Philosophy of Troubleshooting BMC Compression Molding Problems

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

Problems can differ 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 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 because 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 **compression molding**, this means there are several items on the mold and press that should be checked. If problems are found, they should be corrected and the parts re-evaluated before proceeding.

Mold - Check the actual mold temperature and its uniformity across the entire mold face and compare with what the temperature was, the last time this mold was run in this press. They should be the same or very close to it. If not, try to determine why there are differences before starting to mold.

Press - Check actual settings for, close time, breathe cycle and clamping pressure and compare with the setting used the last time this mold ran in this press. They should be the same or very close to it. If not, try to determine why there are differences before starting to mold.

Compression Processing Problems

Please **NOTE** the following:

- Increased cycle time should not be used as a solution for 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 compression startup procedures.
- This troubleshooting guide lists the processing problems in alphabetical order.
- For each problem, the possible solutions are listed in the order of the most frequent to the least frequent solution for that problem.
- Change only one processing variable at a time and thoroughly evaluate its results, before changing another processing variable.
- 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 always available to assist you in troubleshooting processing problems. This may involve investigating material modifications or a different molding compound.

CRAZING / CRACKING - Cracking is hairline cracks that appear on the surface of the part but do not propagate through the entire thickness of the part.

POSSIBLE SOLUTIONS

1. Check mold for back draft or undercuts and remove them.
2. Eliminate any sharp transitions from thick to thin cross sections.
3. Decrease the rate of ejection.
4. Increase the temperature differential between the cores and cavities.
5. Allow the parts to cool at a controlled, uniform rate.
6. Change the placement of the charge to maximize the material fill pattern.
7. Use shrink fixtures to hold the parts flat while they cool.

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

POSSIBLE SOLUTIONS

1. Check all unmolded material for foreign matter and if possible remove it. If it can't be removed, quarantine the remaining material.
2. Check all equipment used in molding the material for potential sources of contamination and remove them.
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. Decrease mold closing speed.
2. Increase the mold temperature differential between the cores and cavities. If that does not resolve the problem, try decreasing it.
3. Vent the ejector pins.

DRAG MARKS - Surface scratches that occur during part ejection.

POSSIBLE SOLUTIONS

1. Vent the ejector pins.
2. Check mold for back draft or undercuts and remove them.
3. 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. Increase mold temperature.
2. Decrease mold closing speed.
3. Check condition of mold plating and re-plate if necessary. If mold is unplated, polish or plate it.
4. Polish the mold.

FLASH (EXCESSIVE) - Parts where the flash is thicker than 0.15 mm (0.006") or with flash extending out into the land areas are considered to have excessive flash.

POSSIBLE SOLUTIONS

1. Decrease charge weight.
2. Increase mold temperature.
3. Decrease mold closing speed.
4. Check parting line for wear or damage and repair as needed.
5. 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 mold temperature.
2. Decrease mold closing speed.

KNIT LINES – Areas where multiple flow fronts meet but do not fuse or knit together.

POSSIBLE SOLUTIONS

1. Decrease the amount of time needed to position the charge in the mold.
2. Change the location of the charge.
3. Decrease mold closing speed.
4. Decrease mold temperature.

LAKING – Irregular dull areas on the surface of the part.

POSSIBLE SOLUTIONS

1. Increase clamp tonnage if possible.
2. Verify that the correct charge weight is being used and change as needed.
3. Verify that clamp pressure is being maintained on the mold during the entire cycle and correct as needed.
4. Decrease mold closing time.
5. Increase mold temperature.
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 mold closing speed.
3. Decrease mold temperature.
4. Check the vents and correct as needed. (See Section #13 "Thermoset Compression Mold Design Tips")

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

POSSIBLE SOLUTIONS

1. Decrease the rate of ejection.
2. Check mold for back draft or undercuts and remove them.
3. Check mold for amount of draft and if possible increase it.
4. Increase mold temperature.
5. Increase cycle time.
6. Vent the ejector pins.
7. Relocate ejector pins or increase the diameter and/or number of pins.

PRE CURE – Localized areas of dull rough porosity.

POSSIBLE SOLUTIONS

1. Decrease the amount of time needed to position the charge in the mold.
2. Decrease press closing time.
3. Decrease mold temperature.

SCUMMING - Dulling or streaks in the part that usually transfer a similar pattern onto the tool surface.

POSSIBLE SOLUTIONS

1. Increase clamp tonnage if possible.
2. Verify that clamp tonnage is being maintained on the mold during the entire cycle and correct as needed.
3. Increase mold temperature.
4. Change the location of the charge.
5. Decrease the amount of time needed to position the charge in the mold.

SHRINKAGE - There are two problems that 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 mold closing speed.
2. Increase mold temperature.
3. Check the vents and correct as needed. (See Section #13, "Thermoset Compression Mold Design Tips")
4. Increase cure time.

POSSIBLE SOLUTIONS FOR INSUFFICIENT SHRINKAGE (OVERSIZE)

1. Decrease mold temperature.
2. Check the vents and correct as needed. (See Section #13, "Thermoset Compression Mold Design Tips")
3. 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 mold closing speed.
4. Check the vents and correct as needed. (See Section #13, "Thermoset Compression Mold Design Tips")

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 wear and correct as needed.
2. Increase mold temperature.
3. Decrease charge weight.
4. Check condition of mold plating and re-plate if necessary. If mold is unplated, polish or plate it.
5. Increase cure time.

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

POSSIBLE SOLUTIONS

1. Check the vents and correct as needed. (See Section #13, "Thermoset Compression Mold Design Tips")
2. Increase mold closing speed.
3. Decrease mold temperature.

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. Check mold for wear and correct as needed.
2. Check condition of mold plating and re-plate if necessary. If mold is unplated, polish or plate it.
3. Add undercuts to hold the parts on movable half of the mold until they are ready to be ejected.

POSSIBLE SOLUTIONS FOR PART WARPAGE AFTER COOLING

1. Increase mold temperature.
2. Check the vents and correct as needed. (See Section #13, "Thermoset Compression Mold Design Tips")
3. Increase cure time.
4. Use shrink fixtures to hold parts flat as they cool.