

Questions on Injection Molding – Harbec Visit

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- 1) What temperature do the injection molding machines currently operate?
 - *Temperature is based on the material, client chooses by characteristics. Typical engineering plastics melt at around 475°F, with a molding temperature of about 125-150°F. Higher temperature plastics, such as PEEK, melt around 730°F with a molding temperature of 300°F.*
- 2) Continuous flow processes for injection molding?
 - *There isn't really continuous flow in injection molding, due to mold cavities and shot sizes. The screw mechanism alone might be able to drive the plastic for 3D printing applications. Check into extruders.*
- 3) How do you handle clogging of the nozzles?
 - *Typically brute force, pull out the nozzle and melt the plastic with a blowtorch.*
- 4) Range of feasible materials?
 - *Basically anything that can be pelletized and melted in the temperature range of the machines. Although PVC is not a good material, as is anything that will produce harmful gasses when heated.*
- 5) Cost of pellets?
 - *Usually, a 55lb bag will cost \$1-\$1.25/lb for lower end plastics. PEEK and other high end plastics cost about \$30-\$40/lb*
- 6) What are the pellets held in?
 - *In a hopper. The pellets are dried then vacuum sucked up into a hopper, which sits right on top of the mold. Usually a completely enclosed system.*
- 7) How are the pellets heated?
 - *Heater bands on screw. Usually 3-5 per barrel, with a thermocouple for each. Shear from the screw moving the pellets produces a lot of heat, which aids in melting process. Sometimes there are specific screw designs for different plastics.*
- 8) How do you get rid of the moisture on the pellets?
 - *Pellets are dried before being moved to the hopper for melting.*

- 9) What is the change over time between different pellets?
- *Ideally shouldn't take that long. If dumping a little plastic in at a time then it's just getting the part out, but if it's a lot of material they wait until the entire material is out and then they will run a cleaner resin (polypropylene) through to clear colors and materials out of the machine. Usually the first few moldings are test, so purge time varies (can use those tests to purge).*
- 10) In filament printing, there is concern about heat transferring up along the filament. This results in extruder malfunctioning. For plastic injection molding, do you care if the heat is transferred along the pellets? What happens if the heat is transferred to the material in the hopper?
- *There is usually some type of backpressure control to prevent plastic from leaving the nozzle area and moving towards the hopper/un-melted pellets.*
- 11) Additional Information:
- *Consider adding a cooling process to the front of the 3D printer head – had issues with diameter changing based on filament and nozzle clogging*
 - *Consider: McMaster, IMS.com, DME company, PCS (injection molding replacement parts)*
 - *In high temperature plastics, hot oil is run through the mold to prevent rapid cooling. In other cases, cold water is run through the mold to aid rapid cooling*
 - *Uses thermoplastic elastomers*
 - *Load minimum amount of material into hopper to reduce waste*