

SPEECH DELIVERED TO ASSOCIATION OF ROTATIONAL MOLDERS AT THEIR SPRING 1977 MEETING  
BY JOHN M. ALLARDICE OF FREKOTE, INC.

MOLD RELEASE is also called -

- : Parting Agent
- : Slip Agent
- : Adherent
- : Release Agent

THEORY

Mold release is defined as a film forming material depositing a solid or liquid film to prevent or at least reduce adhesion between two surfaces. It is an important part of processing. Without mold release there would not be a lot of industries operating today - including rotational molding.

Rotational molding is done at relatively high temperatures which cause plastic materials such as polyethylenes (which are normally easy to release) to become an excellent adhesive. This greatly increases the need for a good mold release system.

TYPES

There are a wide range of release agents on the market today. A few of the more common ones in use in Rotational Molding are:

- Silicones
  - Oils & Emulsions
  - Resins
- FreKote
- Fluorocarbons
- FreKote
- Internal Releases
  - Zinc Stearate
- FreKote

Let's talk a little about each system ...

SILICONE OILS & EMULSIONS

These are relatively inexpensive release agents available from many suppliers. They can vary tremendously in effectiveness because of variety of base silicone oils available. The silicone oils can vary in viscosity, concentration and chemical nature. Because they are a liquid film and are easily wiped from the mold, they have to be applied frequently. This in turn allows a rapid build-up on the mold. Over-spraying of these products can cause knit lines or flow marks, pock marks, surface degradation and early release. They are also well known for causing paintability and adhesion problems unless a thorough and expensive cleaning of the parts is done after molding.

SILICONE RESINS

These have been used in rotational molding. They are applied to the mold from solvent solution in a relative thick film and then put through a long bake cycle. Properly applied and cured they

give multiple releases. Applied in too heavy a film gives a rapid build-up and the resin tends to start flaking from the molds. They normally can't be reapplied over the previous coat, so when its releasing ability is gone the mold must be removed, cleaned, recoated and baked before using again.

### FLUOROCARBONS

These are available in spray-on forms and also as semi-permanent fuse-on type materials. The spray-on types are not good film formers. They release because of their low coefficient of friction and chemical inertness. Their "film" consists of layers of small particles acting as a barrier on a mold surface. Because it is difficult to put on an even coat, it has to be reapplied frequently. Operators should not smoke after handling these releases as break-down of the fluorocarbon when ignited by the cigarette can cause "polymer fume fever" - a temporary flu-like condition.

The fuse-on fluorocarbons do give a continuous film with good release. In "optimum" conditions, they should last a long time. Under real conditions, the first time a bolt drops on the coating or one of the operators hits it with a "convincing" tool or screw driver, the whole job is shot. You then have to spray these areas anyway. To have the mold fixed requires sending it back to the coater, stripping it clean and reapplying the fluorocarbon and, anyway you look at it, that's expensive in dollars, time and production.

### INTERNAL RELEASES SUCH AS ZINC STEARATE

These are blended in the rotomolding powder to aid in release. During the bake cycle they melt and migrate to the surface of the part to prevent adhesion. It takes a fair amount of work to determine workable levels to be used for each part, polymer, etc. Too much can affect the surface of the part and paintability. Too little and you'll have to use an external release anyway. Physicals of the part are almost always affected and its difficult to use on any colored items due to its white blush characteristics after the molding cycle.

### FREKOTE

What can you say about perfection?

Seriously, - FreKote is a higher initial cost release system than most and yet in terms of performance it is one of the least expensive systems available. It is a proprietary semi-organic resin offered in a solvent solution. Properly applied and baked it will provide excellent release, multiple parts, clean molds and non-contaminated parts. It has a low coefficient of friction and gives a hard, durable, extremely thin film.

We have always felt that the thinner the film, the more effective the release function. The thinner film allows precise reproduction of mold detail, allows a more even coating on the mold and increases the apparent hardness and durability of the FreKote film. The thinner film and infrequent reapplications helps keep build-up to a minimum.

It is heat stable to over 900° F. which makes it an excellent system for rotational molding - fluorocarbons degrade rapidly at temperatures above 400° F. and silicones degrade at temperatures above 500° F.



To date, FreKote products have been found effective on most available rotational molding type materials including LDPE, MDPE, HDPE, CLPE, BFG HYCARS, DuPONT's HYTREL, POLYCARBONATE and FLAME RET PE'S.

Now let's cover the mold preparation, application, touch-up and clean-up procedures. I'll be talking about FreKote, but the procedures apply to mold release applications in general and I hope will be informative and helpful in your operations.

### MOLD PREPARATION

The key word is cleanliness - I can't stress that enough - clean, clean, clean. It is very important - the molds must be as absolutely clean as you can get them. FreKote 33 develops good adhesion to mold surfaces - the cleaner the mold, the better the 33 will adhere and the longer the coating will last.

New molds often have a lot of grease and oils on them. A good cleaning with solvents such as Toluene, Chlorothene Nu, Naphtha or MEK will remove these from the mold surface.

On aluminum molds, be sure to remove all the oxides from the surface. Elbow grease and steel wool or Scotchbrite pads do a good job. Follow that with a solvent wipe and let dry. Blow dry with air but only if your compressed air has oil and H<sub>2</sub>O trap -- without the trap you'll recoat the mold with oil.

On steel molds, be sure to remove all the rust from the surface. Use same procedure as on aluminum - elbow grease, steel wool. Better yet is glass beading - that does an excellent job of cleaning. The tire industry even glass beads their aluminum molds, solvent wipe and let dry (but they are much heavier cross-section molds).

So, there we are - a new, clean, dry mold - all set to start our coating procedure.

### COATING

FreKote can be brushed, wiped or sprayed on molds. Spraying usually gives the most even coating and uses the least amount of material. A Sure-Shot sprayer does a good job at line pressure (it is a small hand sprayer which holds about a quart of material and you pressurize like a tire), or an air gun like a Binks 62 gun. A thin, wet film is all that is needed per coating. Drips, runs, or small lakes are to be avoided. If wiping on, please be sure film is still wet when applying. Brushing puts on a good wet film, but it is hard to control drips and runs. Apply three coats of FreKote 33 about five minutes apart. I find it's a good idea to blow out the mold with air after each coat - this removes the heavy solvent vapors that collect and remain in the mold cavities. It also will evaporate and dry any excess material which may remain in the mold. After coating the mold - baking on the film will enhance the durability of the FreKote film. A good minimum bake is 15 minutes at 250° to 300°. A regular cycle is great as a bake since you don't have to change settings, time, temperature, etc.

The mold is now ready to go - clean, coated, ready - load your powder and make parts - part after part - cycle after cycle - fantastic!

TOUCH-UP PROCEDURES

If you start getting a spot that sticks, the best procedure is to lightly steel wool the area - solvent wipe clean and reapply one coat of FreKote 33 and blow dry - let stand and air dry as long as possible - better yet is a hot air gun - blow the solvent vapors away and then hit the recoated spot for a few minutes with a hot air gun. This duplicates oven bake!

Just hitting a sticky spot without cleaning it usually just compounds the problem rather than solving it.

The plastic which stays on the tool gets coated, then during the bake cycle the coated resins soften and allows more resin to stick and the spot grows. Because FreKote is a cured film with adhesion to mold surfaces, touching up the spot with silicones or teflons and then trying to touch up with FreKote won't help since they will prevent our film from getting adhesion to the mold surface and it won't appear to last.

The same procedure is a good one to follow for picking a time to reapply FreKote to the mold. Find a good time in your production cycle to recoat your molds before any sticking occurs. Some people do this once every 24 hours - 48, once a week, etc. One customer lightly steel wools the mold each morning, coats and bakes. This procedure gets a fresh coat on a good solid base and greatly extends the distance between mold clean-ups and reduces chances for sticky spots to occur.

CLEAN-UP

The same procedure for preparing the new molds applies here. So far as I know there isn't a better way than elbow grease and steel wool or Scotchbrite pads. If resin is very heavy, I understand a lot of people burn it out first. On steel molds you can glass bead and this will do an excellent job. To date, I can't think of a chemical you can use that will simply strip the build-up from the molds. A lot of these polymers and resins were designed to be chemically resistant which complicates the cleaning.

In other industries, caustic and acid strippers do effectively remove mold build-up and FreKote.

FREKOTE PRODUCTS AVAILABLE TODAY

- 33      LDPE, MDPE, HDPE, POLYCARBONATES, HY CAR
- 33-C    CL-100, HYTREL
- 34-C    CL-100, ALL OTHERS
- 31      WARPAGE PROBLEMS
- 33-H    IF MOLD IS TOO HOT TO HOLD

Research also now is about to release some heavier solids materials to be investigated as sealers for porous molds, corrosion protection on steel molds, etc.

FreKote has just completed a new production facility which quadrupled our capacity. We now have a fully equipped and staffed Quality Control and Research Lab. This allows us to produce what we feel are the most consistent release materials that we've ever sold. We cross-check all our raw materials before making a batch and run many quality control checks on the finished product to assure you and all our many customers the good results they expect from FreKote.

### SUMMARY

The most important factors to remember in the use of mold releases are:

- 1 - Clean dry molds to start
- 2 - Good, even coating techniques (with all residual solvents or water-carrier dried out) and proper bake or cure cycle
- 3 - Recoat before sticking occurs



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