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MAKER OF PUBLIC FURNITURE IS SAVED BY THE BELL—THE POWDER BELL

A company chooses a powder bell to apply thick powder coatings uniformly to preheated parts. The result is a smooth, durable finish that even a ball-peen hammer can't destroy.

Victor Stanley, Dunkirk, Md., makes litter receptacles, benches, tree guards, and other site amenities for parks, outdoor malls, and similar public places. Some of the company's park benches sit on the US Capitol grounds, and its litter receptacles line Atlanta streets that lead to Olympic competition sites.

The architectural site amenities—also called public furniture—receive little or no maintenance after installation. They also must be mechanically strong. One litter receptacle, for instance, weighs 220 pounds and is held together with 180 overlapping welds. In addition to heavy-duty construction, the furniture requires a sturdy finish, one that withstands year-round exposure to the elements. The finish must also tolerate hard impacts from grounds-keeping equipment and the effects of exposure to fertilizer, road salt, and other damaging substances. At the same time, the coating must maintain its cosmetic appeal. "It's a difficult coating assignment," said Jerry Skalka, company vice president. "The finish on our products has to hold up almost as well as the finish on a $30,000 family sedan without ever being washed or waxed."

PREHEATING PARTS OVERPOWERS FARADAY CAGES

Because of the demands on the finish, Victor Stanley has relied on powder coatings to protect its products since 1971. In the beginning, powder application was fairly simple because the shape of the company's furniture was simple. As time passed, however, the products became heavier and their shapes more complex. Applying powder around the overlapping welds and inside the small gaps that surrounded them was especially difficult, Skalka said.

To overcome the Faraday cages that these areas created, the company experimented with heating parts before coating them. It worked: The hot metal surface overcame the electrostatic effect in the Faraday cages and allowed powder to fill in around the welds. The hot surface also increased the powder film build. This was a plus because a thick, properly applied and cured powder film increased product longevity. Tests conducted by Victor Stanley's powder coatings supplier confirmed that fully preheating the parts (to about 400°F) and applying a thick coat offered better protection than previously.

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MOVING TOWARD A SYSTEM DESIGN

Pleased with the results of preheating, the company sketched out a plan for a powder coating system that included a preheat oven. A quick comparison of energy costs showed that heating the parts with a batch oven was less expensive than heating the parts with a continuous oven. That's because a batch oven can be turned on and off as needed. For Victor Stanley, this was an important feature because the company's production runs are uneven. The company might coat 2 parts at a time or 200 parts, with frequent color changes in between.

To link the preheat oven with the powder application enclosure and the cure oven, Victor Stanley decided to use a batching, or indexing, conveyor. An indexing conveyor moves loads of parts a fixed distance from one point to another, often with the help of a programmable logic controller. Once in position, the conveyor halts the load and awaits a PLC signal to move it forward again.

Because the powder coating system that Victor Stanley designed handles batches of furniture

in succession, the company calls it a continuous batch system. In addition to saving energy, continuous batching promised to simplify powder application: The conveyor could halt loads of parts in the powder enclosure and give the applicators more time with the parts. This would allow the applicators to inspect the coating thoroughly before the parts entered the cure oven, which would reduce rework. The next concern was how to apply powder to the hot surfaces.

GUNNING FOR AN APPLICATION METHOD

Before it began its search for powder spray equipment, the company decided to keep manual applicators at a safe distance from the hot surfaces to prevent burns. The company didn't want applicators reaching into the recesses of

Victor Stanley's coating system uses two ovens and twice the powder of most coating systems. Be that as it may, Jerry Skalka, company vice president, pointed out that the system wasn't designed to skimp on powder. It was designed to improve quality.

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400°F litter receptacles to coat them, even if the applicators used extension lances attached to the guns, Skalka said. Automatic powder application was the obvious answer, but finding equipment that applied a thick, uniform powder finish to hot, irregular surfaces was difficult.

The litter receptacles, especially the interiors, are some of the most difficult products to coat. Three and a half feet deep and 2 feet in diameter, they are hung upside down three or four to a load bar. In a test, the company inserted one or more spray guns into a litter receptacle from below and moved the guns up and down, similar to a reciprocator. Results were poor: 2 mils of powder landed in some areas, and 30 mils landed in others. Skalka said the poor results prompted some vendors to suggest that the company change its powder coating system design to better accommodate the performance of the spray guns. But Victor Stanley was confident that its powder coating system had merit if it could just find the right application equipment.

SOUNDING OUT A POWDER BELL

The company's confidence paid off. Acting on a tip from a vendor that supplies parts for powder application equipment, Victor Stanley decided to investigate a powder bell. Tests proved that a powder bell could uniformly coat the inside of the litter receptacles with 8 to 10 mils of powder. And with a transfer efficiency of 75 percent without reclaiming the powder overspray, the bell reduced the amount of wasted powder compared with spray guns. Limiting overspray is also important because drifting powder can land on adjacent parts, which causes the film build on the adjacent parts to grow too thick. This is especially important at Victor Stanley, Skalka said, because hot parts accumulate powder more quickly than room-temperature parts. If the film is too thick, the parts drip molten globs of powder and must be reworked.

The powder-bell tests, performed at the application equipment vendor's lab, also prompted the vendor to raise an important question about Victor Stanley's powder coating process: How fast will the preheat oven operate? The question took the company by surprise. "We weren't initially interested in [the vendor's] ovens at all," Skalka said. The company already had a reliable oven supplier. However, when the vendor asked to test cure the furniture with its infrared thermoreactor oven, Victor Stanley agreed and was pleased by the results. The vendor's IR thermoreactor oven heated a 1,000-pound load of parts to 400°F in 6 to 7 minutes. That was more than twice as fast as a convection oven, and the temperature of the parts was just as uniform. The same thermoreactor IR oven could also cure the finish more quickly than a convection oven.

The performance of the powder bell and the IR thermoreactor ovens, coupled with the vendor's agreement to automate the equipment, convinced Victor Stanley that it had found the right equipment vendor, Skalka said. —*PC*