G.O.A.T

"A bioengineered facility to fight textile pollution"

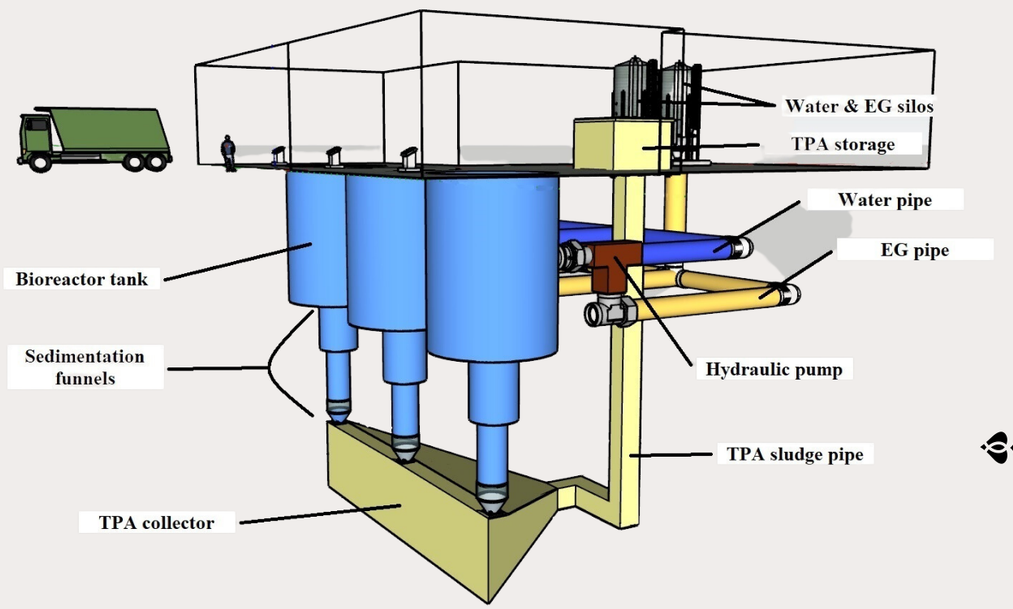
The Problem

The problem regarding plastic pollution in the ocean has gained attention over the last few years, but we have still not successfully stopped the development. Every year it's estimated that 9-14 million tons of plastic end up in the ocean, and this is expected to increase in the years to come. The plastic that ends up in the ocean is not necessary easy to remove either since about 94% sinks to the bottom, while the other 6% ends up in the surface waters or on the beach. The main reason that plastic ends up in the ocean is poor waste management systems, usually in developing countries. This is a threat to both animals and humans as plastic in the digestive system can block important functions in animals, some animals can mistake plastic for food and the accumulation of microplastic is a problem in both animals and humans.

Clothes

The clothing industry is responsible for 20% of the global water pollution as well as 10% of all the microplastics that end up in the ocean each year. On a yearly basis, less than 1% of used clothing is recycled into new clothing and only 13% of textile waste is recycled at all. The rest, 92 million tonnes each year, is sent to landfills or incineration. That is equivalent to a full garbage truck of textile waste every second. In Norway it is estimated that each person throws about 23 kg textiles each year, 65% of this is either partly or entirely made of plastics.

The facility



STEP BY STEP PROCESSING OF CLOTHES BY G.O.A.T. SYSTEM

1. Create culture of Ideonella Sakaiensis.
2. Inoculate culture in media.
3. Transport media into bioreactor tank.
4. Add shredded clothes and incubate.
5. Introduce comb to remove the cloth fibres. I. These cloth fibres will be cleaned, disinfected and processed.
6. Let the terephthalic acid precipitate into a bottom collector.
7. Pump media through 5 nm nylon filter. I. Bacteria, debris, organic matter and terephthalic acid particles are left inside the bioreactor.
8. Push water and EG mixture with high pressure through NaA zeolite membrane, dehydrating the EG.
9. Collect the water and ethylene glycol through different pipes.
10. Refill bioreactor tank with water and grow media. Sell the obtained by-products.

Bacteria

I sakaiensis is a PET-degrading microbe producing two interesting enzymes assisting in the process: PETase and MHETase. It has been reported that a specific strain can degrade nearly all thin PET films during a 6 week period of cultivation. However, it is not yet in a state to degrade everyday PET products. But, recent studies have achieved elevated efficiency of PET degradation by modifying the enzymes, paving the way for further use from the industry.

Issues/opportunities

The research used in this project is still in an early phase, which limits the certainty around our conclusions. Further research is needed to get more precise answers related to how feasible it is to develop the technology. Other uncertainties related to our project is how profitable the solution is as well as the social benefits it can provide. Our solution also relies on fabrics that only consist of natural fibres and PET plastic, or solely PET plastic. This can be a challenge because the clothing industry uses a wide variety of materials, and it is difficult to control each garment.

Despite some challenges related to the solution, there are some interesting opportunities that are worth looking further into. One being that the system will reduce the amount of fabric waste by revitalizing the materials so that they can be reused for new fabrics. A more developed solution can also start tackling other products to increase the extent of the recycling.