Innovation and Sustainability Drives UV-Cured Powder Coating Developments

By Ryan Schwarb, Michael Knoblauch and Rebecca Rutherford

Consumers and markets are relentless in demanding products and services that are less costly and have more value. Innovative creators and manufacturers of products and services recognize this challenge to simultaneously add value while decreasing costs not as opposing or contradictory goals, but as a profit opportunity. UV-cured powder coating satisfies the innovator's challenge.

UV-cured powder coating combines chemistry and curing technology; and it provides both value-added and cost-reducing advantages. UV-cured powder coating is a safe, environmentally friendly and high-performance material. It is applied very efficiently with minimal energy input and has an exceptionally low cost of quality. UV-cured powder coatings are used on a wide variety of substrates, including medium-density fiberboard (MDF), structural foams, plastics, composites, metals and many other heat-sensitive materials.

Process Overview

UV-cured powder coatings are applied like traditional thermoset powder coating. However, the separation of the melt/flow from the cure function is the differentiating characteristic between UV-cured powder coating and thermoset powder coating. Figure 1 shows the UV-cured powder coating application process. The separation of melt/flow from curing significantly reduces substrate thermal exposure and enables the applicator to control each of these functions with precision, accuracy and efficiency—maximizing energy use, improving material utilization and lowering the cost of quality.

New Opportunities

There have been many improvements in UV-cured powder coating chemistry since its introduction in the early 2000s. The first commercial products finished with UV-cured powder coating were made from MDF. Since then, UV powder manufacturers and applicators have pushed the envelope and expanded the number of substrates that are finished with UV-cured powder. Heat-sensitive substrates are ideal products for UV-cured powder coating due to its low heat exposure and fast processing. These substrates include plastics, pre-assembled components and various composites. Other types of composite materials such as carbon fiber and fiberglass can also be coated with UV-cured powder coating.

Common plastic substrates suitable for UV-cured powder coating include ABS, Noryl® and Nylon6. The UV-cured powder coating process is fast and requires a relatively low amount of heat to melt and flow the UV powder. For this reason, UV-cured powder coatings are an ideal finishing material for plastic substrates.

Pre-assembled components can contain a number of different heat-sensitive materials, including various plastics, rubber seals, electronic components and gaskets or lubricating oils. Minimizing exposure to heat is critical for these components to be successfully finished with UV-cured powder coating.

Sustainable

Not unlike the demand for innovation, markets and consumers are demanding sustainable products and services. And, like innovation, "sustainable" products and processes have challenging elements—meeting human needs and being safe for the environment. Consumers are actively seeking out materials and processes that are safe—safe to make, use and dispose. UV-cured powder coatings meet all three criteria. They do not contain solvents, volatile organic compounds or hazardous air pollutants; and are not toxic. They do not need any special material containment or material handling requirements. Use

Figure 1

UV-cured powder coating application process

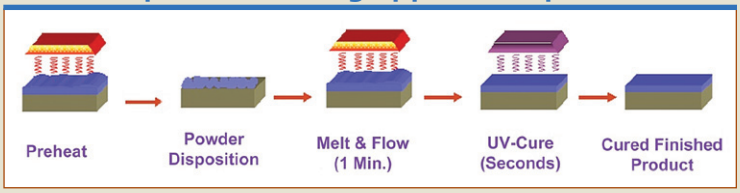
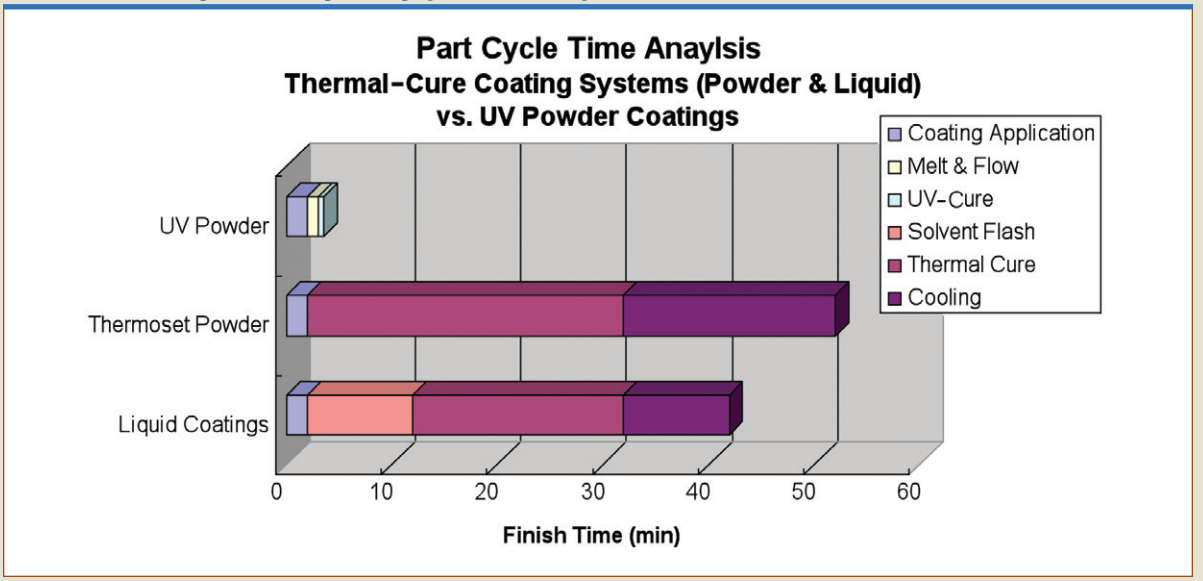


FIGURE 2

Process time cycle analysis by process step



and volume of material permits are not required when building or operating a UV-cured powder coating application system. Material handling is also fast and easy, as color changes can be accomplished in minutes. Up to 98% of residual powder can be reclaimed and re-used, and any waste powder can be recycled as a compounding additive in plastic manufacturing.

Liquid finishing—whether solvent, waterborne or UV liquid—requires significantly more handling, containment and waste handling. Also, liquid finishing takes significantly more processing time to produce a finished product. Figure 2 illustrates the process advantage of UV-cured powder coating compared with thermoset powder coating and liquid finishing.

Conclusion

The constant and continuous demand for innovative and sustainable products and processes will not abate. Market opportunities for UV-cured powder coatings on heat-sensitive substrates will continue to grow, fueled by the innovative developments in UV-cured powder chemistry and its inherent sustainable attributes. There is an exciting and profitable future for UV-cured powder coatings and its ability to coat heat-sensitive substrates.

To learn more, don't miss Schwarb's end-user presentation at the upcoming RadTech UV/EB Technology Expo & Conference 2012, April 30-May 2, at the Hyatt Regency Chicago, Chicago, Ill. Details are available at *www.radtech2012.com.*

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