Decorative Coatings Applicator Installs UV-Paint Line

By Ian Harrison

Erler Industries, located in North Vernon, Ind., is one the most highly regarded applicators of decorative coatings for plastic in North America. This case study reports on the company's journey through a process of education and development that enhanced its capabilities by gaining additional market share in its core business—consumer electronics coatings—and diversifying into new business areas.

Two years ago, Erler made the decision to invest in UV-paint curing and application equipment. Erler already had five very versatile paint lines that were processing materials varying from polyester basecoats, 2K urethane clears, RMI shielding coatings, 2K acrylic monocoats and high-stove enamels.

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With the promise of increased yields, faster production speeds, a reduction in energy costs and VOC emissions, UV technology was very desirable. The move toward UV coatings would be a worthwhile addition to Erler's portfolio of technologies. However, prior to purchasing the equipment for UV-coating processing, the company began a program of process evaluation and development.

Considerations

One of the main concerns was whether the specification of the UV-curing process would adversely affect the existing conveyor speed, as this obviously would have an effect on plant capacity, cycle time and spray booth size. If UV paints offer a faster method of curing, the restriction would be in the speed in which the coatings could be applied.

The first consideration was whether UV-coating materials could be used in robotic paint spraying application, 85% of Erler's production utilizes this method. This consideration was evaluated and proved to be of no concern. However, issues were raised about whether line speeds would increase for UV processing and not for conventional basecoat and 2K clear processes, which would still be used on the adapted line.

If work had to be specifically batched on the line for UV processing, this would mean a considerable amount of down time, thus making the paint line inefficient. The decision was then made to process UV paints at the same speed as the 2K products.

A key issue regarding the purchase of the equipment was whether it could be installed in the current facility and retrofitted into one of the existing robotic paint lines, specifically into a

flash-off tunnel prior to the final cure oven.

After discussions with its spray paint and prospective UV lamp suppliers, it became apparent that an installation would be possible without excessive engineering work. This meant that the lamps could be fitted into the Erler's existing paint spraying facility. Before the lamps could be installed, there were various issues, which were addressed including operator and environmental safety as well as process control.

Erler's developmental program of UV-cure coatings began with laboratory tests, which consisted of coating parts on line, and exposing the coated parts to UV lamps that were housed in a shielded area. The initial trials were positive and the decision to make the investment was made.

Learning Curve

Even though initial testing was positive, Erler still experienced a learning curve as with any other new technology. Many hours of testing were made in order to evaluate the system set-ups and parameters. Huge consideration was given to the level of flash-off required for the UV-coated components prior to passing through the UV-lamp enclosure. It was found that if the UV coating was not given adequate flash-off time and temperature, then cure and film problems would occur.

In order to achieve the desired rate of flash-off, several considerations were made including increased air movement and forced air temperature in the flash-off zone and the installation of infrared (IR) lamps. Care was taken to avoid the coating from skinning over, as this would have caused severe problems with curing.

Consideration was also given to the types of substrates that would be processed through the UV-curing

UV-curing chamber.

equipment. Erler commonly cured onto substrates such as PC/ABS. However, Erler wanted to test other substrates in order to expand its process knowledge. Datapaq temperature recordings were made while processing various substrates through the IR flash-off tunnel. Plant settings were also recorded. This data had a bearing on the overall substrate temperature when the parts entered the UV-curing chamber.

In the end, the plant configuration was adjusted slightly to give the correct balance of air temperature and movement. An IR unit had already been installed into the plant to aid the curing of standard 2K polyurethane clearcoats. This IR unit proved to aid the flash-off of the UV coating as it passed through the flash-off zone.

The way to control UV exposure is to limit the period of direct lamp exposure and reflective exposure while maintaining the line speed. Erler worked with its lamp manufacturer to optimize the lamp and reflector design. UV-lamp energy is linear and Erler had to consider the type and shape of parts that they were going to be painting in the future.

Many measurements were made with a UV radiometer in order to verify that the actual exposure to UV energy was in accordance with the coating material suppliers' energy requirement outlined in the coating material specification.

Datapaq temperature readings were also taken to monitor substrate surface temperature as the components passed through the UV enclosure. The temperature of the substrate was recorded and found to be within polymer material specifications. This alleviated dimensional stability concerns.

Safety and Environmental Concerns

Consideration was also given to plant areas where the UV paints would be mixed and fed into the paint system. All operators were given proper training in the safe use of UV paints. In addition, certain areas of the plant were shielded and insulated in order to eliminate UV rays from the lamps, which could effect workers operating in surrounding areas. UV proof film was applied to all glass panels in the UV-lamp enclosure and its vicinity.

Care was also given to the disposal of waste materials and spray booth filters. Booth filters and empty cans do not dry out until they have been exposed to UV energy. Processes were introduced in order to limit the amount of uncured UV material being disposed of as waste. All empty cans are cleaned out with solvent. This solvent and UV-paint mix is then placed into a solvent recovery unit. The hard waste is disposed of in the normal way; the recycled solvent is used for cleaning purposes.

The booth filters consisting of a paper media over fiberglass netting remain wet after UV product has been sprayed. Care is taken to ensure that used filters are disposed of correctly. The used filters are carefully placed into a series of racks, which are then exposed to UV energy. In time, the UV coating cures and the filter media can be safely disposed.

Summary

Erler has found that UV-cured coatings offer increased coating hardness and adhesion, and increased durability such as improved gloss, better scratch, abrasion and chemical resistance over a conventional two-component urethane coating.

UV processing offers excellent process repeatability, leading to higher yields, which at the end of the day effects the bottom line. Erler Industries sees its UV-curing capabilities as a welcome and beneficial enhancement to their facilities. ◗

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