



Principle Concepts of Injection Molding Class

ZAG Equipment Sales, Inc.

Led by Your Industry Expert, Marty Key

This course focuses on more advanced concepts in injection molding. This course is good for individuals with a basic knowledge of injection molding. The course reinforces the information taught in Elements of Injection Molding while developing a deeper understanding of the concepts of injection molding. Both hands-on and in class lessons are used to make the class interactive for the student.

Topics covered in the class are:

Safety – Safety issues and concerns in the injection molding industry

Material – The types of material used in injection molding. Select the correct parameters for the type of material being molded. The properties and processing considerations for various types of plastics

Controller Review – A review of the machine controller and interface. Each button will be reviewed along with its purpose on the machine and its correlation to the machine controller.

Machine Components – Higher level concepts in machine components, their purpose, and different variation in machines and machine and machine component designs.

Mold Components – The components and types of injection molds. The function of the mold and its components.

Machine Assessment – Basic concepts in assessing a machine's performance. How to perform and understand the relevance of machine testing.

Process Development – This course begins to review the basic concepts of developing an injection mold process.



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Safety

- Safety concerns in molding
- LOTO – OSHA review

Material:

- Experiment – How amorphous vs. semi crystalline behave. Properties, clarity, durability, etc.
- How plastics are made
- Viscosity – How it affects the process.
- Types and properties of Semi Crystalline and Amorphous Material
- Material Data Sheets
- Drying – Hygroscopic material
- Math – Calculate drying time and hopper size
- Additives

Controller Review

Injection Unit:

- Experiment - Melt Temperature, how to take melt temperature
- Back Pressure
- Shot Size
- Injection Speed Linearity
- Components of the injection unit and their purpose
- Screw purpose
- Screw Design
- Non Return Valve.
- Hydraulic vs Plastics vs Cavity Pressure
- Math: Intensification Ratio
- Electric vs. Hydraulic
- How injection units can have different screw sizes, what are the effects
- Shot volume vs. shot size
- Math: Calculating Volume



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Mold

- Components of a mold
- Mold Measurement
- Types of Runners
- Runner Design
- Purpose of a hot runner
- How to stop and start a hot runner
- Hot runner do's and don'ts.
- Valve Gates
- Cavitation
- Vents
- Ejection
- Warp
- Void
- Math: Projected Area
- Sizing a mold for a press

Machine Testing

- Experiment: Check Ring
- Experiment: Load Sensitivity
- Experiment: Injection Speed Linearity
(with decompression and without)
- Perform the test discuss why

Clamp

- Clamp
- Experiment – Calculate tonnage for a mold.
- Experiment – Lower Tonnage until weight increases or you see flash.
- Types of clamps: RAM, Toggle, 2 Plate, Tiebarless
- Tie bars
- Platens
- Ejection
- Die Height
- How to set Clamp Speeds for Opening and Closing

Process Experiments

- Fill Flow Study
- Cavity Imbalance
- Hold Pressure
- Hold Time
- Cooling Time



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Heat

- Material and Heat
- How material is heated
- Degradation
- Shear
- Electrical Heat

Flow

- Experiment: Pressure Limit. Pressure limit the process, record pressure, part weight, and fill time. Make the press not pressure limited and record the same information.
- Math: Calculating Flow Rate
- Math: Transferring a process from one press to another
- Flow explanation
- Non-Newtonian
- Fill Only parts.
- Transfer

Pressure

- Pressure Loss
- Hold Time – with and without gate seal
- Hold Pressure
- Hold Speed

Cooling

- Water Temperature
- Cooling Rate
- Types of Cooling
- Warp
- Cooling Lines
- Turbulent Flow
- Heat Deflection

Defects

- Types and Causes

