The Curing Process

COATING INFORMATION

How an Ounce of Cure Can Be Worth a Pound of Prevention

What ultimately ensures the performance of a fluoropolymer coating is the cure. The cure does several things: it hardens the coating, makes it smooth and creates chemical resistance. It does this either by melt flow or crosslinking the polymer matrix. ("Crosslinking" is joining most of the sites of some component chemicals with the sites of other component chemicals. It's the difference between a group of threads loosely massed together, as opposed to threads sewn into a common cloth.)

However, these characteristics are achieved only if the cure is done correctly, and according to the product data sheet provided by the coating manufacturer that indicates the exact details of how the coating is to be cured. Here are five elements in the process that must be monitored to assure perfect cure:

- Substrate Temperature
- Oven Temperature
- Cure Time
- Air Flow
- Oven Load

Substrate Temperature

This is the most important aspect of the cure, since the substrate actually "cooks" the coating in much the way a frying pan cooks an egg. It's important to remember that the time required to reach peak metal temperature will vary, depending on the kind of substrate and its mass. An extended high-temperature cure may be necessary to sinter or melt/flow the fluoropolymer components in a coating system. The use of pyrometers or thermocouples can be used to monitor both oven and substrate temperatures.

Oven Temperature

Temperature in an oven is key to the curing process. However, temperature within an oven can vary, depending on airflow and the size of the batch to be

cured. Regular ovens cure by heating the air. Infrared ovens, on the other hand, cure by emitting electromagnetic radiation that is absorbed by the parts. Since air does not absorb the light, energy is saved. Other advantages: the light can be used on localized areas and for special repairs. Also, distance from the light source can affect the cure.

Cure Time

There tends to be an inverse proportion between cure time and temperature. With some materials (such as castings), high cure temperatures can cause blistering (outgassing) of the metal. So lower temperatures are used — for longer periods. However, lowering the cure temperature can occasionally reduce the characteristics sought, no matter how long a coating is cured. And too long a cure can degrade a coating (including its color).

Air Flow

This is a critical factor in all ovens. Proper circulation of air not only helps maintain the same temperature throughout the oven, it also eliminates any "dead" zones that can damage the cure. The air flow must be controlled so that all fumes are emitted through proper exhaust systems and do not escape into the workplace, where they could cause a health hazard or in some cases unpleasant odors.

Oven Load

This is an aspect of curing whose importance is often underestimated. The more put into an oven, the longer the cure will take — and the greater the chance of having an uneven cure. As greater mass enters an oven, the effective temperature is reduced. So a heavy load in a line oven may require slowing the belt, just as a full batch oven may require additional time.
There are so many variables in the curing process that achieving a perfect cure is not always easy, but with the right tools and support from the coating supplier, it can be achieved.

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This information has been created by the Retail Marketing Team at Whitford. The Product Knowledge Network (PKN) offers you everything you need to know about nonstick-coated housewares products — all for FREE.

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