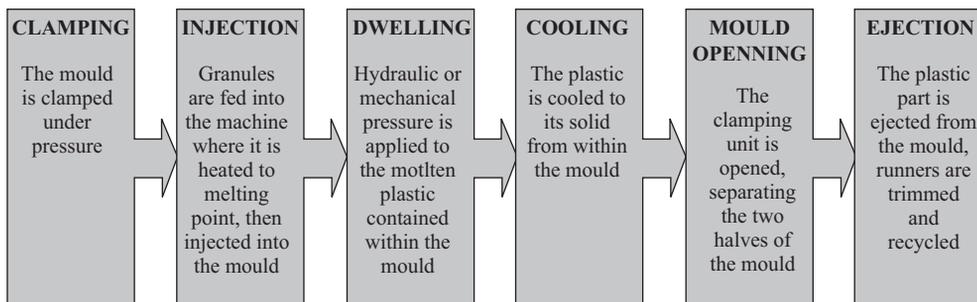


# 2 Injection Moulding

## 2.1 The Injection Moulding Process

Injection moulding is one of the prime manufacturing processes for making parts from plastic material. It is a fast process and used to produce large numbers of identical items and these can be anything from high precision engineering components to disposable consumer goods. The process involves clamping two moulds together into which a molten polymer is injected. High pressure is used to obtain fast filling speeds and stop the mould being over filled. Once the polymer melt has been set to the shape of the cavity, the mould is opened, the part ejected and the process restarts. **Figure 2.1** shows the six main stages in the injection moulding process.



**Figure 2.1** The six stages of the injection moulding process. Reproduced with permission from *Low Energy Plastics Processing – RECIPE European Best Practice Guide*, 2006 [1]. ©2006, RECIPE

As the plastic material needs to be heated until it melts, forced into the mould at high pressure and then cooled until solidification, the injection moulding process is quite energy intensive.

## 2.2 Where and How to Save Energy in the Injection Moulding Process

In an increasingly competitive environment, injection moulders are driven to reduce their costs per part by every available means. There are many other operational elements to consider in achieving this, however, energy consumption is an important factor to address. The energy use in injection moulding can be viewed as occurring in two phases: a high power requirement over a short time as polymer is injected and parts are ejected and a low power requirement over a long period of time as the injected polymer cools.

Energy is required, not just to melt the polymer, and subsequently cool it down again, but to generate the pressure to force the polymer into the mould. Additionally energy is used to open, close and hold the mould under pressure while the part is formed and cooled

Figure 2.2 shows the share of energy used by all the equipment in a typical moulding plant. About 60% of the energy cost can be assigned to the injection moulding machines and their operation presents the greatest opportunity for energy savings.

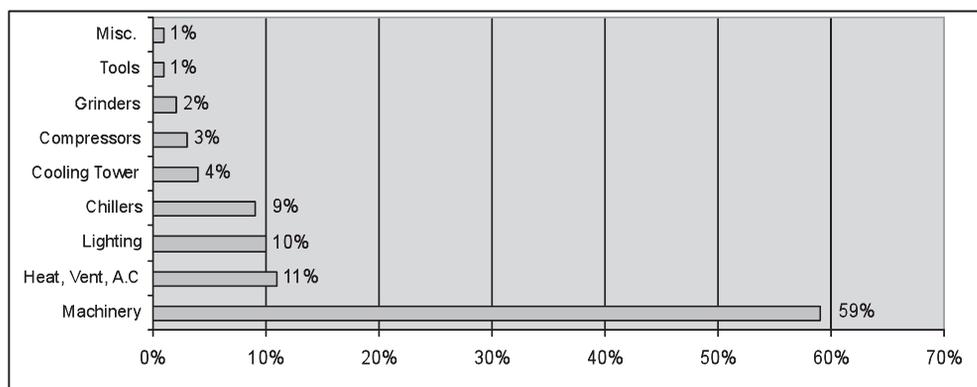


Figure 2.2 Share of energy consumption by typical devices at an injection moulding plant. Reproduced with permission from *Low Energy Plastics Processing – RECIPE European Best Practice Guide*, 2006 [1]. ©2006, RECIPE

The power required to manufacture an injection-moulded part depends on the following factors: