



# Elements of Injection Molding Class

## ZAG Equipment Sales, Inc.

## Led by Your Industry Expert, Marty Key

This class is for individuals who are interested in establishing a knowledge base for injection molding. There is no need for any prior injection molding experience to take this course. The course focuses on specific elements of injection molding. Both hands on and in class lessons are used to enhance the students learning experience.

**Material** – the types of materials used in injection molding, and their properties. Proper material handling techniques, and where to locate relevant material information.

**Machine Controller** – the controls, interface, and function of the injection molding machine

**Basic Machine Operations**

**Machine Components** – the components and function of the injection molding machine

**Mold** – the components, function, types, and purpose of the mold.

**Process** – The purpose and function of each step in the injection molding process.

### Injection Molding Elements

#### Material

- Experiment: How to find information on types of plastic. Google, UL Prospector, Mat web, material supplier. Why is it important?
- Experiment: Take semi crystalline and amorphous parts, show the difference between the 2. Dimensions, chemical exposure, flexibility, clarity, etc. why would you use one material over the other?
- Material: What plastic is, different types, semi crystalline and amorphous, additives, drying

#### Controller

- Review of the controller, interface, and buttons on the machine



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### Basic Instructions for Press Start Up

#### Injection Unit

- Back Pressure Experiment: Set back pressure at 200 weight 3 shots, take average. Put back pressure at 1500, weigh parts. What is the purpose of back pressure
- Experiment: Screw RPM, set RPMs at 50, record cycle time, screw recovery time, and melt temperature. Increase RPMs record cycle time, screw recovery time, and melt temp. What happened to cycle time, recovery time
- Experiment: Decompression: Set decomp to 0 then .75, note any differences.
- Experiment: Shot size, how to determine, how to adjust.
- Experiment (Fill) – Change shot size to make a part that is 25%, 50%, 75%, and 100% full. Document pressure, fill time, shot size. Discuss the purpose of shot size. Repeat using transfer instead of shot size. What is the purpose of transfer
- Activity – Measure the L/D, Compression Ratio, and Screw Profile of 2 different screws. Discuss why they are different.
- Components Hopper, feed throat, screw, barrel, screw motor, thermocouple, heater bands.
- How screw sizes affect pressure and volume

#### Mold

- Tear down a simple mold
- Reassemble
- Components (A half, B half,) locating ring, hot runner, cold runner, gates, vents, types of molds, clamping systems, ejector types, cavitation,
- Tonnage Calculation



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### Clamp

### Review of Tonnage Calculation

### Flash Activity

- Lower Tonnage until part weight changes or flash develops, lower transfer to develop flash. This shows speed doesn't cause flash but going too far too fast.

### Process

#### Fill

- Create fill Only parts at fast fill speed. Do not change transfer, record observations. At the final speed make the parts look like the 95-98% full parts. What happened to the parts and weight? Shows that fast fill parts are often lighter.
- What is a fill only part?
- Non-Newtonian material
- Why do we fill as fast as quality will allow.
- The injection process.
- Shot size.
- Transfer
- Pressure

#### Pressure

- Increase hold pressure.
- Discuss what happens and its effects.
- Hold Time Study, what is gate seal
- The purpose of pressure
- What we use gate seal or not
- Hold Speed





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### Cooling Time

- Set cooling high, reduce cooling, record observations.
- How to use and record a flow meter, why is it important
- Types of cooling: Water, Oil, Air, Electrical
- Types of TCU
- Cycle Time
- Plumbing a mold

### Defects

- Common defects and their causes
- Troubleshooting
- Basic troubleshooting
- Checking setup sheet
- Check first stage
- Checking water connection

