

## *Total Source from Industrial Paint & Powder Magazine...*

### **The Amazing White-Colored E-coat**

An appliance maker enjoys an improvement in coating performance after switching to a one-coat E-coat for its laundry appliances.

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Whirlpool Corp. (Benton Harbor, MI) is no stranger to E-coating parts. Its Clyde (OH) Div. applied an E-coat primer to parts for its washing machines for more than 20 years. So when it came time to take a look at a new coating system to replace the E-coat primer and the sprayed topcoat finish, a one-coat, white E-coat naturally looked like the most logical replacement.

Whirlpool couldn't have been happier with the E-coat primer. It, along with a zinc-phosphate pretreatment solution, provided excellent corrosion resistance. The automated E-coat system also required minimal labor support.

But the topcoat was a solventborne paint with a VOC content of 3.1 pounds per gallon. Whirlpool officials could see that EPA was looking to eliminate some solvents and reduce the use of others. A change was needed.

A high-solids topcoat, with a VOC content of 2 pounds per gallon, was a possibility, but the company was looking for a more dramatic change. Whirlpool's finishing team considered liquid prepainted steel, powder coating and prefinished powder blanks, and rejected all of them because they could not meet the complete coverage ability of the E-coat (Figure 1).

The one-coat E-coat won the selection process. Not only does it eliminate a step in the painting process, it minimizes Whirlpool's capital investment because Clyde Div. can use existing equipment.

A better paint job Through extensive work with its E-coat supplier, PPG Industries Inc. (Springdale, PA), and rounds of verification testing, Whirlpool found that a one-coat finish had many advantages over the existing two-coat process. The one-coat E-coat showed an improvement of 15% in impact-resistance testing and displayed no signs of cracking on standard mandrel bend tests.

Tests also revealed that edges retained more of the one-coat E-coat than the old finishing process. Whereas the one-coat E-coat maintains a paint thickness close to 1 mil around bends, paint thickness might fall under 0.5 mil with the two-coat system (Figure 2).

Whirlpool was excited about the switch to the new E-coat. The appliance manufacturer was getting a better finishing system that was already familiar to its finishing technicians. Everything appeared perfect until engineers discovered a problem with the epoxy E-coat material.

Epoxy-based materials yellow in direct sunlight, a problem for washers that might be located near windows. Yellowing was not originally a concern because a topcoat was applied over the epoxy E-coat primers. With the epoxy E-coat as a topcoat, however, ultraviolet rays from sunlight posed a significant risk to the white finish.

"The first step was to identify the acceptance level for UV exposure. In our industry, UV testing was not looked at very closely so we had to research information on these kinds of tests," says Brett Steffanni, manager of painting operations at the Clyde facility.

"Next, we had to develop a test that would suit our needs and give us assurance of a good quality product. After plenty of testing and research at our technical center, a UV specification for our products was developed," he adds.

Whirlpool tested several potential one-coat E-coat products, but quickly found they were not going to meet their new standard. Engineers then turned their attention to acrylics because they do not yellow when exposed to UV rays.

In general, acrylics are durable enough to stand up to sunlight, but do not resist detergents as well as epoxies. Whirlpool spent months working with PPG to develop an acrylic E-coat that would be more detergent-resistant. After months of experiments and testing, the development team created the version of cathodic acrylic E-coat used today.

Because epoxies and acrylics are not compatible, Whirlpool had to remove all epoxy paint completely from the finishing process. Whirlpool worked with KMI Systems Inc. (Crystal Lake, IL) to add new postrinse sections

instead of cleaning the old ones, and the bath was re-lined. The finishing team thoroughly cleaned the oven and replaced all filters and anodes.

The work didn't end there. Low-NOx burners were installed in the E-coat oven because early testing revealed that the white E-coat material was yellowing as a result of natural gas by-products left in the oven. The new burners solved problems with color shifts.

Whirlpool's finishing team introduced the new material to the E-coat system during shutdown periods over the Christmas and New Year holidays. Several verification tests were performed on newly painted products before full approval was given to the new one-coat E-coat.

Once Whirlpool started finishing washer cabinets on the line, the benefits were immediately apparent. Coating quality improved, even with the elimination of one step in the coating process. Overall emissions were reduced by 20 to 40% compared to the emissions from the two-coat process. And training costs normally associated with a new finishing system were averted because Whirlpool was a long-time E-coat user.

Based on the success of the one-coat system in Clyde, a similar system was put in place at Whirlpool's other laundry-appliance-manufacturing facility in Marion, OH. "Hindsight is always 20/20, and we did not go through this program without some minor problems. But we can easily say that the one-coat finishing process was a successful project at Whirlpool," Steffanni says.

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