Basic Injection Moulding Trouble Shooting Guide

Contents

Common sense on trouble shooting


Shop floor safety guidelines

Common Sense On Trouble Shooting

1. Determine whether problem occurs consistently or not. (In most case, you cannot control consistency.)
2. Identify possible causes (refer to table below).
3. Take corrective actions
4. Install control measures, monitor whether new process is capable to prevent problem reoccurrence or not.
5. If non go back to step 1. If yes, finalize settings, document changes, and notify all concerning parties for the modifications.

Short shot

Possible causes:
Process- Insufficient injection pressure/ injection rate insufficient material feed

   Excessive cooling of the melt

Mould- Unbalanced multi-cavity mould

   Insufficient air venting blocks resins flow Runners, gates, or vents too small

   Material flow length too long.

Material- Material viscosity too high

   Foreign material clogging nozzle and/ or gates

   Mould temperature too low

Machine- Feed hopper blocked

   Barrel has no resins left

   Undersized cylinder heating capacity

   Material leaks/ back flow

Warpage

Possible causes:

Ejected part too hot/ in-balance cooling
Improper balance core and cavity temperature

Poor knock out mechanism balance

Over packing in gate area because of high injection pressure

Holding time too long

Moulded in strains / internal stress built up

Small undercut in mould Varied part’s wall thickness

Improper balanced multiple gates

Material flow too long, insufficient gates Low rigidity on part design

**Mould Flash**

![Mould Flash Image]

*Possible causes*

Injection pressure/injection rate too high

Barrel temperature too high

Insufficient clamping pressure

Mould sliding cores clearance too large Imprecise mould alignment

Foreign material caused clearance on mould mating surface

Mould temperature too high Air venting design too large
Material over packed the mould cavity
Mould parting defects after age
Hopper temperature too high

Brittleness

Possible causes
Material thermally degraded-
  Screw speed too high
  Residence time too long
  Backpressure too high
Material not predicted
Regrind content too high
Materian contamination
Use of improper colorant
Inadequate radii at corner, notch, or thread
Voids or notch on part after moulding
Inappropriate hopper temperature
Mould temperature too low
Moisture contend too low after moulding (for PA)

Excessive Shrinkage

Possible causes:
Insufficient cooling
Injection rate too low
Packing pressure (injection, holding, back) too low
Mould temperature too high

Inappropriate hopper temperature

Runner / Gate size too small

Varied part’s wall thickness

Insufficient additives (nucleator)

**Sink Marks / Voids**

![Image of a sink mark]

*Possible causes:*

- Insufficient injection pressure
- Insufficient holding time
- Insufficient backpressure
- Insufficient material feed
- Hopper and melting temperature too high
- Insufficient sprue/runner/gate size
- Improper gate location / material flow length too high
- Material leaks / back flow
Non-uniform part’s wall thickness

Mould temperature too high for sinks and too low for voids

Insufficient air venting for voids

**Mould sticking**

*Possible causes:*

Over packing, injection pressure too high

Holding pressure too high

Insufficient cooling

Regrind content too high

Insufficient tapers/draft angle on mould/sprue

Insufficient mould release/resins lubricant used

Undercuts at mold/moving slides failure

Material experiences ”positive shrinkage”

<table>
<thead>
<tr>
<th>Core &amp; Cavity</th>
<th>Polished surface on core</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Insufficient knockout action</td>
</tr>
<tr>
<td></td>
<td>Surface irregularities in the mould</td>
</tr>
<tr>
<td>Sprue-</td>
<td>Nozzle and sprue bushing miss-aligned</td>
</tr>
<tr>
<td></td>
<td>Sprue bushing not polished</td>
</tr>
</tbody>
</table>

**Drooling**

*Possible causes:*

Nozzle temperature too high

Melt temperature too high
Material too moist

Shut off valve malfunction

**Silvery Streaks Splash Marks**

Possible causes:

- Material too moist
- Overheated material
- Residence time too long
- Air trapped in melt
- Check if excess mould release agent on mould cavity
- Reduce regrind

**Flow marks Jetting**

Possible causes:

- Material melt front too cold
- Irregular injection rates
- Inconsistent nozzle heating
- Big variance in part’s wall thickness
Mould too cold

Gate size/design inappropriate

**Odor**

*Possible causes:*

Melt temperature too high

Material contamination

Residence time too long

Material had been overheated or even burnt at hold up spots within the machine

**Low gloss**

*Possible causes:*

Material too cold

Rough cavity surface/poor cavity polishing

Injection pressure too low

Sprue/Runner/Gate size too small

Excess mould release agent/lubricant on mould surface

**Weak Weld lines**

*Possible causes:*

Inadequate venting at weld(s)
Mould temperature too low
Melt temperature too low
Material too viscous (setting too quickly)
Injection speed too low
To small sprue, runner or gate size
Gate location(s) too far from weld
Excess mould release agent on mould surface

**Un-melted Granules**

![Granules Image]

*Possible causes:*
- Material too cold
- Insufficient plasticizing capacity, slow plasticizing
- Melt contains granules with higher melting pressure
- Insufficient backpressure
- Barrel not well insulated
- Screw type is inappropriate for the material plasticizing

**Rough Surfaced Orange Peels Wrinkles**
**Possible causes:**

Rough cavity surface

Material flow too slow-

Insufficient melt temperature

Insufficient mould temperature

Insufficient injection pressure

Insufficient injection speed

Screw forward time too slow

Gate size too small

**Discoloration Color Fading**

**Possible causes:**

Material suffers thermal degradation

Melt temperature too high

Colorant melt temperature too low

**Brown Stains Black Streaks**
Possible causes:

Material oxidized or contaminated

Screw/barrel not cleaned

Excess oil/grease on mould surface; probably from knockout pins

**Screw Slippage**

Possible causes:

Screw/Barrel worn out

Feed hopper blocked

Too much lubricant in material

Material too wet

**Burn Marks**
**Possible causes:**

- Injection speed too high
- Temperature settings too high
- Not enough mould venting or venting blocked
- Material too heat sensitive
- Gate size/design inappropriate
- Core shift causes excessive material heat up from friction when passing narrow section

**Safety Inside the Injection Moulding Workshop**

Injection moulding machines are powered by electricity. They are fast, power and dangerously hot. Despite the fact that they are built to run safely, users still have to treat them with respect because the high clamping tonnage and high temperatures needed to process the plastics are just as effective as crushing or destroying the operator hands, arms, legs and fingers.

Be cautious and pay attention when operating injection moulding machines, or else accidents could happen.

Do not reach over or under protective guards when the machine is running.

Do not climb or crawl into the machine when the machine is operating.

Wear face shields, long gloves and other protective clothing when purging the barrel and when working around the injection nozzle or the mould where hot plastic may be expelled.

If a piece of plastic is caught inside the mould when the latter closes, hit the machine emergency stop button. Do not slide open the safety gate and grab for the plastic. Wait until the clamping action has stopped. Damage moulds can be replaced, but not crushed hands and fingers.

Before starting your work shift, walk around the injection moulding machine that you had been asked to operate. Make sure that all safety guards are in place, observation windows are clear and not broken or missing, and all safety interlocks are in working order and properly adjusted.

Do not fix or adjust the injection-moulding machine when its motors are running.

Stand clear when a maintenance mechanic works on your machine. Do not attempt to help unless requested specifically.
Ejector pins, ejector plates and boxes, cores and core activator are moving parts. Pinch points are created as these devices travel. Watch your hands and fingers.

**Safety devices**

Every injection-moulding machine has built-in electrical, hydraulic and mechanical safety devices. Find out where they are located and check to make sure that they are operational, as operator on an earlier shift may have disabled some of them.

**Clothing and Safety Glasses**

Your facilities will no doubt have certain rules and regulation on what you should wear on the job to safeguard your safety. Be particularly cautious about the types of shoes you wear as split hot plastic can easily burn through thin shoes and sharp plastic parts, runners or spruces can pierce soft soles. Wear safety glasses and ear protectors even if they deem to be awkward and inconvenient. Protect yourself with these gears for your own safety.

**Motor stop button**

If you have to reach into the mould space for some reason, stop the motor that drives the whole machine. The motor or emergency stop button is purposely located close at hand as part of the requirements under government safety regulations.

Do not reach into the material hopper or feed throat while the machine is running. The rotating screw can grind fingers off efficiently. Again, shut off the motor first.

**Hot Plastic**

Melted plastic is extremely hot. Do not under-estimate the temperatures and pressures that are at work in your moulding machine.

**Purging**
Purging is the expelling of hot plastic material from the injection barrel into the open air. Wear long gloves, long sleeves, a facemask and safety glasses. Purging of hot runner moulds is particularly hazardous.

**Electrical Heaters and Wiring**

The injection barrel is heated by relatively high voltage electricity (normally 220 VAC). Be very careful of the heated portion, the heater band at the nozzle is often exposed, so look out for it.

Be alert to other electrical hazards on your molding machine and around you in the shop floor. Make it a habit to watch out for electrical boxes with covers removed, open control panel doors, broken or damaged wiring conduit, frayed or spliced electrical cords. Report them accordingly.

**Caution: Scrap Grinders**

Grinders can throw pieces out from the feeding chute back in your face, so be careful if they operate near you. If you have to clean the grinder, turn it off and disconnect the power completely. Do not just shut off the switch. Better still, pull out the power plug and hang it up where you can keep an eye on it. Avoid someone coming along and turned the machine back on while you have your hands and fingers inside the grinder.