



# POWDER COATING

THE AUTHORITY SINCE 1990

VOLUME 16 NUMBER 3  
April 2005 \$10.00

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**Bellmaker chimes success with  
one-step cleaner**

# One-step cleaner chimes success for bellmaker's powder installation

**Outsourcing powder coating tolls a cumbersome clang for a maker of wind bells. Building his own powder line with a one-step cleaner as the system's cornerstone lays the foundation for melodious product quality and process control.**



*Parts enter the wash system by passing through polyethylene panels with slats cut into them.*

From the ruggedly independent mind of a lobsterman burst forth an idea of sweet musical resonance. Jim Davidson navigated the waters off the coast of Maine with the coastal and harbor bells as guides. More than just markers, their sounds had an evocative quality that Davidson wanted to capture. To this end, he started to experiment with steel to recreate the gongs and bells that floated among his lobster traps. With his love of the sea and his cleverness, he created a collection of bells to mimic the harbor bells and sea gongs. Through playing with different weight of steel, he created wind bells that echoed the ocean sounds he knew so well. These chimes proved popular, and in 1975, Davidson and his wife May began a family enterprise, North Country Wind Bells, from their town of Round Pond, Maine. Thirty years later, the business thrives but still relies on family ties and a strong entrepreneurial spirit. “Working in a family business has its challenges, but it’s highly rewarding to be able to carry things out,” said Connie Davidson, operations manager and daughter of company founders, Jim and May Davidson.

The challenges of competing and thriving in the gift industry, and the cost of steel was exacting heavy demands on North Country Wind Bells, however. The company was outsourcing its wind catchers—the bell’s bottom pieces—to be powder-coated, applying a lacquer finish in-house. After seeing what powder lent to its wind bells in terms of appearance, though, the company decided to eliminate the lacquer finish. But finding a reliable coater who offered quick turnaround time proved difficult. And outsourcing meant a loss of control. As a result, quality and creativity suffered by prohibiting the company from developing designs as quickly as desired. The initial delay with sending parts away to be coated was compounded

by workers having to inspect the coating on returned parts to ensure they were the right color and texture. “With luck, the last guy could turn around parts within a week,” Davidson said. “But before [him], it was anywhere from 2 weeks to a month.”

### Laying the groundwork

Frustrated with outsourcing, North Country Wind Bells decided to apply its proven do-it-yourself business model to bring powder coating in-house. Davidson said she wanted to realize cost-savings by adding powder capabilities while being able to realize a quick return on investment (ROI) for the coating system. How to install a whole powder coating system that produced a quality finish without taking too big a bite out of the budget? Davidson said three elements proved indispensable to this challenge:

- a lot of homework and legwork
- a creative shop manager
- an alternative one-step pretreatment method

Davidson and Paul Prentice, shop manager, began researching the powder-coating process. Their explo-

*“It was pretty impressive at that point,” said the company’s operations manager. “We thought that this would be a good return on our investment with the quality of cleaning as well as the environmental benefits. No water is needed. No heat is needed. There’s no waste. That’s the key.”*

ration began by following the typical progression in a powder system. Initially, they extensively examined various pretreatment methods. While perusing the pages of *Powder Coating* one day, they read about a solution that seemed to address their objectives (**Editor’s note:** See “One-step cleaner lets coater do more and spend less,” *Powder Coating*, October 2003, p. 60; go to [www.pcoating.com] and click on Article Index).

Davidson read about a one-step pretreatment method, an alternative to traditional aqueous parts cleaning. The chemical, a propylene 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 (low-pressure flowcoat), immersion,

and batch coating systems. Process times range from 60 to 90 seconds. The cleaning solution has unlimited bath life and never needs changing, demanding 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, the company contacted the supplier who then visited Maine and gave a presentation. Next, North Country Wind Bells gave the supplier sample parts to process. “It was pretty impressive at that point,” Davidson said. “We thought that this would be a good return on our investment with the quality of cleaning as well as the environmental benefits. No water is needed. No heat is needed. There’s no waste. That’s the key.”

### Working with what you’ve got

Before it could bring powder capabilities in-house, North Country Wind Bells needed a new building. It had what it needed—a 4,000 square foot addition—by fall 2003. From that point until April 2004, Prentice single-handedly began engineering and assembling the company’s powder system with the assistance of a design house familiar with the system’s requirements. The line design (256 feet of conveyor in a rough oval) largely grew out of the surface preparation requirements of the one-step cleaner and the ingenuity and hard work of Prentice. “He did all of the brainwork and [supplied] the brawn as well,” Davidson said. “He really did. There’s no two ways about that.”

The line came together in a process of trial and error. If a block arose,



*Spray nozzles apply the one-step nonaqueous cleaner to parts. A propylene glycol-based compound, the chemical cleans, phosphatizes, and seals metals without postrinses.*

Davidson and Prentice did further research. They also relied on support from the pretreatment supplier and a consulting firm. Ultimately, North Country Wind Bells fashioned its own signature coating line that impressed experts in the field.

Instead of buying prefabricated equipment, Prentice built the components from scratch and modified used equipment. Prentice constructed the washer housing and powder coating booth from polypropylene. He retrofitted a batch convection oven to work as a conveyORIZED cure oven. In another feat of creative reengineering, Prentice fashioned a dry-off oven by taking an old spray booth and bolting some infrared (IR) panels inside the structure. "It works really great," he said. "Work with what you've got."

### Going through the line

Before powder coating, workers place welded parts on wagons, wheel them to the line, and then hang the parts on swivels and S-hooks. Once on the line, parts first go up and into the 26-foot-long wash system that has seven compartments. The first compartment serves as a buffer area to keep the chemical vapors of the one-step cleaner inside the washer. Before and after the spray zone, the tunnel floor is made into short steep sections that are piped back to the tank to improve chemical recoument. Parts then enter the spray section of the flow coater that has 26 nozzles spraying at different angles to completely coat part surfaces. After being sprayed with the chemical, parts pass through another drip-off section that recovers excess chemical and returns it to the tank, and prevents the chemical from dragging out of the washer. Next, an air knife blows off the parts. Finally, parts go through another drip-off area and a final buffer section that creates negative pressure inside the booth so that none of the vapors escape.

Flapped entryways and exits get pushed open as parts go through each washer section. Constructed from 1/16-inch-thick low-density polyethylene sheets that have slats cut

into them, these dividers contain any spray drips or vapors inside and ensure that one washer section doesn't interfere with the functions in neighboring sections. The excess chemical drains back into the original tank to be reused. A filter removes any dirt from the chemical. During cure, the chemical imparts a polymer coating to parts.

Testing determined that the line needed to run at 2 feet per minute to sufficiently saturate the parts with the cleaning chemical (parts need to be in the spray section for 1 minute) and to achieve an adequate cure in the oven (parts remain in the oven for 26 minutes).

After exiting the washer, the dry-off oven equipped with eight IR panels removes any remaining chemical and preheats parts before entering the spray booth. One operator manually coats parts. Currently, the company applies four colors—green, red, black, and white—and anticipates more in the future. To facilitate color change, the spray operator has three different color-dedicated guns. All powder is sprayed to waste. Prentice vented the booth at both ends and across the top to keep the negative pressure in the system. Parts then go through a convection cure oven measuring 8 feet wide by 8 feet tall by 24 feet long.

### Adopting powder a resounding sensation

North Country Wind Bells' powder installation echoes with success. The company has liberated itself from the fetters of outsourcing. As a result, it can bring new designs to the market at a faster rate than it used to. It has also realized a significant cost savings by eliminating outsourcing. What's even better, product quality has improved because the pretreatment enhanced product durability. The powder finish provides a better texture and color than the lacquer finish the company previously applied, Davidson said. In-house coating capabilities means that the company can now achieve the finish it wants.



*The company's line of Wilderness Bells™ won the 2004 New England Products Trade Show new product award for New England craftsmanship.*

Something unexpected also occurred. Currently, the line can process what it takes a week to weld in just two days. As a result, North Country Wind Bells has donned another hat—that of the custom coater. This will serve as a supplement to its main business.

In addition, the system itself doesn't toll a heavy cost. By using the one step-cleaner, North Country Wind Bells has greatly reduced operating costs in terms of the water and energy consumption associated with other types of surface preparation. Moreover, the in-house designing and installation performed by Prentice drastically shortened the time to realize ROI. "If somebody else would have had to do this, I'd say our ROI would be considerably longer," said Davidson. "With the way we were able to do it, we project a ROI of 3 to 4 years."

**PC**

One-step nonaqueous pretreatment:  
**Carpenter Chemicals, Alexandria, Va.**  
703/683-1570. [www.cc-ic.com](http://www.cc-ic.com)