Electronics Waste Plastic Recycling

CloudBlue is an aggregator of electronic waste: they receive post-consumer electronic material, sort it, and sell it to recyclers. One of the many problems with recycling this waste is dealing with the plastic that houses most electronic products. The plastic materials found in the electronics waste stream are difficult to recycle because there are many different types of plastics that are all highly engineered and include many additives and coatings.

Very few companies even have the capability of dealing with these plastics because of their variability. Therefore, our team set out to help CloudBlue solve their plastic problem by developing a product that can be made from their mixed plastic waste stream.

Example products from the waste stream. CloudBlue receives many components such as laptops, desktops, printers, and other electronic equipment.

Our team was dedicated to exploring the characteristics of the mixed plastics in CloudBlue’s waste stream, ideating products that capitalize on these characteristics, and outlining the manufacturing and financial strategies for large-scale production of one final product. The strategy throughout was to add design value by developing a repeatable shape.

Fibers were created by melting plastic and pulling it using experimental methods. The plastic was not sorted before melting or during pulling. While fibers were an important study in our project, they were not taken forward because the development time for fibrous products was longer than the sponsor desired.

Implementation Strategy

Case Study: Bathroom Stalls

1. Materials Handling

2. Manufacturing

In addition to ideating product concepts, we have developed strategies for the implementation of the bathroom partition product. The two diagrams above map the steps to the process. In order to develop this process we talked with many people in industry and assessed the financial viability of this product. We have established contacts with manufacturers who can help CloudBlue push this product to market.

Product Concepts

As we learned more about product applications, we discovered a large area of opportunity: building materials. There are construction standards such as LEED that encourage builders to use much recycled content. We therefore wanted to find an application in this area. Below are the three product concepts that we believe are most feasible for CloudBlue.

Bathroom Stalls Partitions:
- easy manufacturing
- high volume market
- low human interaction
- controlled environment
- LEED points

Floor Tiles:
- easy manufacturing
- higher human interaction
- only loaded in compression
- LEED points

Roof Tiles:
- more complex shape
- uncontrolled environment
- low structural requirement
- no human interaction
- LEED points

Layering and Compression Molding

Compression molded blocks were chosen for a more in-depth study because our exploration showed promise in the material and our ideation lead to viable product concepts. While contamination from the recycled material was a main concern, initial tests suggest that this is not a huge issue. Regardless, we decided to explore processing techniques that would reduce this problem as well as other concerns such as surface finish. Layering virgin and recycled plastic in the compression molding process allowed us to create a material to resolve these issues.

SolidWorks model of the mold used to make the 1-inch by 1-inch samples. A sanded, finished sample.

Some of our samples were water jet cut into dogbone shapes for tension test samples.