

# Contents

<a href="#"><u>Materials</u></a>	1
<a href="#"><u>Manufacturing processes</u></a>	2
<a href="#"><u>Tools and processes</u></a>	3

# Materials

## Plastic

- *Acrylic:*
  - Cheap
  - Comes in various colours
  - UV resistant
  - Strong
- *PVC:*
  - Durable
  - Cheap
  - Waterproof
  - Abrasion resistant
- *ABS:*
  - Lightweight
  - Weathering resistant
  - Scratch resistant
  - High impact

## Metal

- Aluminium/copper
  - Light
  - Malleable
- Mild steel
  - Strong
  - Durable
  - Malleable
- Stainless steel
  - Strong
  - Durable
  - Environmentally friendly
  - Corrosion resistant

## Wood

- Oak wood (hardwood):
  - Strong
  - Durable
  - Quite heat resistant
  - Considered aesthetic
- Pine wood (soft wood):
  - Lightweight
  - Cheap
- Plywood (a mix of soft and hard wood):
  - Lightweight
  - Durable

- Moisture & chemical resistant
- 

## **Manufacturing processes**

### **Blow moulding** (used for PVC, thermoplastics, ABS, etc)

1. Plastic pellets are poured into mould.
2. Heat melts the plastic, which is transported by the screw.
3. Plastic gets injected into the mould.
4. Air is blown to expand the plastic.
5. It is cooled and removed.

### **Injection moulding** (used for PVC, acrylic, etc)

1. Plastic pellets are placed into the hopper.
2. The screw carries the pellets along the tube.
3. Heat melts the plastic into a liquid state.
4. It is injected into the mould.
5. Pressure is applied to ensure it fills all empty spaces.
6. It is cooled and removed.

### **Vacuum forming** (used for acrylic)

1. A thermoplastic sheet is heated until bendy and pliant.
2. It is placed on top of the mould.
3. Air is vacuumed out, which forces the plastic into shape.
4. Trim access material.

### **Compression moulding** (used for acrylic, PVC, other thermoset composites)

1. A sheet of thermoplastic is heated until pliable.
2. It is clamped to the mould.
3. It is compressed into the shape of the mould.
4. It is cooled and removed.
5. Trim excess material.

### **Turning process** (used for metals)

1. Adjust the speed of the lathe.
2. The lathe rotates the metal.
3. Adjust the angle and placement of the cutting tool to correct diameter.
4. The cutting tool moves to cut the metal into cylindrical shape.

### **3D printer** (used for ABS plastic)

1. Use CAD software to design the 3D model.
2. Convert it into a vector file that is compatible with the printer.
3. Set up speed, strength and resolution.
4. The printer will read it and print.
5. Cut off excess material.

### **Laser cutting**

1. Create a design using CAD software.
2. Save the design into an appropriate file type.
3. Send the design to the laser cutter.
4. The machine cuts the design on the material.

### **Die casting** (metals)

1. Pour the metal into the chamber
2. The plunger will push the metal into the cavity

---

## **Tools and processes**

### Cutting:

- Die cutter
- Craft knife
- Cross-cut saw
- Laser cutter

### Printing:

- Lithography
  - Used in large scale productions where large outputs are necessary. E.g. books
- Screen printing
  - Used to create identical custom patterns in smaller scale productions. E.g. custom T-shirts
- Etching
  - Used to produce smaller batches of prints and artwork

### Glueing:

#### *Permanent methods:*

- Epoxy resin
  - Used to join most types of materials together such as plastic and wood
- Contact adhesive
  - Also used to join most materials with the exception of joining 2 metals
- PVA glue
  - Used to join wood
- Hot glue (HMA a.k.a hot-melt adhesives)
  - Joins most materials with the exception of metals (hot glue does not stick to metal)

*Temporary methods:*

- Velcro
- Spring clips
- Magnets
- Finger joints
  - E.g. Box joints, Dowel joints and Dovetail joints