



# UV coatings aid in creativity

**Furniture designers embrace the design freedom UV powder coatings provide.**

*By Mike Knoblauch*

**A**s location is to real estate, design is to furniture. Design is the first and most apparent element in the evaluation of a piece of furniture.

As a developer must comprehend a mix of variables that will affect the outcome of the real estate investment, the designer must comprehend the mix of design variables and incorporate them into the product to produce a great product. The most important of these design variables is materials and finish.

Good development and design follow a set of rules and processes. The designer, with a firm understanding and a commitment to use the most appropriate materials and finishes, can capture and utilize the inherent principles of light, color, space, mass, movement and time when creating products.

Design is not a random event. It is the compilation of a set of structured activities and decisions that set about to solve a problem, fulfill a need or bring order to a group of chaotic elements.

The purpose of this article is to demonstrate that the continuing development and use of UV cured powder coating as a finishing medium enables the designer to manipulate the substrate materials in new ways and provides a great finish to achieve specific product objectives. UV cured powder coating is both an application technology and a finishing material.

## **UV cured powder-coating system**

The following diagram illustrates the application setup of a UV cured powder coating system. The sys-

tem has four separate and distinct processes.

**1.) Preheat:** Preheating ensures consistent UV powder deposition on each part.

**2.) Automated Powder System:** The automated electrostatic spray system consistently and evenly applies the UV cured powder to each part. The automated system controls film build face-to-face and edge-to-edge. The next two processes make UV cured powder coating separate and distinct from other types of finishing.

**3.) Flow:** The flow oven turns the solid UV powder to a crystalline state, bringing out the color, texture, gloss and performance properties of the finish. The flow process in UV cured powder coating is much faster and requires temperatures that are significantly lower than those needed to flow all types of thermal powders.

**4.) UV Cure:** UV curing is the characteristic that distinguishes UV cured powder coating from thermoset and low temperature thermal powder coating. Cure begins and ends when the UV light energy from the UV lamps activates photo-initiators that are part of the UV powder formulation. The UV light energy instantaneously creates molecular cross-linking and polymer bonding throughout the finish. Once exposed to UV light, the part is cured, finished and ready to be packed.

Each part hangs on a moving conveyer as it travels through the system and requires hanging holes, which suspend and ground the part for UV powder deposition on the surfaces and edges. UV curing

is "line of sight," meaning the UV light has to "see" each surface where there is powder.

The oven dimensions and the configuration of the line layout will determine the maximum size of a part the system can accommodate. And because the UV cured powder system has such low heat inputs, it is possible to package parts as they come off the line without requiring a cooling stage.

Process time is a critical factor when considering finish technology and material. From end to end, UV cured powder coating is an exceptionally fast, automated, one-pass finishing system that is capable of consistently finishing varying sizes of part runs.

### The substrate

Medium density fiberboard (MDF) substrate is the largest volume substrate currently used with UV cured powder coating. MDF is readily available, cost-effective, easily machined and quite plas-

ensure a good finish result, it is important to pretest in order to know which mill produced the MDF product. In all cases, those which work well are standard 47-lb. density products. Once a suitable MDF substrate has been identified and validated, it should be specified on all drawings with the name of the producing mill.

MDF has become ubiquitous in the design and construction of furniture. MDF accommodates the use of high pressure, melamine, paper and vinyl laminates, but it is less accommodating in the use of liquid finishes, which require multiple finishing operations.

Laminates are highly suitable and cost-effective for parts that are one-dimensional. They are less suitable for 2-D and 3-D parts because secondary operations are required to completely finish the part.

Secondary operations constrain design flexibility. For example, square corners, square edges, seams, seams that reveal whitewood, edgbanding that does not

substrate and UV cured powder coating offer unique and varied design possibilities combining space, mass and movement of MDF along with the color, texture and gloss of UV cured powder.

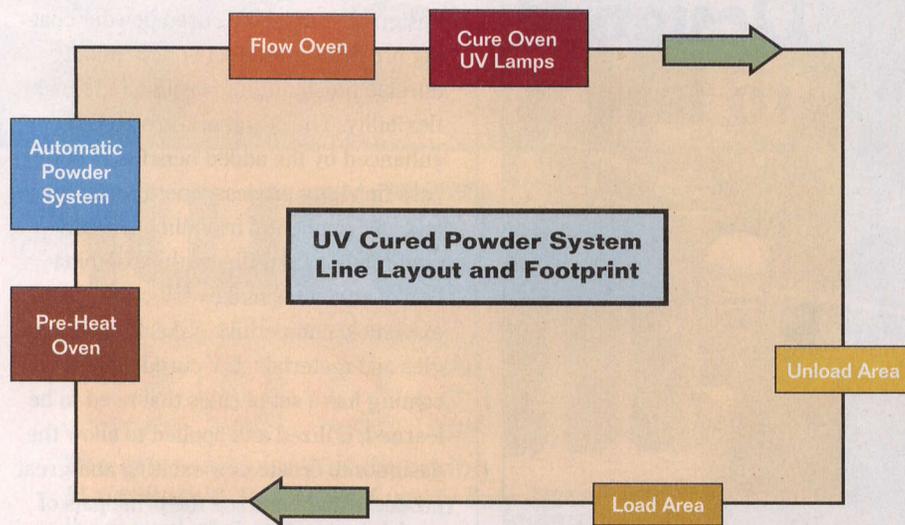
### Color, texture, gloss

Good use of color enables the designer to effect individual mood and behavior, a stimulus to produce a desired response. The use of lighting further enhances the stimulating effect of color. Using lighting with a metallic UV cured powder finish can produce a highly attractive and attracting finish. UV powder coating allows the designer to combine the attributes of color, texture, gloss and performance into a satisfying finish. UV cured powder coating provides the designer an exceptional broad palette with which to creatively design.

Using standard color matching equipment and techniques, it is possible to replicate the colors from the RAL™, Pantone™ and PMS™ color systems, as well as other color sources.

RAL™ is a paint system and is the preferred color matching system. Multiple color finishes are available, combining two and three colors into a nebula finish. Textures range from smooth to heavy, with a fine micro texture being the most suitable and providing outstanding surface durability. Gloss can range from 5 to 50 units on a 60-degree scale. One current limitation of UV cured powder is the inability of the UV cured powder formulators to produce an acceptable smooth texture and matte finish in the less than 5 units of gloss range.

Performance property measurements are an important characteristic of finish evaluation. UV cured powders have excellent surface performance in the areas of abrasion, hardness, scratch and stain resistance. Typically, UV cured powder will measure in the 4H range on ASTM D3363 Pencil Hardness and performs exceptionally well in Taber Abrasion ASTM D4060 testing. Typical Taber test results: CS-10 Wheel, 500mg load and



tic in terms of design capability.

UV cured powder coating eliminates the need for secondary operations such as edgbanding, T-molding, hand trimming and backside finishing.

It is important to recognize that some MDF materials are better suited for UV cured powder coating than others. To

match the laminate, edgbanding that can peel away and the inability to finish complex shapes limit the design.

Liquid finishes on MDF are more problematic than laminate because they require multiple operations to build up the finish to the desired color and gloss. As the picture below demonstrates, MDF

500 cycles the test result was .09mg loss, far under the minimum requirement of not less than a 50mg loss.

What sets UV cured powder coating apart from other finishing technologies and materials is the molecular cross-linking of the polymer structure of the powder. Once cured, the internal resin compounds of the powder have coalesced and cross-linked into a molecular structure that is significantly more durable than a thermally cured material, whether it be a low temperature or standard temperature thermal cured material.

Additionally, UV cured powders are more stable and easier to apply with better results than all types of thermal powders applied on MDF. There are no environmental issues or restrictions associated with UV cured powders, in the material state or in application; it can be considered a "Green" product.



### Creativity is key

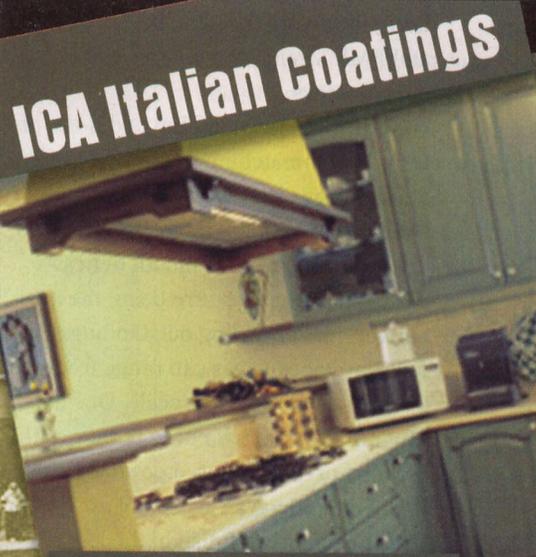
UV cured powder coating enables the designer to work beyond the rectangular and monolithic mass of laminate,

melamine, paper, vinyl materials and high-cost wet finishes. The designer is able to articulate the machining of the MDF substrate and be more creative; adding a sense of movement and reducing the mass of the design elements.

Finishing the product with an effective and efficient UV cured powder coat further enhances more creatively machined design elements. UV cured powder coating produces a product of high quality, durable finish, infinite design and finish flexibility. The designers' creativity is enhanced by the added benefits of one-pass finishing process, energy efficiency and environmental friendliness. Fully understood and utilized, this combination of attributes makes UV cured powder extremely competitive. Like all technologies and materials, UV cured powder coating has a set of rules that need to be learned, utilized and applied to allow the designer to create new exciting and great products that embrace the principals of light, color, space, mass, movement and time. ●

*Ed. note: Mike Knoblauch led DVUV's development and implementation of its new UV Cured finishing technology. He is recognized both in the U.S. and Europe as an expert in the UV cured powder process.*

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