
Release Agent Trouble Shooting Guide

This Trouble Shooting Guide is designed to provide solutions to common release problems and the various interrelating factors that cause poor release of reinforced plastic parts. We have identified four categories of problems that call for special attention:

1. Hang-up or sticking of parts in the mold.
2. Fisheyes occurring in applied release agent films.
3. Pre-release of gel coat or laminates.
4. Poor surface finish or porosity.

Sticking and Hang-up

Experience has shown that the release agent is often blamed for any problem relating to sticking and hang-up. However, we have found that these problems are sometimes traceable to inadequate mold design or fabrication. Many molds involve complicated geometry, under-cuts, or have been engineered without adequate draft on vertical surfaces. The result is a mechanical lock-in of the first laminate. Less commonly, similar mechanical hang-ups could be caused by porosity in the mold surface permitting in-flow of liquid resin. This makes part removal impossible after hardening and cure. No release agent can compensate for poor design or poor mold surface preparation. An experienced mold maker's craftsmanship is the best protection against many false starts.

A common misconception in proper mold preparation is that there is no difference among the abrasive buffing compounds used in final mold polishing. Easily available automotive-type compounds have often caused sticking. Many documented cases have proven that this thin residue can stubbornly persist even through 3 or 4 coats of wax on the plug. It holds the first laminate with a grip that is so powerful that the part must be chiseled out of the mold. Proper compounds, formulated for FRP work, will have an emulsion base. Residue is then easily, completely removed by a water rinse after polishing.

From the number of complaints gathered over many years, it appears that many release agent problems are self-created in the user's operation. Virtually every release product is a balanced compound, designed to be applied as received. Many economy-minded fabricators attempt to stretch supplies by adding extra solvent or water to their release agents. This may reduce active ingredients to negligible levels. Such false economy often proves expensive in the long run.

Equally expensive are instances in which empty cans that contained release agent products have been reused for plain solvent or other chemicals without removing the original label. Again, an admirable attempt to save costs causes problems when analysis of the contents reveals the error.

For the purpose of this guide, it is assumed that molds are fabricated from reinforced plastics as this is the most common method used in contact molding. Of course, many of the factors mentioned may relate and apply to other mold types and materials as well. The general information sheets on our release agents offer suggestions relating types of release products to various resins/elastomers and should be consulted as a starting point.

Waxing of production molds is often relegated to inexperienced personnel doing a hurried job. This practice increases the chance that some areas of the mold may have been left without wax protection. Sticking and hang-ups are often the end result.

Laminate hang-up may also result from less specific causes including the weather. For example, if a PVA film release solution is being used, it must be permitted to dry completely. Cold, damp conditions will slow the drying rate markedly. Attempts to hurry drying with a warm air fan over the sprayed mold are not recommended. Doing this may cause the wet PVA to skin over on the exposed film surface, while leaving solution trapped underneath. Preferably, the mold itself should be pre-warmed under such conditions.

Finally, the cost of proper mold preparation is well worth the investment. Mold wax applied to a freshly prepared FRP surface made ready by skillful sanding, buffing, and cleaning, will, for the most part, remain at the outer surface, even with brisk and vigorous polishing. Completion of a few (4-6) laminating cycles ensures that the mold is more fully cured, that any excess styrene monomer has volatilized, and that the exothermic heat of resin cure has conditioned the waxed mold face by driving the wax film well into microscopic pores in the tooling gel coat which provides a wax-enriched mold surface.

A PVA film release (Plastilease® 512B) is strongly recommended on new tooling for its insurance value. If waxing has been insufficient, this PVA barrier may be easily re-dissolved by working warm water down into the interface between the laminate and mold to float the laminate free.

Obviously, best results will always be obtained by using a quality wax - one specifically formulated for FRP work. As with buffing compounds, many commercial all-purpose paste waxes may contain shellac-like additives to enhance gloss. These additives could lead to hang-up, as previously discussed, and should not be used for FRP mold making applications.

Fisheyes

Causes for fisheyes are almost always found within the user's plant from one or more conditions. Minute traces of silicone or invisible oil matter can upset the best run molding shop.

Many paste waxes contain significant amounts of silicone oils, making it almost impossible to apply a smooth, water-based film. PVA solution releases are carried in a water/alcohol system that will bead up on these oily or highly waxed surfaces.

One of the first places to investigate regarding the cause of fisheyes is in the plant spray system. Compression of air leads to condensation of moisture and/or oil within the equipment. Be sure that air lines are clean and that traps are cleared of condensate on a regular basis.

Additionally, airborne mist from sprayed silicones can travel

distances up to several hundred feet. They can also be carried by wind under doors that are closed. A check around the operation, or even the one across the street, may turn up the source of this type of contamination. Also, most wiping rags obtained from a commercial laundry are oil treated for softness and to aid in dirt pick-up while dusting. A thin oil film may be transferred to parts when using these rags. New brushes may also be a contaminant source for similar reasons.

Powdery dust and residue from sanding or buffing operations and parts finishing can also cause fisheyes.

After having checked for all the factors discussed above, it may be a simple matter of using proper technique to avoid fisheyes. The general data bulletins for specific release agents offer suggestions regarding application techniques.

Pre-Release

This problem is sometimes called "lifting" when gel coat films are concerned. It can also occur with thin-ply laminates.

Pre-release is quite often related to resin properties, notably the shrinkage characteristics of polyester. Many shops spray gel coat on their molds at the end of the day or on the night shift. By morning, the film may have lifted completely due to a slight shrinkage that allows it to come loose from the mold contours. To help prevent this problem, make it a practice to place at least one ply of reinforcement behind the gel coat before closing up shop. This should guard against lifting.

Laminating in hot climates or summer heat, or over-catalyzation with peroxide can also lead to a fast cure and

high rate of shrinkage. Maintaining ambient conditions as close to normal as possible is recommended. Make reasonable adjustments in operating routines, but avoid radical changes in an effort to push laminating too hard and perhaps beyond the limits of the materials.

Release agents may be a contributing factor if they are applied to excess, or if the agent itself is perhaps too efficient. In this instance, the direct opposite of thinning and stretching might be mentioned. Leaving the lid off the Mold release container, or even covering too loosely, may allow solvent loss through evaporation and could result in an unbalanced system overly rich in active ingredients.

Poor Surface and Porosity

As in pre-release, surface defects are most likely due to factors other than the release agent.

A well-fabricated FRP part will take the exact mirror image of it's mold. Roughness will come through if the mold is worn and pitted. Release agents, even the film-forming variety, can never compensate for inadequate tooling and should not be relied upon to overcome inherent mold defects or age-induced problems.

Badly surfaced parts may be traceable to excess application of the release agent (leading to runs, drips, ridges and streaking); build-up of release agent (in which case a good

mold cleaning will help); resin over-spray settling on the mold before gel coating; moisture condensation on the mold; inadequate atomization of peroxide; a release material incompatible with the resin; or other possible causes.

Chronic reject rates of high proportion should lead a good manager to closely investigate the causes. He should begin with basic maintenance of equipment, proper adjustment for operating, and the condition of the tooling. Many times it is easy to achieve an impressive reduction in repair/refinishing costs simply by devoting the extra time and effort to doing things right the first time around.