

Polymer Injection Moulding

In this manufacturing process, there are three main components to creating a product. This includes the mould itself, the injection units and also the clamping units. The clamping element is very important as this unit holds the moulds together during the process of injection and cooling; Therefore it is important that the mould sections are clamped before beginning the injection process. During the next phase, small plastic pellets are poured down the hopper which acts as a funnel. The hopper is found on top of the injection unit which feeds the pellets into a cylinder where they are heated until they become molten form. On the far end of the cylinder there is a screw motor drive attached to a hydraulic press. This mixes the pellets and forces the molten to the end of the cylinder; Once the materials has gathered in front of the motorised screw, the injection process can begin.

The heated material is pushed through a sprue, into the moulds by the speed and pressure applied by the screw. Next, the dwelling phase begins which is essentially a pause in the process, this then gives time for pressure to be applied to the moulds. By applying pressure this ensures that every cavity is filled through the mould.

Materials.

Polymers, also referred to as resin, are used in the process of injection moulding. This includes thermoplastics such as, nylon, polystyrene, and polyethylene. In this process it is also possible to use some thermoset plastics; this includes, epoxy resins and phenolic. process include alloys or it is possible to create blends. Blends are the combining of various materials that have been previously developed. Despite having stated that sprues and runners could be re-used or recycled after production, this is only accurate of thermoplastic materials such as; Acrylonitrile Butadiene Styrene, better known as ABS. This is to do with the specific property of being able to be re-shaped using heat after its initial mould.

ABS consists of monomers which create its flexibility, some examples of products made with ABS through the process of polymer injection moulding are LEGO bricks, outdoor and indoor drain pipe systems.

With using ABS, it is easy to alter the material to improve the final outcome or function; such as, strength, resistance against impact and heat. To achieve the glossy exterior and improve its heat resistance it is important to mould at a high temperature, whereas moulding at a lower heat will improve impact resistance and its strength.

Polyamide, also known as Nylon can be used to create a wide range of products ranging from medical appliances to sports and automotive products. Nylon has good electrical properties and chemical resistance which is why it is good for use in medical industries. Its external properties include resistance to impact and abrasion's also.

PP or Polypropylene is also a material compatible with polymer injection moulding, used for its resistance from impact, stress, chemicals such as acids and detergents. HIPS or High Impact Polystyrene is also a good material for this process due to its low cost and impact resistance.

Product examples.

Some examples of products made from the polymer injection moulding process would be LEGO bricks, plastic containers, plastic furniture such as chairs and table sets. Other examples are electrical and medical equipment, golf club heads, plastic instruments such as clarinets are made from ABS which can be injection moulded.

Polymer injection moulded materials such as polyamide, also known as nylon can be used to create industrial components, and apparel.

As the injection moulding process comes near the end it is essential to undergo the cooling process, as this allows time for the material to harden and become solid before releasing from the mould units. Once this has happened, the clamps are opened to separate the parts before moving on to the final stage. Finally, the ejecting rod and plate separate the finished piece from its mould. The sprues and runners that have been unused in the process can then be recycled for future moulds.

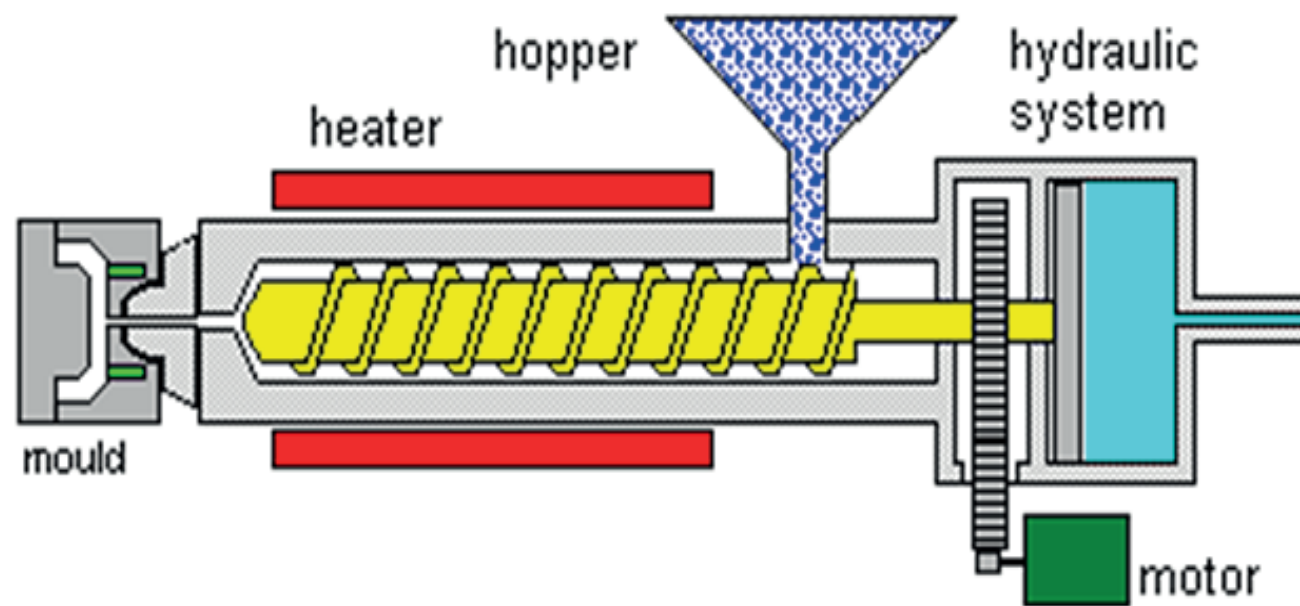
Post Processing.

Depending on the mould, some parts may be required to undergo post mould work to ensure the finish part is assembled or completed before receiving the final specific needs. Eventually the machine will be purged, this is the cleaning of the internal components, it is time consuming, costly and wasteful.

Suppliers

Dudley associates - Precision Tools and Plastic Injection Moulding
01455 558 825
sales@dudleyassociates.com

Patterson & Rothwell - Injection Moulding Specialists
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Patterson-Rothwell.co.uk



Design Considerations.

When in the process of designing for the moulding process it is important to consider the complexity of the design and the mould. Depending on the design it can affect the cost and time efficiency of the manufacturing process. You should also consider the costs of manufacturing, the product quantity as a higher quantity will increase cost of manufacturing and parts, how many parts will the design require to achieve a successful outcome.

Time.

Time of manufacturing can be varied depending on the size or complexity of the part or mould. The time of manufacturing can vary between seconds to minutes; however, the time spent to set up or create a mould is anywhere between a few minutes to a few hours. Factors to consider when using this manufacturing process is cost, larger moulds will be more time consuming, resulting in expenses in not only materials but also production time and the cost of employees.

Volume of production.

Polymer injection moulding is a very quick process in comparison to other moulding methods. This allows product to be produced at a fast pace, even from using one mould. Due to the high output of products and the fast rate of production, this makes polymer injection moulding a very efficient and cost effective method of production.

Costs.

Polymer injection moulding varies due to the amount of cavities involved in the mould. Not only does this affect cost but also the complexity of the design affects the cost because a complex design would be required to have more cavities for the process to be effective. With this process being automated, manufacturers can save considerably on overhead costs and labour. With the reduced cost in employees, the process becomes a more cost effective way of manufacturing.