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I-PAN

INNOVATIVE POPLAR LOW DENSITY STRUCTURAL PANEL

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D8.5/1- LCA VALIDATION

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Document information

Abstract

The Life Cycle Assessment (LCA) is an instrument for analysing products and /or services which takes each stage of the product/service's life into account, the raw materials, construction or supply in case of services, the utilization and lastly disposal at the end of the product's life. The ISO 14040 series standard requirements have been utilized as a reference for the LCA.

The LCA analysis has been conducted by the partner, CIAOTECH principally utilizing the data provided by IMAL and IBL Spa, as well as using their own skills and resources, the databases available and of course in conjunction with the project partners as well.

Keywords

Poplar, wood, wood-based panels, engineered wood, environment, LCA, carbon footprint, GWP

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* Abbreviations of editor/contributor name

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LIST OF ABBREVIATIONS AND DEFINITIONS

DM	Deliverables Manager
DoW	Description of Work
EC	European Commission
PM	Project Manager
PMQP	Project Management and Quality Plan
PMB	Project Management Board
PR	Peer reviewer
TMB	Technical Management Board
QM	Quality Manager
WP	Work Package
OSB	Oriented strand board

INTRODUCTION

IBL is an industrial facility for the manufacture of OSB panels where it has been possible for the partners to experiment innovative solutions to make improvements to the OSB panel production process due to the fact that IBL is a partner in the IPAN project.
The I-PAN project, which started in October 2012, has addressed a series of technology innovations to the OSB manufacturing process.

OSB is employed in a variety of industrial sectors, ranging from the building sector, to maritime industry and the recreational sector, thanks to the following characteristics:

- Easily engineered in terms of size, thickness, strand orientation and with a relatively large choice of adhesives, e.g. UF, MF, MDI, PU resins, etc..
- Uniform and flawless (gaps, core voids, holes).
- Stable and durable.
- Water-resistant (waterproofing can be achieved with additional membranes).
- Desirable structural properties: high strength-weight ratio and rigidity.
- Versatility: it can be employed for wall/roof sheeting, subfloors or single-layer floors and I-joists.
- Less expensive than traditional plywood.

The innovations introduced by the I-PAN project have regarded various aspects of the production process:

1) Innovations to process steps dealing with strand drying, handling and metering;
2) Polymerization of resins at lower temperatures to reduce toxic elements in the emissions and reduce energy costs;
3) Innovations to the blending process and surface layer treatment for dust forming, greatly improving the mat forming process.

Moreover, the I-PAN panel has been produced with poplar wood from controlled poplar plantations and with 30% of wood coming from the upper part of the trees and reintroduced into the process, which would otherwise be treated as waste material.

Such innovations have led, on one hand, to important environmental benefits and on the other to the manufacture of a panel which possesses the same structural characteristics as the conventional panel but which is lighter in weight. This is a key factor for additional environmental benefits associated with the transport phase.
We have an LCA Report - the Life Cycle Assessment (LCA) study – that is to be checked and validated

1 LCA ANALISYS

The *Life Cycle Assessment* (LCA)) is an instrument for analysing products and /or services which takes each stage of the product/service's life into account, the raw materials, construction or supply in case of services, the utilization and lastly, disposal at the end of the product's life. The ISO 14040 series standard requirements have been utilized as a reference for the LCA.

Through the LCA it is possible to:

- Identify the opportunities to improve the overall performance of the production system and/or supply of the service;
- Analyse the products from the point of view of the whole system, or functional unit, in a coherent, transparent and reproducible manner, aimed at guiding the choice of the raw materials, innovating the product and its packaging;
- Analyse the levels of atmospheric emission (e.g. CO_2) related to the production and/or supply of the service.

The ultimate target is to mitigate the impact of the product or service on the environment.

As stated in the abstract, the LCA analysis has been conducted by CIAOTECH in conjunction with all the partners, and with IBL in particular. IBL is to proceed with the validation of the work carried out by the partner as provided for in the Grant Agreement.

For this activity, with reference to IMAL's competence, a "*Critical Review*" has been made of the LCA analysis in compliance with the ISO 14044 standard requirements which is the standard that sets forth the requirements and guidelines for the Life Cycle Assessment.

The review work consists of the following stages:

- Documental review of the LCA study proposed;
- Random review of the calculation methods used;
- Verification of the data sources and factors utilized.

These will be looked at in detail in the following sections.

2 LCA VALIDATION

Life cycle assessment (LCA) is a methodological framework for estimating and assessing the environmental impacts attributable to the life cycle of a product, such as climate change, stratospheric ozone depletion, tropospheric ozone (smog) creation, eutrophication, acidification, toxicological stress on human health and ecosystems, the depletion of resources, water use, land use, and noise—and others.

However, LCA is not a means to determine absolute environmental impacts of those systems. No environmental model can absolutely represent a system because the scale and complexity associated with building and executing those models makes verification and validation difficult, if not impossible (Oreskes, Shrader-Frechette et al. 1994). Nevertheless, such models can be useful for providing insight into the system, so long as the proper context is understood and all of the assumptions leading to the resulting conclusions are made clear. When comparing multiple systems, LCA becomes a powerful tool because the relative environmental performance of those systems can be useful information when determining the environmentally preferable alternative (Goedkoop, De Schryver et al. 2010). Determining which of two systems (modelled and assessed under the same assumptions) is environmentally preferable can be done with more confidence than trying to determine whether one system, modelled without a baseline, has acceptable environmental performance.

The leading standards used for performing LCA's are ISO 14040 and 14044. ISO 14040 outlines general principles and framework, while ISO 14044 provides requirements and guidelines. A major issue with these standards is that the language is vague, and it can be difficult to determine if an LCA is being performed according to the standard. Furthermore, there is no way to certify that an LCA was performed according ISO standards. Nevertheless, ISO 14040 and 14044 do provide a useful guideline for performing an LCA. The tool used to perform the LCA in this research (CCalC) allows for the model being built to follow the ISO standards closely, but it cannot guarantee that ISO standards were followed .

Though LCA can have many advantages, there are a number of unresolved issues (Reap, Roman et al. 2008; Reap, Roman et al. 2008). Key problems that are most likely to influence this research include issues with data quality, allocation of environmental burdens, and system boundaries. These issues are somewhat mitigated because this research performs a series of LCA's under the same assumptions and conditions. Issues with data quality, allocation, and system boundaries affect all of the analyzed processes equally. Though the absolute environmental impacts of these systems may not be achieved with high accuracy, the results are determined with high precision, which is necessary for determining the trends and relationships that are required to answer the research questions.

According to the ISO 14040 and 14044 standards, an LCA is made up of four parts : goal and scope definition, inventory analysis, impact assessment, and interpretation. ISO 14040 defines the principles and framework of the LCA, while ISO 14044 provides requirements and guidelines.

2.1 DOCUMENTAL REVIEW OF THE LCA ANALYSIS PROPOSED

Following the analysis of Deliverable D2.6, it may be said that:

The goal and scope

is to compare the environmental impact of the traditional OSB production process with the environmental impact of the innovative I-PAN process. The unit of measure utilized, 1 mc of OSB, is the conventional one and which has also been used in the production analysis and environmental impact analysis.

The Life Cycle Inventory (LCI)

Life cycle inventory (LCI) data have been collected by specific technology used in each life cycle stage through close collaboration with researchers and companies currently involved with the technology. As described in the LCA report, the **LCA software package CCaLC Tool** (Carbon Calculation over the Life Cycle of Industrial Activities, developed by a research group based at the University of Manchester), which contains some LCI databases for commercially available materials and processing technologies, has been used when data were not directly available.

The Life Cycle Impact Assessment (LCIA)

The results reported in this paragraph have been obtained using the LCA software package CCaLC Tool (Carbon Calculation over the Life Cycle of Industrial Activities, University of Manchester). With the CCaLC Tool it is also possible to calculate the added value of the industrial process. The aim of our analysis is to assess the life cycle impact only, so the added value data will not be considered.

Interpretation of the results

The I-PAN LCA study considers the environmental impacts of all the phases going from the supply of raw materials through to the realization of the OSB panel.

The usage and disposal phases will not be taken into account since there are no differences between the traditional OSB and the I-PAN panel.

The only exception is the transport of finished panels from the production site to the distribution centres: in fact, the innovative I-PAN panel is lighter than the traditional OSB, thus resulting in the saving of CO2 emitted by trucks during transport, separately assessed in this study.

The final interpretation of the report is valid and reflects what was expected.

2.2 RANDOM REVIEW OF THE CALCULATION METHODS UTILIZED

We have checked the data used in the assessment; these are the data from our authorization, the Single Environmental Authorization (AUA) and are in compliance with the values indicated therein. Since we do not possess suitable means, we shall assume that the reference data are good.

2.3 VERIFICATION OF THE DATA SOURCES AND THE FACTORS UTILIZED

The sources used and the information derive from IBL and IMAL and so, within the limits of the relative accuracy since the data have not been collected for the single work process stage, but as a set of stages, these are the best levels of reliability that we can have.

We believe that the final interpretation of the report is correct as the process that has been implemented is definitely more reliable than that of our competitors, but there is still room for improvement if the information on the utilization of input and output resources is collected more efficiently in order to understand which environmental impacts can be avoided and which technological improvements are to be applied in similar situations.

3 CONCLUSIONS

The LCA written by Ciaotech is to be considered approved and hence validated. The difficulty had with collecting information on the process and breaking down the data to have details on the inputs/outputs for each stage of the process will encourage us to organize the information in a better way in future, so that we may also, in a couple of years, repeat the LCA analysis with more reliable data, and not just approximate data, to be able to make comparisons with the BAT- Best Available Technology – present above all in our industrial sector and in others as well.