ATISOL C2C

Ecodesign of a "vapour and air barrier membrane" made of renewable materials

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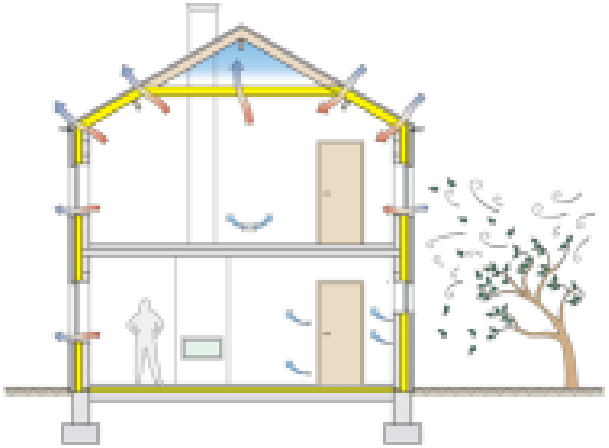
Context

- Building: about 40% of the total energy consumption in EU
- European directive on energy efficiency of buildings:
  → solutions for insulation that are
  - simple
  - effective
  - lasting
  - respectful of the environment and the users



- Low energy consumption house
  → thermal insulation & effective ventilation
- Necessity of vapour and air barrier between insulation (cold) and inside (warm and moist) to prevent humidity condensation and mould growth

Project - ATISOL C2C

- To develop a "vapour and air barrier membrane" with the lowest impact on its whole life cycle

- Renewable materials and recyclable product
  ⇒ vegetal self-adhesive binder on renewable nonwoven reinforcement support

- Market:
  - Renovation: Belgium 3 Mm^2 - France 40 Mm^2
  - New wood constructions: Belgium 3 Mm^2 - France 25 Mm^2

- Project objective: ≤ 2.5 €/m^2

Project - ATISOL C2C

- Funded by The Walloon Region and supported by GreenWin
- 4 years project - started on September 1st 2016, ~2.7 M€
- 2 phases:
  - 25 months Industrial Research → **GO**/NO GO
  - 23 months Experimental Development

Partnership

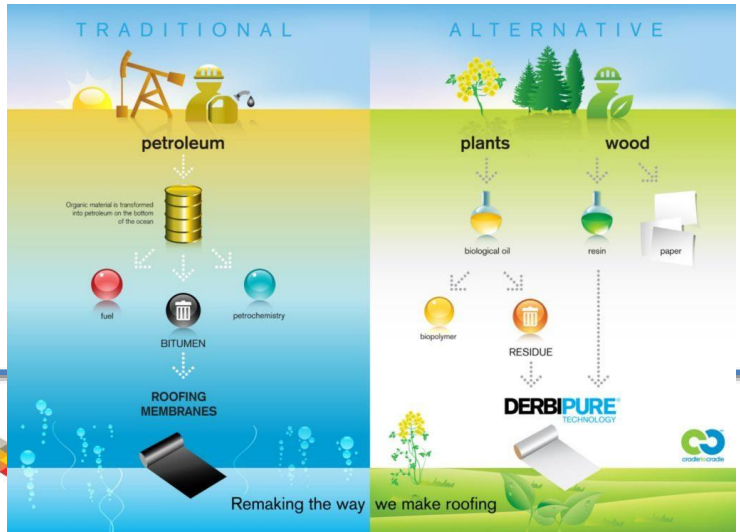
- Derbigum: expert in flat roofs since 1932, sustainable solutions
- Sioen: expert in spinning, weaving, and coating of technical textiles
- Belgian Building Research Institute (BBRI-CSTC): private research institute
- Centexbel: textile competence centre at the service of the industry
- Liège University: expert in LCA

Project - ATISOL C2C

- Implementation of insulation system combined with vapour barrier → 3 major problems:
  - important time for placing (corners, tapes, windows,...)
  - random durability in time (tapes junction, adhesion to wall,...)
  - low disassembly and re-use level

- Solution: self-adhesive binding
  - ⇒ <u>no tape</u>
  - ⇒ easier implementation especially on details (corners, windows,....)

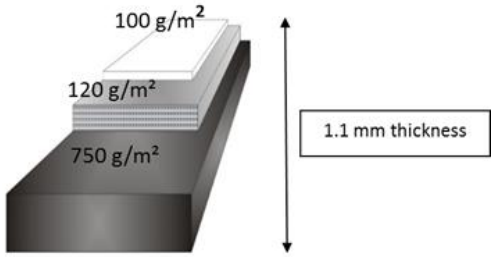
- Starting point/reference: Derbiskin® based on the patented vegetal waterproofing Derbipure® (C2C) (roof)

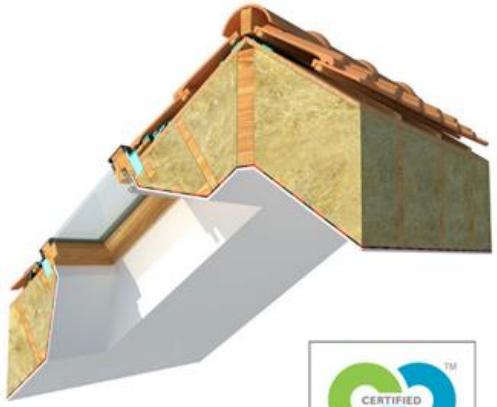


Derbiskin® - v1

Membrane:

- Acrylic coating
- Polyester nonwoven reinforcing support (PET/rPET)
  ⇒ *to be replaced by renewable raw material*
- Self-adhesive binder
  - Vegetal oil
  - Resin (vegetal)
  - Polymers (fossil)
    ⇒ *improvement of the formula, characterisation, adhesive properties,...*
- C2C certified (bronze)





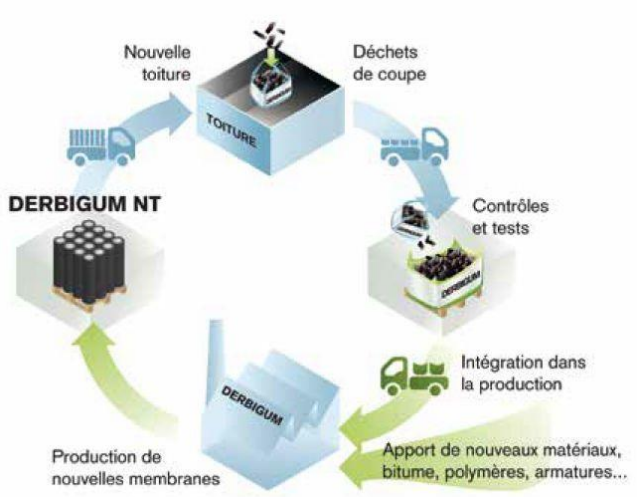
Derbiskin® - v1

C2C: End-of-Life

- Derbigum: pioneer for years in terms of recycling
- Unique and patented recycling system:
  treats and recycles old bituminous roofing materials and clippings

- **LCA of the recycling process**
  - High impact of gas consumption for the heating of the GUMIX
  - Substitution of 25% of raw bitumen in the binder

  ⇒ reduction of 13% of impacts in GWP100
  30% in ADP-FF



⇒ Integration of the Derbiskin® in the bitumen recycling loop

Derbiskin® - v1

- Preliminary Life Cycle Assessment (LCA) of the membrane
  Only raw materials + transport to the production site (BE)
- CO_2 capture by vegetal oil
- FU = 1 m^2 of Derbiskin

→ Relatively high impact of acrylic coating

→ Benefit in GWP100 due to vegetal oil

⇒ New formulation - ecodesign

- No acrylic coating: calandering
- New nonwoven reinforcing support: partly renewable

Derbiskin® - v2

Nonwoven support:
mix of cellulosic fibre (CF) (min 75%) and fossil polymer(s)

- Cellulosic fibre (CF)
  - Advertised to be one of the most sustainable and environmentally friendly fabric
  - Made from wood pulp (CO_2 capture)
  - Mostly European wood source, and EU processing

- rPET: from Europe

or

- Bico:
  - Two-component fibre → hypothesis PET/PBT
  - From Asia - no economically viable European alternative

LCA of Derbiskin®

Goal and scope:

- Cradle-to-gate: A1-A3 in EN 15804
- FU = 1 m^2 of Derbiskin®

- Simapro 8.5.2
- Ecoinvent 3.4
- CML-IA Baseline 3.05

LCA of Derbiskin®

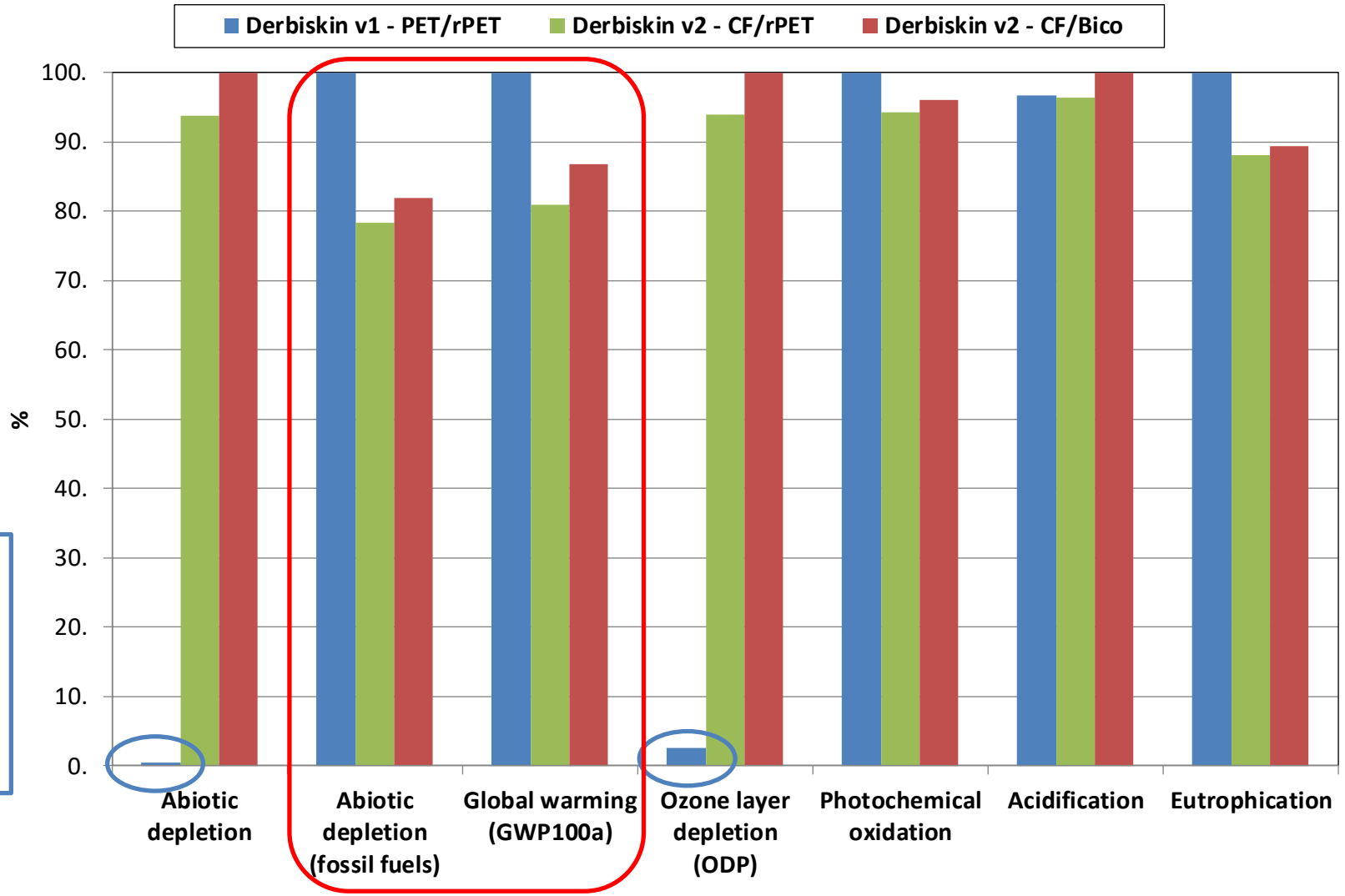
Inventory and model

- PET/rPET nonwoven support (Derbiskin® v1)
  - Data from EPD (A1-A3, cradle-to-gate)
  - Abiotic depletion: 0 kg Sb eq/kg (?)
  - Ozone depletion potential: 0 kg CFC11 eq/kg (?)

- Cellulosic fibre (Derbiskin® v2)
  - LCA results from scientific paper (CML-IA)

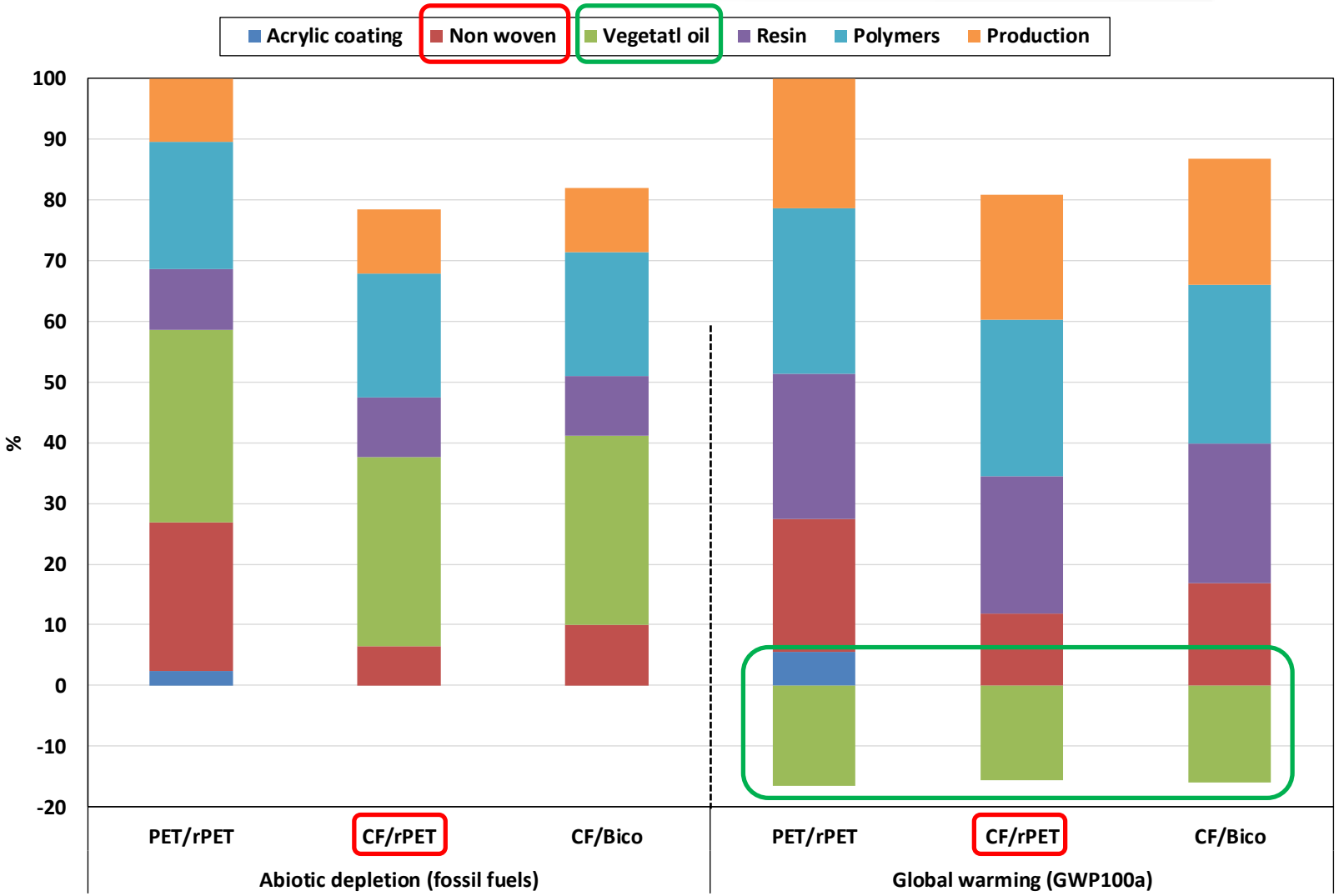
- Production: primary data - Derbigum, Perwez, BE – 2018
- Electricity for production: green mix (French hydraulic production)
- Heat for production: industrial gas burner

LCA: v1 (r)PET ↔ v2 (CF/rPET-Bico)



Non woven: EPD data → ?

LCA: v1 (r)PET ↔ v2 (CF/rPET-Bico)



Conclusions

- Interest of preliminary LCA → ecodesign
  ⇒ removal of acrylic coating

- Interest of vegetal oil based self-adhesive binder: embedded biogenic carbon

- Nonwoven (partly) renewable
  - Cellulosic fibre: improvement of impacts in GWP100 and Abiotic depletion (fossil fuels): embedded biogenic carbon and reduced fossil fuel consumption
  - rPET (slightly) better than Bico

- Cost similar to usual systems

ATISOL C2C - To be continued…