



## Philosophy of Troubleshooting Molding Problems

There is no "cure-all" for eliminating molding problems. Every mold is distinctive and has its own peculiarities, even molds which 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 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 **compression molding**, this means there are several items on the preforms, preheater, 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.

**Preforms** - Check the durometer of the preforms which should be 60 to 90 on the Shore D scale. Also, make sure they have been stored in a sealed container, in order to prevent changes in material moisture content due to the storage environment.

**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 and adjust preheater setting as needed.

**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.

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

### **POSSIBLE SOLUTIONS**

1. Heat inserts to mold temperature 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. Change the placement of the charge.
4. Increase mold temperature.
5. Decrease mold closing speed.
6. Add or change breathe cycle.
7. crease cure time.

#### **POSSIBLE COLD POWDER SOLUTIONS**

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

**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. Increase preheat temperature.
3. Decrease mold closing speed.
4. Check condition of mold plating and re-plate if necessary. If mold is unplated, polish or plate it.
5. 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 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, 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 build up 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.

**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 which looks 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 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 mold closing speed.
2. Increase mold temperature.
3. Increase preheat temperature.
4. Check mold venting and correct as needed.( See Section #13, "Thermoset Compression Mold Design Tips" )
5. 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. They are generally 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 unchromed 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 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 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 unplated, polish or plate it.
3. Add undercuts to hold part until properly ejected.

**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.

Date Printed: April 22, 2008  
Date Revised: August 15, 2007  
Supersedes Revision Dated: February 6, 2001

This information is suggested as a guide to those interested in processing Plenco Thermoset molding materials. The information presented is for your evaluation and may or may not be compatible for all mold designs, runner systems, press configurations, and material rheology. Please feel free to call Plenco with any questions about PLENCO molding materials or processing and a Technical Service Representative will assist you.