Plastics Industry

Injection Molding

Application Note

Today, **Injection Molding** employs sophisticated technology to process plastic stock into finished products. It requires precise motion, pressure, and temperature control.

The powerful programmable controllers now available have the necessary computing speed for these applications.

In addition to relay ladder logic, they can be programmed with high-level computer-like languages. Routines written in C or other languages can be imported.

Tight coupling between PLC sequencing and motion control lets the system run at maximum speeds.

The injection molding process is used to turn plastic stock into finished products. The process involves many steps:

1) Plasticize the raw material: heat the plastic stock hot enough to melt it, but not hot enough to damage it.

2) Fill the mold: inject the plasticized material into the mold. This “shot” step requires precise motion and pressure control.

3) Pack the mold: reduce the pressure to the pack value and maintain it for a specified time to assure the mold is full.

4) Hold time: reduce and maintain the pressure at the hold value while the plastic cools.

5) Pressure release: release the pressure and wait for the part to finish curing while moving the injector into position for the next part.

6) Open the mold. Both motion control and pressure control are needed to operate the mold.

7) Eject the part.

The motion control modules from Delta Computer Systems, Inc. are uniquely suited to controlling these steps. These modules combine four axes of linear transducer interface with four 12 or 16-bit analog inputs, allowing coordinated control of position and pressure with a 1 or 2 millisecond loop time. One module can control the plasticizer screw, the shot injector, the mold clamp, and the part ejector.

With Delta’s Event Control Firmware, sequences up to 255 steps long can be programmed into the module. Event response time is 1 or 2 milliseconds.

A well-planned PLC program can control injection molding and motion control sequencing. Result: Higher throughput.

Important considerations:

Hydraulic: Sufficient hydraulic oil, adequate accumulator pressure, proper valving and accumulator location, plus fast linear valves with zero overlap, will ensure better control of machinery.

Controller: Fast PLC scan times and I/O update times of 40 ms or less improve response time. Result: Increased throughput.

Benefits of using Delta's motion control modules include:

- High density modules: four linear transducer I/O and four pressure control loops
- Fast 1 or 2 ms control loop: smooth transition from position to pressure (all in the same module)
- Error handling capabilities: the modules react to errors and quickly reports to the PLC via bus communications
- Fully tested: Third Party Vendor module
- With optional Event Control Firmware - up to 255 synchronized steps

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Delta Computer Systems, Inc. manufactures motion controllers, color scanners, and other industrial controls providing high performance automation solutions to a wide range of industries.