



Published in the January 1996 issue of Industrial Paint & Powder Magazine

## 'Ridgid' Specs Call for Powder

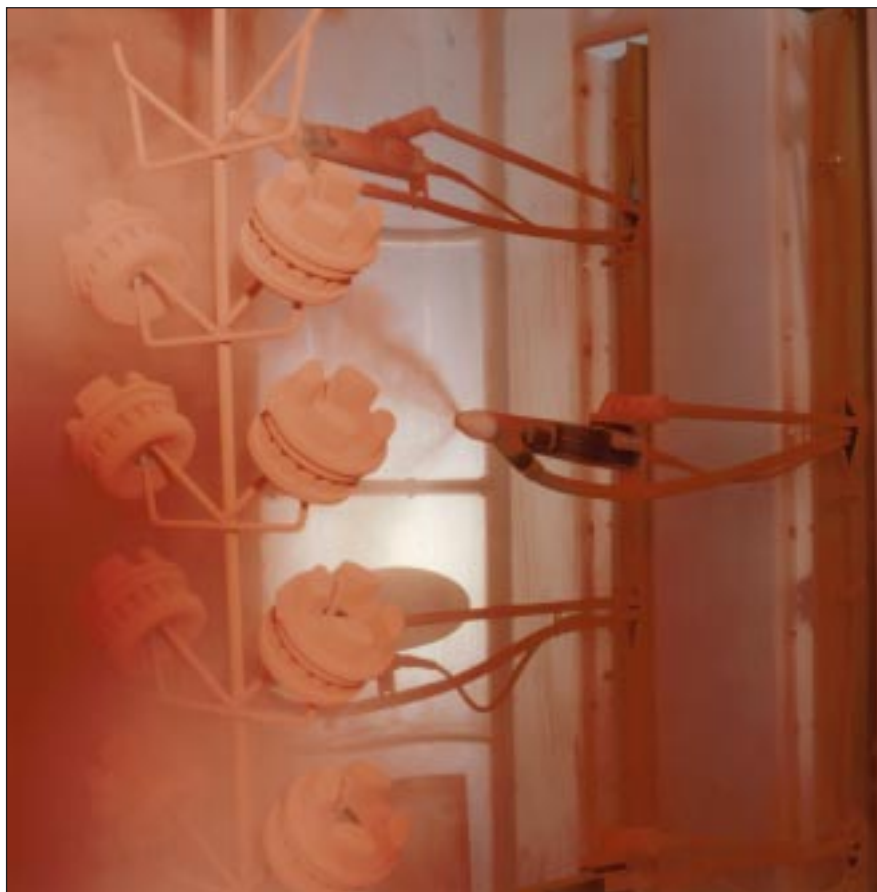
*Powder coatings have helped Ridge Tool achieve global product finish quality.*

Jane M. Bailey, Editor

Most manufacturers have rigid specifications for the finish quality of their products. In the case of Ridge Tool Co., maker of "Ridgid Red" tools and equipment, powder is now the coating of choice because of its superior finish.

Ridge Tool is the last remaining wrench and threading machine manufacturer in the United States. The company's product line, such as pipe cutters, pipe wrenches, pipe threaders, copper cleaning brushes, ball-peen hammers, straight snips, hole saws and drain cleaning hand tools, are used primarily by professional contractors.

Globalization was a key factor in the company's decision to switch to powder. Ridge Tool currently operates three manufacturing plants: Elyria, OH; Orange, VA; and Cork, Ireland. Until two years ago, each plant had its own liquid paint supplier. Because the paint batches varied from plant to plant, Ridge Tool was painting parts with the "color of the day," according to Arthur Hotes, staff manufacturing engineer at Ridge Tool and worldwide powder system start-up manager. "When we wanted to combine parts made in Elyria with parts made in Cork, the color often



*The Nordson Horizon booth is equipped with fixed automatic guns.*

didn't match," explains Hotes. "The driving force for conversion to powder was finish consistency. Now we have a single powder supplier that supplies all three plants, so we get the same Ridgid red color at all plants. This has greatly improved the finish quality in terms of color control and film thickness."

Worldwide product consistency will help Ridge Tool with future expansion plans into China and other regions in the next few years. Hotes says powder operations will be installed in these plants also.

### **Powder down the line**

The Elyria, OH, plant is the most recent, and perhaps the most impressive, of Ridge Tool's facilities. The first powder line at Elyria was installed in January 1995, and ran parallel to the existing liquid line during a three-month transition period. The liquid line was replaced in April with a second powder line. The total turnkey system for the two lines was designed and installed by Industrial Heat Enterprises International Inc. (Franklin, WI).



*The Smart-Spray automated gun-triggering system uses multiple sensors at the entry of the booth to identify incoming parts on the rack and accommodate different part sizes. The increased efficiency of powder has eliminated 95% of all manual touch-up work required with liquid.*

A sloped load/unload zone provides efficient parts racking along a single 1,000-foot conveyor line. The line runs at approximately 6 feet per minute to accommodate existing rates of manufacturing — the speed at which workers can effectively hang parts on racks.

A five-stage polypropylene spray washer system from Industrial Heat Enterprises prepares up to 500 part configurations ranging from thimble-sized parts to 60-inch wrenches. The five stages are: wash, clear-water rinse, iron phosphate, clear-water rinse and final clear-water rinse. The fourth and fifth stages backflush to the third; and the second stage backflushes to the first, which becomes the makeup water for the first and third stages. Parts then enter a 400°F dryoff oven for 10 minutes, followed by a 40-minute cool-down.

Next, parts move into either of the two “environmental” powder rooms. National Partitions (Hialeah, FL) designed the two prefab buildings (one for each powder line), which were erected on-site. The rooms are air-conditioned and humidity-controlled. Each room is 45-feet wide by 40-feet deep by 14-feet tall. The floor has an epoxy finish for easy cleanup. Walk-off mats keep dirt from entering the room and prevent powder from being tracked through the plant.

Inside each powder room are two Horizon® 400 series booths from Nordson Corp. (Amherst, OH). The automatic booth is equipped with eight fixed Nordson Versa-Spray® corona guns. Two manual touch-up stations in the automatic booth, use Versa-Spray handguns with a 6-inch extension. Commonly used colors (red and silver) are reclaimed. A manual booth with two operator

stations is used for nonreclaimed colors. Hotes estimates Ridge is getting about 95 to 98% transfer efficiency because most of the powder is reclaimed. The automatic and manual booths roll on- or off-line, depending on the part to be coated.

A series of custom-modified Nordson electronic eyes recognize and identify various products and components as they enter the booth. As a result, guns are able to accommodate both spacing on the line and configurations on the racks, minimize coating buildup and reduce the amount of oversprayed powder that is recycled through the system.

Nordson's Smart Spray® automated gun triggering system uses multiple sensors at the entry of the booth to identify incoming parts on the rack. The photo eyes automatically adjust gun triggering



*A temperature- and humidity-controlled room houses the automatic and manual powder booths, providing a clean working environment. (Photos courtesy of Nordson Corp.)*

for different part sizes. Due to the relatively basic shapes of most parts being coated, combined with the increased efficiency and durability of powder, 95% of all manual touch-up work required with liquid has been eliminated.

Upon leaving the powder room, parts enter an elevated bottom-entry gas-fired convection cure oven for 37 minutes at 375°F. They stay in a cool-down area, located under the oven to conserve space, for 45 minutes before moving to the unloading area.

Hotes says that the self-contained powder rooms make cleanup easy. Each room is vacuumed daily to prevent contamination problems.

### **Durability enhanced**

Ridge Tool has found that powder is providing increased durability for its products, according to Hotes. "Previously, the viscosity of the

liquid paint had to be reduced, but this thinning process resulted in minimal coverage. From a quality achievement standpoint, we were caught in the middle. If the paint was too thin, we experienced ghosting and shadowing and a less-than-attractive appearance. If it was too thick, we experienced runs and sags, and it was more prone to chipping. With powder, we're getting a better, more durable finish."

The company is able to achieve a more consistent film thickness: 1.7 to 2 mils for sheet metal or steel parts, 3 to 4 mils for castings to

hide surface defects. The powder is supplied by Morton Powder Coatings (Reading, PA) to all three Ridge Tool locations in two basic formulas: hybrid for Ridgid Red, and epoxy for silver, black and other colors.

In addition to durability, the powder coatings are also providing enhanced appearance. Morton supplies a textured powder, an effect that Ridge Tool could not get with liquid paint. "In addition to color consistency, we wanted a truly durable coating, and we wanted a texture that users would immediately recognize and appreciate," Hotes says.

### **Some lessons learned**

In its conversion to powder, Ridge Tool learned that trials in a lab may not work in production. One of the biggest problems was with outgassing in castings. When stripped and recoated, the castings

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**The increased efficiency of powder has eliminated 95% of all manual touch-up work required with liquid.**

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release gasses. Hotes says this problem didn't show up in lab samples. The company tried a heat-soak prior to powder coating, but it was not totally effective. Morton came to the rescue, reformulating the powder to include an outgassing compound, which corrected the situation.

Another challenge was masking. "We had to learn where parts needed masking through trial and error," explains Hotes. The company found that powder required a change of mind-set where machining operations were concerned. With the liquid line, painting always followed machining because the paint was too thin and prone to chipping to withstand machining after painting. But the powder coating process requires more masking, so the order has been reversed. For certain parts, powder is applied before the part is machined to eliminate masking. "Initially, we tried machining and then powder coating, and wound

## Tools Around the World

The Elyria, OH, facility is not the only plant meeting the "Rigid" specifications of Ridge Tool. The company has two other facilities: one in Orange, VA; and the other in Cork, Ireland.

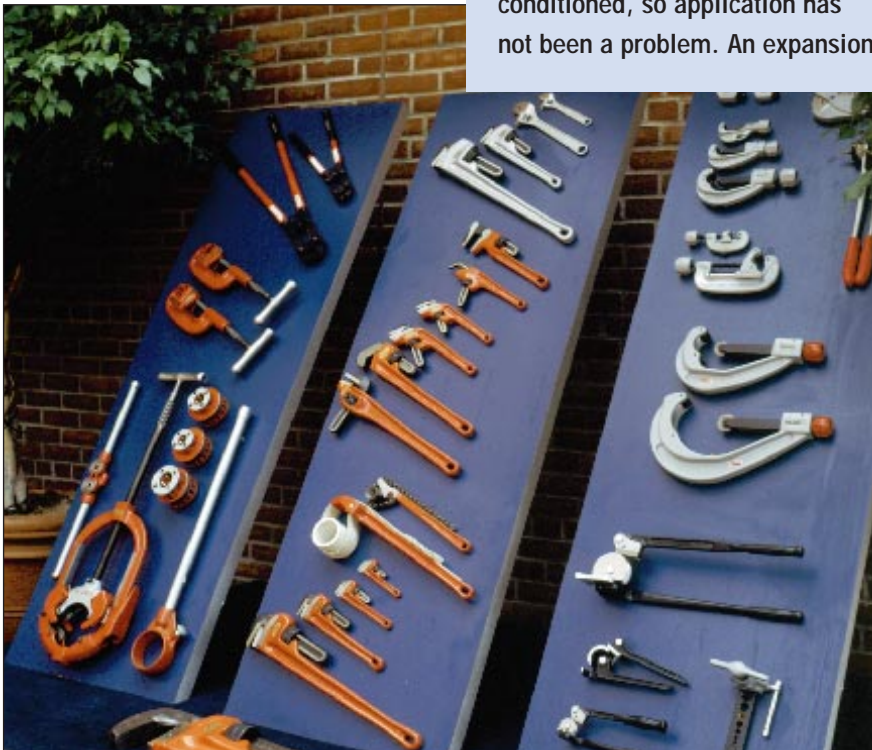
The Orange plant was the first to be converted to powder in November 1993. This plant still has a backup liquid line for painting plastic covers, although the company is considering redesigning the product to eliminate the necessity of having a liquid booth, according to Arthur Hotes, staff manufacturing engineer at Ridge Tool and worldwide powder system start-up manager.

The main difference between the Elyria and Orange plants is Orange's lack of an environmental powder-application room. Hotes says the whole plant is air-conditioned, so application has not been a problem. An expansion

in progress will add sufficient space to install a room around the booth to contain the powder.

Across the Atlantic, Ridge Tool operates a plant in Cork, Ireland, which converted to powder in July 1994. Unlike the Orange plant, the Cork powder enclosure is not air-conditioned. "We have not had problems, because of the consistency of the temperature and humidity there," Hotes says. "It doesn't have the fluctuation we have in the United States."

The powder conversion at the Cork plant was the most impressive of the three, according to Hotes. "We are particularly proud of this system conversion. It came on-line and never missed a minute of production." The conversion was accomplished during a two-week vacation shutdown, and the powder startup began the following Monday morning.



"Rigid Red" tools have improved durability and color consistency with powder coatings.

up with powder in areas where we didn't want it. You don't know that until you've been through it," Hotes says.

All things considered, Hotes says the powder system is great. "We made some mistakes along the way, but we learned some valuable lessons."

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