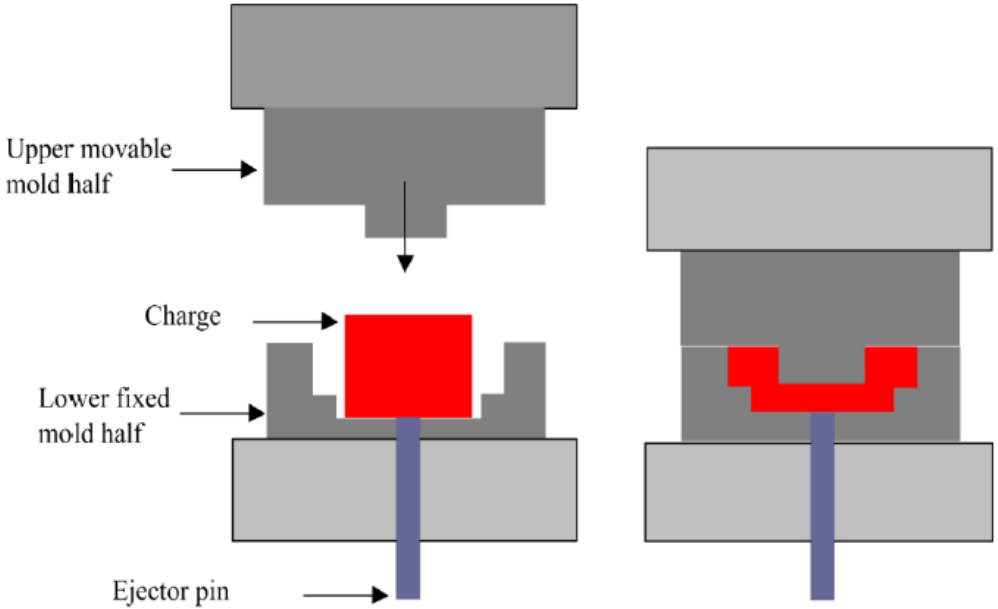
Compression Molding

- Compression molding process is one of the low cost molding methods as compared to injection molding and transfer molding.

- It is a high pressure forming process in which the molten plastic material is squeezed directly into a mould cavity, by the application of heat and pressure to conform to the shape of the mold.



Compression Molding Setup

Compression Molding Cont..

- In compression molding of thermosets the mold remains hot throughout the entire cycle; as soon as a molded part is ejected, a new charge of molding powder can be introduced.

- On the other hand, unlike thermosets, thermoplastics must be cooled to harden. So before a molded part is ejected, the entire mold must be cooled, and as a result, the process of compression molding is quite slow with thermoplastics.

Compression Molding Cont..

- Compression molding is thus commonly used for thermosetting plastics such as phenolics, urea, melamine, an alkyds; it is not ordinarily used for thermoplastics.

- However, in special cases, such as when extreme accuracy is needed, thermoplastics are also compression molded.

Mold Design

The three common types of mold designs are:

- Open flash
- Fully positive
- Semi-positive

Open Flash

- In an open flash mold a slight excess of molding powder is loaded into the mold cavity.
- On closing the top and bottom platens, the excess material is forced out and flash is formed.
- The flash blocks the plastic remaining in the cavity and causes the mold plunger to exert pressure on it.

Fully Positive

- In the fully positive molds no allowance is made for placing excess powder in the cavity.
- If excess powder is loaded, the mold will not close; an insufficient charge will result in reduced thickness of the molded article.
- A correctly measured charge must therefore be used with this mold, it is a disadvantage of the positive mold.
- Another disadvantage is that the gases liberated during the chemical curing reaction are trapped inside and may show as blisters on the molded surface.

Semi-Positive

- The semi-positive mold combines certain features of the open flash and fully positive molds and makes allowance for excess powder and flash. It is also possible to get both horizontal and vertical flash.

- Semi-positive molds are more expensive to manufacture and maintain than the other types, but they are much better from an applications point of view.

Compression Molding Animation

Source: https://www.youtube.com/watch?v=-FxiWMnY4aQ

Process Parameters

Important factors to be considered before compression molding process are:

- Amount of plastic material (charge).
- Heating time
- Melting temperature of plastic material.
- Pressure required to squeeze the material in to the mold cavity.
- Cooling time.

Materials Used

- Different types of thermosets and thermoplastics materials can be used for
- compression molding process.
- For example: Epoxy, Urea formaldehyde (UF), Polyester, Polyamide (PI),
- Polyethylene (PE), Polypropylene (PP).

Applications

Compression molding is used for manufacturing:

Electrical and electronic equipments, brush and mirror handles, trays, cookware knobs, cooking utensils, dinnerware, appliance housings, aircraft main power terminal housing, pot handles, dinnerware plates, automotive parts, flatware, buttons, and large container.

Applications

Carbon Fiber Reinforced Composites

Plastic Trays

Plastic Caps

Advantages

- Low initial setup cost and fast setup time.
- Heavy plastic parts can be molded.
- Good surface finish of the molded parts.
- Wastes relatively little material as compared with other methods.
- Thermoplastic composites with unidirectional tapes, woven fabrics, randomly orientated fiber mat or chopped strand can be manufactured.

Limitations

The limitations of the compression molding process:

- Low production rate.
- Limited largely to flat or moderately curved parts with no undercuts.