

# Columbus Discovers UV Powder—A Case Study

By Steve Couzens

UV powder coating for heat sensitive substrates, such as medium density fiberboard (MDF), is no longer a technical topic or industry buzzword. Rather, it is a production method to give a high-quality, long-lasting powder coated finish to a newly designed 3/4" MDF store wall panel system. Reaction time to an ever changing marketplace of products and services is essential for today's business. The letters CAD, CNC, IR & UV are all about the speed of design and manufacturing, with UV powder putting a superior finish on the product. Columbus Show Case, a manufacturer of wall panel systems, recently discovered the benefits of UV powder on MDF.

## Understanding the Benefits of UV Powder

A production line making MDF parts coated with UV powder moves along at a higher speed and has lower heat requirements than a traditional thermoset production line. Figure 1 shows the temperatures reached in both systems as well as the cycle time from start to finish. The amount of

"heat history" that the MDF sees with UV cure is about one third that of thermoset powders. Let's examine the key areas that get the job done.

## Controls a Product's Finish and Appearance

Applying UV powder at a much lower temperature than thermoset powder enables penetration into the routed areas of the MDF. Without the various hotspots of edges and deep inside routed areas to overcome, the film build is more controllable and uniform over the surface of the part. The melt and flow oven hits the powder quick and hard with IR and convection heat, moving the UV powder into the gel and flow state. The UV lamps in the chamber following this oven will trigger the photoinitiators in the powder, causing the cure in 2-4 seconds. This shorter production cycle gives the applicator of UV powders much more control as well as production speed through the system.

## Eliminates Warp of MDF and Achieves Smoother Film Build

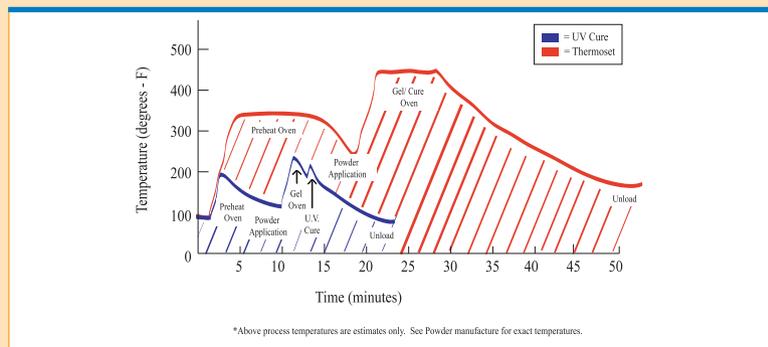
Some product designs call for a much longer sheet of MDF. Spraying UV powder over a 3/4" MDF wall panel that is 4' x 12' is not an everyday production activity. Since excessive heat is not required to cure the powder, the production flexibility and control of the parts to be coated is greatly increased.

## Provides a Superior Surface

Testing has proven that UV powder coatings on MDF excel in abrasion resistance, stain resistance, impact and chip resistance. Table 1 shows the common test methods and the results of UV powder. The Kitchen Cabinet Makers

FIGURE 1

### Process temperature/dwell time analysis thermoset vs. UV cure



Association testing has long been an industry standard comparing paper overlays, film and laminate materials.

## VOC Free

UV powder is applied electrostatically with virtually no waste. Electrostatic spray efficiency for powders has made a tremendous impact on painting in the metal-formed industry, and now this technology is available for MDF. The theory of attraction of the UV powder comes from charged particles leaving the spray gun heading toward the grounded MDF part. There is moisture at the surface (and throughout) the MDF wood, and that moisture content attracts the powder to the part, holding it there as the MDF part travels through to the melt and flow stage of this process. The overspray powder is collected and returned to the automatic system as reclaim to be used again.

## Columbus Discovers UV Powder

Columbus Show Case located in Columbus, Ohio, manufacturers wall panel systems out of aluminum framing and MDF panels for retail stores throughout the United States. Jeff Orwig, a general manager for the company's wall panel systems division, had previously used a liquid coating on a job with several problems. He had to find a way to solve these problems in that liquid silver paint was once again being specified for another job. The issues with this silver paint were that it was hazardous to apply with painters needing respirators. In addition, it had very long drying times. The installation of the wall system took time, and when the MDF panels were dry, the edges of one panel did not always color match the next panel. Orwig wondered if there was a better way.

## UV Powder Coater Gives Columbus a 'Map' to Success

After several phone calls and a visit by a UV powder coater with Columbus Show Case, a strategic map was drawn to provide the answers. The UV-powder supplier quickly matched the color as well as performance specifications with a product now known as "Izzy Silver." The coater was given a small sample to run through their system.

The painted MDF panel samples were then shipped overnight to gain approval from the retail store that needed a quick turn around to meet the deadline for the opening of a new store in New Jersey.

There were no problems in processing these panels for the UV-powder coater, nor upon installation at the new store. The UV-powder coated wall panels provided excellent results. This store site is being used by Columbus Show Case as a model installation for future sales.

## Why UV Powder Made the Difference and Solved the Problem

Tables 2 and 3 outline the preparation that the liquid paint required and the limited shelf life of the mixed product. The use of spray equipment approved for use with hazardous materials will always be a concern with proper ventilation required to

### TABLE 1

#### Technical data for UV powder coating

Tests	Results
Scratch Resistance (3.7 ANSI/NEMA LD3)	200g - No visible scratch
Scratch Resistance (ASTM D3363)	2-4 H Hardness (Typical)
Abrasion Resistance 1000 Cycles (ASTM D4060 CS-10 1000g Load)	Loss ~ 20mg/500 cycles
Impact Resistance (6 NEMA LD3 Ball Drop 30")	Pass - No cracking or loss of adhesion
Adhesion (ASTM D3359 Method B)	5B
*KCMA Shrinkage and Heat Resistance Test	No noticeable change (Typical)
*KCMA Hot and Cold check Resistance Test	No noticeable change (Typical)
*KCMA Chemical Resistance Test	No noticeable change (Typical)
*KCMA Detergent and Water Test	No noticeable change (Typical)
Xenon ARC (AATCC Light Resistance—Hours)	<ul style="list-style-type: none"> <li>• 40 hours: no change</li> <li>• 80 hours: no change</li> <li>• 120 hours: little to no change</li> </ul>
<b>Direct Screw Withdrawal Test—ASTM D1037 part 61</b>	
Edge Pull	Negligible effect
Face Pull	Negligible effect
<b>Static Bending—ASTM D1037 Part 11</b>	
(depending on the type of board and thickness)	Negligible effect to less than 5% loss
<b>Textured Finishes</b> **Unlimited Textures Reference	
<b>Texture Finish Gloss Level (ASTM D523)</b>	From 3 to 25 units on a 60-Gloss Meter
<b>Smooth Finishes—Flow Characteristics</b> ***PCI Orange Peel Index	Between 6 to 8 on a scale of 1 to 10 (10 being a mirror finish and 1 being a heavy orange peel appearance)
<b>Smooth Finish Gloss Level (ASTM D523)</b>	From 30 to 90 units on a 60-Gloss Meter
* KCMA: Kitchen Cabinet Makers Association ** Unlimited Textures: A Division of Mold-Tech *** PCI: Powder Coating Institute	<i>The above tests were performed by external and independent laboratories.</i>

apply the liquid. The application difference between these two processes shows a major time and cost saving advantage of using UV powder. Notice how long it took to 'build' the liquid paint and also the fact that it had to be protected with a clear overcoat. When all the data was reviewed, the UV powder was just what Columbus needed to solve the problem.

### Understanding Different UV Powder Chemistries

When a product is headed toward a specialized market, UV powder can help you get there. Let's review a couple of possible market segments to see how UV powder can successfully work to provide answers to future problems as well as help create new markets.

#### **Anti-Microbial UV Powder and MDF**

Healthcare, dental and educational areas are all in need of new disease preventive products. UV anti-microbial powder coating applied on MDF work surfaces and drawer fronts in these types of facilities are a natural fit. With healthcare costs continuing to rise, MDF furniture will be designed in this market just to utilize this new powder coating. The overseas market in Third World countries is currently testing MDF and UV-powder coated dental workstations. More information is being requested for disease prevention within the United States and Canada.

#### **Water Resistant Board and UV Powder**

Bird and doghouse makers as well as the outdoor home hobbyist all realize the benefits of working with wood. With newer offerings of water resistant board and some modified UV powders, new market segments will certainly open up. Once again, the ease of design and production of MDF parts made from this new family of fiberboard and UV powders will come together in new innovative ways in the next 2-3 years. White picket fences made this way may be popping up soon in your very own yard.

### Summary

All past testing of UV powders and UV-curing technology has brought about a process that works. Time-after-time. Day-after-day. Design-after-design. The ability to coat MDF parts with UV powder can solve problems. ▶

### Acknowledgements

The author would like to acknowledge the contributions of the following companies: Columbus Show Case Company and Protech Powder.

—Steve Couzens is the U.S. sales manager with Radex UV Powder Coating, London, Ontario, Canada.

## TABLE 2

### Silver liquid paint preparation

#### Read Masterlink MSDS

1. Add two ounces of Masterlink per one gallon of paint.  
**Note:** Wait to add Masterlink to the Stuffmaster products until immediately prior to its application. Mix thoroughly!

**Ratio of Masterlink to product:** 2 ounces/gallon

**Shelf life once added:** 36 hours

**Pot life once added:** 36 hours

2. Thin MC2000 with water, if necessary. This may be required if using a siphon feed or a gravity feed HVLP. Add 2 ounces at a time.  
**Note:** Use an empty 2 ounce Masterlink bottle to measure water.
3. Strain MC2000 with nylon strainer bag.

### IZZY silver UV-powder preparation

1. Empty the box of IZZY silver powder into electrostatic spray system.

## TABLE 3

### Silver liquid application



Initial Coverage Complete Coverage

#### What to expect with each pass:

**1<sup>st</sup> Pass:** Primer still visible—may appear cloudy or striped.

**2<sup>nd</sup> Pass:** Finish begins to fill in—becoming more uniform. Striping and cloudiness may still be visible.

**3<sup>rd</sup> Pass:** Cloudiness and striping should disappear as finish fills in.

**4<sup>th</sup> Pass:** The surface should be close to complete. Proceed to fifth pass—if necessary.

**5<sup>th</sup> Pass:** Process should be complete with five coats of Liquid Silver.

**Note:** Wait until each pass is dry to touch before proceeding on to the next coat.

#### Clearcoat application:

1. Protective clearcoat can be applied as soon as the metallic base coat is dry to the touch.

**Note:** The clearcoat will not hide any flaws or imperfections in the metallic basecoat.

2. Use the same settings to apply the Ultra Clear protective clearcoat

**Note:** Apply in one coat—clear.

**Note:** The clearcoat may appear milky upon application but will dry clear.

### IZZY silver UV-powder application

One coat system through UV-powder line onto—MDF. Total time: 22 minutes.