TEP4854 - Plastic free oceans, GROUP 3

EcoFungi Solutions

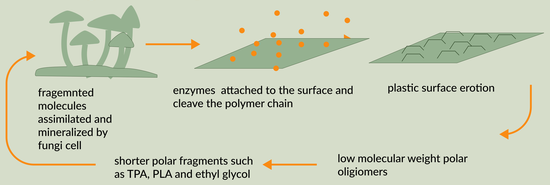
References and further work

see support document

Background

Plastic pollution is a pressing global issue, with 400 million tons of plastic is thrown away every year on a global scale. In Norway alone over 70.000 tons of plastic was collected in 2023 [3]. This leads to extensive microplastic pollution. In response, EcoFungi Sol. has developed a sustainable approach, utilizing the natural bioremediation in fungi.

Bio degradation process

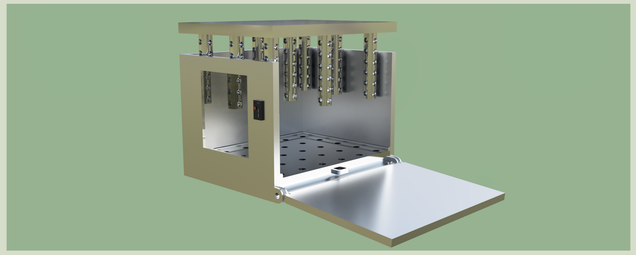


Scientific research

There are over 400 different types of fungi that have the ability to break down plastic using their enzymes and convert into biomass. We choose a mixture of different fungi species to digest different type of plastic e.g. PS, PE, PC and PU . [12] Most of the researches are on identifying new species of fungi able to digest plastic rather than designing the industrial methods of using the existing fungi. Research has proved that UV-pretreatment improves the biodegradation efficiency of plastic (PE and PS), by increasing roughness, hydrophilicity, microbial viability, biofilm formation [17].

Product

This desgin compactly promotes easy accessibility and modularity. Able to store both plastic and fungi in high volumes. The cylindrical extrusions conected in the roof and bottom shelf will store fungi, accessing the plastic through small holes which will fill out the remaining space. This is designed for maximize the contact surface.

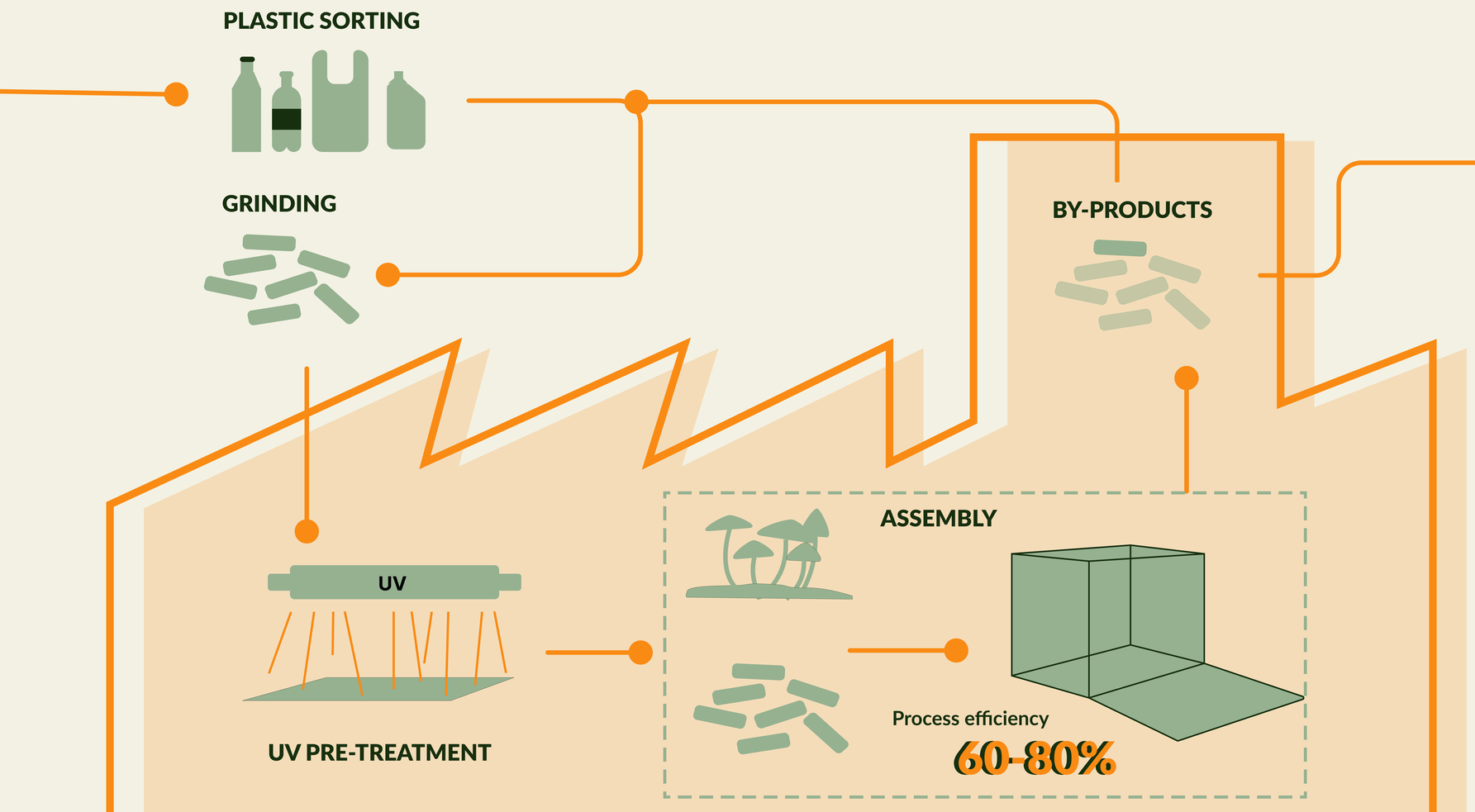


Assumptions

- It is possible to cultivate fungi for large scale degradation of plastic.
- Economical feasibility.
- The fungi mix can degrade different composites of plastic.

Benefits for society:

The primary objective was to create a plastic recycling process that eliminates the production of microplastics. Fungi breaks down the plastic into its primary chemical components. Leveraging fungi-based bioremediation offers an organic and environmentally friendly alternative. EcoFungi Sol. proposes a natural solution to an industrial problem.



The process:

Plastic Sorting: collected and sorted plastic goes into the process

Grinding: Granulation of sorted plastic.

UV Treatment: Degradation enhancement and Cleaning.

Assembly: Insert plastic into the module with pre-grown fungi. This degradation has en efficiency of 60-80%, and takes 14-16 days. [14]

By-products: Non-degraded plastic going back into the sorting or to biofuel production.

Biofuel: Fungi and degraded plastic converted to Biofuel at a separate location. (The efficiency is ranging from 2.0-40.0% w/w ratio, depending on oil content)[7]