

The Electric Injection Molding Machine

Lesson 3

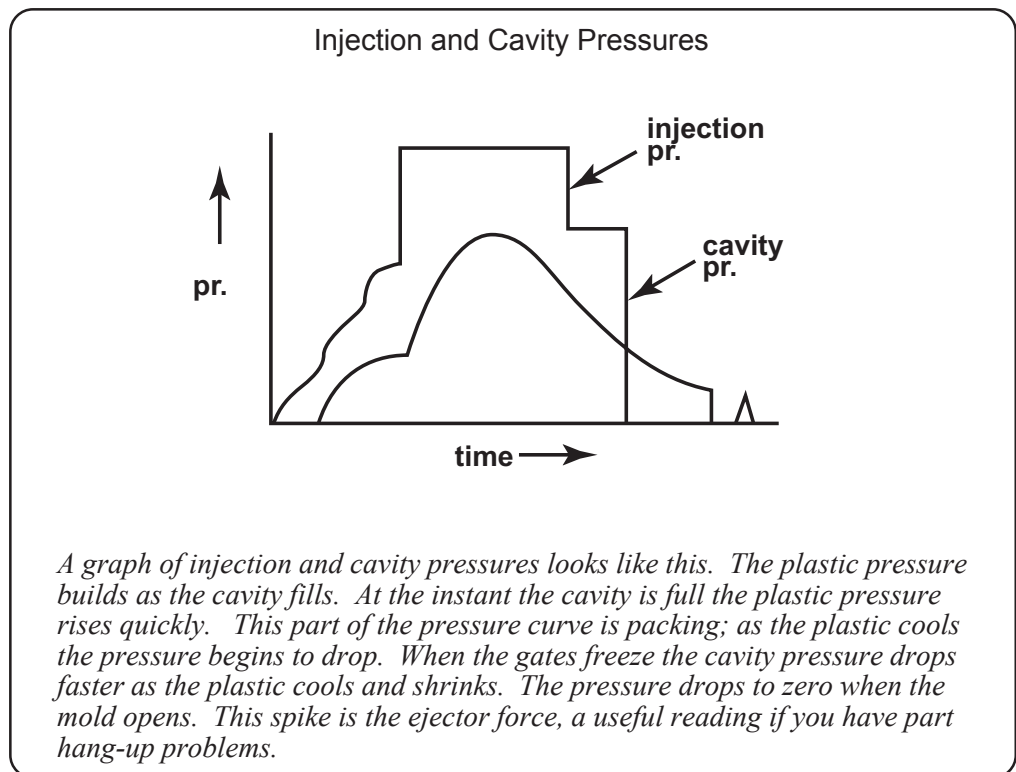
"Setting Controls for Maximum Efficiency"

I. Setting the Clamp Controls

A. Open and Closing Speed and Travel Distance

1. Uses ball screw drives to open and close a toggle clamp
 - a. precise
 - b. fast acting
 - c. repeatable
2. Large molding machines called hybrids may use a combination of ball screw toggle for most of the travel and short hydraulic cylinders and pistons for the final high pressure lockup.

B. Clamp Sequence



Notes

C. Mold Open Distance

1. Set the distance the mold opens to the minimum safe amount that will allow the molded parts to fall free.

D. High Speed Low Pressure Mold Close

1. Mold close sequence begins when the molded parts are clear of the mold
2. A minimum mold closed time is desirable to reduce overall cycle time.
3. Molder can set several clamp speed settings.
4. Mold will be set to close at a high speed but low pressure for most of the travel distance.
 - a. Saves cycle time

E. Low Speed Low Pressure Close

1. When the mold closes to a point where a molded part could have hung up, the molder slows down the clamp speed to a low speed, low pressure setting.
2. A load cell continuously measures the force against the moving platen
 - a. if it senses an obstruction such as a runner or plastic part, it will signal the control system to stop the platen.
 - b. If there is no obstruction, the mold will continue to close.
3. The distance at which the clamp switches to low speed low pressure is set by the technician for each mold.

NOTE: Both the distance and the amount of resistance that will stop the clamp are important settings to avoid mold damage.

F. Clamp Force Setting

1. Clamp force should not be higher than that needed for the specific mold.
 - a. Clamp force too low:
 - flash will occur
 - b. Clamp force too high:
 - the mold vents may be compressed so there is less venting out of the mold and that can cause burn marks.
 - damage a mold and even indent the platen surface.

Notes

2. Each machine manufacturer specifies the minimum platen area the mold should cover to avoid platen damage.

G. Ejector Settings

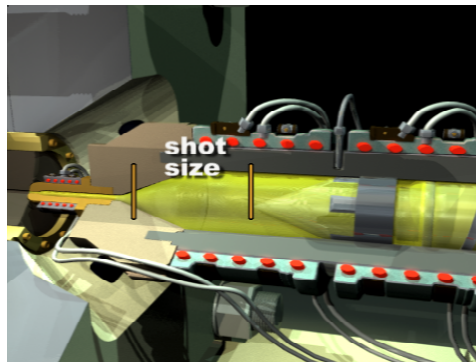
1. When the part ejection system is controlled by a ball screw drive, the advantage is that the molder can set the exact timing and travel of the ejector system.
 - a. Saves cycle time
2. The timing and the ejector travel is set at the control screen.
 - a. An error can cause severe damage to a mold.

II. Injection Unit Controls

A. Screw Back Setting

1. The screw back control setting determines how much plastic is accumulated in the injection cylinder by the extruder screw.

Plastic Volume Ahead of Screw



The amount of plastic between the screw back position and the vpt setpoint is the amount of plastic injected into the mold by the fill rate control settings.

2. Example of a startup method for a mold that will eject short shots.
 - a. During an initial startup of a mold the technician sets the pack and hold pressures to zero to avoid any confusion about which control is causing the plastic flow.
 - b. The velocity to pressure transfer is set to make sure there is a small cushion when the screw reaches the vpt setpoint.

Notes

- c. The molding technician then sets the screw back position to intentionally make short shots.
- d. The machine is cycled in semi-automatic mode making short shots.
- e. The screw back position is gradually increased until the parts are about 90% full for most molds.
- f. Then the pack and hold pressures are adjusted to fill out and pack the molded parts.
- g. If a reasonable the pack pressure doesn't complete the filling of the parts the vpt setting should be slowly increased until the part are about 95% full with zero pack and hold pressure.

NOTE: This is a very brief description of a startup method. Each plant should have its own written machine startup procedure.

B. Nozzle Pressure

1. Molding machines have a control for the amount of pressure the nozzle exerts against the sprue bushing.
2. The injection unit needs enough pressure to avoid plastic leakage but not so much that you could damage either the nozzle tip or the seating area of the sprue.

C. Injection Rate Control

1. Ball screw drives allow the molder to accurately control injection rates to speed up or slow down the plastic flow rate at any point in the injection stroke.