



# Design a prototype to remove polystyrene from processed 0-10mm construction and demolition waste.

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## C&D Waste Plant:

A material handler feeds the waste material into the first process, a shredder. Conveyors transport all this waste material around the plant bringing it from the different processes as seen in figure 1 and separating it into the different bays as shown in figure 2.

## Separation method's researched:

- Air
- Vacuum
- Electrostatic

The electrostatic concept ranked as potentially the best method of removing the polystyrene. As one object loses electrons and becomes positive, the other object gains electrons and becomes negative, then opposites will attract which can be seen in figure 4 below.

## Testing the electrostatic concept:

### Test 1:

- Voltage applied to a piece of aluminium.
- Problem – voltage was too low to create the static force required to attract the polystyrene.

### Test 2:

- This test proved the concept that the polystyrene would stick to a static force.



Figure 1: Conveyors transporting C&D waste material



Figure 2 : Separation bays

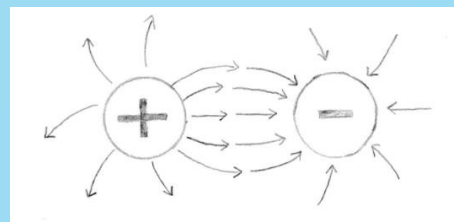


Figure 4: Electrostatic charge concept



Figure 6: Test 1 setup



Figure 7: Test 2 setup



Figure 8: Test 2 results

## The finalised design:

The finalised design contains one vibrating table. It has one drum which will be statically charged. A brush will be used to help clear the polystyrene off the drum. A box will be used to collect the polystyrene, this can be taken out and emptied by a forklift when it is full. This solution can be easily modified to suit slightly different C&D plants. This solution will be easy to integrate into the plant.

## Contribution to the knowledge of the removal of polystyrene for the future:

- High voltage and controlled environment are necessary for use of electrostatic concept to remove the polystyrene.
- Drum material – Plastic material to be considered as lower voltage can be used. Coating the aluminium drum with a plastic material or putting a plastic material over the drum could also be a potential solution.
- A system could be designed with multiply drums, allowing one drum to clean off while the other drum was still collecting the polystyrene.
- Integrating conveyors for future design – allow for continuous flow of material.

## Problem statement & aim:

Polystyrene of 0-10mm is not removed from the final waste, and is sent to landfill, incurring high costs and environmental issues. The aim of the project is to design a prototype to remove this polystyrene present in the construction and demolition (C&D) waste.



Figure 3 : Polystyrene present in the C&D waste

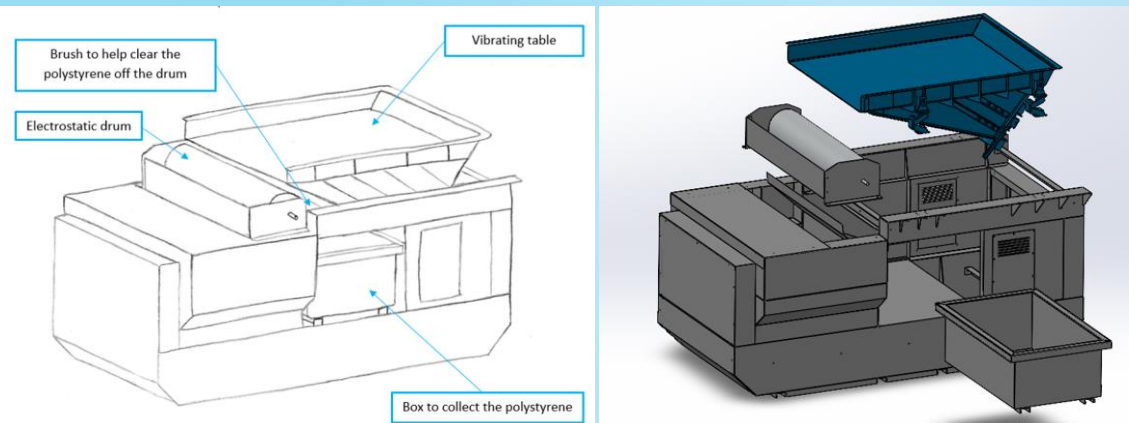


Figure 5: Sketch and exploded CAD model of the finalised design