



PRECIOUS PLASTIC MONASH UNIVERSITY

Start Here:

Throughout the process of building and running the integration unit 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. 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 Unstable Pallet:

A sheet metal steel pallet was found to be not structural enough for our application as the final weight of the unit came to around 450 kg. Instead we opted to making our own pallet in house from 2.5mm RHS mild steel to satisfy our strength requirements.

1.2 Mounting Machines to Unit:

We want the unit to be as modular as possible so that future modifications and upgrades could be made. For this reason, we added a timber base plate above the pallet to screw the machines into opposed to a permanent option such as welding.

1.3 Pallet Crossbars:

For stability, 5 crossbars were added underneath the pallet. Using this method is perfecting fine with a forklift but caused issues when transporting the unit using a pallet jack. The jack was caught between the crossbars and the frame while jacking, bending the bars. To resolve this, the crossbars were cut off and the sides reinforced.

1.4 Insufficient Tabletop Clamping:

Additional fasteners were added for the tabletop due to the Shredder imposing significant torque and vibration to the unit. Calculate your required clamping based on post inspection, motor power and FEA.



PRECIOUS PLASTIC MONASH UNIVERSITY

1.5 Table Legs:

The table legs proved to be a problem that popped up out of nowhere! Initial ideas included struts bracing back to the unit or removable legs. The strut idea was shut down as the area under the table was crucial to access electricals and attach injection moulds. The removable table legs were scrapped due to minimal packaging and also we set ourselves a requirement of being able to set up the unit in 5 minutes. Incorporating legs that you would have to bolt on each time would make us exceed that value.

In addition to this, the tables will be used as workbenches and inevitably lent on. Do some calculations to ensure the hinges and timber you use are strong enough.

1.6 Height of the Unit:

Check your countries standards for door heights. In Australia the standard door height is 2040mm so we designed for that. Unfortunately we didn't realise that all fire doors / elevators are 1980mm. The central tower of the unit had to be cut down to ensure the unit could be transported anywhere.

1.7 Funnel into Collection Tray:

The shredder's pellets were not falling into the collection tray because they were falling so far from the sieve. This meant pellets were being scattered all around the drawer. A funnel was incorporated to direct the feed into the tray.

1.8 Shredder and Wiring:

The wiring from the Shredder and Extruder did not have enough length to be run around to the door of the central tower. Instead, notches were drilled out to be fed underneath the timber so that the final set up looked neat and presentable.



PRECIOUS PLASTIC MONASH UNIVERSITY

1.9 Electrical:

With regards to the electrical setup of the Integration Unit, we took advantage of the services of a licensed electrician in order to carry out all our electrical work. Working with 240V is hazardous, and we recommend that extra precautions be taken for this aspect of the project, and that a qualified individual is employed.

We made only minor changes to the designs in Dave Hakkens' download kit. The first of these was to relocate the PID controllers to a common centralised control panel for improved ease of use and ergonomics.

We also made changes to the main 240V power distribution system: we installed the following:

1. 4 x emergency push buttons to isolate the unit from all 240V power supply. The push buttons are wired in series and loop in the contactor relay that allows the distribution of current through the switchboard. In this way, if any of the push buttons are depressed, all power is isolated to the switchboard.
2. Circuit breakers and contractors to prevent shorts
3. 3 x 10a regular power outlets to power the machines and the required accessories such as PID controllers and audio/video displays. One of these outlets powers the contractor and breaker, and the other allows 2 power inputs to operate.
 - a) The shredder and extruder motors are both rated at 1.5kW and are connected on the same power line (1)
 - b) The compressor is rated at approximately 1kW and is connected on power line (2)
 - c) The PID controllers and accessories are powered by line (3)



PRECIOUS PLASTIC MONASH UNIVERSITY

2. Future Upgrades:

2.1 Washing and Drying:

Washing and drying components were originally considered to be integrated into the unit. These features were removed due to size and power restraints. It was near impossible to keep the unit at 1x1m and run from a 10 Amp circuit while also supporting washing and drying mechanisms. If you aren't restrained by the aforementioned, including washing and drying would be very beneficial as that would mean the entire process of plastic recycling would be contained in the unit!

2.2 Trailer:

A recommended upgrade that we are currently working on is a trailer that not only transports the unit but also functions as a stall to be used to display and/or sell products.

2.3 Live Feed Locations:

We currently have included a live feed camera inside the shredder to help with demonstration purposes. Increasing the the number of live feed cameras could be a nice addition. It would allow, for example, someone to watch a bowl be formed in the oven and the plastic ooze out.

2.4 Compartmentalised Drawers:

Our drawers that are being used are categorized by Electrical, Safety & PPE, Moulds and Raw/Shredded Plastic. Since there isn't much packaging space in the unit, thinking more about the use of the space occupied by the drawers could allow you to utilise a compartment based drawer system to store more items.

2.5 Umbrella:

Another initial idea that was rejected. An umbrella would be a great asset for protection from the sun/rain and also branding. The difficulties we came across were in regard to not having enough space. Increasing the central tower size could allow for it to be mounted in the centre.