Environmental impact assessment of bio-based binders: from production to industrial applications

Saicha Gerbinet (1), Sandra Belboom (1), Vincent Briard (2), Carl Hampson (3) and Angélique Léonard (1)

(1) Department of Chemical Engineering – FEP. (Products, Environment and Processes) - University of Liège, Building 86 – Sart-Tilman, 4000 Liège, Belgium, Saicha.Gerbinet@ulg.ac.be
(2) Knauf Insulation Sprl, Head of Sustainability, Products and Buildings, Avia Parc, Rue E. Francqui, 1435 Mont-St-Guibert, Belgium
(3) Knauf insulation Sprl, ECOSE development manager, St.Helens, United Kingdom

A binder?

**Use:** e.g. holds together fibers for mineral wool insulation products

**Traditionally:** based on Phenol Formaldehyde Urea (PFU).

**Knauf Insulation**

- Developed a new binder: ECOSE Technology
- No added formaldehyde
- Bio-based materials
- First developed for mineral wool products (glass and stone wools)
- Others applications possible: wood composite panels, etc.

**Environmental impact?**

**Life Cycle Assessment (LCA)**

- All life cycle steps
- Energy and material fluxes for the entire life-cycle analysed
- 4 interdependent steps
- ISO 14040 and 14044 norms [1]

**ECOSE LCA:**

1. **LCA of ECOSE main component:** Carbohydrate

   - Agriculture
   - Starch extraction
   - Hydrolysis

   - Belgian practice + adapted to others countries (yields) [2]

2. **Inclusion of other components**

   - High contribution of carbohydrate (agricultural practice)
   - Comparison with other binders: results depend on the environmental impacts categories. ECOSE better if related to resources depletion, GWP

**ECOSE application LCA:** Glass mineral wool products

- A lot of products/production sites but production process always similar
- Developed a generic model: Able to model all products from all Knauf Insulation plants in GaBi software [3]
- Included ECOSE LCA
- Modified version to study products with PF (old plant data)

**Results:**

- Environmental Products Declarations
- Ecodesign
- Comparison ECOSE vs PF (results depend of the impact categories)
- Comparison with products using other binders

**Conclusions and perspectives**

**Carbohydrate LCA:** High contribution of agricultural pratices

**ECOSE LCA:** High contribution of Carbohydrate (agriculture)

Comparison with non biobased binders: results depend of the environmental impact

**GMW LCA:** Generic model: Ecodesign and EPD

Comparison with PF binders: results depend on the environmental impact

**Perspectives:** Other sources for carbohydrate

Other ECOSE applications: Stone wool, wood composite panels, etc.

Bibliography:
2. Walloon Agricultural Research Centre (GRA-W), ALT4ER project, 2014.