

## **Philosophy of Troubleshooting BMC Transfer Molding Problems**

There is no "cure-all" for eliminating molding problems. Every mold is distinctive and has its own peculiarities, even molds which are duplicate. The same holds true for molding presses. Therefore, what works for one mold or press may not work for another.

Problems can vary with conditions such as: the shop climate, material or equipment resulting in numerous variables, many of which are not obvious and are difficult to identify. The troubleshooting suggestions that follow; have been used to successfully resolve the stated problem. However, due to the reasons mentioned above, several of them may seem to be contradictory.

The most important thing to remember is this; make some reasonable adjustment and carefully observe the results. Document the change and keep track of the response by comparing parts from before and after the adjustment to determine if the effect is favorable. This will lead to other changes that should eventually produce a solution to the problem.

Thermoset materials cure as a result of a chemical reaction. Temperature has a major role in the speed of the reaction and to a lesser degree so do pressure and time. Therefore, all three items need to be verified before troubleshooting any molding problem.

For **transfer molding**, this means there are several items on the mold and press that should be checked before troubleshooting any molding problem. If problems are found, they should be corrected, and the parts re-evaluated before proceeding.

**Slug weight-** Check the charge weight of the BMC slug to confirm it meets the desired weight so material is not wasted, or short shots are produced.

**Mold Temperature-** Don't just read the press temperature controller. Check the actual mold temperature and its uniformity across the entire mold face using a calibrated

pyrometer and surface probe. Compare this temperature with what the temperature was the last time this mold was run in this press. The temperatures should be the same or very close. If not, determine why there are differences before starting to mold

**Press** - Check actual settings for close time, transfer time, and transfer and clamping pressures. Compare the current settings with the setting used the last time this mold was in the press. They should be the same or very close. If not, determine why there are differences before starting to mold.

### **Transfer Processing Problems**

Please **NOTE** the following:

- Increased cycle time should not be used as a solution to a molding problem, except as the very last resort to maintain the integrity of the molded parts.
- Various processing changes are suggested as possible solutions for the different problems encountered during the molding of thermoset parts. In general, these changes should not exceed the recommended ranges presented in the previous sections on transfer startup procedures.
- This troubleshooting guide lists the processing problems in alphabetical order.
- For each problem, the potential solutions are listed in the order of the most frequent to the least frequent solution for that problem.
- It is important to change **only one processing variable at a time**. Process 3-5 cycles and evaluate the results before adjusting another processing variable. Keep an accurate record with each change that is made.
- Please keep in mind that in order to resolve any given processing problem, one may need to apply a combination of the possible solutions that are listed.
- PLENCO's Technical Service Group is available to assist you in troubleshooting processing problems.

**CRAZE CRACKING** - Hairline cracks that appear on the surface of the part but do not propagate through the entire thickness of the part.

### **POSSIBLE SOLUTIONS**

1. Reduce the transfer ram speed.
2. Reduce transfer pressure.
3. Increase mold temperature on core side of the mold.
4. Increase mold temperature on the cavity side of the mold.
5. Work with PLENCO Technical Service to adjust formulation.

**CONTAMINATION** - Any foreign material visible within the surface of the molded part.

### **POSSIBLE SOLUTIONS**

1. Inspect the molding material for contamination and if possible, remove it. If it cannot be removed, quarantine the remaining material.
2. Inspect all processing equipment used in the molding process for potential source(s) of contamination and clean if found.
3. Check for air borne particulates from other processes and eliminate their source.

**DIESELING** - A burnt spot on part, often accompanied by non-fills.

### **POSSIBLE SOLUTIONS**

1. Add a breathe cycle.
2. Inspect vacuum gasket for damage.
3. Check vacuum system to ensure that it is drawing a minimum of 21" Hg in the mold. If it is not, resolve the problem with the vacuum system.
4. Decrease transfer pressure and/or transfer ram speed.
5. Vent the ejector pins.
6. Vacuum Vent the mold.

**DRAG MARKS** - Surface scratches that occur during part ejection.

### **POSSIBLE SOLUTIONS**

1. Check mold for metal burrs on the parting line.
2. Check mold for amount of draft and if possible, increase it.

**DULL APPEARANCE** - The surface of the part has a hazy or satiny appearance instead of a glossy appearance.

**NOTE:** Make sure part is completely filled out and mold is not stained.

### **POSSIBLE SOLUTIONS**

1. Review condition of the mold's surface to determine course of action.
2. Polish area.
3. If chrome is determined to be worn, have mold stripped, polished and chrome plated.
4. Increase mold temperature.
5. Increase transfer pressure.

**FLASH (EXCESSIVE)** - A part is considered to have excessive flash when the parting line flash is thicker than 0.006" (0.15mm) or the flash extends into the land area.

### **POSSIBLE SOLUTIONS**

1. Decrease transfer pressure.
2. Decrease ram transfer speed.
3. Decrease charge weight.
4. Increase mold temperature.
5. Check parting line for wear or damage and repair as needed.
6. Increase clamp tonnage if possible.

**FLOW LINES** - Visible lines on the surface of the part that show the flow pattern of the material as it filled the cavity.

### **POSSIBLE SOLUTIONS**

1. Decrease transfer pressure.
2. Decrease transfer ram speed.
2. Decrease mold temperature.
3. Relocate gate and if possible, increase gate size.

**KNIT LINES** - Areas where multiple flow fronts meet but do not meld or knit together.

### **POSSIBLE SOLUTIONS**

1. Decrease transfer pressure.
2. Decrease mold temperature.
3. Change location of gates and/or vents to move knit line to non-critical areas of the parts.

**LAKING** - Irregular dull areas on the surface of the part.

### **POSSIBLE SOLUTIONS**

1. Verify that the correct charge weight is being used and change as needed.
2. Increase the mold temperature.
3. Increase transfer pressure.
4. Increase transfer ram speed.
5. Check vents for wear, repair as needed.
6. Check parting line for wear or damage and repair as needed.

**NONFILLS OR SHORT SHOTS** - Areas of surface porosity due to parts not being completely filled out.

### **POSSIBLE SOLUTIONS**

1. Increase charge weight.
2. Increase transfer pressure.
3. Decrease mold temperature.
4. Increase gate and/or runner size.

**PIN CRACKING** - Small surface cracks around and/or above ejector pins.

**POSSIBLE SOLUTIONS**

1. Inspect condition of ejector pins for: dull surface, burrs, chipped edges, sharp edges. Correct as needed.
2. Inspect condition of ejector pin holes for washed or worn edges.
3. Slow down ejection speed.
4. Increase mold temperature.
5. Increase cycle time.

**PRE CURE** - Localized areas of dull rough porosity.

**POSSIBLE SOLUTIONS**

1. Increase transfer pressure.
2. Increase transfer ram speed.
3. Decrease mold temperature.

**SHRINKAGE** - There are two problems which will cause a part to not meet its dimensional requirements, the part has excessive shrinkage (undersize), or the part has insufficient shrinkage (oversize).

**POSSIBLE SOLUTIONS FOR EXCESSIVE SHRINKAGE (UNDERSIZE)**

1. Increase transfer pressure.
2. Increase mold temperature.
3. Check the vents and correct as needed.
4. Increase cure time.

**POSSIBLE SOLUTIONS FOR INSUFFICIENT SHRINKAGE (OVERSIZE)**

1. Decrease mold temperature.
2. Decrease transfer pressure.
3. Check the vents and correct as needed.
4. Decrease cure time.

**SINK MARKS** – Slight depressions on the surface of the part that resemble dimples.

**POSSIBLE SOLUTIONS**

1. Increase charge weight.
2. Increase mold temperature.
3. Increase transfer pressure.
4. Check the vents and correct as needed.

**STICKING IN MOLD** – Part will not release from the cavity and a piece or all of the part will remain stuck until it is manually removed.

**POSSIBLE SOLUTIONS**

1. Check mold for lack of polish. Polish mold surface as necessary.
2. Decrease clamp tonnage.
3. Decrease transfer pressure.
4. Decrease mold temperature.
5. Decrease charge weight.
6. Check mold for undercut(s).
7. Check condition of mold plating and re-plate if necessary. If mold is unplated, polish or plate it.

**TRAPPED GAS (BURN MARK)** – A porous, dull, discolored and sometimes scorched area on the surface of a part.

**POSSIBLE SOLUTIONS**

1. Inspect vacuum gasket for damage. Replace as needed.
2. Check vacuum system to ensure that it is drawing a minimum of 21" Hg in the mold. If it is not, resolve the problem with the vacuum system.
3. Decrease transfer pressure.
4. Decrease transfer ram speed.
5. Adjust mold temperature to hotter on movable side and cooler on stationary side.
6. Decrease clamp tonnage.

**WARPAGE** – Part is twisted or warped rather than straight or flat. This can occur when ejected from the mold or after cooling.

**POSSIBLE SOLUTIONS FOR PART WARPAGE WHEN EJECTED FROM MOLD**

1. Inspect parts for undercure – will lack rigidity after ejection from mold. Add cure time, raise mold temperature.
2. Slow ejection speed.
3. Check condition of mold plating and re-plate if necessary. If mold is unplated, polish or plate it.
4. Add undercuts to hold the parts on movable half of the mold until they are ready to be ejected.
5. verify ejection system is set correctly.

**POSSIBLE SOLUTIONS FOR PART WARPAGE AFTER COOLING**

1. Increase mold temperature.
2. Decrease transfer pressure.
3. Check the vents and correct as needed.
4. Increase cure time.
5. Use cooling fixtures to hold parts flat as they cool.
6. Increase gate size.
7. Relocate the gate.