

Philosophy of Troubleshooting 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 duplicates. The same holds true for molding presses. Therefore, what works for one mold or press may not work for another.

Problems 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 problems. However, due to the reasons mentioned above several of them may seem to be contradictory.

The most important things to remember are; make some reasonable adjustments, carefully observe the results and give it time. Document the changes 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.

Before troubleshooting compression-molding problems – the preforms, the preheater, the mold, and the press, need to be checked.

If problems are found, they should be corrected and the parts re-evaluated before proceeding.

Preforms - Check the preform hardness using a Durometer. Take three readings per preform being careful to avoid gaps between the granules. A reading of 50 or higher is desired.

Preheater - Clean any build up off the grid plates. Then check the actual grid height, preheat time and general operation of the preheater. Adjust or repair as needed, then check the preform temperature and uniformity of preheat with a calibrated pyrometer and needle thermocouple then adjust preheater setting if necessary.

Mold - Do not 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 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, breathe cycle and clamping pressure then compare with the setting used the last time this mold ran in this press. The settings should be the same or very close. If not, 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 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 process a few cycles before thoroughly evaluating the results, before changing another processing variable.
- Please keep in mind 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.

BULGE OPPOSITE INSERT - Bulges that appear on the side opposite and directly over molded-in inserts.

POSSIBLE SOLUTIONS

1. Heat inserts before using.
2. Use a shorter insert.
3. Increase mold temperature.
4. Increase preheat temperature.

CURE BLISTER - Area of gas entrapment (blister) caused by not completely curing the part before removing it from the mold. This generally shows up as a bulge on opposite sides of the thickest cross-sectional area of the part. When broken open there will be a large void in the center of the bulge.

POSSIBLE PREHEAT SOLUTIONS

1. Increase preheat temperature.
2. Decrease rate of preheat.
3. Increase mold temperature.
4. Change the placement of the charge
5. Decrease mold closing speed.
6. Add or change breathe cycle.
7. Increase cure time

POSSIBLE COLD POWDER SOLUTIONS

1. Increase mold temperature.
2. Use minimum charge weight.
3. Decrease mold closing speed.
4. Add or change breathe cycle.
5. Increase cure time
6. Warm up the compound to 150°F (66°C).

DULL APPEARANCE - The surface of the part has a hazy or satin 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. Increase preheat temperature.
3. Decrease mold closing speed.
4. Check condition of mold plating and re-plate if necessary. If mold is un-plated, polish or plate it.
5. Polish the mold.

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

POSSIBLE SOLUTIONS

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

HARD SPOTS (PRECURE) – Slight bumps on the surface of the part that are usually uneven, pointed, and rough and have definite outlines.

POSSIBLE SOLUTIONS

1. Speed up the placement of the charge.
2. Change the placement of the charge.
3. Increase mold closing speed.
4. Decrease mold temperature.

MOLD STAINS – A buildup of volatiles on the molding surface that will cause that surface area of the part to be dull and pit marked. This can eventually lead to part discoloration and parts sticking in the mold.

POSSIBLE SOLUTIONS

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

MOTTLED SURFACE APPEARANCE - A non-uniform coloring or texture on the surface of the part.

POSSIBLE SOLUTIONS

1. Increase charge weight.
2. Decrease preheat temperature.
3. Decrease mold temperature.
4. Add or change breath cycle.

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

POSSIBLE SOLUTIONS

1. Increase charge weight.
2. Increase preheat temperature.
3. Increase mold closing speed.
4. Decrease mold temperature.
5. Check mold venting and correct as needed. (See Section #13 "Thermoset Compression Mold Design Tips")

ORANGE PEEL - Surface appearance that look like an undersurface craze or numerous small ripples and resembles the skin of an orange.

POSSIBLE SOLUTIONS

1. Decrease mold closing speed.
2. Increase preheat temperature.
3. Increase mold temperature.

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 temperature.
2. Increase preheat temperature.
3. Check mold venting 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 mold venting 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 mold venting and correct as needed (See Section #13, "Thermoset Compression Mold Design Tips")

SKIN BLISTERS – Small areas of gas entrapment (blisters) on the surface of the part that when broken open, appear to have occurred just under the "skin" of the part. The blisters are spaced randomly about the surface of the part, and many times will appear on only one surface.

POSSIBLE SOLUTIONS

1. Decrease mold closing speed.
2. Add or change breathe cycle.
3. Increase charge weight.
4. Decrease mold temperature.
5. Check mold venting 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.

Please Note: When molding single stage phenolic molding compounds or granular thermoset polyester compounds, Plenco recommends that the mold be chrome plated, since these materials have a tendency to stick to non-chromed surfaces.

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 un-plated, 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 mold venting and correct as needed.(See Section #13, "Thermoset Compression Mold Design Tips")
2. Decrease preheat temperature.
3. Increase mold closing speed.
4. 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 un-plated, polish or plate it.
3. Add undercuts to hold part until properly ejected.
4. Increase cure time
5. Increase mold temperature.

POSSIBLE SOLUTIONS FOR PART WARPAGE AFTER COOLING

1. Increase mold temperature.
2. Increase preheat temperature.
3. Check mold venting and correct as needed.(See Section #13, "Thermoset Compression Mold Design Tips")
4. Increase cure time.
5. Use a shrink fixture.