PRECIOUS PLASTIC MONASH UNIVERSITY

Start Here:

Throughout the process of building and running the machines we found various problems which were not accounted for during the design phase. This document describes these issues and the solutions or work-arounds implemented in order to meet operational requirements. General changes were added to the original machine's designs not as solutions to any problems, but as general improvements to better suit the overall aesthetics or to make use of easily obtainable components. In the document, future possible upgrades have been added to help collaboration from other Precious Plastic chapters, so have fun, and let's recycle!

1. Problems Encountered:

1.1 Heating System:

When selecting an oven, it is ideal to find an oven with heating coils on either the side walls or back wall, as the oven chosen for our integration unit had the heating system on the base. This created a temperature gradient, which was observed to be length dependant inside the oven, which creates issues with manufacturing and loss of quality. Numerous tests were conducted in order to find the specific wait times and temperatures needed for the various plastic types. Therefore, a more considered selection process is needed for a more efficient heating process, but whatever oven you are able to obtain will work as long as you perform the appropriate testing.

1.2 Base of the oven:

The oven in use is a laboratory oven and it is designed to be floating from the base to isolate the high temperatures from the environment. This system lacks support for the base which would fail under the compression forces experienced during operation. Therefore, support rods were added to sustain the forces applied to the base. However, this caused the cooling down of the oven to take a longer amount of time as the rods were solid metal, but since the base was now strong enough for compression this lag time was over looked as the oven met the specifications needed for our integration unit.

1.3 Scissor Jack:

The scissor jack used is designed to hold 1000kg of force of compression. This compressive resistance was not maintained whilst being used in an inverted position. During operation tilting of the jack, extra weights added and one-sided weight of the wheel assembly led to the failure of the hinge points. Therefore, springs were added to both of the jack scissor arms which help to counter the effects of issues observed.

1.4 Jig plates:

The top jig plate during operation was observed to swivel inside the oven. This led to the plate hitting the sides of the oven and causing the compression to not be even. To avoid this, three rods were passed through the two plates and acted as a guide to maintain a steady compression force.

1.5 Hollow tubes to solid rods:

In order to avoid the compression tubes from failing during usage, the change was made to solid rods from hollow tubes. This allowed for a stronger member and the point of failure was discarded from the rod.

2. Future Upgrades

2.1 Jack configuration:

The current jack could be upgraded to avoid failure in the hinges. There are jacks on the market that are closed from the hinge points. Although these jacks are more expensive and would need a bit of machining to implement it onto the integration unit, the rewards and time saving for using it out-weighs the system used now.

2.2 Transparent door:

As the oven does not provide a way to see into the oven a transparent door would be useful. This allows for a more interactive process and avoids damaging the components inside the oven as any faults can be seen during the compression. This would allow the door to remain shut whilst observing the stage of melting the plastic is in.