



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 **transfer 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.

Transfer 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 transfer 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, a combination of the possible solutions may need to be applied.
- 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.

BALL & SOCKET - An internal circular failure pattern observed on transfer molded parts after breaking of the thickest cross-sectional area. One surface will resemble a ball and the other surface will resemble a socket. The texture and color of the socket area will differ from that of the ball.

POSSIBLE SOLUTIONS

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

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 SOLUTIONS

1. Increase preheat temperature.
2. Increase mold temperature.
3. Decrease rate of preheat.
4. Increase transfer pressure.
5. Add or change breathe cycle.
6. Decrease transfer speed.
7. 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. Increase transfer pressure.
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 transfer pressure.
2. Decrease charge weight.
3. Increase preheat temperature.
4. Increase mold temperature.
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. Increase transfer pressure.
2. Decrease mold temperature.
3. Decrease preheat temperature.
4. Relocate gate and if possible, increase gate size.

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

POSSIBLE SOLUTIONS

1. Increase rate of preheat.
2. Decrease transfer pressure.
3. 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 #23, "Thermoset Transfer Mold Design Tips")
2. Polish the mold.
3. Increase preheat temperature.
4. Increase mold temperature.
5. Decrease transfer pressure.
6. Decrease transfer speed.
7. Decrease clamp tonnage.

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 transfer pressure.
4. Decrease mold temperature.
5. Check mold venting and correct as needed.

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

POSSIBLE SOLUTIONS

1. Increase transfer pressure.
2. Increase preheat temperature.
3. Increase mold temperature.
4. Increase transfer speed.

RUBBERY PARTS OR RUNNER - Parts and/or runner are rubbery on ejection from the mold.

POSSIBLE SOLUTIONS

1. If possible, increase mold temperature.
2. If possible, increase preheat temperature.
3. Request from material supplier a version of the material that has a lower hot rigidity specification.

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. Increase preheat temperature.
4. Check mold venting and correct as needed. (See Section #23, "Thermoset Transfer 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 #23, "Thermoset Transfer 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 transfer pressure.
4. Check mold venting and correct as needed. (See Section #23, "Thermoset Transfer 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 transfer pressure.
2. Add or change breathe cycle.
3. Increase charge weight.
4. Decrease mold temperature.
5. Check mold venting and correct as needed. (See Section #23, "Thermoset Transfer Mold Design Tips")
6. Relocate gate and if possible, increase gate size.

STICKING IN MOLD - Runner and/or part will not release from the mold and a piece or all of the item 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.

SUBGATES STICKING IN MOLD - Subgates will not release from the mold and a piece or all of it will remain stuck until it is manually removed.

POSSIBLE SOLUTIONS

1. If a new mold, check subgate design and correct as needed.
2. If an existing mold, check subgates for damage or wear and repair or replace as needed.
3. Request from material supplier a version of the material that has a higher hot rigidity or deflection specification.

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

POSSIBLE SOLUTIONS

1. If mold is vacuum vented, check if system is pulling a minimum of 21" Hg in the mold. If not, resolve problem with vacuum system.
2. Check mold venting and correct as needed. (See Section #23, "Thermoset Transfer Mold Design Tips")
3. Decrease preheat temperature.
4. Decrease transfer pressure.
5. Decrease mold temperature.
6. Decrease clamp tonnage.
7. Increase gate and runner size.

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. Decrease transfer pressure.
4. Check mold venting and correct as needed. (See Section #23, "Thermoset Transfer Mold Design Tips")
5. Increase cure time.
6. Use a shrink fixture.
7. Relocate gate and if possible, increase gate size.

Date Printed: January 29, 2009
Date Revised: January 13, 2009
Supersedes Revision Dated: August 15, 2007

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