The ABCs of applying nonstick coatings

What causes the most common problems with nonstick coatings, how to avoid them, and how to make sure coatings perform as designed

So much of what we do in product development, once an order is placed, is reacting to a variety of circumstances, most of which can be prevented or better planned with the right product knowledge.

In the problems faced with nonstick coatings (chipping, peeling, blistering, etc.) there is always one recurring truism: proper coating application is critical to the finished product.

This is even more critical with the new coatings and technology, including sol-gel “ceramic” coatings. In fact, the application is as important as the coating formulation itself. The application instructions must be followed precisely. Improper application directly impacts the durability and performance of the coating. Only if a coating is applied properly will it perform as it was designed (and will you get what you paid for).

Losing some control

For those who have been in our industry a few years, you may remember a speech by Steve Forbes at the IHA industry breakfast in 2010. Mr. Forbes talked about the US tax code. He said that if we took one American’s tax information and had 10 different accountants prepare the tax return, we would get 10 different results — all within the boundaries of our tax code. This is similar to what we experience in the coating industry.

Coating companies have limited control once the coating is in the manufacturer’s hands. While we all have programs to help vendors around the world if they have problems, the key is that they have to let us know they are having problems. We all tend to assume application is being done correctly, but some problems aren’t always evident or immediately identified.

When a coating fails to perform the way it was designed to, the vast majority of the time it is because something went wrong during the application process. A misfiring gun, an oven not reaching the proper temperature, too much coating applied — all can happen without warning. The
better the quality control, the more likely these discrepancies will be found.

Many factors play a role in proper coating application. Defects such as chipping, peeling, mud cracks, rapid wear and most important — since this is why you use a non-stick coating — poor nonstick performance, are usually the results of inferior surface preparation of the substrate, improper film thickness, or cure.

So if you’re like many, and leave decisions regarding coating application up to the manufacturer, it may be time to start asking some key questions. Having the right product knowledge is all about preventing problems and saving valuable time and money. This issue of PKN was created to help you understand what can happen to your finished product when a mistake is made during the application process.

**A. Proper surface preparation**

Proper substrate preparation plays a crucial role in optimum coating adhesion and durability. This includes both cleaning and roughening the substrate surface to be coated. First, the surface must be thoroughly cleaned to remove all surface contamination. (Surface contaminants may result in decreased adhesion properties and defects in the dry film such as fisheyes, peeling or flaking.)

Then the substrate is roughened by chemical etching, or grit-blasting with abrasive media, which allows the coating to “bite” into the surface. This results in a strengthened coating-to-substrate bond.

**B. Dry-film thickness (DFT)**

It is important that the coating be applied according to the recommended dry-film thickness measurement specified on the coating’s Product Data Sheet (PDS). If a coating is applied too thickly, problems such as mud-cracking, sagging or blisters can occur. If too thinly, hazing or low gloss will be apparent.

**C. Proper cure**

Curing bonds the coating to the substrate by heating at approximately 750°F - 800°F/400°C - 425°C for about 10 minutes for PTFE coatings and 550°F - 600°F/285°C - 315°C for sol-gel “ceramic” coatings. The bake schedule varies according to the type of coating being applied, but if the temperature is incorrect, or the timing is off, a host of defects...
can appear in the finished product. Some of these are: reduced or no release, peeling of the coating, hazing, low gloss, orange peel appearance and mud-cracking.

If you want to know more about what to ask your vendors, and how to check these critical components of coating application, please contact us at retail@whitfordww.com.

**Additional resources on the PKN website**

- More Common Coating Problems: To see more coating problems and their causes, go to: www.productknowledge.com/common-coating-problems.html.
- Important Steps to Achieve Ideal Surface Preparation.

**Update on PFOA**

**PFOA and PTFE are NOT the same**

PTFE (polytetrafluoroethylene) is a fluoropolymer used to create a nonstick surface on cookware, bakeware, and other food-related items. The FDA (Food and Drug Administration), NSF (National Sanitation Foundation), and EPA (Environmental Protection Agency) and other agencies all make clear that PTFE is completely safe for people and the environment.

PFOA (perfluorooctanoic acid) has been used as a processing aid in the manufacture of PTFE. In recent years, the US EPA became concerned about emissions of PFOA into the environment; consequently, the EPA intends to regulate the use of PFOA by December 31, 2015. In the meantime, the EPA has stated: “The information that EPA has available does not indicate that the routine use of consumer products poses a concern. At present, there are no steps that EPA recommends that consumers take to reduce exposures to PFOA.”

**PFOA Stewardship Program**

As a result of the the EPA's concerns about PFOA, six major fluoropolymer manufacturers joined with the EPA in a voluntary program to “work toward the elimination of PFOA from emissions and products by the end of 2015.” The program is referred to as the “2010/2015 PFOA Stewardship Program” and the manufacturers appear to be on track to meet the goals of eliminating PFOA in PTFE manufacturing by December 31, 2015.

The Stewardship Program does not impact the use of PTFE in any applications.
over, the EPA does not intend to ban or restrict the use of PTFE. PTFE coatings are here to stay.

What is Whitford doing?

Whitford purchases PTFE from companies that are signatories to the 2010/2015 Stewardship Program. We have been working with each of our PTFE suppliers to confirm they are making progress to eliminate the use of PFOA in the fluoropolymers we purchase by December 31, 2015. Whitford currently offers a wide range of coatings containing fluoropolymers made without PFOA.

What options are available to you?

If you want to use Whitford coatings made without PFOA in the manufacture of your product, please contact your Whitford sales or technical representative for more information.