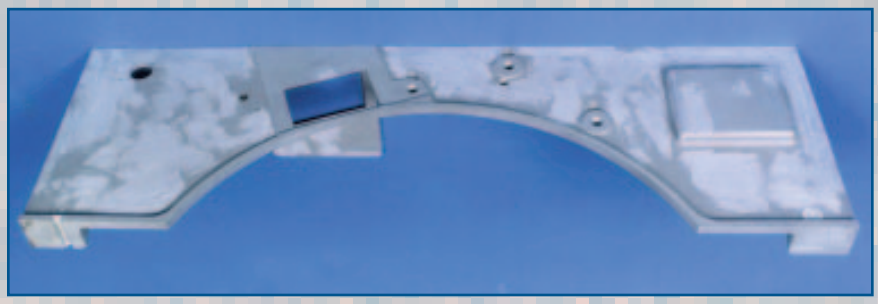
Thermoplastic Powder & a Ceramic Filler Make an Easy-to-clean Finish For Pharmaceutical Equipment

A pharmaceutical manufacturer was looking for a way to ensure that the protective aprons at the base of pill hoppers remained free from bacteria-harboring voids and other defects. The aprons would require a finish that would meet rigorous sterile standards and facilitate easy cleanup.

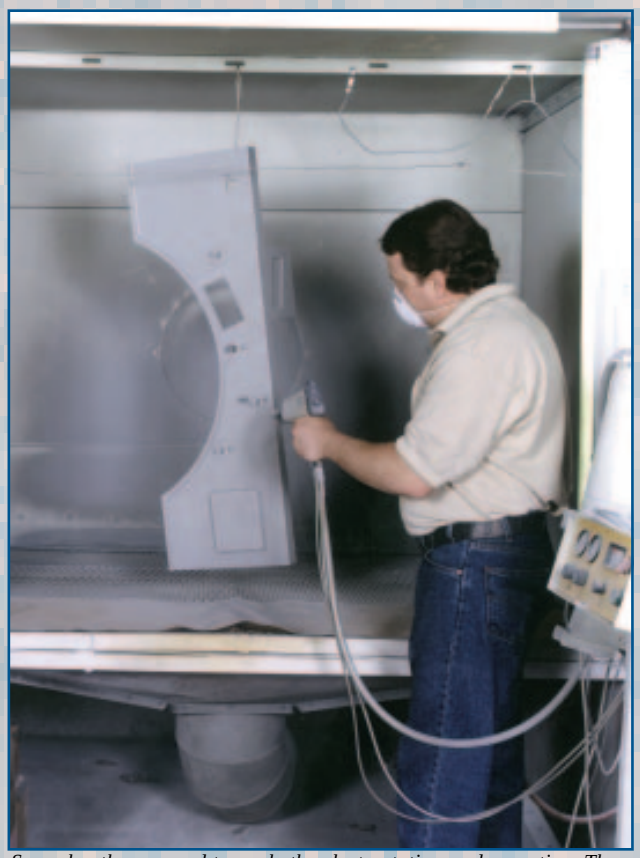
The equipment manufacturer turned to Corro Therm, Inc., a 6,500 ft^2 jobshop in Feasterville, PA, that specializes in industrial coatings.

The aprons arrive at Corro Therm as bare aluminum castings, 41 in. long by 13 in. wide by 2.4 in. high. Each casting is shaped in a semicircle, and when they are finished, two are mated together at the base of each hopper.



The material used to fill holes in the castings can withstand temperatures of more than 1,000 °F.

When the castings arrive, they are typically marred with imperfections—tiny holes and pockmarks that would harbor bacteria. The imperfections require additional treatment before finishing, because the nylon coating used will not cover the holes.



Spray booths are used to apply the electrostatic powder coating. The technique provides 90 percent transfer efficiency, substantially reducing waste disposal costs.

Filling the Holes

After Corro Therm receives the castings, they are pre-baked in an oven at 500 °F to remove entrapped air and eliminate potential blistering. They are then grit-blasted to clean the surface. The holes are then filled by spatula or gloved hand with a high-temperature water-based ceramically bonded inorganic compound* that was invented by the company's founder and president, Bill Landherr. The inventor says the substance applies easily, does not run, cures as hard as aluminum, withstands temperatures in excess of 1000 °F, and is water soluble for easy cleanup.

Most other fillers, according to Landherr, require two parts, which need to be mixed. They also need to be applied within a short time span.

> "There are many powder coat jobs that we can start with a part in the morning, and put it into the box by noon," Landherr said.

The proprietary substance used at Corro Therm eliminates those problems, and it withstands melting temperatures of 420 °F without shrinking, when the powder coating is heated in an oven after it is applied.

**CT-334, Corro Therm, Inc.*

The powder coated aprons are baked in a batch oven at 420 °F for about 15 min to melt the nylon coating, cooled, coated and baked a second time.

After the filler sets, it is lightly sanded to smooth the surface, then baked at 350 °F to cure it to a hardened surface. Threaded holes and other openings are masked to ensure the aprons will fit together properly. The parts are primed and air-dried before receiving the final coating.

Powder Application

The powder coating on the aprons can be no more than .011–.020 in. thick on one side of the casting. "Powder coating by dipping into a fluid bed was out of the question for this part," said Landherr. "First, we only wanted to coat one side, and a fluid application gets the whole part. A fluid bed also puts on a heavy coating, which makes removing the masks more difficult. Instead, we chose electrostatic powder coating to put the nylon finish on one side, and apply a thinner and more uniform layer, so the masks could be removed easily."

In the electrostatic technique, powder is charged in a powder gun and sprayed on a grounded (positively charged) part. Transfer efficiency with this technique can be as high as 90 percent, cutting the costs and lowering waste disposal. The castings are coated cold, then baked in a batch oven at 420 °F until the powder is melted (for about 15 min per casting).

With this approach, "the coating is very uniform and melts virtually at the same time, giving a consistent grey color," Landherr said. "An alternative approach of preheating the casting and then applying the nylon would have produced different melting patterns and different shades of grey," he said.

After cooling, the castings are coated a second time, cooled, unmasked and inspected. The final product has a smooth nylon finish to meet the sterile requirements of the pharmaceutical processing environment. The final product is easily cleaned and very durable.

Coro Therm receives the apron castings in groups of seven to 10 and returns the finished product within several days. If there is a critical deadline, the company can return a lot the next day. The complete job, including baking, blasting, filling, sanding, priming and powder coating takes about six hr.

A Specialty Finisher

Landherr started the business as a one-man operation in 1971, building one homemade oven and spray booth, and purchasing several used ovens. He developed his interest in special coatings through the U.S. Navy and commercial experience with aircraft structures.

Corro Therm specializes in difficult custom jobs that are not economically feasible for larger companies. A large part of the finishing at the shop is powder coating, which is environmentally friendly and efficient.

"There are many powder coat jobs that we can start with a part in the morning, and put it into the box by noon," Landherr said. "Spray paint takes much longer." P&SF

Bill Landherr, founder/owner of Corro Therm, inspects the coating on an apron casting.