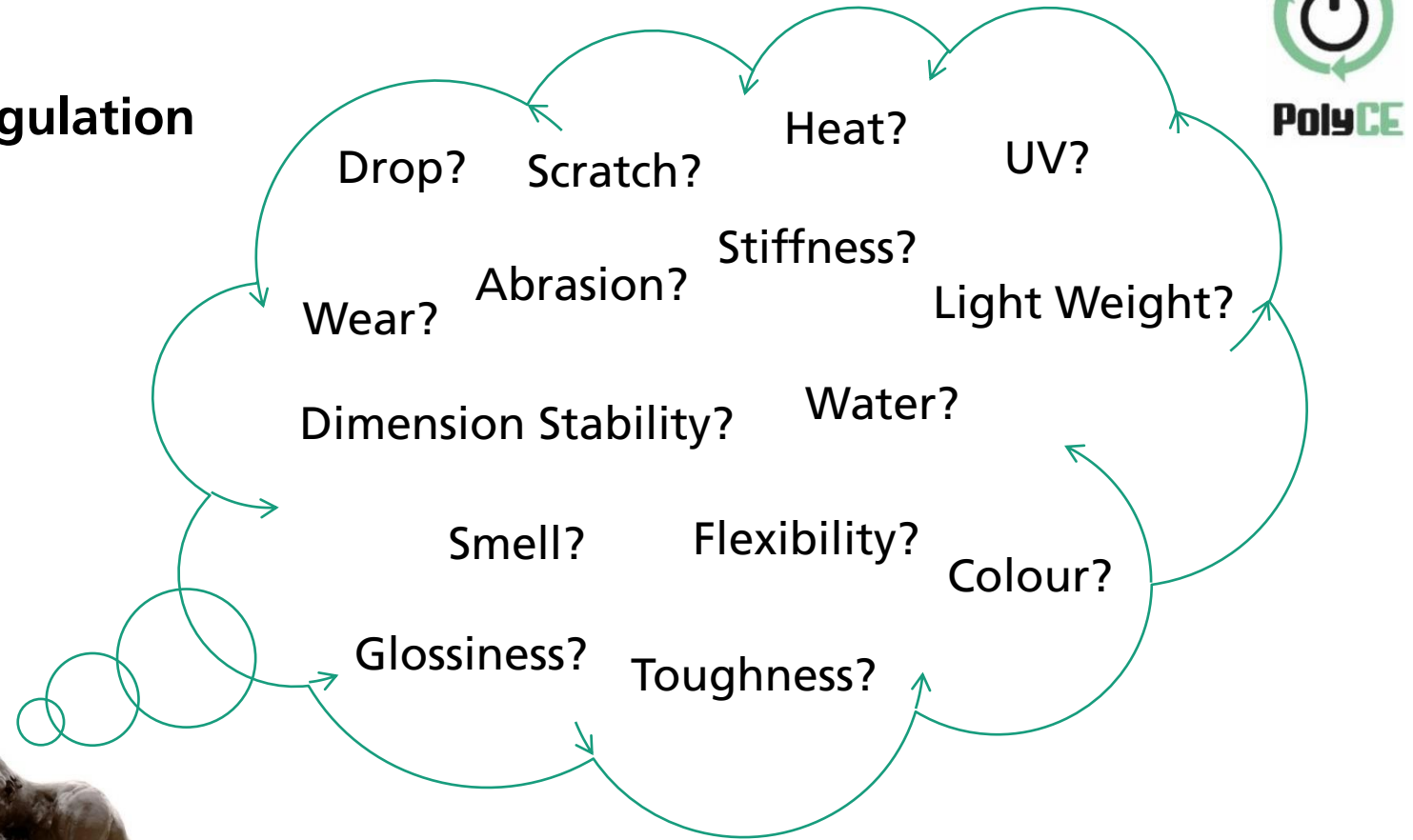
Recycling challenges – Complexity of WEEE plastics



The recycler's perspective

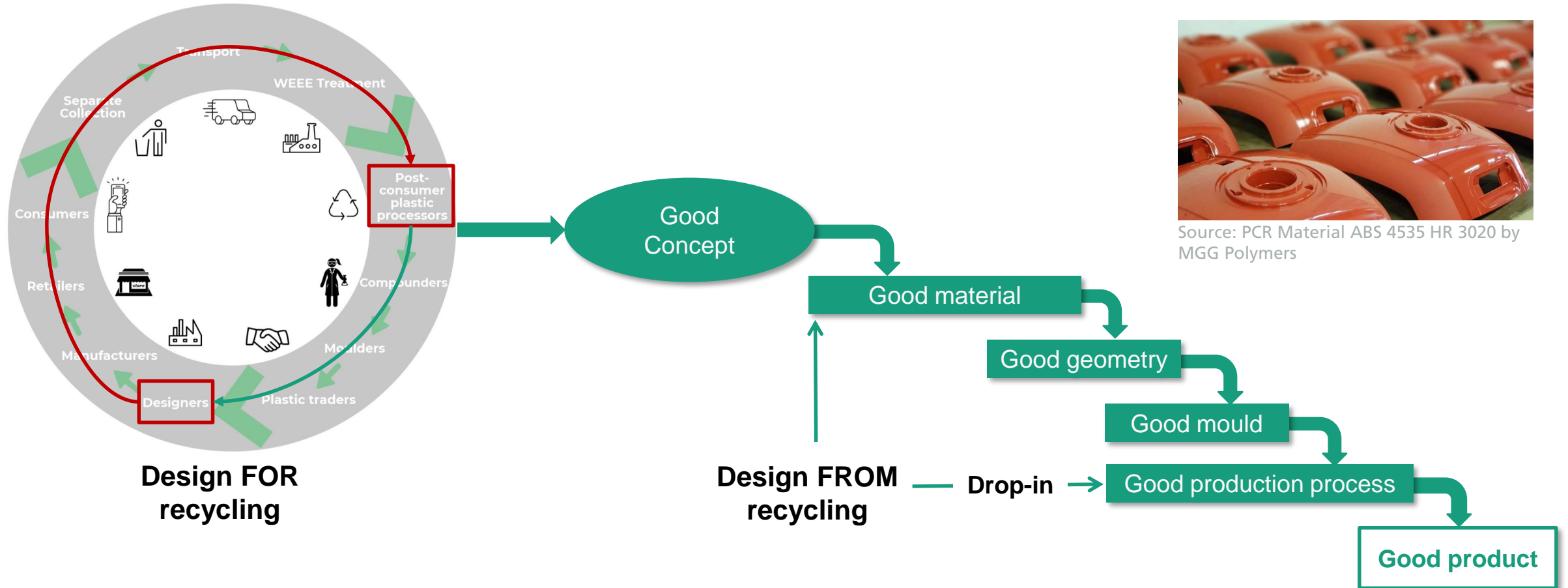
Downstream challenges – Evolving regulation

- UN Conventions
- EU Waste Legislation
- Product Legislation and Listings
- Designers' requirements



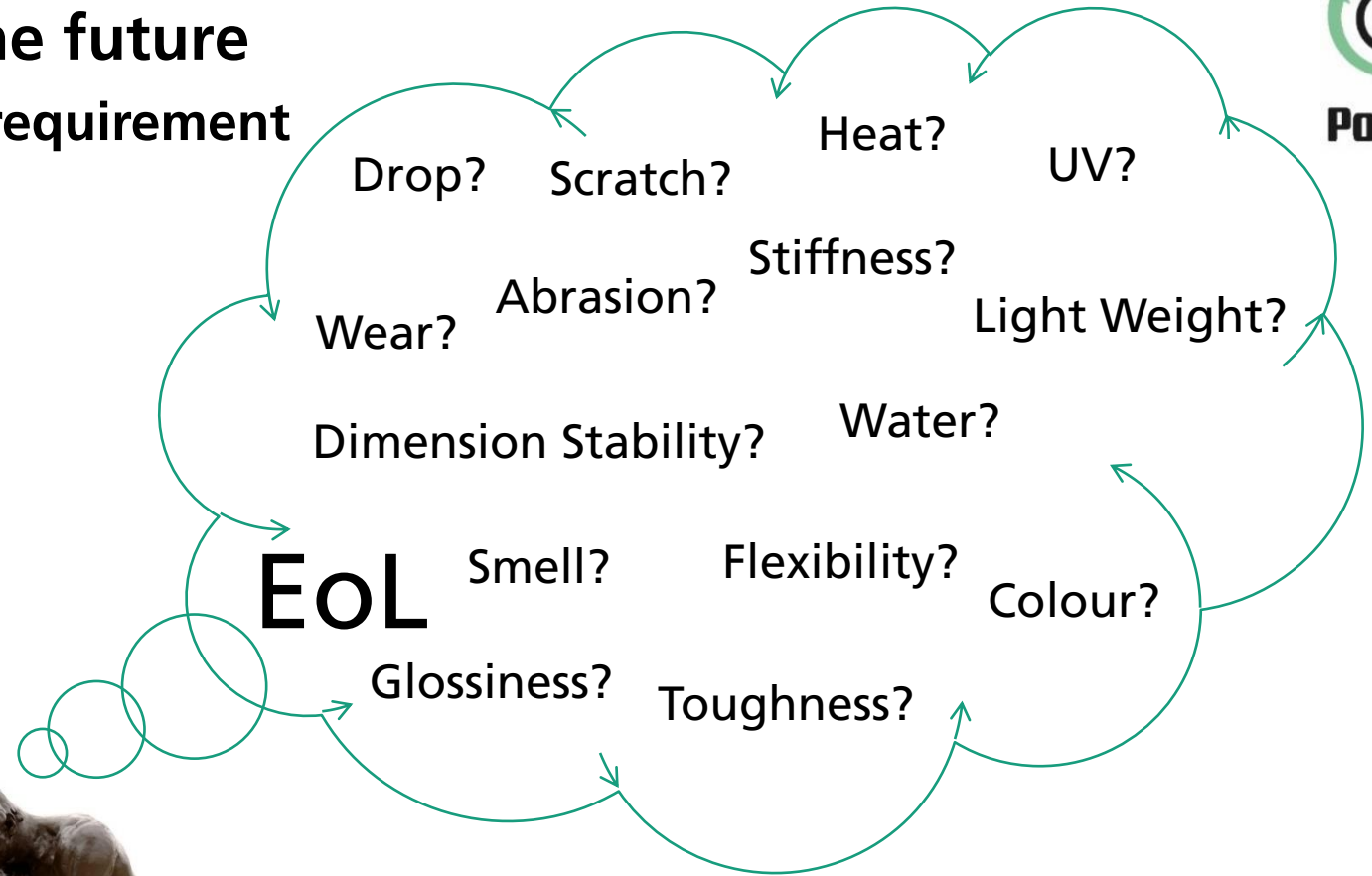
Design FROM vs. design FOR recycling

The design waterfall



The designer's perspective in the future

EoL needs to become a performance requirement



Design for recycling - Polymers and non-hazardous additives

Recommendations for product designers

- Use whenever possible a limited number of common plastics: ABS, PC, PC/ABS, PP, HIPS & PA.
- Try to avoid thermosets and elastomers, especially as foams. If thermosets are necessary, they should have another density than the common plastics used.
- Do not use halogenated polymers (e.g. PVC blends).
- Do not use Polyoxymethylene blends like POM/ABS. If POM is needed use it unblended.
- Do not use silicone compounds, oils or greases.



Trace pollution of 0.1% PVC in PP causing corrosion of a steel mold for PP. © MGG Polymers

POM content (mg/kg) in plastic before extrusion	Formaldehyde (mg/m ³) above granulate
250	1,26
160	0,76
40	0,52

POM content and formaldehyde emissions at extrusion with state of the art emission control of extrusion line (TRGS 900: maximum concentration in the workplace: 0,37 mg/m³). Source: MGG Polymers

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Design for recycling - Polymers and non-hazardous additives

Recommendations for product designers

- If possible avoid coatings (painting, lacquering, plating, galvanizing).
- Avoid using glass fibres or carbon fibres. If reinforcement is needed, prefer talc.
- Avoid moulding different plastic types together by multi-material injection moulding processes (e.g. 2K).
- Avoid using connections that enclose a material permanently (e.g. moulding-in inserts into plastic, rivets, staples, etc.) -> The connecting force of a connection should be lower than the separating force of a shredder

Design for recycling - Hazardous substances and components

Recommendations for product designers

- Do not use substances of very high concern (SVHC) according to REACH (Art. 59)
- Concentrate hazardous components to one module / a restricted location to facilitate manual removal.
- When fixing hazardous or polluting components (e.g. batteries) in a product, use easily detachable solutions (e.g. click/snap) instead of permanent fixing such as adhesives.

Next steps

Further research related to design for recycling in PolyCE

- Add guidelines on FR plastics
- Provide product specific guidelines
- Dissemination

THANK YOU FOR YOUR ATTENTION!

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