Case Study: LIFE CYCLE ANALYSIS OF HEMP BLOCKS by ISOHEMP

IsoHemp develops and manufactures natural products used in building renovation and construction. Hemp blocks, the company’s flagship product, are composed solely of hemp fibres and lime. They offer benefits in terms of thermal, hydraulic and acoustic regulation while remaining completely natural. They therefore have applications in new constructions with all types of frames, for external insulation, interior insulation and interior masonry.

Description of the company

Project team

• Séverine Coppée – GreenWin ;
• Life Cycle Champions: Aline Teillet – CoRI and Jonathan Guevorts – ValBiom ;
• Coach: Sylvie Groslambert – ULg-PEPs ;
• SME: Jean-Baptiste de Mahieu – ISOHEMP.

Motivation factors

Environmental and economic motivations:
• Decision-making support for ideas for enhancements already planned in order to improve the process ;
• Exploring any improvement that could increase competitiveness.

LC approach used in the project

• Life Cycle Analysis (LCA) according to the standards ISO 14040 and ISO 14044.
• LCA in accordance with the standard EN 15804 with a view to establishing an Environmental Product Declaration.

Short description of the project

Key objectives of the project

IsoHemp would like to quantify the current manufacturing process in order to:
• Identify any improvements that could be made ;
• Guarantee to consumers that the product has a zero environmental cost on an objective scientific basis ;
• Establish an Environmental Product Declaration.

The aim of the project was to assess the environmental impacts of the manufacturing process for hemp blocks made by IsoHemp in order to evaluate and improve the eco-design approach developed for the manufacture of this natural insulation solution. The functional unit was defined as 1 pallet of hemp blocks ready for dispatch to the customer.

Sector

Timeline

June 2015 – November 2015

Responsibility

Innovation

Competitiveness
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A "cradle-to-gate" Life Cycle Analysis of IsoHemp hemp products was conducted in order to quantify the environmental impacts of the current process. The functional unit was defined as 1 pallet of hemp blocks ready for dispatch to the customer. A pallet of blocks is equivalent to 1.296 m³ of blocks composed of hemp fibre, hydrated lime, hydraulic lime and water. The block therefore contain no additive that could be harmful to human or to environment. A life span of 100 years was used in the final calculation of environmental impacts. This analysis was used to identify the stages in the life cycle of hemp blocks with the biggest impacts and to identify avenues for improvement.

### Implementation challenges/ lessons learnt

The environmental impact of IsoHemp hemp blocks affects mainly the categories of global warming potential over 100 years (GWP100a) and abiotic depletion (fossil fuels). The impact on the global warming category has a negative value of -1.04 kg CO₂ eq. for 1 m³ of hemp blocks (for a lifespan of 100 years). This negative value indicates long-term storage of CO₂, which is beneficial for the environment. Sequestration is linked to both the use of CO₂ for growing the hemp (photosynthesis) and carbonation of lime (hydraulic and hydrated). The abiotic depletion (fossil fuel) is mainly due to hydraulic lime and its importation from France. This product has specific properties that could however be replaced by an alternative material with a lesser impact. The replacement of French hemp with Belgian hemp has also been considered but the trials conducted by IsoHemp are not yet conclusive.

### Results of the project

Environmental impact

<table>
<thead>
<tr>
<th>Activity</th>
<th>Abiotic depletion</th>
<th>Abiotic depletion (fossil fuels)</th>
<th>Global warming (GWP100a)</th>
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</thead>
<tbody>
<tr>
<td>Water</td>
<td>100</td>
<td>100</td>
<td>100</td>
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<tr>
<td>Hydration lime</td>
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<td>Mining</td>
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<td>Storage</td>
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<tr>
<td>Palletising</td>
<td>100</td>
<td>100</td>
<td>100</td>
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<tr>
<td>Abiotic Reserve</td>
<td>100</td>
<td>100</td>
<td>100</td>
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</tbody>
</table>

An estimated saving of 1 euro/pallet in the case of replacing the current corner pieces with a less harmful alternative.

Block manufacturing requires premium quality raw material inputs in order to supply customers with a product with a constant technical performance. To achieve this, there are currently only a few industrial firms that can supply raw materials suitable for block manufacture. Other local production would be positive for the global environmental balance but this product would require improvement... So is it economically and environmentally effective?
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Description of maturity in LC approaches before the project

IsoHemp was already aware of Life Cycle approaches. The product and the process were initially the subject of an eco-design approach and therefore already optimised from an environmental impact standpoint, leaving little room for significant improvement.

Description of maturity in LC approaches after the project

The project raised awareness through a quantitative analysis of the process and identified the most significant impacts that IsoHemp will attempt to improve, namely the packaging of pallets of hemp blocks and, to a lesser extent, transport logistics. The company also wishes to introduce wider external communication concerning its product, notably by lodging an EPD.

Maturity and strategy

Before pilot project

After pilot project

Long term objective
Using corners to replace the galvanised steel corner pieces currently used would necessitate protecting the pallets from rain. However, this represents an investment of around EUR 150,000, which is too costly for the company in the short term but will be implemented over the next 2-3 years.

The LCIP project highlighted the strengths and weaknesses of management decisions on the environmental performance of the company. These impacts are consistency directly linked to high economic costs. Although it is not possible to reduce an environmental impact with an economic impact, this provides a development opportunity, either directly for the company or for specialised researchers.

**Environmental assessment**
The analysis of raw data was used to objectively assess the performance and make relevant choices.

**Economic assessment**
The results of the analysis allow a better identification of the advantages of changes.

**Social assessment**
The project was used to integrate the entire team and give them a sense of involvement. No decision is made without the team that implements it.

The actions currently planned are:

- To set up communication linked to the environmental approach;
- To establish an Environmental Product Declaration;
- To make a market analysis of new corner pieces;
- To minimise the impact of lime and hemp.

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