RECYCLING IN CONSTRUCTION INDUSTRY
THE FUTURE IS CIRCULAR?

JULY 15TH 2020

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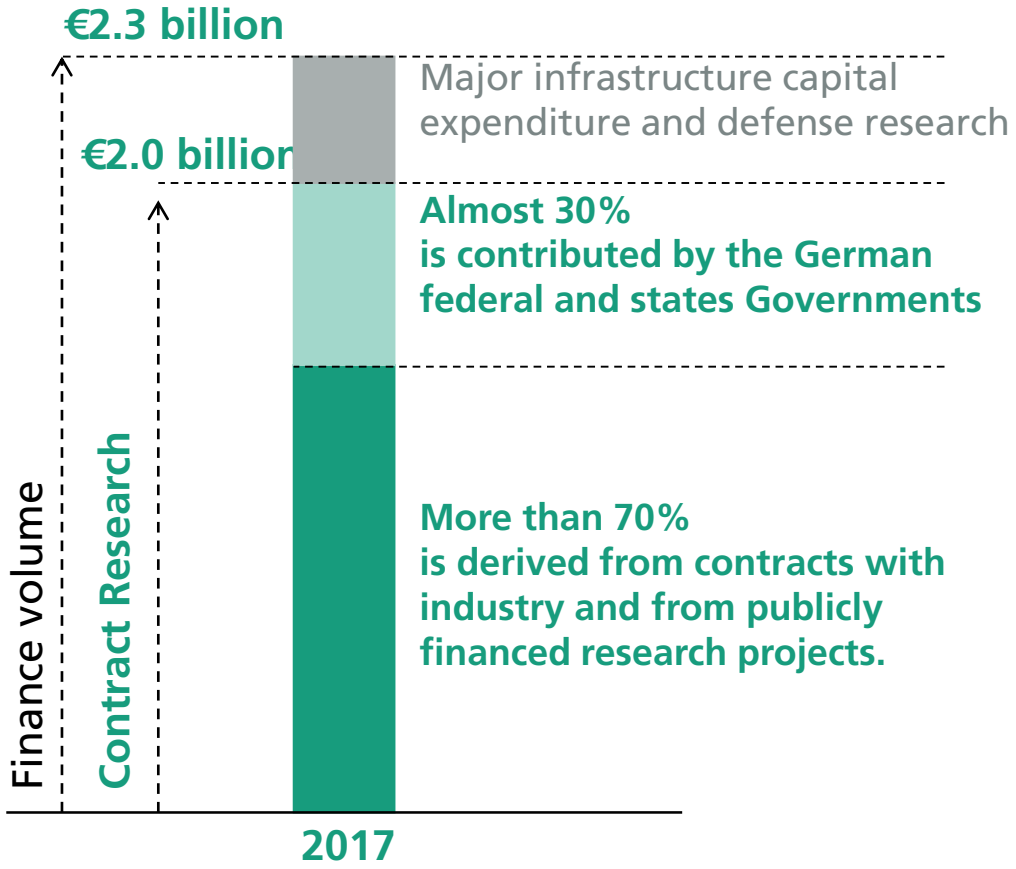
The Fraunhofer Society

The Fraunhofer-Gesellschaft undertakes applied research of direct utility to private and public enterprise and of wide benefit to society.

25,327 staff

72 institutes and research units



The Fraunhofer IVV

Food
High-quality, healthy and convenient foods and ingredients

Packaging
Safe, customer-friendly and recyclable packaging and materials

Processing Machinery
Optimized equipment and processes, innovative cleaning technologies

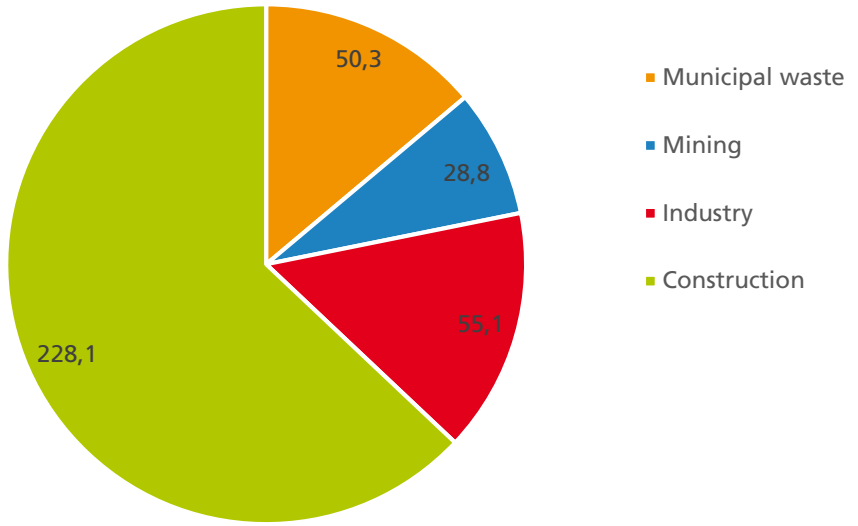
Product Performance
Holistic sensory optimization of materials and market-ready products

Recycling and Environment
Innovative recycling technologies and environmental analysis

Recycling in Construction Industry
The challenge

- Construction / demolition is the main source of waste in most western countries
- Large potential for recycling in this field
- The challenge is to recover **one type of material at a high purity**
  - Costs of materials are rather low, which makes limits the complexity recycling processes
- Many materials used in the construction sector are being recycled
- Especially polymers and complex mulit-materials present challenges in terms of recycling

Waste volumes in Germany (2018) in million tonnes



https://de.statista.com/statistik/daten/studie/2864/umfrage/abfallaufkommen-in-deutschland-seit-2000/

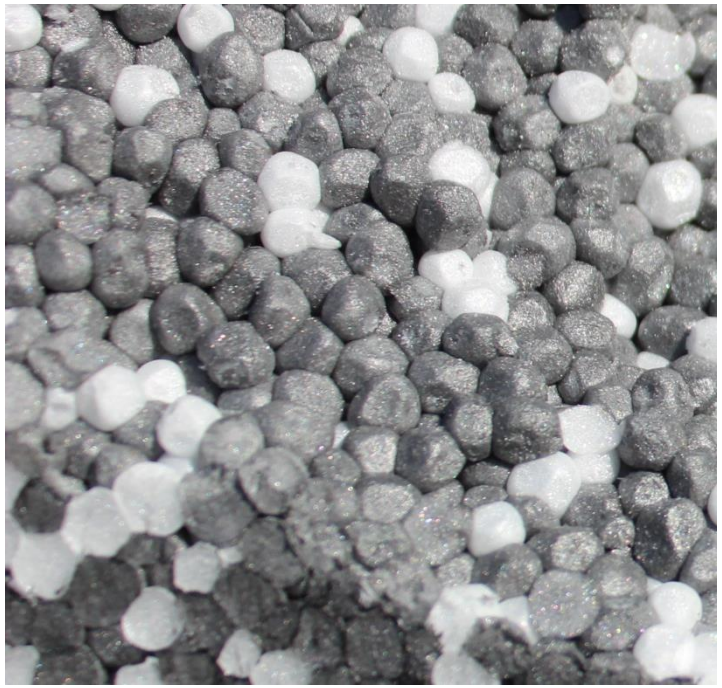
Recycling of Construction Materials
State of the Art

Recycling is well established in the construction industry for many materials:

- Steel
  - Separated on site or in dedicated recycling companies
  - Circular use possible due to processing in blast furnaces
- Windows (Glass / PVC frames)
  - Exisiting recycling plants for glass and PVC frames exist
  - Glass and PVC can be resued
- Concrete
  - Reuse of post-use concrete e.g. in road construction

- Many more materials are being recycled already

Recycling of Construction Materials
New challenges - Polymers



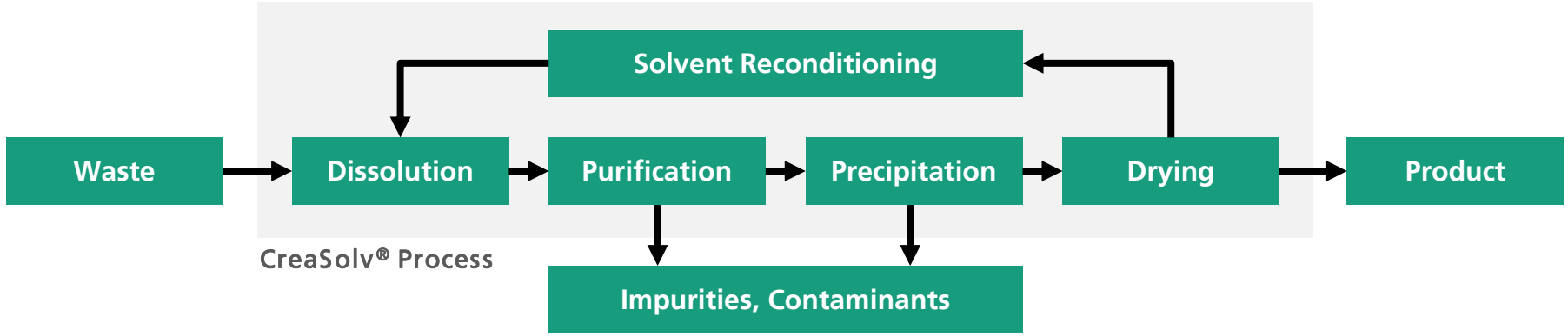
EPS Insulation

PVC Flooring

Vacuum insulation panels

Recycling of Construction Materials

The Approach – Solvent-based recycling



Recycling of Construction Materials
Vacuum insulation panels

- Vacuum insulation panels (VIPs) are a promising solution for the **highly effective insulation** of building at low insulation thicknesses
- Recycling of VIPs is challenging, due to the **complex structure** of the panels
- In scope of the **INNOVIP** project, Fraunhofer IVV developed a recycling process, which allows the separation of the materials used at high purity

Recycling of Construction Materials
PVC flooring

- PVC flooring can contain **plasticizers** including **hazardous phthalic acid esters (e.g. DEHP)**, which can no longer be used in new flooring
- CreaSolv® Process can remove plasticizers from the polymer (> 99%), which allows ist reuse
- Process is being developed to **TRL 5 – 6** in the project **CircularFlooring** funded by the European Commission (Horizon 2020)

Circular Flooring

Recycling of Construction Materials
EPS Insulation

- EPS insulation often contains **flame retardants** no longer allowed according to REACh regulations (e.g. **HBCD**)
- EPS insulation mostly contains **impurities** (e.g. plaster), which has to be removed from the polymer to allow its circular use
- Fraunhofer IVV is working on the **solvent-based recycling of EPS** in two projects
  - CircularEPS funded by the German Federal Ministry of Education and Research
  - PS-Loop funded by the European Commission

PolyStyreneLoop

- It was shown the closed-loop recycling of EPS, including the removal of **HBCD** to a level of **< 100 ppm**
- **Pilot plant** is being installed in the Netherlands (planned start up mid 2021)

Recycling of Construction Materials
Summary

- In the recycling industry, many **recycling processes** are already **established**
- Due to the broad range of materials used in the industry and the large waste quantities, the is still **large potential** in terms of recycling (as **source** and **destination** for recycled materials)
- New materials used as well as new regulations pose **new challenges** for the recycling industry
- **New processes required** in order to increase the amount of recycled material in the field

Thank you for your attention!

Fraunhofer IVV

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