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Pretreatment Switch Nets Six-Figure Annual Savings

ONE-STEP CLEANER/PHOSPHATE SYSTEM PAYS OFF AT MICROFINISH

By Jim Destefani
Editor

For more than 45 years, Microfinish Co. Inc., with three plants in St. Louis and Warrenton, MO, has handled contract metal finishing jobs for producers of auto parts, vending machines, electrical controls and lawn equipment. Originally involved in tumbling and plating, the company now operates a fully automated zinc electroplating facility, a vibratory finishing plant, and two powder coating lines.

The company's Warrenton plant operates two powder lines: a large line with an environmental room surrounding an automated eight-gun spray booth, and a smaller batch line that is semi-automated and can handle parts to 24 ft long. The primary line has a cycle time of 1 hr, 15 min, and runs at speeds of 8-12 fpm depending on the parts being processed.

The plant processes a wide variety of parts—steel stampings, die-cast aluminum components, wire products, and other part types. "They're all sizes, and they come to us in all kind of condition as far as cleanliness, so we have to have a system that can handle a wide range of parts," explains plant manager David Piant.

In the fall and winter of 2004-2005, the rising cost of natural gas was taking a toll on profits in Microfinish's powder coating operation. Each 2-million-btu burner in the company's conventional cleaner/phosphate system was using 930 million btu per month. Managers set out to investigate ways to save on gas costs.

The company was already familiar with microbial cleaning, having used BioPrep 20/100 self-regenerating cleaner, manufactured by BioClean USA (Bridgeport, CT), in its zinc plating facility facility for many years. Microfinish managers remained skeptical about the use of a one-step cleaner/phosphate spray wash system in its powder coating operation, but the potential energy savings prompted the company to initiate an experimental switch.

PRETREATMENT CHANGE-OVER

Microfinish had been using a traditional five-stage cleaner/phosphate system consisting of cleaner, rinse, iron phosphate, rinse and rinse stages, according to Piant.

"The stage 2 rinse ran at 140°F, and the phosphate ran at 135°F," he explains. "We had tried an ambient-temperature phosphate, but you really need a stainless tank for that. Our tanks are carbon steel.

"On the old system, we had to drain the alkaline cleaner tank every two months to remove the sludge and recharge it," he continues. "We adjusted the pH so we could go to drain with the old cleaner, and sludge was hauled to our St. Louis plant for disposal."

Piant says Warrenton plant personnel drained and recharged the conventional phosphate tank every four months, and did the same with the rinse tanks at least once a week. "That was water that was lost down the drain," he

Components for a security camera system move through the pretreatment system at Microfinish.

recalls. "We went through 250 gal of cleaner concentrate a month, and 250 gal of phosphate every two months."

OPERATING IMPROVEMENTS

Microfinish made the switch to the one-step cleaner/phosphate system early in 2005. Combining cleaner and phosphate into a single stage allowed managers to turn off one burner. The company instantly realized energy savings of 25-30%. "We only heat stage 1 now," Piant explains. "There's enough residual heat in stage 2 to have some extra cleaning and phosphating without additional energy costs, and stages 3 and 4 are just rinses now."

An added bonus was water and chemical savings enabled by the closed-loop system. Instead of using nine gallons of water per minute, the new system required only three gallons per minute. "We counterflow the rinses and use that water to make up stage 2 and 1," says Piant. "We have a little bit of overflow here, that's why we still

The heart of the system is this control and clarifier module, which automatically monitors and replenishes the pretreatment solution to maintain proper operating conditions.

use three gallons per minute. Our water bill dropped from $1300 to $400 per month." Chemical usage for the pretreatment system dropped 60%, he adds.

Nozzle and other equipment maintenance decreased from seven man-hours per week to less than one hour, translating into a labor savings of $1575 each month.

Dumping and waste disposal is no longer required.

"We're still adjusting to the new maintenance schedule," Piant says. "On the rinses we dump and recharge every two months, and on the wash itself it's every six months.

"What we're going to do is put the cleaner in a holding tank, get the sludge out, and then recharge the tank with the same fluid. We don't have to dispose of it because all the oils are eaten up by the enzymes in the solution."

Environmentally, the system has practically eliminated discharges to drain. "Occasionally, the local sewage people used to come in if they were having a foaming problem," Piant recalls. "They'd take readings and records, and it was never our plant. But we haven't seen them since we switched to this—there's hardly any water discharged from it."

COST SAVINGS: CONVENTIONAL VERSUS ONE-STEP PRETREATMENT

Item	Conventional Cost	One-Step Cost	Monthly Savings
Natural gas	$10,400	$7000	$3400
Water/sewer	$1300	$300	$1000
Chemicals	$3700	$720	$2980
Labor	7 man-hrs/week	<1 man-hour/week	$2060
		TOTAL SAVINGS	**$9440**

QUALITY IMPROVEMENTS

According to Piant, the company is seeing improved part quality in addition to the operating benefits from the combined cleaner/pretreatment system. Parts have improved corrosion resistance both in-process and after powder coating.

"Once parts are through the pretreatment process and dried off, we don't have to worry about them rusting," he says. "We used to have more problems with that." Coated parts have exhibited improved salt spray testing resistance, probably due to better powder adhesion, he adds.

HOW IT WORKS

BioPrep CP cleaner/iron phosphate is a low-temperature, self-regenerating solution that simultaneously cleans and prepares metals for painting and powder coating. The patented product uses naturally occurring bacteria to consume oils and greases removed from parts during cleaning, eliminating contaminant buildup and extending the life of the solution.

A control module supplied by Bioclean automatically monitors and replenishes the pretreatment solution to maintain proper operating conditions. The bath normally runs at concentration of 3-5% by volume at a temperature

Microfinish receives parts in all conditions, from already clean to dripping with oil. Parts are shown before pretreatment and after powder coating.

ABOUT THE COMPANY

MICROFINISH CO. INC.

Launched as a plater in 1959, Microfinish has grown to a three-plant operation with plating, powder coating, and mechanical finishing capabilities. The company serves more than 300 customers throughout the Midwest, processing components for automotive, vending machine, electrical/electronics, lawn equipment, and communications applications.

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of 105-135°F and pH of 5-5.5. Process time in a spray application is 1-2 minutes. Stainless tanks are recommended, but the product can also run in mild steel tanks.

"You don't have to worry about oils, because the bacteria eat them and constantly reproduce themselves," Piant explains. "The system is controlled by the clarifier, which constantly recirculates water, adjusts the pH, and adds chemicals as needed."

According to Piant, workers check pH twice per shift and send samples to Bioclean monthly for analysis. "The bacteria count is controlled mainly by pH," he explains. "Too high, and they go dormant. Too low, they reproduce really fast and they can actually eat up all the food and then die off." The population of bacteria in the solution is huge—10^7 to 10^8 microbes per cubic centimeter.

System pH is maintained in the 4.5-5.5 range. "The pH goes up as the bugs reproduce, so if it's off it usually goes high," Piant says. "Then we add phosphoric acid to bring it back down." Running aluminum parts also tends to drive up the solution pH, he adds.

Samples sent to Bioclean are analyzed for cleaner concentration, subcomponents like molybdenum and phosphorus, pH, bacteria count, and other parameters. "We don't need a chemist here to constantly adjust things," Piant says. "We send samples of the solution off to Bioclean, and they let us know what, if anything, we need to do. But as long as enough cleaner is still there, we're usually OK."

One of the main system maintenance tasks is removal of dead bacteria, which would cause an unpleasant odor if left in the system. The system uses a lamellar plate clarifier to remove dead bugs, which settle to the bottom of the clarifier tank and are drawn off. "We bleed off a gallon or so a week of dead microbes and other sludge that accumulates in the clarifier," Piant says.

These parts are headed into the spray booth on Microfinish's smaller line for a clear coat powder finish.

One key feature of the system is a pump—essentially, an oversize model of the type used in fish tanks—that constantly aerates the solution even if the line is down for extended periods. The aerobic bacteria in the system require air to keep reproducing and consuming oils and greases, so they work especially well in spray systems such as that operated by Microfinish.

The one-step cleaner/phosphate is available in several variations optimized to handle different types of oils and greases. For example, one formulation is aimed at cleaning of wire goods, which tend to be coated with stearate-based drawing compounds that can be difficult to remove. Another allows zero-hydrogen processing of sensitive aerospace components.

LEARN MORE

The Value of Spray System Optimization

Pretreatment systems are too often perceived as being pretty simple. A few pipes, a pump, some liquid and a few spray nozzles. What could be simpler? As long as the pump is working and the nozzles are spraying everything's fine, right? In many cases, the reality of what your system is actually producing couldn't be further from that statement. When it comes to your system's spraying performance, if you don't have a comprehensive Spray System Optimization Plan in place, it may be costing your company thousands of dollars per year.

Find the link to this article at *www.pfonlinc.om/articles/080603.html*

For more information from Bioclean USA, phone 877-333-4559 or enter PF Direct Code **895NV** at www.pfonline.com.