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Expect the Unexpected in Process Changes

Years ago, the conventional paints used for surface finishing seemed to be perfect. Conventional paints, however, created a pollution problem, so we had to find alternatives. Today, we are using paints and coatings that are safe—or safer—for the environment. Industry is also continuing to search for ways to improve the coatings, and to reduce their costs.

One company spent more than 20 years developing the coatings used for its outdoor signs. The signs were subjected to extensive exposure to outside environments—sun, rain, cold, heat, wind, dust, etc. They had to maintain a clear advertising message with a bright appearance. The finish required some exacting parameters, such as UV resistance, bend capability, multiple baking (because as many as six colors were added with a screen printing process), a clear coat, and a final bake. After finishing, the metal was bent to form an embossed picture, letters and frame. One of the standard tests for the conventional coatings was outdoor exposure for up to five years, without deterioration of color, gloss, or corrosion of the base metal, which was usually cold-rolled steel.

Developing a New Paint

Following about three years of testing with salt spray, UV light, direct impact, scratch test and the bending mandrel, a new process was developed with a special high-solid/low-VOC polyester coating formula. The process required an iron phosphate conversion, a chromic acid final rinse, and longer and lower temperature drying before application. The dryoff oven was modified, and a cooling air stage was added before parts entered the paint booths. When everything was ready, production was started.

What happened? As each stage of the new process was evaluated, there were many changes made:

- New nozzles were installed in the four-stage washer
- A new "no-dump" chromium rinse was added
- Drying oven and cooling were modified
- New electrostatic paint guns were installed to spray straight from the drum
- Training was initiated for all personnel
- The screen printing material was upgraded with the high-solid/low-VOC inks and finer mesh screen (from 150–180 up to 250–300 mesh)
- Screen bake-ovens were modified to shorten the bake time for the lighter coatings

When the system was operating properly, the finished signs were tested for breaks in the paint at bends. No breaks were detected on the 1/8-in. radius bends. We patted ourselves on the back for all the work that had been done.

The Real Test Failed

A few months later, however, the company received complaints about the paint cracking at the bends on the galvanized signs. There were no complaints on the cold-rolled-steel signs.

We began to put galvanized test panels through a series of homemade tests:

- Bending while hot from the oven
- Bending while cold from the refrigerator
- Placed in severe outdoor weather
- Subjected to continuous pressure for several days
- Alternate hot- and cold-water dipping
- Over- and under-baking

We finally found the problem. With the new painting equipment that provided heated paint at the proper viscosity and pattern, with minimum overspray, and the production team able to paint more parts/hr, they started to take line-stop breaks instead of alternating personnel to keep the line moving. When this happened, it produced higher coating weights on the phosphate, chromium, primer and paint, and an over-bake in the oven while the line was stopped for 15–18 min breaks, or for 30 min or more during lunch. Things were too good. So, we returned to training personnel on the proper operation of the system.

The paint supplier was relieved at the outcome, and went back to the lab to develop a formula that could better withstand the line stops. Now, with new paint formulas, better trained personnel, and a management team dedicated to quality, the company has a great operating plan.

It is not always someone's fault when things go wrong. It is everyone's fault, however, if we do not help each other find a way to become perfect. I know we all want to be, but we are all just human. Ask us to help. *P&SF*