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Engineering Thermoplastics
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Injection Molding Troubleshooting Guide

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Our mission, therefore, is to satisfy the needs of our customers and facilitate improvement in their profitability by offering a comprehensive range of engineering thermoplastic compounds with a unique balance of Quality, Value, and Service.



Injection Molding Trouble shooting guide

The purpose of this guide is to identify a broad range of molding problems that can arise in injection molded parts. This is intended as a guide only and may not be the optimum solution for every application.

When troubleshooting, it is important to remember that the first step is to identify the “true” issue. When making processing changes, make one change at a time and allow two cycles, at a minimum, before moving on. If the change made does not fix the problem, then you should put that setting back to it’s original setting before making the next change.

When it is necessary to request technical service, please have the following information available.

1. What type of problem, i.e. molding, part failure
2. Material type and lot number
3. Injection molding parameters
4. Nominal wall thickness, gate size, number of cavities
5. Material handling procedures, regrind percent used, drying times and temperatures
6. Shot size versus barrel size

Black Specks	
Possible Cause	Suggested Remedy
<ol style="list-style-type: none"> 1. Contamination in material 2. Heater Band malfunction 3. Contamination from previous run 4. Degraded Polymer 	<ul style="list-style-type: none"> ➤ Replace with new material ➤ Check for over run/over heating a) Clean screw and barrel b) Check for hang up areas in screw and check valve areas a) Lower melt temperature b) Lower back pressure c) Lower screw RPM

Blisters/Bubbles	
Possible Cause	Suggested Remedy
<ol style="list-style-type: none"> 1. Moisture in material 2. Air Entrapment 3. Degraded polymer 	<ul style="list-style-type: none"> ➤ Check moisture levels of material and dry if needed a) Check vents and clean if needed b) Reduce clamp pressure to minimum amount needed c) Increase back pressure a) Lower melt temperature b) Lower back pressure c) Lower Screw RPM

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Brittleness	
Possible Cause	Suggested Remedy
<ol style="list-style-type: none"> 1. Moisture in material 2. Excessive melt temperature 3. Melt temperature too low 4. Contamination 5. Excessive amounts of regrind 6. Improper gate size/location 	<ul style="list-style-type: none"> ➤ Check moisture level of material and dry if needed a) Lower melt temperature b) Lower nozzle temperature c) Decrease back pressure d) Check for long residence times in the barrel and lower temperatures if needed ➤ Increase melt temperature a) Inspect resin for contamination (replace if contaminated) b) Purge machine thoroughly ➤ Reduce regrind % (general rule- 25-30%) a) Increase gate size to obtain optimum filling b) Relocate gate away from potential stress areas

Burns in gate area	
Possible Cause	Suggested Remedy
<ol style="list-style-type: none"> 1. Burrs or sharp corners at the gate 2. Gate size too small 3. Color concentrate shear sensitive 	<ul style="list-style-type: none"> a) Polish gate area to eliminate rough areas and sharp edges b) Decrease gate land length ➤ Gate size should be 50-80% of the nominal wall thickness ➤ Remove color concentrate and run natural to verify

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Burns at the end of fill	
Possible Cause	Suggested Remedy
1. Plugged vents	➤ Clean vents
2. Over clamping	➤ Reduce clamp pressure to minimum needed
3. Inadequate vents	➤ Add vents
4. Melt temperature too high	➤ Reduce melt temperature
5. Injection rate too fast	➤ Decrease injection rate

Cracking/Crazing	
Possible Cause	Suggested Remedy
1. Contamination	<ul style="list-style-type: none"> a) Change to different lot of material b) Eliminate regrind as contamination source c) Remove colorant
2. Part removal	<ul style="list-style-type: none"> a) Redesign knockout system for balanced ejection force b) Rework mold and provide adequate draft angles and eliminate excessive undercuts
3. Packing excessive material into the mold	<ul style="list-style-type: none"> a) Decrease pack pressure b) Decrease shot size c) Increase transfer point to lower peak injection pressure d) Decrease injection time
4. Non-uniform or too cold of a mold temperature	<ul style="list-style-type: none"> a) Increase mold temperature b) Supply uniform cooling to cavity
5. Chemical contamination	<ul style="list-style-type: none"> a) Do not over use mold release b) Clean mold

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Delaminating	
Possible Cause	Suggested Remedy
1. Melt temperature to low	➤ Raise melt temperature
2. Material contamination	➤ Check material feed system for contamination ➤ Try different lot/box of material
3. Incompatible color concentrate	➤ Try virgin only run to verify and change color to a compatible concentrate if needed
4. Injection rate to low	➤ Increase injection rate
5. Air entrapment in mold	➤ Increase venting
6. Mold temperature to low	➤ Increase mold temperature

Dimensional Inconsistency	
Possible Cause	Suggested Remedy
1. Non-uniform feeding of material	a) Adjust temperature for optimum filling b) Increase shot size to maintain proper cushion c) Replace check valve if cushion cannot be maintained
2. Insufficient packing of part	➤ Increase injection forward time and pressure to ensure gate freeze off
3. Regrind levels inconsistent	a) Review regrind blending procedures b) Decrease level of regrind
4. Melt pressure variations	➤ Increase fill pressure to maintain the selected velocity of most runs
5. Unbalanced runner system	a) Increase holding pressure to maximum b) Increase injection rate c) Balance runner and gate sizes to provide balanced filling

Discoloration	
Possible Cause	Suggested Remedy
1. Material Overheating	a) Decrease melt temperature b) Decrease screw RPM c) Decrease back pressure d) Decrease residence time e) Check barrel and nozzle heater bands and thermocouples
2. Material oxidized by drying at to high temperature	➤ Set drying temperature at manufactures recommended settings
3. Contamination by foreign material	a) Review material handling procedures b) Purge injection cylinder

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Excessive Cycle Time	
Possible Cause	Suggested Remedy
1. Poor mold cooling	<ul style="list-style-type: none"> a) Increase mold cooling in hot spots of parts b) Ensure fast turbulent flow of water through cooling channels
2. Clamp speeds slow	<ul style="list-style-type: none"> a) Adjust clamp speed for minimum mold open time b) Low pressure close time excessive, adjust clamp positions and pressures
3. Melt and mold temperatures too high	<ul style="list-style-type: none"> ➤ Decrease melt and mold temperatures to minimum temperatures needed for proper fill
4. Screw recovery time excessive	<ul style="list-style-type: none"> a) Check machine throat and hopper for blockage b) Check for worn screw and barrel

Flashing	
Possible Cause	Suggested Remedy
1. Excessive melt/mold temperature	<ul style="list-style-type: none"> ➤ Reduce melt and mold temperatures
2. Excessive packing of material	<ul style="list-style-type: none"> ➤ Decrease packing pressure
3. Injection pressure too high	<ul style="list-style-type: none"> a) Decrease injection pressure b) Decrease boost time c) Decrease injection rate d) Increase transfer position
4. Projected area too large for available tonnage	<ul style="list-style-type: none"> ➤ Switch to larger tonnage machine
5. Uneven or poor parting line and mating surface	<ul style="list-style-type: none"> a) Remove mold and carefully inspect and repair parting lines b) Repair cavities and cores that do not have a positive shut-off
6. Mold clamping pressure not properly adjusted	<ul style="list-style-type: none"> a) Increase clamping pressure b) Check parting line for obstruction c) Check press platens for parallelism
7. Non-uniform cavity pressure due to unbalanced filling	<ul style="list-style-type: none"> a) Balance/increase runner and gate sizes to obtain uniform filling b) Properly balance cavity layout for maintaining uniform cavity pressure

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Flow Lines	
Possible Cause	Suggested Remedy
<ol style="list-style-type: none"> 1. Melt temperature to low 2. Mold Temperature to low 3. Gate size to small 4. Non- uniform wall thickness 	<ul style="list-style-type: none"> ➤ Increase melt temperature ➤ Increase melt temperature ➤ Increase gate size ➤ Redesign part for more uniform wall thickness to provide for optimum filling

Nozzle Drooling	
Possible Cause	Suggested Remedy
<ol style="list-style-type: none"> 1. Nozzle temperature to hot 2. Moisture in material 	<ol style="list-style-type: none"> a) Decrease nozzle temperature b) Decrease melt temperature c) Reduce back pressure d) Increase screw decompression <ol style="list-style-type: none"> a) Review material handling procedures to eliminate moisture pick up b) Dry material according to manufactures recommendations

Parts sticking in mold	
Possible Cause	Suggested Remedy
<ol style="list-style-type: none"> 1. Over packing material in mold 2. Insufficient draft on cavities/sprue 3. Part to hot for ejection 4. Undercuts to big to allow part release 5. Molded part sticking to stationary half of mold 6. Knockout system incorrectly designed 	<ol style="list-style-type: none"> a) Decrease first stage injection pressure b) Decrease boost time c) Decrease injection forward time d) Decrease packing pressure e) Increase transfer position <ul style="list-style-type: none"> ➤ Redesign to allow maximum allowable draft <ol style="list-style-type: none"> a) Increase cooling time b) Decrease melt temperature c) Decrease mold temperature <ul style="list-style-type: none"> ➤ Redesign or reduce undercut <ol style="list-style-type: none"> a) Redesign sprue puller b) Increase nozzle temperature <ul style="list-style-type: none"> ➤ Redesign for balanced ejection force

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Short Shots	
Possible Cause	Suggested Remedy
1. Melt temperature to low	➤ Raise melt temperature
2. Mold temperature to low	➤ Raise mold temperature
3. Insufficient material volume	a) Increase shot size to maintain a constant cushion b) Inspect non-return valve for wear
4. Air entrapment causing resistance to fill	a) Provide adequate venting b) Increase number and size of vents
5. Restricted flow of material to cavity	a) Increase gate size b) Increase runner size c) Use larger orifice nozzle

Splay (Silver Streaking)	
Possible Cause	Suggested Remedy
1. Excessive moisture in material	a) Review material handling procedures to eliminate moisture pick up b) Dry material according to manufactures recommendations
2. Melt temperature to high	a) Decrease barrel temperatures b) Decrease nozzle temperatures
3. Excessive shear heat	a) Reduce screw RPM b) Increase gate and runner size c) Decrease injection rate d) Check nozzle for obstruction
4. Air entrapment	a) Reduce screw decompression b) Improve mold venting
5. Condensation or excessive lubricant on mold surface	a) Increase mold temperature b) Clean mold surface c) Minimize use of mold release
6. Moisture condensing in feed section of barrel	a) Decrease throat cooling b) Increase rear zone temperature

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Sinks and Voids	
Possible Cause	Suggested Remedy
<ol style="list-style-type: none"> 1. Improper part design 2. Insufficient pack and hold times 3. Insufficient volume of material 4. Gate freezes off prior to properly packing out part 	<ul style="list-style-type: none"> ➤ Core out thick wall sections ➤ Ensure pack and hold time is sufficient for gate freeze by performing a gate freeze analysis a) Increase shot size to maintain a constant cushion b) Inspect non-return valve for wear a) Increase size of gates and runners b) Increase size of the nozzle and sprue

Sprue Sticking	
Possible Cause	Suggested Remedy
<ol style="list-style-type: none"> 1. Nozzle orifice is larger than sprue orifice 2. Insufficient taper on sprue bushing 3. Imperfections on inside of sprue 4. Over packing material in sprue 5. Nozzle temperature too low to provide clean break 	<ul style="list-style-type: none"> ➤ Use nozzle that has an orifice at least .010" smaller than the sprue orifice ➤ Increase taper on sprue bushing (Minimum of 1.5° over the length of the sprue) ➤ Eliminate imperfections and polish surface in direction of draw a) Reduce pack and hold time b) Decrease injection forward time c) Utilize machine sprue break a) Increase nozzle temperature b) Use reverse taper nozzle

Surface Imperfections	
(Glass on surface, mineral bloom)	
Possible Cause	Suggested Remedy
<ol style="list-style-type: none"> 1. Melt temperature too low 2. Mold temperature too low 3. Insufficient packing of the part 4. Insufficient material in mold 5. Injection rate too slow 6. Water on mold surface 	<ul style="list-style-type: none"> ➤ Increase melt temperature ➤ Increase mold temperature ➤ Increase pack pressure a) Increase shot size and maintain constant cushion b) Decrease injection transfer position a) Increase first stage pressure b) Increase boost time c) Increase injection speed a) Increase mold temperature b) Look for water leaks and repair if needed

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Surface Imperfections (cont.)	
Possible Cause	Suggested Remedy
7. Excessive build up of lubricant on mold	<ul style="list-style-type: none"> a) Clean mold surface b) Use mold release sparingly
8. Moisture in material	<ul style="list-style-type: none"> a) Review material handling procedures b) Dry material prior to molding
9. Inadequate venting	<ul style="list-style-type: none"> ➤ Increase number of vents

Warpage	
Possible Cause	Suggested Remedy
1. Part ejected while too hot	<ul style="list-style-type: none"> a) Decrease melt temperature b) Decrease mold temperature c) Increase cooling time d) Cool part in warm water after ejection e) Use secondary fixture to hold part dimensions
2. Shrinkage differential due to non-uniform shrinkage	<ul style="list-style-type: none"> a) Increase injection rate b) Increase pack pressure c) Balance runners and gates d) Increase runner and gate size e) Increase/decrease injection time
3. Melt temperature too low	<ul style="list-style-type: none"> ➤ Increase melt temperature to provide better pack out of part
4. Shrinkage differential due to non-uniform wall thickness	<ul style="list-style-type: none"> a) Increase cooling time b) Redesign part with uniform wall thickness
5. Insufficient pack and hold times or pressures	<ul style="list-style-type: none"> ➤ Add pack and hold time or pressure
6. Ejection system poorly designed	<ul style="list-style-type: none"> ➤ Redesign ejection system for balanced ejection force
7. Differential mold cooling	<ul style="list-style-type: none"> ➤ Balance mold temperature

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Weak Weld Lines	
Possible Cause	Suggested Remedy
1. Melt temperature too low	➤ Increase melt temperature
2. Mold temperature too low	➤ Increase mold temperature
3. Insufficient pressure at weld line	<ul style="list-style-type: none"> a) Increase first stage injection pressure b) Increase boost time c) Increase pack pressure d) Increase pack time e) Increase injection rate/speed
4. Air trapped in mold	<ul style="list-style-type: none"> a) Increase vents at weld area b) Decrease injection speed to allow air removal c) Decrease clamp pressure to minimum pressure
5. Injection rate too slow	<ul style="list-style-type: none"> a) Increase injection speed b) Increase boost time c) Increase first stage injection pressure
6. Flow distance from gate to weld line area excessive	<ul style="list-style-type: none"> a) Relocate gate or use multiple gating b) Utilize overflow tab in mold to increase strength in weld line area

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