

UV Powder Goes Green

By Steve Couzens

Exelon Corporation set out to combine several of their suburban office sites into the most efficient office setting in downtown Chicago. They began a rather lengthy search for information to help them with their goal to go with a “green” office building. They wanted to exercise in practice their corporate vision statement, “Exelon will be the best group of electric generation and electric and gas delivery companies in the United States—providing superior value for our customers, employees, investors and the communities we serve.”

In order to tell Exelon’s story on how UV-powder coatings helped the company reach its goal, some terms need to be defined.

- **Green.** This term has been generically used for years and means ecology-friendly, recycling efforts for various materials, review of landfill sites, global warming, greenhouse

gases and conserving energy. GREEN is also the name for Global Rivers Environmental Education Network (www.green.org). This group focuses on water resources and works through schools and education systems in the United States. The term green has now become more closely associated with the United States Green Building Council (USGBC, www.usgbc.org), which developed the LEED rating system.

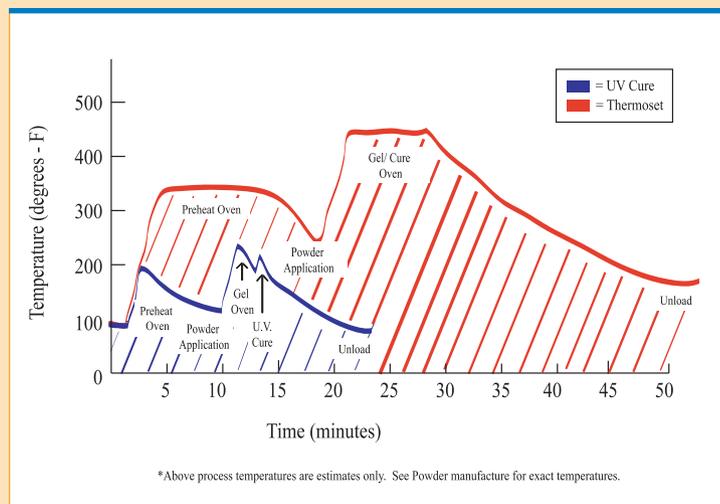
- **LEED.** This term stands for “Leadership in Energy and Environmental Design.” These well-defined guidelines are a nationally accepted benchmark for the design, construction and operation of high-performance green buildings. LEED addresses a variety of building projects, giving certain point values through individualized rating systems.
- **LEED-CI.** This is the Commercial Interior Rating System. Using LEED-CI, tenants and design teams can make sustainable choices to improve the indoor office working environment that promotes productivity, operates more efficiently and secures healthy surroundings.

Factors in the Decision to Use UV Powder

Exelon chose Interior Solutions Incorporated, Milwaukee, Wis., as the main coordinator for the interior design of the 220,000-square-foot project, which covered 10 floors in an existing landmark building in downtown Chicago. ISI then secured Inscape Solutions of Holland Landing, Ontario, Canada, for design and construction of the office desk and file cabinet system that would yield the highest number of LEED-CI credits for the building. Medium density fiberboard (MDF) was

FIGURE 1

Process temperature/dwell time analysis thermoset vs. UV cure



chosen for all of the drawer fronts and the cabinet doors because of the recycled nature of wood chips used in the manufacturing of the material and it's suitability to ecology-friendly powder coatings. Inscap went one-step further and specified SierraPine Medite II MDF, which uses a "formaldehyde-free" resin-binding system in the manufacture of this particular grade of medium density fiberboard.

Another factor leading to the decision of the 3/4" MDF over steel, fabric or plastic substrates was the "office sound environment." MDF has good mass, structure and weight to it, acting as a sound deadening material when drawers and doors were being open or shut. In addition, there is no odor given off by the powder-coated drawers and doors. Designers also liked the warm touch of the powder coated surface. Now the question was

asked: "Which powder coating system should be used for the greatest LEED/green values—thermoset or UV?"

After input was received from the different companies involved with this project, UV powder was chosen over thermoset powder coating for several reasons, the most important being 'total heat utilization' to apply and cure the coating. With a closer look at Figure 1, you will note that less heat is required to bring the MDF up to powder application temperature. After application, the amount of heat required to obtain the cure of the thermoset coating is very substantial compared to the UV process of crosslinking with light. Heat is not only expensive to produce, but utilizes natural resources that can be saved for the future, thus fitting in perfectly with the "green" way of thinking.

Specific Process Advantages of UV Powder

Radex UV Powder Coating, London, Ontario, Canada, was awarded the contract to machine and UV-powder coat the thousands of drawer fronts and cabinet doors that would come from the 600 sheets (4'x 8') of Medite II MDF. The main process advantages of a UV powder line are:

- Speed of the UV cure. The average time a part is on the line is 25 minutes vs. 50 minutes with thermoset. After the UV cure chamber, the part starts to cool down.
- Quicker handling and packaging of the coated parts, needed for quick turn around production.
- Much less heat stress on the smaller MDF parts and no warping on the tall thin cabinet doors.
- Lower application temperature of the UV powder gives better wrap

TABLE 1

Chemical resistance tests

Stain—NEMA LD3 3.4 Standard	Norm	LTC Coating	UV Coating
10% Providone Iodine	NEMA LD3 3.4	No effect	No effect
Acetone	NEMA LD3 3.4	Slight gloss reduction	Slight gloss reduction
Ethyl Alcohol	NEMA LD3 3.4	No effect	No effect
Rubbing Alcohol	NEMA LD3 3.4	No effect	No effect
Household detergent	NEMA LD3 3.4	No effect	No effect
Vegetable oil	NEMA LD3 3.4	No effect	No effect
Coffee	NEMA LD3 3.4	No effect	No effect
Tea	NEMA LD3 3.4	No effect	No effect
Milk	NEMA LD3 3.4	No effect	No effect
Catsup	NEMA LD3 3.4	No effect	No effect
Yellow mustard	NEMA LD3 3.4	Slight stain	Slight stain
Vinegar	NEMA LD3 3.4	No effect	No effect
Red lipstick	NEMA LD3 3.4	No effect	No effect
Grape juice	NEMA LD3 3.4	No effect	No effect
Ink, black felt tip	NEMA LD3 3.4	No effect	No effect
Ink, washable blue	NEMA LD3 3.4	No effect	No effect
#2 Pencil	NEMA LD3 3.4	No effect	No effect

TABLE 2

Mechanical properties tests

Parameter	Sample Tested			
	UV Curing		LTC Curing	
	Powder Coated	Non-Coated	Powder Coated	Non-Coated
Internal Bond Strength , kPa (ASTM D 1037- 99, #28)	916	976	1,024	1,001
Modulus of Rupture , Mpa (ASTM D 1037- 99, #11)	37.2	39.1	39.6	39.1
Modulus of Elasticity , Mpa (ASTM D 1037- 99, #11)	3,832	4,185	5,020	4,158
Screw Pull Force , N Edge Pull (ASTM D 1037- 99, #61)	1,375	1,462	1,411	1,507
Screw Pull Force , N Face Pull (ASTM D 1037- 99, #61)	1,274	1,277	1,292	1,359

around curves and edges of the part as the MDF is not overheated and dried out, which kicks back the electrostatic force.

- With the very short cure time of the UV lamps, the micro texture profile of the coating surface is easily maintained

throughout the various times of the production run.

MDF machining capabilities and the UV-powder coating were completed at the same location as well as having warehouse space for raw sheet stock and finished goods to work through such a large order.

Specific Property Advantages of UV Powder

Protech Powders, Montreal, Canada, provided the medium brown color match requested by the customer and made the Nuvocoat high-performance office furniture UV powder. When looking for qualities in

TABLE 3

Physical properties tests

Parameter	Sample Tested	
	UV Curing	LTC Curing
Adhesion (ASTM D 3359-02)	5B	5B
Abrasion Resistance Weight Loss, mg (ASTM D 4060-01)	28	39
Ball Impact Resistance, Max Height No Damage, PO (NEMA LD- 3,1995)	46	42
Linear Scratch Resistance 200 g Mass (ANSI/ NEMA LD- 3,1995)	No Visible Scratch	No Visible Scratch

a UV-powder coating, three specific areas need to be evaluated:

- Chemical Resistance Tests (Table 1)
- Mechanical Properties Tests (Table 2)
- Physical Properties Tests (Table 3)

Exelon Receives Highest Environmental Rating

So how did Exelon do on achieving its goal? The lead paragraph in a recent Exelon press release (April 23, 2007) says it all.

“Exelon today announced that the U.S. Green Building Council has awarded Exelon’s headquarters with the Leadership in Energy and Environmental Design (LEED) Platinum Commercial Interiors (CI)

certification. Exelon’s new green headquarters is the largest office space in the world to be LEED-CI certified at the platinum level.

We are very proud of this accomplishment, said John W. Rowe, Exelon’s chairman, president and CEO. We are pleased to help Mayor Daly and the city of Chicago meet their environmental goals through our compliance with the *The Chicago Standard* for sustainable buildings.”

Summary

With the recent conclusion of the mega office furniture trade show (NEOCON) in Chicago, it was very apparent that Exelon has set standards

of “green” that will be followed in the future by many other companies purchasing office furniture. The precedent for maximum LEED point levels with a UV-powder finish (low-heat consumption and recyclable powder) over MDF (recycled/recovered wood and no added formaldehyde) for future office furniture components will surely be taken into account. ▶

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

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