



Liquid Application Case Study – Residential Window and Door Industry



Automation Sends Productivity Soaring

An automated paint line gives the flexibility to finish more than 3,000 aluminum parts in 10 to 20 colors during a single shift.



Nordson Rotary atomizers accommodate a multitude of part profiles, handle frequent color changes, match colors consistently and continuously, provide a quality finish and minimize paint waste and touchup.

In the highly visible world of premium windows and doors, architects, builders and property owners often have special needs and high expectations. Windows and doors must have resistance to a variety of environmental conditions. Once installed, the windows and doors are subjected to decades of extreme weathering, from direct sunlight to salty ocean air to cold mountain winds. Plus, the doors must withstand temperatures that range from 20-100° F. Through all of this, the finished product must continue to look great.

More and more, the marketplace wants special features that set their homes or buildings apart from the rest. They turn to customized shapes, sizes and colors that create a distinctive look.

To keep up with growing market demands, one of the Midwest's largest window and door manufacturers,

managed to meet delivery schedules by outsourcing the painting of its aluminum windows and doors to designated job shops. While the finish quality, consistency and durability from the paint shops were excellent, outsourcing lead times became so extended that they were beginning to result in lost work.

For this company, outsourcing lead times became too excessive, and they eliminated outsourcing to establish an in-house paint operation. Two goals were established: reduce lead time and decrease the cost of painting the windows and doors. To do this the company installed a fully automated, in-house paint line to finish all its aluminum parts, including cladding, screen channels and accessories.

The new paint operation was designed to be completely self-sufficient, and the 30,000-sq-ft facility was equipped to meet very specific objectives.

This particular company manufactures more than 100 aluminum window and door profiles that range in size from 0.1875 inches wide to 14 ft long. Most orders involve relatively small custom jobs, 20 to 30 windows in specific shapes and designer colors, and are run on a "per order" basis. "We needed to finish between 3,000 to 4,000 parts per day with the flexibility to apply two to 20 colors during a single shift," explains a company representative, "In short, we needed a paint system that could accommodate a multitude of part profiles, handle frequent color changes, match colors consistently and continuously, provide a quality finish and minimize paint waste and touchup."

Therefore, batching and inventorying solutions were out of the question.

At the paint shop, the windows and doors are presorted by individual orders, checked into a temporary holding area

and manually loaded onto horizontal racks attached to an overhead conveyor moving at a constant speed of 8 fpm.

At the beginning of each day, orders are sorted by color required, and the order in which the colors will be painted is established. This information is then programmed into the paint line's control system. Even though the control system can be programmed to know that there are three white orders, two tan orders and five green orders, it cannot be programmed to know when one order ends and when the next one begins. So, to notify the control system of an upcoming color change, a color flag is placed on the conveyor. Because the line moves at a constant speed, when the color flag breaks a line of light at a set distance from the booth, the control can calculate the exact time to make a color change.

The company also uses an automated triggering system from Nordson to automate its paint line. The triggering system includes an operator interface, PLC controller, photo cells and conveyor encoder. The paint line operator enters trigger points and delay on/delay off times into the operator interface. As parts pass through the photo cells, a signal is

sent to the PLC. Again, because the line moves at a constant speed, the signal triggers the spray guns on as the leading edge of the part approaches the spray devices and triggers the spray guns off as the trailing edge of the part passes through the spray booth.

Control is a key feature, since every order requires a fairly unique racking pattern. For example, it's not unusual to see a single half-circle window frame hung on a rack. The controls will minimize any waste. The precise control of the spray gun triggering not only minimizes paint waste, it also reduces cleanup costs and helps control VOC emissions.

Another important part of the automated system are the spray guns. Based on the finish quality achieved by the job shops previously used, the company's engineers knew that they wanted to use rotary atomizers in the new paint system. "We investigated Nordson RA-20 rotary atomizers and were immediately sold on the finish quality, minimal paint overspray and consistency from piece-to piece and rack to rack," says the company's facility manager.

The rotary atomizers apply paint between 0.8 and 1.2 mil (dry) and are checked

routinely to minimize the need for touch-up. A manual spray booth is positioned immediately after the automated booths to reinforce coverage in unusual circumstances such as double-hung parts with extreme configurations and recesses.

The company currently uses an average of 110 gallons of paint per day (shift) to coat 2,500 to 3,000 parts. Rotary atomizer technology allows very low paint utilization. The ability to achieve close-in painting gives high transfer efficiency and good penetration. Likewise, spray pattern control of the rotary atomizers helps reduce overspray and paint waste. The rotary atomizers are positioned only 5 inches from the parts. This is possible because the RA-20 doesn't have a minimum sparking distance.

"The automated paint line has given us tremendous flexibility," the facility manager explains. "We can now handle 10 to 12 different color changes and produce 3,000 finished parts every day. By eliminating the need to outsource, we've dramatically reduced our lead time on custom colors. Best of all, we've achieved all this and are only running at about a third of our capacity."



Rotary atomizers can now handle 10 to 12 color changes and produce 3,000 finished parts every day, eliminating the need to outsource and dramatically cutting lead time.

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