Opening the Gate to a Simpler Process

- Nickel Plating Primer
- Low-Cure, High-Solids Coatings
At Behlen, the installation of the same powder coating and the same powder application equipment at its three finishing facilities helped simplify its manufacturing process so that it could deliver the highest quality product to its customers . . .

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 Behlen Mfg. Co. (Columbus, NE) is a metal fabricator that serves a variety of markets—livestock equipment, pre-engineered metal building systems, hydraulic presses and grain storage, handling and drying equipment. Behlen Country, formerly known as the livestock equipment division, manufactures and finishes farm gates, corral panels, horse stalls, dog kennels and a variety of other livestock handling equipment. “It’s an industry leader providing product to farm store retailers like Tractor Supply, Quality Farm and Country plus all the farmer-owned cooperatives across the country. Some products, such as the horse stalls and gates, go to Lowes and Home Depot,” said Tony Raimondo, chairman and CEO of Behlen.

Behlen Country comprises three manufacturing and finishing facilities in Columbus, NE; Baker City, OR; and Huntingdon, TN. Each of these regional plants manufactures the complete line of Behlen Country products but with a different product mix and some differences in product design depending on the specific needs of the company’s customers in that region. For example, in the Northeast, many of Behlen’s customers are farming hobbyists, many of which have a small farm with a horse stable. These individuals are looking for a product with fancier designs and a more decorative finish. This is in contrast with the company’s customers in the Midwest and West, generally the more traditional farmer, who are more concerned with form and function than design and appearance. Behlen has also had great success with new products aimed at the growing pet products market. For example, the new powder coat finish on the wire mesh dog kennels has helped the company dramatically exceed sales expectations.

However, sometimes it is necessary for these plants to ship product out of their region. Therefore, Behlen must be able to color match every part between all three plants while maintaining a consistent, high-quality finish. To make this process as simple as possible, Behlen is using the same powder coating and same powder application equipment in its three plants.

The Beginning of Simplification

“In Columbus, we started by flow coating everything with a solvent-based paint. They did and still do some of the painting with a silicone-polyester paint. From there, we took on all our gates and other products and went into hand spraying. That didn’t give us the weatherability and the quality that we needed for our Behlen Country products. So we ventured into the high-solids world,” stated George Werner, manufacturing engineer at Behlen.

For a number of years, the high-solids coating provided Behlen the finish it required. But, as market demands and environmental regulations changed, the high-solids coating suffered from some of the same issues that the air-dry paint did. “We switched to high-solids, which was more durable. But, it still didn’t have the durability we were looking for,” explained Bob Stachura, president—corporate manufacturing at Behlen. “And, the cost factor was a problem too. On gates, you’re blowing a lot of liquid through. Even though the paint wraps, you still use a lot of liquid. The transfer efficiency was really bad. We were hoping to get a 60% transfer efficiency, but in reality it was probably 40-45%.”

With its need for a more durable, cost efficient and environmentally friendly coating, Behlen Country took this opportunity to simplify its finishing processes. For Behlen Country, this meant using the same powder coating and installing the same application
The configuration of Behlen’s spray booths allows it to maximize uptime by minimizing the time required for color changes. The closest booth is used for red and green powder and can be rolled on and off line. The middle booth is a batch booth and is used for blue powder, which is sprayed to waste. The booth at the far end is used for gray powder only since it is the predominant color used by Behlen.

equipment in its two existing plants and its new plant in Huntingdon, TN, all of which took approximately 16 months.

The Powder

Behlen Country is using Corvel® 3000 TGIC polyester powder coatings manufactured by Morton Powder Coatings. It chose this chemistry because of its excellent resistance to outdoor exposure. In addition, the adhesion of the powder coating is superior to the adhesion of the high-solids coating, providing Behlen’s customers an excellent finish with outstanding physical properties.

Plus, one formulation would allow Behlen Country to purchase the powder in larger amounts, reducing the powder’s cost per pound. The difficulty was that Behlen had a different cure schedule in each of its plants due to the different oven lengths—375°F for 7 min in Columbus, 375°F for 11 min in Baker City and 360°F for 20 min in Huntingdon. To overcome this problem, Morton sent one of its formulators to each of the plants to observe the ovens and the curing schedules. The powder manufacturer then had no problem formulating a fast-cure TGIC polyester powder coating that would meet the demands of the different cure schedules in each plant.

Switching from high-solids to a powder coating provided Behlen Country with a number of advantages. One of the more significant advantages was the reduced environmental impact of the powder coating, especially when Behlen was ready to build its new plant. According to Don Green,
director of environment and safety at Behlen, “In the case of our Huntingdon, TN, facility we would have had to apply for construction permits in the state of Tennessee and perhaps waited for several months while review of that permit application was in progress. We would have probably had to hold up completing the plant while waiting for approval from the state of Tennessee that it was okay to go forward with a solvent-based operation. But, with the powder coating system, since there are no HAP or VOC emissions, there was no permit necessary.”

While the powder coating saved Behlen some upfront costs, because permits weren’t needed and allowed the company to get its plant up and running faster, there were a number of other environmental benefits to the powder coating as well. “With a solvent-based paint operation not only do you have to deal with disposal costs directly, but you have to buy replacement filters for your paint booth. You have to buy replacement paper. You have to buy 55-gal drums. You have all these things plus the man-hours involved in handling the paper and handling the sludge. With powder though, there are no cradle-to-grave responsibilities,” explained Mr. Green. “There are a lot of advantages down the road that we may not see for awhile but will eventually demonstrate cost savings. The only waste generated is a small amount of spray-to-waste powder, which is a non-hazardous waste and can be landfilled.”

Any point where two pieces of metal are welded together can cause a significant Faraday cage problem. But, thanks to the powder coating and application equipment, Behlen gets complete coverage over the entire part.

“We probably had a 75% reduction in waste disposal costs. In Columbus alone, that’s in the $150,000-$200,000 per year range. That number includes some of those replacement material purchases I mentioned earlier. With the Baker City and Huntingdon plants, we’re talking probably another $50,000-$75,000 per year savings at each facility by not using solvent-based painting operations.”

In addition to cutting environmental costs, the use of powder coating has reduced application costs as well. The reduction in application costs is primarily because of the increased transfer efficiency the powder coating provides. Behlen’s products, such as farm gates or wire mesh dog kennels, tend to have large holes or openings. When the company was spraying a high-solids coating, much of the paint missed the part resulting in a low transfer efficiency—about 40-45%. While powder coatings also have a tendency to be sprayed through the part,
Notice how Behlen hangs three gates per rack, which Behlen has found to be the optimum rack capacity. The gates are staggered so that the entire surface area of each part can be "seen" by the spray guns.

their overall transfer efficiency is much higher because the powder that missed the part can be recycled and reused. “Now we get a 95-98% transfer efficiency. This lowers our costs since we are reusing material, which is one of the reasons we wanted powder,” stated Mr. Stachura.

Another benefit from the switch to powder coating has been increased durability and enhanced appearance of Behlen’s products. Many of Behlen’s customers have already commented on the superior performance and look of the powder coating. “Behlen Country customers demand quality, and the new powder coat system has substantially improved the quality of the finish. Many customer compliments have already been received about the superior quality and durability of the new powder coat finish. Clearly, our new powder coat system has substantially enhanced the value of our products to the customer,” said Mr. Raimondo.

The Application Equipment

Just like the powder coating, the powder application equipment was critical to Behlen’s success with its new finishing systems. The application equipment was vital because of two challenges Behlen faced in coating its parts: Faraday cage areas and film thickness control.

Every product that Behlen produces has a number of weld areas. This is especially true of those products that have wire mesh on them (every time the wires cross there is a weld area). These weld areas are difficult to coat because of the Faraday cage areas they create.

Another challenge for Behlen was controlling the powder coating thickness on the parts. At first glance, the products that Behlen manufactures seem rather easy to coat. But, because the products have many tubular parts, film thickness control is extremely difficult. A common result is for too much powder to be sprayed on the sides of the part and not enough on the top or the bottom of the part.

To overcome these challenges, Behlen turned to Nordson for its powder coating expertise. After hours and hours of testing in the lab, the two companies created a powder coating system that consisted of two automatic booths and one manual booth for Behlen’s Huntingdon plant.

The first and third spray booths on the line are Excel 2000s* with 28 automatic spray guns and 2 manual guns. The first booth is fixed online and is used for gray powder only because of the high volume
that is sprayed; the second booth is used for red and green powder and can be rolled on and off line. Between these two booths is a Versa Coat® batch booth that is used for blue powder, which is sprayed to waste because of the low volume that is used. This configuration allows Behlen to maximize the uptime of the line by minimizing the time needed for color changes.

Another advantage of this system for Behlen is the airflow management system in the booths. The airflow management system allows Behlen to create the proper powder cloud, which helps to ensure the proper film thickness on all surfaces of the parts, increases transfer efficiency and aids in the coating of Faraday cage areas.

A further advantage of the Excel booths is that the automatic guns are placed on in-and-out gun movers. This is important because Behlen hangs three gates per rack. The gates are staggered so that the center bar can be “seen” by the spray guns. However, the gate in the center is farther away from the guns on either side of the booth than the gates hung on the outside of the rack. Without in-and-out gun movers, the gates on the outside would be coated too heavily and the gate on the inside would be coated too lightly. However, with the in-and-out gun movers, all the gates are coated at the proper thickness. Behlen also had two spray guns installed on the top and bottom of the first and third booth to ensure that each part was powder coated at the proper film thickness.

By using the same powder coating and the same application equipment in all three plants, Behlen has greatly simplified its powder coating process. The company has only one training process for each of its plants. Also, when one plant learns something about the line or if a problem is solved that information can be passed onto the other plants. “What we learn in one plant, we can use in the other two because we have the same powder supplier, the same equipment supplier and the same chemical supplier,” explained Mr. Stachura. And depending on the capacity required in each plant, Behlen can send the spray booths from one plant to another, which is something the company has already done. As you can see, installing the same processes has made life at Behlen much simpler and ensures that the company’s customers receive the highest quality product possible.