About Precious Plastic

Ultimately, “Precious Plastic” is a platform for people all around the world to collect, recycle, build and sell recycled plastic goods. The precious plastic open source project encourages anyone to get involved by developing machinery and business opportunities to buy and sell recycles plastics projects and of course this allows for a cleaner earth by collecting un-wanted plastic.

Crutchfield Engineering manufactures and provides further development on the plastic shredder, extruder and Injection moulder, based on open source blueprints from the Precious Plastic machine series to reduce plastic waste.

Plastic can become a source of income, or an educational tool for your community, and Precious Plastic wants to show the world the incredible opportunities of plastic waste in order to eliminate plastic pollution, reducing the demand on new virgin plastic and closing its materials loop – while creating better livelihoods for people around the world. Precious Plastic is, above all, a cultural tool to change the way society perceive plastic.

The machines are made using commercial grade materials that easily available for quick maintenance and assembly times.

The set includes a plastic shredder, an extruder, and an injection moulder, which can each be used to turn waste plastic into new products. Hakkens first showed prototype versions at the Design Academy Eindhoven graduation show in 2013, and has spent the last two years refining his ideas and designs from which we also grew our inspirations.

"People can play around, start a business and recycle like rockstars," said Hakkens, who also designed the original Phonebloks modular mobile phone.

He hopes to address the reported 311 million tonnes of plastic waste created around the world each year, less than 10 per cent of which is currently recycled.

"Most of this will end up in the wrong place, landfills, oceans, inside animals," he said. "It's damaging our earth."

A recent effort by designers and companies to clear up waste plastic from the oceans and raise awareness of the problem has resulted in a variety of projects.

Architecture firm Spark also wants to recycle the material into a series of elevated beach huts.

Hakkens has used the Precious Plastic machines to create chopping boards, bowls, clipboards and plant pots that feature a distinctive mottled pattern of colours – all from waste material.
Safety precaution

**SAFETY PRECAUTION**

**ATTENTION**

Please read and understand the precautionary steps before embarking on operating, assembling or servicing the machine as hazards can result in serious injury or death.

Crutchfield Engineering or Precious Plastic do not take any responsibility for negligence or unsafe actions by the operator.

- Do not operate, assemble or service any machinery when fatigued.
- Never leave running machines.
- Always unplug unit when not in use.
- Ensure the unit is use indoors ONLY
- This machine is not a toy. Close attention is necessary when used for education purposes or involving the public.
- Do not use with damaged cord or plug. If machine is not working as it should, contact Crutchfield Engineering for assistance.
- Do not use the cord to pull or carry by cord. At all times, keep the cord out of harm’s way and heated surfaces.
- To unplug the unit, use the plug; not the cord.
- Do not handle plug with wet hands.
- Vents should be kept clear of objects that may reduce airflow.
- Keep hair, loose clothing, fingers and all parts of body away from openings and moving parts. Use safety glasses and heat resistant gloves.
- Do not pick up anything that is melted, burning or smoking.
- Turn off all controls before unplugging unit.
- The unit reaches temperatures during operation and therefore great care must be take to prevent severe burns or damage to surrounding.
Operation dangers

- Do not feed extruder with bottles, containers that may have flammable or combustible material inside.

- Do not use around explosive liquids or vapours, as electrical devices produce arcs or sparks which can cause a fire or explosion.

- Operate extruder in a well ventilated area. Heat generation may cause preeminent damage to the surrounds.

- The machine operates at high temperatures and therefore great care needs to taken to prevent severe burns or damage to the surrounding environment.

- **WARNING IF ANY OF THE MOTOR HOUSING PARTS SHOULD BECOME DETACHED OR BROKEN, EXPOSING THE MOTOR OR ANY OTHER ELECTRICAL COMPONENTS,, HEATERS. OPERATION SHOULD BE DISCONTINUED IMMEDIATELY TO AVOID PERSONAL INJURY OR FURTHER DAMAGE TO THE EXTRUDER. REPAIRS SHOULD BE MADE BEFORE REUSING THE EXTRUDER**

Lifting the heavy devices

- **Ensure** appropriate personal protective equipment worn like gloves, safety goggles. And steel-toed safety shoes or boots.

- **Lift Properly** – Use **proper lifting techniques**: bend at your hips and knees to squat down to your load, keep it close to your body, and straighten your legs to lift. Consider wearing a lumbar support belt for spine support and encourage leg lifting.

- **Add Handles** – When moving materials manually, workers should attach handles or holders to loads.

- **Get Help** – When an oversized load is too bulky to properly grasp or lift, get a co-worker to assist you to reduce risk to yourself and avoid damaging the material. If you cannot see around or over the load, seek help from another employee to help you move the material safely.

- **Blocking Materials** – Use blocking materials that are large and strong enough to support the load safely. Blocking material should be in good condition, and not have cracks, be splintered, or dry rotted. When placing blocking material under a load, be cautious that load is not released before removing hands from under the load.

- **Do not place hands, finger or other body parts under a heavy load.**
Unpacking and Getting started.

The plastic extruder is designed to be in a ‘packed’ form that allows the extruder to be shipped without taking unnecessary space. This is done by placing the main extruder unit from the side deck to the upper deck with the provided fasteners. The main extruder unit is fastened down with 4xM8 bolts on both decks for quick assembly. The main extruder unit already has the gearbox attached.

You will need:

2x size 13 spanners or sockets

Figure 1 – removal of extruder in packed assembly
Please see the lifting heavy loads safety precautions before attempting this step.

Ensure the electrical cabling is free and not restricting the motion of movement.

**Step 1** - Swing the stand 90 degrees (on its side) so the extruder lies flat as shown in *figure 1* and ensure the stand is stable and on a flat surface. Use 2x size 13 spanners to remove the bolts. You may need to place the frame on two beams in order for the motor to rotate out the frame, if necessary.

**Step 2** – Slide the extruder unit out and place the extruder on a surface that is safe and clear of any objects or obstructions. Be careful of wiring pulling or tugging.

**Step 3** – Swing the stand upright again and mount the extruder on the top deck matching the holes. The orientation is shown in figure 2.

![Figure 2 – Final assembly](image)

**Step 4** – Insert the same screws from step 1 and tighten with the provided nyloc nuts.
Running the Extruder.

Before the Extruder is plugged in and started. Ensure that the extruder screw is clear of any material, other than plastic and that nobody is servicing the machine. Please refer to the safety precautions before operating the extruder. Please ensure the correct Health and safety requirements are met in your region before any operations can proceed.

- Keep hands clear from moving parts.
- Jewellery, long sleeves or any other loose items is prohibited.
- The extruder will be generating temperatures well over 100 degrees Celsius.
- All people must stand clear of the heating barrel at all times.
- Heat resistant gloves must be worn at all times.

Step 1 – Choose the desired extruding nozzle / mould.

The extruder is fitted with a 3/4 inch bsp female thread at the end of the barrel to screw in nozzles. The possibilities are endless in terms of nozzle shapes and sizes. Using common plumbing fittings makes nozzles easy to make for attaching to the machine.

It is advisable to purge extruder before using a different material.

Step 2 – Plug the electric cord into mains 230Vac and switch on

Ensure both motor and heater controller switches are in the off position before plugging the unit into 230V ac source.
Step 3 – Switch the control unit on which brings you to the home screen on the display.

Step 4 – select the plastic profile to be extruded

Home screen

1) The home menu screen will be in a “READY” state.

2) Press down and release on the selector switch (the rotating knob under the screen).

3) Navigate to “heat profile” by rotating the selector knob either left or right.

4) Press down and release on the selector switch when the menu item “heat profile” has been indicated with the arrow.

5) Navigate to the desired plastic profile that is to be processed by rotating the selector knob either left or right.

6) The screen will now indicate the chosen plastic symbol, the abbreviation and the set point of that particular chosen profile.
– Allow for warming

1) Allow the band heaters to reach full temperature. The actual temperature can be observed at all times and compared with the set-point for the particular chosen plastic.

2) Initial warming can take anything between 10-20 minutes before running the motor to extrude. (the motor will only run if 80% of the set temperature is met)

---Custom temperatures can be set by the following steps:

7) From the home menu screen.

8) Press down and release on the selector switch (the rotating knob under the screen).

9) Navigate to “manual heat” by rotating the selector knob either left or right.

10) Press down and release on the selector switch when the menu item “manual heat” has been indicated with the arrow.

11) Navigate to the desired heater set up, either T0 or T1 by rotating the selector knob either left or right and then select the appropriate heater. The labels on the wiring will indicate which set of heaters will be changed.

12) Either in T0 or T1 customer temperature menu. Rotating the selector knob either left or right to adjust the temperature displayed. Press in-ward on the selector switch once the desired temperature setting is shown. Then select back until the main screen appears again.

Step 5 – Switch the motor on when the temperatures are ready.

Once the barrel has been warmed for 10-20 minutes at the set temperature. The motor can now be switched on to run the extrusion process.

1) From the home menu screen.

2) Press down and release on the selector switch (the rotating knob under the screen).

3) Navigate to “motor power” by rotating the selector knob either left or right.

4) Press down and release on the selector switch when the menu item “motor power” has been indicated with the arrow. This will allow the motor to be switched on.

5) The same above steps must be taken to switch the motor off

FOR EMERGANCY, The top toggle switch can be flipped to the off position to switch the unit off.
**Keep on** filling the specified plastic waste in the hopper to feed the process. If required a plastic pole or plunger may be used to feed the plastic. Only shredded plastic can be used for this process. **Ensure no metal objects are in the material before extruding.**

Note: time to time, it may be required set temperatures higher than the melting temperature of particular polymer for better results.

The extruder was tested with a 32mm square tube for beam production.