

KNT Symposium - Bischof

Techno-economic & environmental assessment of chemical recycling for technical plastics

- Focusing EPS-based ETICS

Motivation

- **ETICS (External Thermal Insulation Composite Systems)** are a popular solution for building insulation, benefits: increased energy efficiency and building longevity
- Expanded Polystyrene (**EPS**) is the predominant insulation material in ETICS (~80% market share), benefits: **cost effectiveness, light weight, durability** and **excellent insulating properties**



(1) Building envelope, (2) Adhesive mortar, (3) insulating material: EPS, (4) Dowels or rail systems, (5) Reinforcing mortar, (6) Reinforcing mesh, (7) Exterior coating

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Challenges

- With installation starting in the **1970s** in Germany and **lifetimes of 40-60** years [1], so far no need for extensive End-of-Life treatment options assessment
- **Status Quo:** Waste treatment via **incineration** in Municipal Solid Waste Incineration (MSWI) plants, however
 - Highly **linear approach** in terms of resource use
 - MSWIs running close to full capacities → **inflated waste treatment costs** for ETICS [2]
- Effective Recycling hindered by
 - Application as composite systems
 - Use of flame retardants



Sources:

- [1] Albrecht, W., & Schwitalla, C. (2015). Rückbau, Recycling und Verwertung von WDVS.
- [2] Heller, N., & Flamme, S. (2020). Waste management of deconstructed External Thermal Insulation Composite Systems with expanded polystyrene in the future.

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Approach

Dissertation Plan

- **ETICS Quantification** and **waste projection** for Germany
- **Life Cycle Assessment** of chemical recycling (via pyrolysis) and clinkering (cement production)
- **Recycling center & network design** and assessment

Helmholtz research project „FINEST“

- Use and management of finest particulate material flows in a sustainable **circular economy**



Project Partners



Thank you for your attention!