

Video Transcript: How To Make 100% Recycled Plastic Skateboard Decks - RPSD

Required Tools

- Four small cold chisels
- Four big cold chisels (25mm diameter or bigger)
- A ½ inch socket wrench
- a 30mm socket, and one or two long ones if you have them available
- An Impact Driver
- A ½ Impact driver adapter
- A drill
- M4 Drill Bit
- M10 Drill Bit
- Large Adjustable Wrench
- Pliers
- Set of chisel
- Set of Flat Head Screwdrivers
- Car Upholstery Remover Tools
- Spatulas
- Heavy hammer
- 4 M20 x 80 hex bolts
- Some silicone oil
- A Hanging Scale
- Chain hoist
- 1,5m lifting strap
- Two crowbars
- A ½ inch driver offset handle
- an extension handle
- A beam made from the same material as the decks
- A Heat Gun

Required Safety Equipment

- Overalls
- Steel toe cap boots
- Heat Proof Gloves
- Glasses
- A face shield
- 3M mask with an ABEK2 filter or higher

Required Infrastructure

- Cooling Fans
- Ventilation for workspace
- An Extrusion Machine
- A mould

Step 1: Mould Preparation

The primary source of plastic we recycle to use in the decks is Polypropylene as it works well with the mould and creates a nice bounce for the final decks.

Any polypropylene can be processed using a Shredder/Granulator, which is [another open-sourced machine](#). Ideally, the plastic would be shredded down to 5-3mm flakes.

Though the deck only use up to 1.75KG of material. We recommend having 2.5Kg of material at hand for the extrusion process in case something goes wrong.

With your boots and overalls on, we will begin by opening the mould. Move into the correct position under the chain hoist and apply the brakes to the mould so it is securely stationary.

The fastest way to open it is with the impact driver and the driver offset handle. Use the Impact driver to loosen the bolt from the bottom whilst holding the nut in place using the offset handle from the top.

If the impact driver is not strong enough, you can loosen them with the socket wrench and offset handle. When using the socket wrench it's better to use the long 30mm socket to give you a bit of extra length.

You can store the fasteners in the pockets on the top of the support structure.

Once all the bolts are removed, lift off the top support structure and place it to one side.

Using the lifting strap and the chain hoist, lift off the top face of the mould.

Apply a layer of silicone oil to the inside faces of the mould using a rag piece of cloth. Make sure the mould is evenly coated with a light layer to stop plastic from sticking and burning later in the process.

If you are creating a deck with a coloured gradient. Sprinkle some coloured plastic (polypropylene again) at one end and as the base colour exudes it will spread it along the body of the deck. Only a thin layer is required, and results may vary on the actual colour outcome dependent on what base deck colour you are extruding.

Lower the top face, using the chain hoist, and re-install the top support structure and the bolts

Notice it has arrows on the top, these show the direction of the flow of the plastic so you know which way round it should go.

When tightening the bolts start with the middle two, then one end, then the other end.

Use the impact driver and offset handle to tighten them, in the same way you loosened them.

Step 2: Starting the Mould

Before turning on the mould or the extruder make sure to turn on your ventilation. We used some oven hoods, directly above the mould. Though an arrangement of industrial fans would also suffice.

Now plug in the control boxes of the mould and the extruder.

Switch them on, using the green switch, making sure the emergency stop is released.

Set the PID controllers to the required temperature. For this video, we are using polypropylene, so the temperatures and speeds shown are to work with this material, but if you change the plastic type you may need to change them.

On the extruder, set the first PID controller slightly less than the second two.

Now, wait for the mould and extruder to heat up. It should take around 15 mins for the extruder and 30 mins for the mould.

While they heat up you can prepare your plastic. You can add about 20% of a pure colour to white or transparent and still get a very strong tone.

If you want to test the material to see its colour or how it melts, now is the best time.

Place a bucket of cold water under the hopper and allow some plastic to drop into the bucket. If you are happy with the colour then it's time to proceed to the next step.

Once the mould and extruder have reached the correct temperature, allow them to stabilize at this temperature for around 5 minutes.

Step 3: Filling the Mould

Add your plastic to the hopper

Set the potentiometer on the motor control panel (Arrow on screen) to the lowest setting

Then press the green button on the motor control panel to start the extrusion screw.

Slowly turn up the potentiometer on the motor control panel until it reaches around 15.

To make sure the plastic doesn't get stuck in the hopper stir the granules using a beam, we recommend using a similar plastic to what you are putting into the extruder as some cross-contamination may occur from grinding against the screw. Wood would also be acceptable but not ideal. Do not use metal as this will damage the extruder screw.

Under any circumstance do not put your fingers into the screw otherwise they can get broken too!

Watch as the plastic comes out the end of the nozzle to see if it is melting correctly and that you are happy with the colour. Let the plastic collect in the bucket. You can re-shred it and use it later.

Finally, press the red button on the motor control panel to stop the extrusion screw.

Whilst the mould is preheating you can prepare to attach the nozzle to the extruder.

You'll notice we added a tap to the mould, this is to quickly lock in the plastic when the mould is full without losing any pressure and without any plastic leaking out.

We found that a ½ inch tap is the best. ¾ inch is too hard to release and ¼ inch breaks too easily.

We put a tap on the exit hole also, as this one doesn't take much pressure it can be smaller, ¼ inch is enough. It should be left open when filling the mould.

The tap must be opened to fill the mould.

Gently try and open it, don't force it, it can break,

If it's stuck it most probably has plastic inside.

You can use a heat gun to soften it and try again.

Once it opens you can use a drill bit to clean it, use the m4 drill to make a pilot hole and use the m10 to clean out the bulk. Be careful not to drill the threads, or the aluminium block and make sure the tap is open.

If there is any leftover plastic debris in the thread, you can use a heat gun and a flathead screwdriver or spatula to clean it.

Check your PIDS to see if they have reached temperature, if not, wait a bit.

Once the PID controller on the mould has reached temperature, wait 5 minutes and give the bolts on the mould one last tighten using the socket wrench and offset handle, before attaching it to the extruder. They can become loose in the heating process.

Line up the nozzle of the extruder with the nozzle of the mould.

Using the handles, attach the mould nozzle to the end of the extruder.

If necessary, move the adjustment bolt, with the socket wrench, to align the mould nozzle to the end of the extruder.

When it's fully tight, lock the wheels of the extruder with all 4 breaks.

Step 4: Filling the Mould

To fill the mould start by adding your plastic to the hopper

On the motor control panel, set the potentiometer (Arrow on screen) to the lowest setting

Then press the green button to start the extrusion screw.

Slowly turn up the potentiometer on the motor control panel until it reaches between 5 and 10.

Let it run slowly for the first five mins to clear out any plastic from the entry to the mould without building up too much pressure.

After five mins you can turn the potentiometer up to around 30.

Continue to add plastic to the hopper. Don't let the hopper empty at any point otherwise air will get pumped into the mould and you will get air bubbles in the deck.

Remember to stir the plastic

Every few mins check to see if plastic is coming out of the exit hole.

Once you see the plastic coming out of the exit hole, close the exit tap

Continue to extrude into the mould for ~3 mins after the plastic starts to exit the mould, to build up pressure inside it.

Finally, press the red button on the motor control panel to stop the extrusion screw and immediately close the entry tap to lock the pressure inside.

Unlock the breaks on the extruder.

Using the quick-release handles, unscrew the mould from the nozzle of the extruder.

Immediately put a threaded end cap at each end of the mould whilst it is still hot to keep any overflowing plastic out of the thread.

Once the cap is in place you can also open the tap again to make it easier to clean after.

Now that they are separate you can turn off both the extruder and the mould using the green switch on the control box.

Move the extruder away, position your cooling fan in place, and turn it on.

With active cooling, like this, it takes around one hour for the mould to cool down. If you leave it to cool without a cooling system it takes 3-4 hours, so we highly recommend getting one.

Step 5: Opening the mould

You can check that mould is cool by turning it on briefly to see the temperature on the PID, or by using a thermometer. If it is less than 60 degrees it's ready to open.

Once it is cool you can start opening the mould using the same technique that you used to open it at the beginning of this video, with the impact driver on the bottom, which catches the nut, and the driver offset handle on the top.

Again, so that you don't lose them; you can keep them in the pocket in the top support structure.

If the impact driver is not strong enough you can loosen them with the socket wrench and offset handle.

Again, if the bolts are really stuck. You can use an extension handle to get a bit more leverage.

Once all the bolts are removed, lift off the top support structure and place it to one side.

Run the lifting strap through the middle two handles on the top face and hook them on the chain hoist. Lift the top face to see if it lifts off without any more work. Be careful not to lift the whole mould too high if it doesn't open immediately as it may separate in mid-air and fall onto your feet (it's 380kg). If this is all it takes to open it, great!

If not, don't worry, there are a few things you can do to help get it open.

You will notice a small slot around the edge of the mould between the C beams and the horizontal plate.

1. Take the crowbars, and try to lever the mould open in the same spots, between the handles. If you have a friend around, ask them to help you. Sometimes this is all it takes so you can try again to lift it open. Once it has opened a bit you can easily slide the cold chisels in to prevent it from closing again.

If this doesn't work

2. Take 4 small chisels and hammer them into the spaces between the handles to release the mould a little bit. Then Repeat with the 4 big ones.

When trying either of these techniques do not lever from the ends as this puts a lot of stress on the end bolts connecting the aluminium deck face to the steel horizontal plate, and may tear the threads.

3. Finally there is a 3rd method you can try, there are 4 m20 threaded holes in the horizontal plate, These are release holes. Take 4 m20 hex bolts and tighten them by hand in the holes. Now take the socket wrench and turn each of them a ¼ turn, at a time, in rotation, to slowly lift up the top face.

This method should only be the last resort as it puts a lot of wear on the mould.

Once you have freed the top face fully and lifted it fully, release the breaks and move the mould out from underneath it, revealing your deck.

You can lever the deck out of the mould with a flat tool, we found these which are designed for removing car upholstery. Use something soft, like plastic.

Never use anything metal otherwise you will scratch the mould.

You can also try using suction cups.

The deck should easily lift out, as the plastic shrinks a little bit as it cools.

Place the deck to one side on something soft

Clean any flash plastic off of the mould with a hammer, chisel and spatulas. Make sure the top face is clean.

Apply a layer of silicone oil to the top and bottom face of the mould.

Position the mould back under the top face and lower it using the chain hoist to keep the top face of the deck protected.

If you are going to make another deck right after, remember to put the next batch of coloured plastic by the entry hole for creating the gradient.

You can also place the top support frame on top of the mould and re-insert the nuts and bolts in the mould so that they don't get misplaced. This also keeps the inside of the mould clean.

Step 6: Finishing the deck

Now the deck has been shaped there are a few last things you need to do to finish it.

You are going to need:

- A hand drill
- A 5.5mm drill bit
- A small countersink
- A de-burring tool for sheet metal
- A fine half-round file
- Hand Sanitiser
- A clean rag
- Spray mount
- Grip Tape
- AnAlan key
- A Wrench
- A Ruler
- 8 M5x40mm countersunk bolts (Two different colors)
- 8 M5 Locknuts
- Some raiser pads

Start by drilling the truck holes.

You'll see eight pilot holes, take the hand drill and the 5,5mm drill bit and drill them from the top of the bottom face of the deck to the top face.

Now take the countersink and countersunk the holes on the top face of the deck so that the hardware sits below the surface.

Next, using the metal deburring tool, give the edge of the deck a radius.

To make sure that grip tape sticks well, we are going to apply a layer of spray mount to the deck.

Stick the grip tape to the top of the deck, starting in the middle and working out towards the nose and the tail.

Use a half-round file to remove the excess grip, by running it at 45 degrees along the edge of the deck.

Be careful in the dip at the beginning of the transition to the nose and the tail, a lot of the time the grip doesn't stick well here, and sometimes it needs an extra spray of glue.

You can also use a razor blade to remove the excess grip, but it really helps if you mark it first with the file.

Finally, we are going to install the trucks

You need longer bolts than normal decks, we use 40mm.

We suggest using soft riser pads to protect the plastic from the sharp metal edge of the trucks. We found these, [Niks Originals, made from cork.](#)

Install the trucks, the deck has a nose and a tail, and the nose is longer and higher than the tail, you can check by using a ruler.

You can also tell by the arrows on the mould. The arrow points to the nose of the tail, or the direction in which you would skate it.

You can differentiate the two by putting two different coloured bolts at the tail of the deck.

Tighten the nuts, and your deck is done!

Now it's time to hit the street!