Climate impacts of silo constructions and improvement possibilities

This study conducted a Life Cycle Assessment (LCA) of a silo construction project in Uddevalla, focusing on comparing different material and method choices with their environmental impact measured in CO_2e. CO_2e is a common unit used to summarize climate impact caused by different greenhouse gases. LCA is a methodology used to evaluate the environmental impacts of a product, process, or activity throughout its entire life cycle, from raw material extraction to disposal. It considers four stages: A - Construction Phase, B - Use Phase, C - End-of-life Phase, and a D phase encompassing other factors. An LCA for life cycle stages A1-A5 has been conducted in this study. Three scenarios - best case, worst case, and one based on generic data - were analyzed to identify differences in emissions based on supplier and material choices. The results indicate that the selection of material suppliers plays a crucial role in the overall environmental impact and that clients should demand climate-smart alternatives to drive the industry towards a more sustainable direction.

Silo constructions are an integral part of many industrial processes, not just in the grain industry, and their design and material choices can have significant consequences for the environment. This study aims to analyze and compare the environmental impact of different material choices for silo constructions, with a focus on CO_2e emissions. Using LCA, we examine how material and supplier choices affect the environmental impact of the silo project. With this background, the goal was to be able to provide the client with specific suggestions for actions to reduce carbon dioxide equivalent emissions in the project, as well as in future projects.

Environmental impact data was collected from various material suppliers for the silo construction, often through Environmental Product Declarations (EPDs). An EPD is a documentation providing information about a product's environmental performance based on an LCA conducted for the specific product. It typically describes the environmental impact of the product from raw material extraction to end-of-life disposal, and it can be used to compare environmental performance between different products. The three scenarios described earlier were analyzed together with compiled costs for different actions to gain a broad understanding of potential emissions and economic effectiveness of each action.

The results show that the choice of material suppliers has a significant impact on the overall environmental impact of the silo construction. For the tree cases the following emissions are expected:

- Best case: 4600 tons CO_2e
- Worst case: 7200 tons CO_2e
- Generic data: 7700 tons CO_2e

Top three economic effective actions:

- Electric crusher plant: -7241 kr/ton CO_2e
- Concrete: 1059 kr/ton CO_2e
- Glulam: 1500 kr/ton CO_2e

The differences in emissions between different suppliers are significant, emphasizing the importance of selecting climate-smart alternatives. By selecting the right concrete supplier, emissions can decrease from 1900 tons to 1400 tons, resulting in a total reduction of 500 tons of CO_2 emissions. Furthermore, the silo construction in Uddevalla was compared to a similar facility in Sala, where the choice of materials and construction showed to have a crucial influence on the overall environmental impact. Finally, it was shown that certain measures saved on both emissions and costs. If the crushing plant is powered by electricity instead of diesel, the project saves significant amounts of carbon dioxide equivalents while reducing costs.

The discussion focuses on the importance of clients taking active responsibility in demanding climate-smart alternatives and the industry transitioning towards more sustainable construction practices. Additionally, the challenges of collecting data for LCA, especially from electronics suppliers, are highlighted, along with the need to increase transparency regarding material content to make more accurate assessments of environmental impact.

The study emphasizes the importance of carefully considering material choices and properly sizing building structures to minimize environmental impact. By including environmental requirements in the procurement process, clients can play an active role in promoting sustainable construction practices and driving the industry towards a more sustainable future. At the same time, the study underscores the need for increased accessibility and transparency of environmental data to facilitate the implementation of LCAs in construction projects.

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