

Ecovative Design Mushroom Packaging Life Cycle Assessment

Ecovative Design, LLC (Ecovative) is a materials science company developing a new class of high-performance products which serve as environmentally responsible alternatives to traditional foam packaging, insulation, and other plastic-based materials. Ecovative's EcoCradle® Mushroom® Packaging is a new technology for environmentally responsible packaging materials made from agricultural byproducts and mycelium, or mushroom "roots".

Challenge

Ecovative uses fungal mycelium (mushroom "roots") to bond together locally sourced agricultural byproducts into Mushroom® Packaging base material. This material is used in a variety of applications including as blocking and bracing packaging as modeled in this study. As Ecovative expands into its new 28,000 square foot manufacturing facility, they requested that NYSP21's Green Technology Accelerator Center compare the environmental impact of three different Mushroom® Packaging base material configurations to understand and help optimize their unique new biomaterials manufacturing process.

Solution

NYSP21 engineers mapped Ecovative's new manufacturing processes through the use of a Life Cycle Assessment (LCA), a tool used to evaluate the full environmental impact of products and processes. The LCA purpose was to: evaluate the impact of competing Ecovative internal inoculation processes; understand the relative contribution of material changes, supplier locations, transportation impacts, energy use, etc. to environmental impact; and highlight specific manufacturing processes of interest in the results. Primary data was collected directly during multiple process runs. By doing a comprehensive cradle to grave LCA on their baseline process, priorities and opportunities for significant environmental improvement were uncovered.



Results

The LCA results are leading to process improvements and energy efficiency gains by comparing process alternatives, and process changes are being recommended for installation in Ecovative's facilities. Results include:

- Two material configurations comparing inoculum processes showed that the inoculum type had an insignificant impact, directing Ecovative to shift its research focus away from developing new inoculum processes.

CHALLENGE

- Ecovative wanted to compare the environmental impacts of the three ways they package materials, and thus optimize their manufacturing process

SOLUTION

- NYSP21 mapped the new manufacturing processes through a Life Cycle Assessment (LCA) to evaluate the full environmental impacts

RESULTS

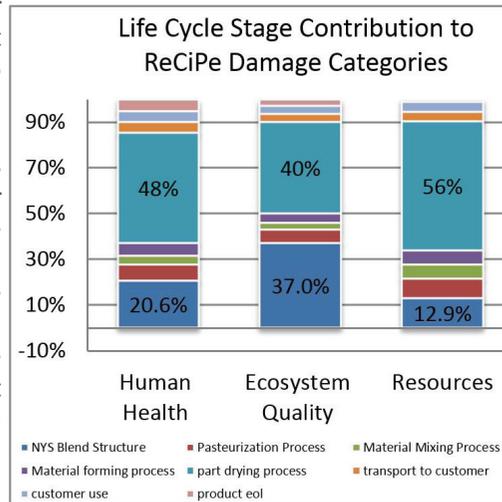
- LCA results lead to process improvements and increased energy efficiencies
- Material comparisons showed the base material (mushroom roots) didn't cause substantial impacts
- The part drying process was shown to contribute over 50% of the entire life cycle carbon footprint. As a result, Ecovative is testing an alternate drying process that uses about 1/3 the energy and dries in minutes instead of hours.
- Ecovative continues to use the LCA model to compare to other alternative packaging foams

TESTIMONIAL

“The NYSP2I Green Technology Accelerator Center was a perfect fit for Ecovative’s needs to understand and optimize a unique new biomaterials manufacturing process. Ecovative uses growing fungal mycelium (mushroom “roots”) to bond together locally sourced agricultural byproducts into materials called Myco Foam for use as packaging, insulation and more. Under the GTAC program, Ecovative worked with Life Cycle Assessment experts from RIT to measure, model and analyze the environmental impacts of the Myco Foam pilot manufacturing system. This invaluable work has impacted decisions across the company, leading to process improvements and energy efficiency gains. Further work was conducted to research and manage testing of Mushroom Packaging parts to achieve Biodegradable Products Institute certification. Additionally, an apparatus and work plan was devised that enables faster future research and testing for compostability claims. These clear and quantified claims allow Ecovative to expand its market opportunities.”

- Sam Harrington, Ecovative Design

- An additional material configuration comparing a different structural feedstock showed that the material strength to weight ratio was critical shifting focus to higher performance feedstocks that could be grown locally to also reduce transportation impacts.
- The part drying process was shown to contribute over 50% of the entire life cycle carbon footprint. Additional impacts are highlighted in the neighboring chart. As a result, Ecovative is testing an alternate drying process that uses about 1/3 the energy and dries in minutes instead of hours.
- Ecovative continues to use the LCA model internally to compare to common alternative packaging foams.



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