Injection Molding: Definition, Parts, Process, Advantages, Disadvantages, and Defects (With PDF)

Hello, viewer Amrit here, today we will learn about an interesting process of manufacturing technology – **Injection Molding**, today we see the **definition, parts of an injection molding machin**e. And also see the **working process of the injection molding machine**.

At the end of the article also you get a **PDF downloadable link** of this. So don't worry about that.

Let's see some history. **Injection molding** is invented by **JohnWesley in American Inventor 1872**.

The Construction of the machine is very simple as compared now day's machine.

It works like a **hypodermic punch, using a piston and plunger, injection of plastic through a cylinder whose temperature is very high into the cavity of the mold**.

The industry of injection molding is progressed a very slow at the time of invention over many years, at that time the product made by this process is hair comb, buttons, and other products.

In 1903 the inventor invents cellulose acetate, it is less burnable than other cellulose its was made in powder situation from which it readily injected it into the mold.

Injection Molding Definition:

The injection molding is an old technique in which various product is made by using the injection machine.

By using a required amount of forces for their developed finished product.

By introducing the new product design and its existence in the required field.

Injection molding will make the product very fast and the rate of production is quick.

So the come into the mass production of the product.

In today's world product is of high good quality and finished with a good edge.

Injection molding started with a host of the material mainly include the metals.

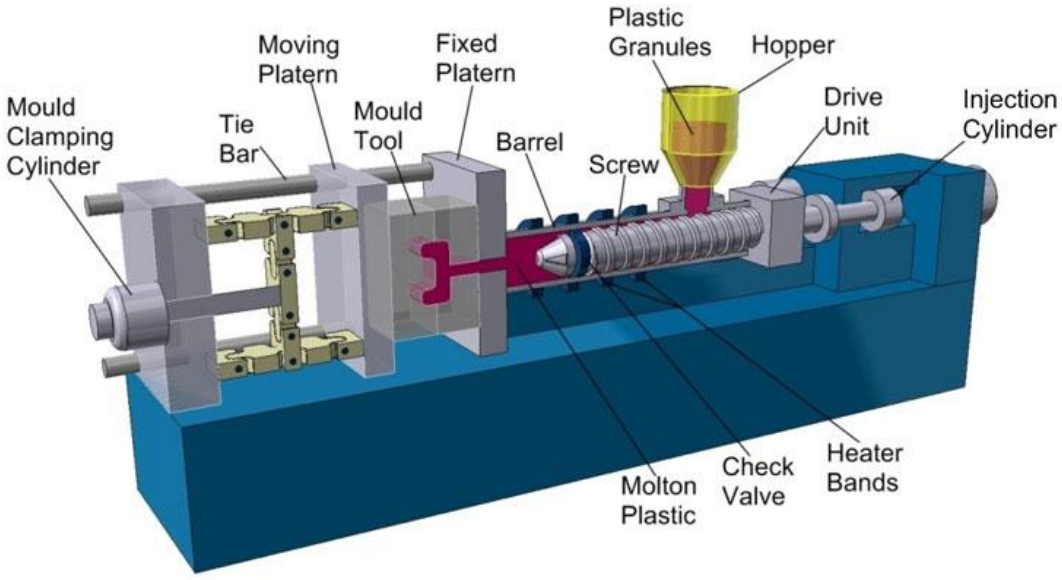
The particle is the unit of fed into a heated barrel, mixed (using helically shaped).

Parts of Injection Molding machine:

An **injection molding machine consists of the following parts**:

- Hopper
- Screw motion
- Heaters
- Nozzle
- Extraction Pin
- Split Molds
- Clamping Unit
- Injection Unit
- Drive unit
- Hydraulic Unit

Here is the **diagram of an injection molding machine**.



And here is the **function of each part of an injection molding machine**.

Hopper:

Here we insert the ingredients of plastic material for the molding process.

Screw Motion or Archimedean Screw:

It pushes the ingredients of plastic material in a forward direction.

Heaters:

It is used to increase the temperature of the system to prepare the product in a good finished and

We can say that the heater works is to melt the ingredients of plastic polymers.

Nozzle:

The material temperature increases to such an extent it quickly enters into the mold cavity.

Extraction Pin:

It works like split molds and the shape formed to remove from it and further process to be carried out.

Split Mold or Cooling channels:

Cooling of the product done into the system.

Clamping unit:

It is used to clamp the tool.

Injection unit:

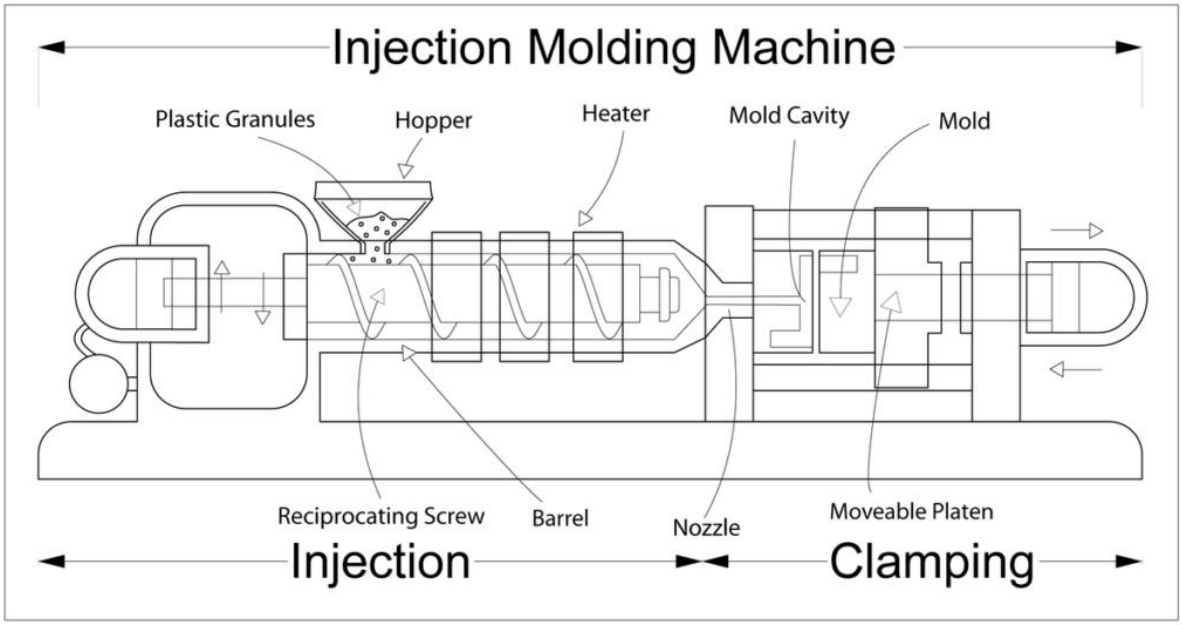
In the Injection unit, it can be used to inject the mold (Plastics).

Drive unit:

The driving unit is used to ram the mold in the cavity.

Hydraulic system:

Raming the mold by the press.



Schematic diagram of an Injection Molding Machine

Injection molding process step by step:

Here is the **step by step process of Injection Molding**:

- Material particles are nourished into a hopper then from hopper it comes into the system.
- There is an Archimedean screw which works is to rotate and sends forward the present material.
- Now it comes to the heated area here it gets heated between ingredients plastic polymer.
- At the nozzle, the temp having high at such extent it send fast to the Mould cavity and
- Here the cooling process is done.
- Now Extraction pin removes the mold cavity parts and then formed the product.

Here you can make any of product like a bucket, Mobile parts, Helmet and many more.

Injection Moulding is a modern technique in which the grain is made up of the desired material like PVC, Plastics, etc.

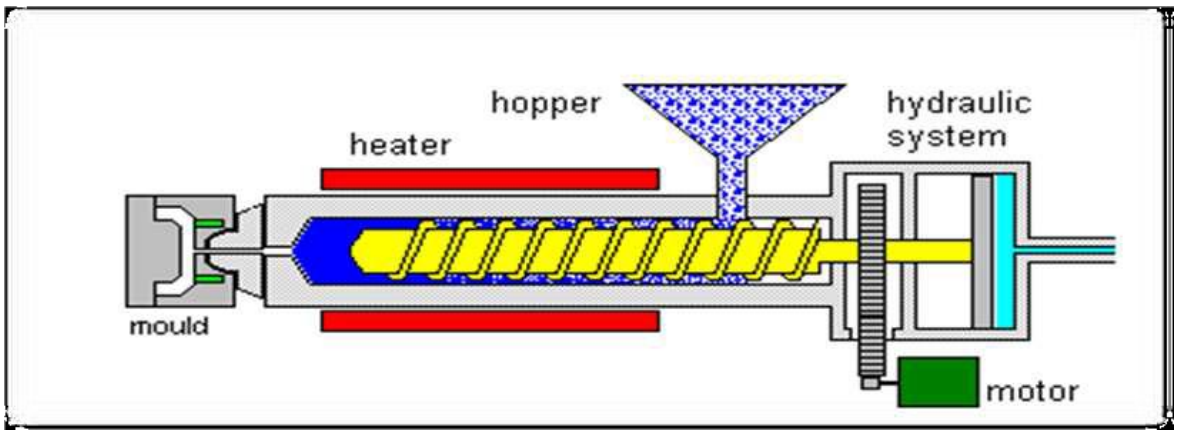


Diagram of the Injection Molding Process

Let's see Types of injection moldings:

These are **some types of injection molding**s:

- Metal injection molding
- Die casting
- Injection molding of liquid silicone rubber
- Thin-wall injection molding
- Reaction injection molding

Let me give you the brief descriptions of these:

Metal injection molding:

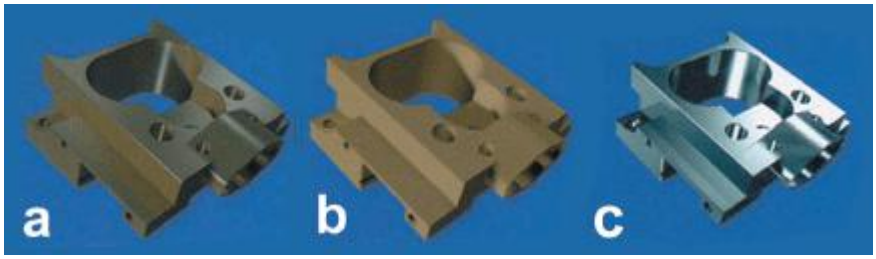
In this process **metal powder mixed with the polymer binder material powder** and then **generate the feedstock**.

Then this feedstock goes for injection molding where the desired shape cavity is present. The feedstock is injected into the cavity and then we get the **“green” mold metal part**.

Generally, the size of the cavity is bigger than the actual desired shape because after cooling the mold metal maybe shrink, that’s why we give extra space.

After this process, we need to **separate the polymer binding powders from the metal part**, for this process, the green metal part may be dissolved in chemical composition or maybe also heated.

Then the **final operation sintering** is done. In this operation, the metal part is heated in a chamber and reduces its free space.



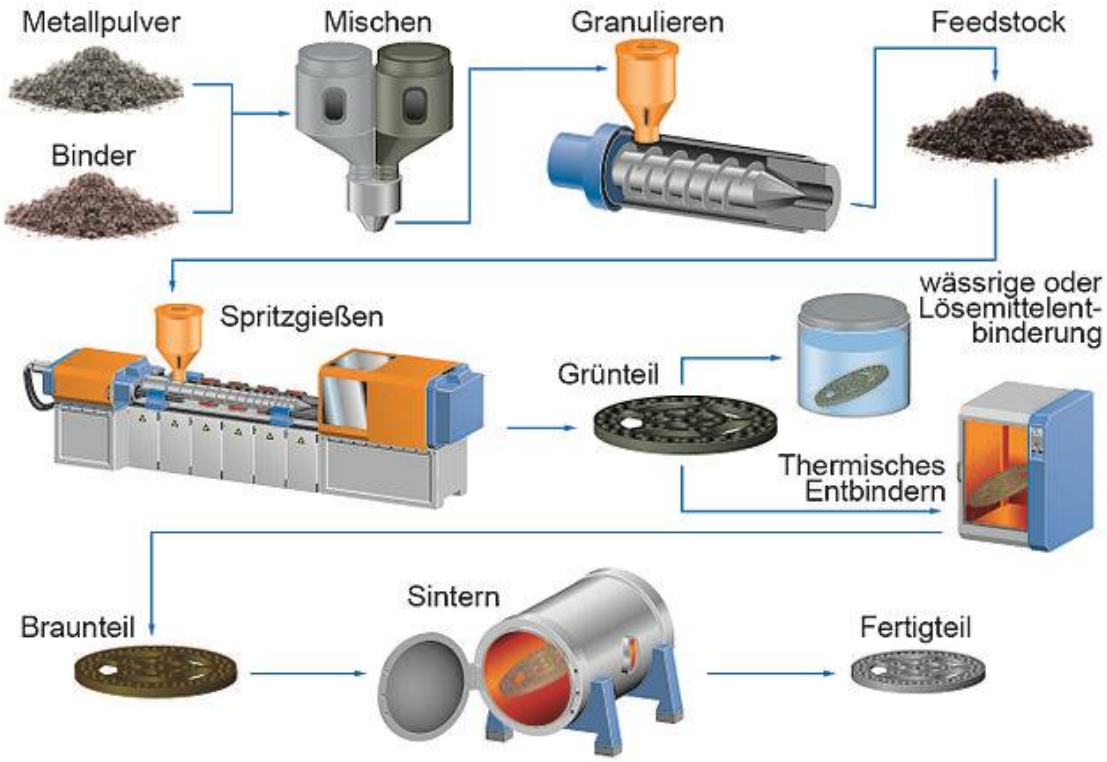
a) Molded Part b) after binder removal, c) after sintering

Through this type of molding process, the high volume of production can be obtained.

The following metals are used for this process

1. Low alloy steels
2. Stainless steels

3. High-speed steels
4. Irons
5. Cobalt alloys
6. Copper alloys
7. Nickel alloys
8. Tungsten alloys
9. Titanium alloys



Metal Injection molding process diagram

By Carloburkhardt – Own work, CC BY-SA 4.0, https://commons.wikimedia.org/w/index.php?curid=42993726

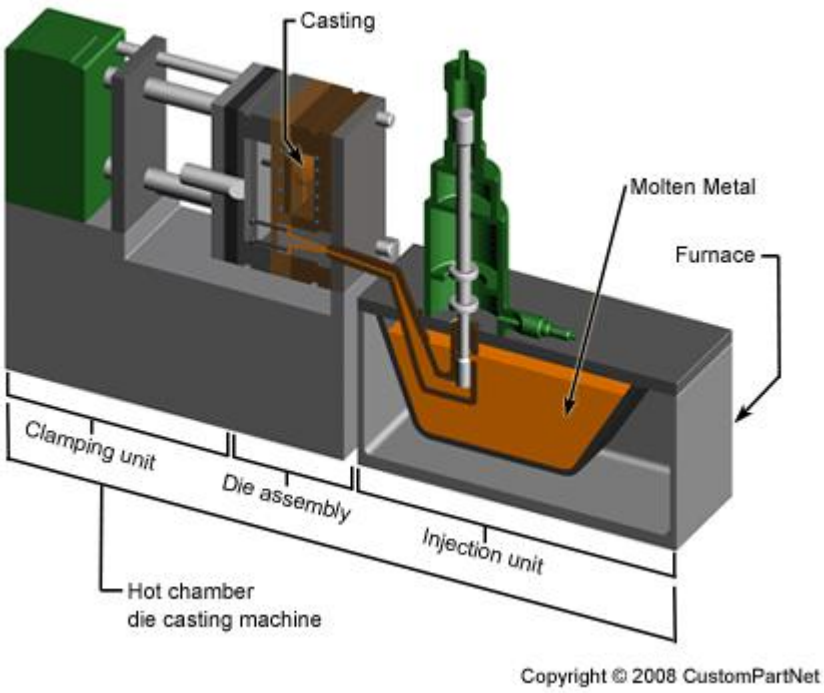
Die casting:

Through this process, we can achieve a perfect dimensional accuracy and a very good surface finish.

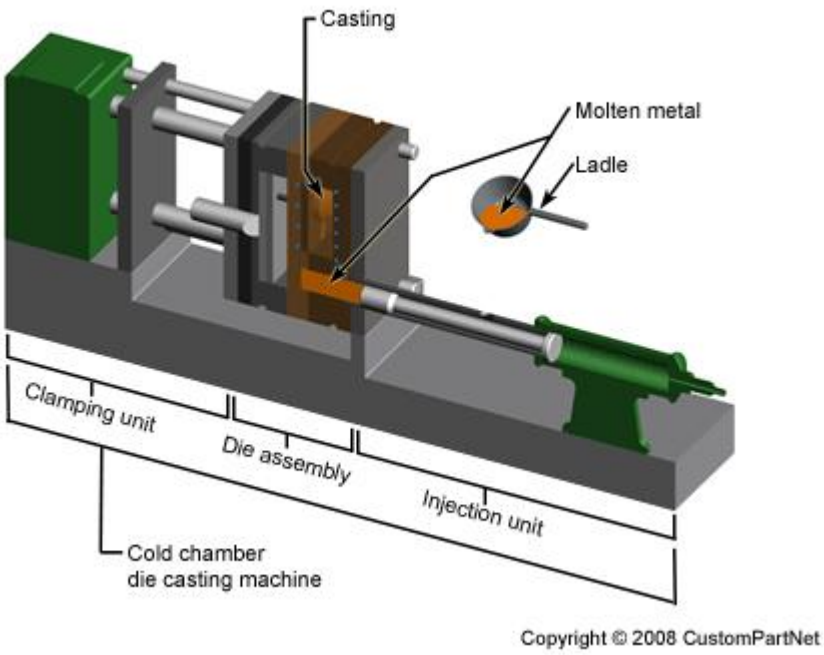
In this process, we press the molten metal inside the dies and get the desired shape.

Die casting is done by two methods:

1. Die casting hot chamber
2. Die casting cold chamber



Hot chamber die casting
Photo courtesy: custompartnet.com



Cold chamber die casting
Photo courtesy: custompartnet.com

Die casting cold chamber machine overview

Generally, we used these alloys for die casting:

- Zinc
- Aluminum
- Magnesium
- Copper
- Lead

- Tin

Injection molding of liquid silicone rubber:

Through this process, we can produce durable material parts.

Thin-wall injection molding:

This type of molding process we can apply where we need to produce plastic thin parts so that the cost of mold precess is much less than any other molding process.

We use this type of molding on food packing, medical, computer hosing making, etc. industries.

Reaction injection molding:

In this process, two types of material are mixed in very high pressure into an impinging mixer and then inject to the mold at low pressure.

Injection molding defects:

These are the **defects that may occur in injection molding**:

- Flow lines
- Burn marks
- Warping
- Vacuum voids or air pockets
- Sink marks

- Weld lines
- Jetting
- Discoloration
- Delamination
- Short shot
- Flash

You can check this article from In-touch quality to know how to prevent these types of defects.

Advantages of Induction Molding Process:

The **advantages of an injection molding process** are:

- Quick production.
- Small labor wages.
- Large production of the product.
- Many particles (material) used at the single or same instant.
- The small product part is easily manufactured.
- Leaves very less scrap during the production of a product.
- Ability to create a hole in the product.
- The color is easily controlled in production.
- The finishing is required in very less amount.
- Dimension is very appropriate.

Disadvantages of Induction Molding Process:

The **disadvantages of the injection molding process** are:

- High initial tooling and machinery cost.
- Molds are also very costly.
- The designs will have to be created before any process can begin.
- This could put production behind schedule or cost more money for the company.

You may think that Why we Use Injection Moulding?

We use injection molding for obtaining daily essential products likes:

- Brush
- Mug
- Bucket
- Mobile parts and Covers
- Laptop parts
- Mouse parts and much more.

Conclusion:

More ever injection molding plays an important role in making special types of parts with greater dimensional accuracy.

So I hope you all learned about the injection molding process as also parts, types, defects, advantages, and disadvantages of injection molding process.

Now I want to hear from you. If you like my article do share with your friends and also on your social handles. And **if you have any doubt you can use our discussion board where you can ask your question, also you can comment down below your doubts**, or whatever you wanna tell me. I love to hear your opinion and suggestions.

We also have **dedicated Facebook community for you guys, if you wish you can join our community, here is the link of our Facebook group**. So, Cheers, and enjoy the rest of your day.

Also, I wrote an article on parts, types, and operations Lathe Machine and also parts, types and operation of Shaper Machine you may be interested to read that too.

- **Wanna need more this type of article on the Manufacturing Process? Here it is.**