One-step cleaner lets coater do more and spend less

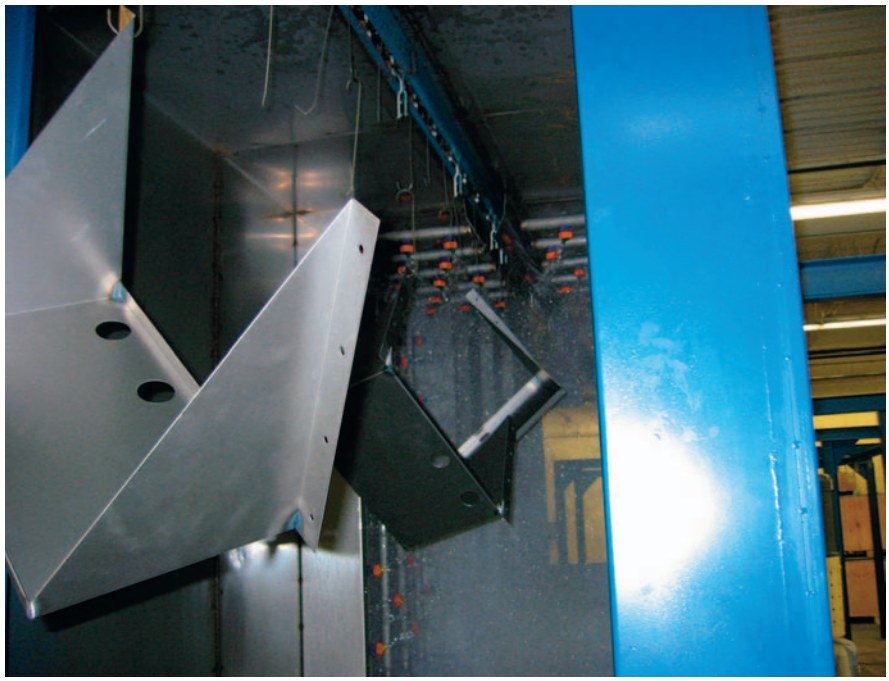
With its two-step iron phosphate washer waning, a custom coater switches to a one-step cleaner that provides greater production efficiencies at a lower cost.

Advanced Graphics, a custom coater in Stratford, Conn., finds its niche in mid-volume jobs that demand a high-end finish. It applies powder and liquid coatings to plastics and a variety of metals with steel, aluminum, and aluminum castings comprising the majority. The company employs 35 people; 31 work directly with the finishing process, including 10 finishers who apply coatings. The rest prep parts, apply custom masking, and perform inspections. The custom coater also offers screen-printing on coated parts and other ancillary services, such as light assembly and custom packaging. Primarily serving the data communications, telecommunications, and medical equipment sectors, the company has a customer base that ranges from fabricators making sheet metal lawn ornaments to a high-end stereo manufacturer whose tuners sell for $5,000 to $30,000.

Driven by customer demand, Advanced Graphics has used powder for the past 5 years. The company uses three batch booths each equipped with a manual coronacharging gun. Powder use continues to grow as the company expects to add another booth and gun setup within the next 6 months. “Environmentally, the powder surpasses liquid,” said Jim Auten, operations manager. “Our powder use has continued to grow and I see it growing more.”

Winding down washer slows down shop

For the past 6 to 7 years, the coater pretreated parts by applying an iron phosphate in a two-stage cabinet washer. The unit works like a big dishwasher. A worker opens the front door, lays the parts on a 48-inch turntable, closes the door, and turns it on. The turntable rotates and parts get sprayed as it turns. The company adopted this method as it phased out chlorinated solvents. The washer did an excellent job. It was faster and cost less to run than applying chlorinated solvents.



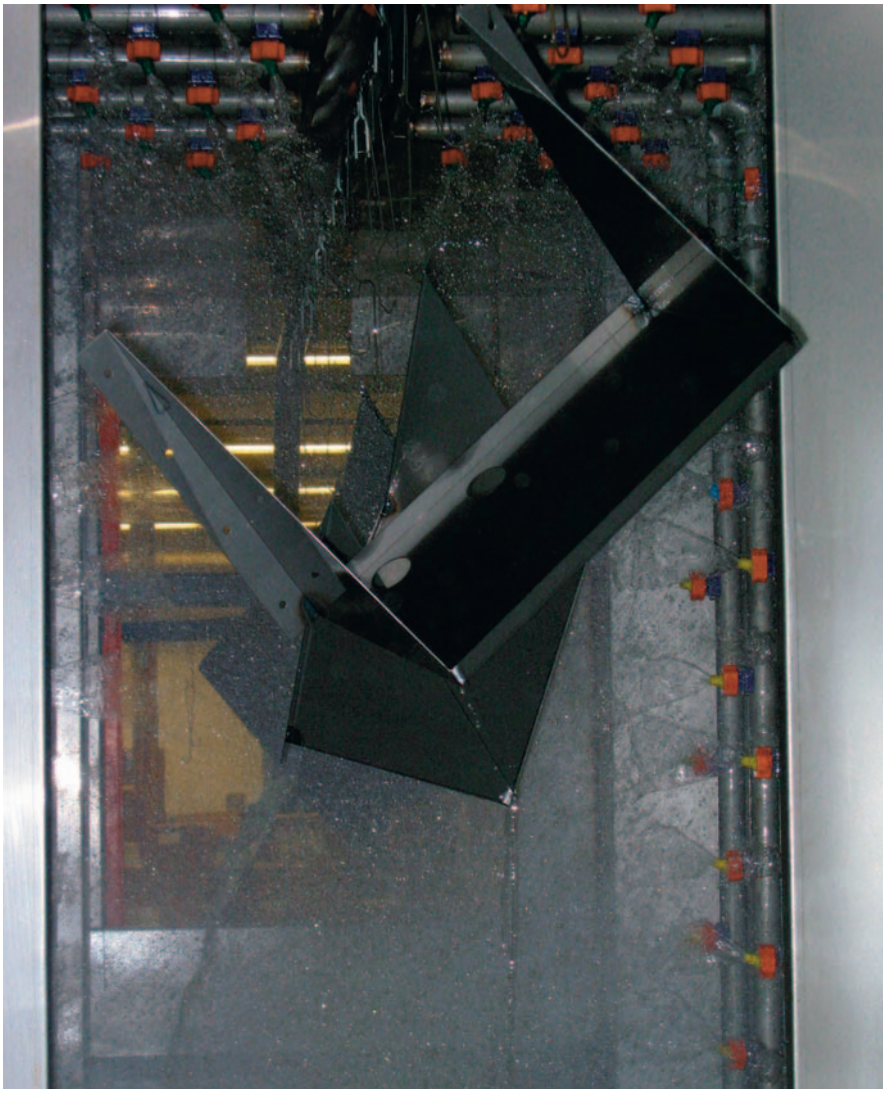
The self-contained, conveyorized parts washer applies the chemical with spray nozzles.

However, it had a fatal flaw—the washer was made of mild steel. At the time Advanced Graphics adopted iron phosphate, it proved difficult to get a cabinet washer in stainless steel. After 6 years, the washer was reaching the end of its service life. The phosphates were eating up the mild-steel housing. As the tank walls thinned, the washer began lagging behind demand. "Up until the last day, it washed great," Auten said. "But it didn't look like it was going to be around for long. It was starting to hurt production, too. We had to bring an employee in and have him work late or come in Saturdays just to keep up with our production using that washer. We just got busier and busier, and the parts just couldn't get through it fast enough."

Looking for a new kind of cleaner

From that point, Advanced Graphics started searching for a replacement for its ailing washer. It considered two alternatives: an inline conveyorized multistage washer that applied an iron phosphate and a one-step chemical process.

In industry trade magazines, Auten read about a one-step pretreatment method, an alternative to traditional aqueous parts cleaning. The chemical, a polypropylene glycol-based compound, cleans, phosphatizes, and seals metals without postrinses. The one-step pretreatment process works at ambient temperature and can be used in spray, immersion, and batch coating systems. Process



Advanced Graphics ran its two-stage iron phosphate cabinet washer 8 hours a day, 5 days a week, and half a day on Saturdays. The new system pretreats everything in about half a day.

As the tank walls thinned, the two-stage cabinet washer began lagging behind demand. "Up until the last day it washed great," said the company operations manager. "But it didn't look like it was going to be around for long. It was starting to hurt production, too. We had to bring an employee in and have him work late or come in Saturdays just to keep up with our production using that washer. We just got busier and busier, and the parts just couldn't get through it fast enough."

times range from 40 to 90 seconds. The cleaning solution has unlimited life and never needs changing, requiring only chemical additions to compensate for drag-out. The process doesn't create effluent or solid waste or generate hazardous substances, such as hazardous air pollutants. To learn more, Auten looked on the supplier's web site. "[The process] seemed to work well, but we were very hesitant because it really seemed too good to be true," he said. "We got the impression that it might be snake oil for the finishing industry. It does everything, but nothing can do that."

To legitimize the capabilities of this surface preparation method, Advanced Graphics began testing it in house. Workers filled a 5-gallon pail with the chemical. Anytime a job went through the two-stage cabinet washer, workers pulled some parts and processed them in the bucket with the chemical for comparison. Auten figured that if the product didn't work, he would only have to strip and redo a couple of parts the conventional way. That proved to be unnecessary, however. "The product worked great," he said.

Weighing iron phosphate against the nonaqueous solution

In terms of equipment and capital investment, the one-step cleaner proved to be less expensive than an iron phosphate washer. As Advanced Graphics began getting quotes for a system to apply the one-step cleaner, it also received quotes on a comparable system that used an iron phosphate. According to Auten, the iron phosphate system demanded a larger footprint than the washer to apply the one-step cleaner. The iron phosphate system also cost twice as much, largely because the washer had three to five stages and needed a dry-off oven. (The other system performs surface preparation in one stage.) "It's not that the aqueous people were overcharging," Auten said. "It's just that there's a lot more to the machine."

In terms of operating costs, the one-step cleaner is less expensive than the iron phosphate system. This may seem strange when comparing the chemical costs. The one-step chemical costs $30 a gallon. The chemical isn't diluted for pretreatment. Iron phosphate costs $200 a drum, and it can be diluted a lot. However, other factors outweigh the initial cost disparity. The one-step chemical functions at ambient temperature, eliminating the cost of heating tanks with electricity or natural gas. In addition, no waste disposal is necessary with the one-step cleaner. Iron phosphate users wind up getting a discharge permit and sending it to the sanitary sewer or treating it and reusing it. Either way involves costs. When Advanced Graphics looked at the waste treatment options to go with an inline iron phosphate washer, the cost associated with permitting fees and water testing fees totaled $1,500 dollars a month.

Ringing in the New Year with a new washer

The washer was installed and became operational at the end of December 2002. The self-contained, conveyorized parts washer applies the chemical with spray nozzles. The unit measures 24 feet long, 8 feet wide, and 12 feet tall, and has three moving parts: a pump, an exhaust blower, and a blow-off blower. Despite being much smaller than the new washer, the previous system had more complex heating controls for each stage. As a result, the potential existed for more malfunctions and breakdowns. "Things break now and then," Auten said. "If you have one washer with 100 moving parts and one with three moving parts, and they only break down 2 percent of the time, there's a big difference in how many things you're fixing."

The chemical bath needs little maintenance. The bath itself, unless abused, should never have to be changed. When using iron phosphate, the company got a month to 6 months of bath service life, depending on how well workers maintained it. Then the bath got dumped and refilled. Now, workers only top off the chemical to compensate for drag-out and normal use. A bag filter handles the solution. A pressure gauge on it

The company provides custom coating and screen printing to a variety of industries, including computer, telecommunications, electronic, and medical.

indicates when the filter is becoming clogged. At that point, a worker simply changes the bag filter. Every 2 months, the company sends a pint sample to the suppliers who test it and make sure it's still within operating parameters.

The blow-off system plays a crucial role in the operating efficiency of the washer. The air knife removes chemicals from parts exiting the washer and returns it to the washer for reuse. Any excess solution that leaves the washer on the part will evaporate. "It's not a problem process-wise, but any chemical—at $30 a gallon—that gets dragged out starts to add up," Auten said. "The drier the parts are when they leave the washer, the better. Any solution you can reclaim is money in your pocket."

Further improving the system

Even though the new washer is similar to a conventional parts washer, workers noted distinct differences. For example, the chemical emits an odor if enough of the chemical evaporates. A large portion of the vapors settled higher than the 4-inch lip of the conveyor openings. As a result, the vapors emitted from the end of the washer and dispersed throughout the shop. With an aqueous washer, the 4-inch lip sufficiently contains splash and keeps water and chemicals from spilling out of the machine. Because this was vapor containment, not liquid containment, the company needed to modify the washer. To remedy this, the washer manufacturer bent up a couple of 12-inch panels for the end

of the washer. Those panels trap the odor by containing the vapors until they condense and fall back into the tank in liquid form.

Cleaning up in cost savings and operating efficiencies

By adopting the one-step cleaner, Advanced Graphics has maintained, if not exceeded, its pretreatment quality compared with its iron phosphate system. At the same time, the new wash system costs less to operate and provides increased capacity compared with the previous system. In terms of operating costs, the company's electric bill dropped $1,000 a month. Capacity has roughly doubled. The coater ran its two-stage iron phosphate cabinet washer 8 hours a day, 5 days a week, and half a day on Saturdays. The new system pretreats everything in about half a day. In addition, the person operating the pretreatment system is now free to perform other tasks. "That's an additional cost savings," Auten said. "Basically, we're saving half an employee. It's been tremendous to us."

The one-step cleaner also provides greater scheduling flexibility than the iron phosphate washer. Previously, the company had a 3-day window of opportunity between washing and coating a part. Beyond that, adhesion problems potentially existed because the phosphate coating has potentially reacted with moisture in the air. Normally, this constraint didn't pose a problem. However, holidays such as Memorial Day, that have a 3-day weekend, cramped production. The company wouldn't wash parts on the day before the long weekend because they may or may not be good when workers returned to coat them after the holiday. This is never an issue with the new pretreatment. Workers can wash parts that will be coated within a week. "As far as production planning that was a huge benefit," Auten said. "When you have a finishing line just standing around after a holiday weekend and parts waiting to be pretreated, you're losing a lot of time and money."

Auten appreciates the simplicity of the process. There's very little to it. He noted someone doing 12 parts a day could buy a pail of the cleaner and get the same quality with throughput being the only difference. "With the phosphate washer, the more money you spend, the better system you wound up with," he said. "With this pretreatment, you build the washer to the capacity you want to process. There's really no advantage to overkilling the machine because you're getting just as good a product. It seems too simple. We've been thrilled with it." **PC**

One-step nonaqueous pretreatment: ***Carpenter Chemicals, Alexandria, Va. 703/683-1570. www.cc-lc.com***

Editor's note

For further reading on pretreatment, see *Powder Coating* magazine's Web site Article Index at [www.pcoating.com].