FEATURE

UV&EB-Curing Technology: Pollution Prevention Benefits Speak for Themselves

By Martha Marrapese

Any lawyer would be kidding herself if she did not admit to relishing the occasional opportunity to apply traditional common law doctrines to make a modern point. I am guilty-as-charged myself. And when it comes to the contribution of ultraviolet and electron beam (UV&EB) technology to 21st century pollution prevention—*res ipsa loquitor: the thing speaks for itself.*

A new generation of end users, state regulators, and the public are now "discovering" the P2 benefits of UV&EB. And, they are spreading the word.

According to the U.S. Environmental Protection Agency (EPA), "pollution prevention" (P2) means source reduction and other practices that reduce or eliminate the creation of pollutants. As defined under the Pollution Prevention Act (42 U.S.C. §133), source reduction includes practices that reduce the amount of a hazardous substance entering a waste stream or otherwise released into the environment (including fugitive emissions) prior to recycling or disposal. Equipment or technology modifications, process or procedure modifications, reformulation or redesign of products, and the substitution of raw materials that reduce hazardous substances qualify as source reduction and P2.

RadTech and its first government affairs director, Alex Ross, helped pioneer the concept of pollution prevention hand-in-hand with UV&EB in the early 1990s *(http://pfonline.com/articles/110003.html)*. It has taken another ten years for it to be accepted as simply common sense. A new generation of end users, state regulators, and the public are now "discovering" the P2 benefits of UV&EB. And, they are spreading the word. To use a contemporary observation, "How sweet it is!"

P2 Benefits Associated with UV&EB

The most well-recognized P2 benefit associated with UV&EB technology results from the high solids and low volatile organic compound (VOC) content of the ingredients in a UV&EB coating, adhesive or ink. As a result, the technology beneficially limits emissions of hazardous air pollutants (HAPs) in the earth's atmosphere. The EPA recognizes UV&EB as having low or no VOC emissions, and correspondingly low concentrations of HAPs in a document devoted to the subject, *Ultraviolet and Electron Beam (UV&EB) Cured*

Coatings, Inks and Adhesives, EPA-456/K-01-001 (July 2001) (*http://www.epa.gov/ttncatc1/dir1/fuv-eb.pdf*). A small sampling of the EPA air pollution control rules that recognize the P2 benefits of UV&EB include the following:

- The national emission standards for hazardous air pollutants (NESHAP) for surface coating of metal cans recognizes that UV technology can assist facilities in reducing air emissions and complying with the standard. 68 Fed. Reg, 2,110 (January 15, 2003). The EPA notes that the best performing metal sheet coating sources predominately control emissions through the use of UV-cured coatings or catalytic oxidizers. 68 Fed. Reg. at 2,121.
- The plastic parts and products NESHAP recognizes that the best performing headlamp coating facility achieved its low HAP emissions in part due to the use of a UV-cured clearcoat technology. 67 Fed. Reg. 72, 276, 72,291 (December 4, 2002). In fact, the EPA set the compliance date for the rule to make the transfer to lower-emitting P2 technologies possible: "We want to encourage the use of these pollution prevention technologies." 67 Fed. Reg. at 72,294.
- UV&EB-cured coatings are listed by the EPA as complying with Clean Air Act requirements for Reasonably Available Control Technology (RACT), Best Available Control Technology (BACT), and Lowest Achievable Emission Rate (LAER) on the Agency's Clearinghouse (*http://cfpub1.epa.gov/rblc/htm/bl02.cfm*).

Examples of UV&EB and P2 Benefits

As California and other states have implemented these clean air rules, an appreciation of UV&EB technology benefits has grown. The California Air Resources Board (CARB) and California's South Coast Air Quality Management District (SCAQMD) recognize the emission reductions "achieved in practice" by UV&EB on their technology clearinghouse resource lists (*http://www.arb.ca.gov/bact/bactnew/determination.php?var=667*). SCAQMD recently gave RadTech a coveted, P2 recognition award. Surfing a public P2 Web site will link you to a State of North Carolina page devoted to P2 that includes case studies of successful P2 projects involving UV&EB technology in the wood products industry (*http://www.p2pays.org/ref/16/15336.pdf*).

The Northeast Waste Management Official's Association (NEWMOA) has recognized the P2 benefits of UV-coating technology. NEWMOA, the parent organization of the Interstate Mercury Education & Reduction Clearinghouse (IMERC), published a case study in which Hussey Seating Company of North Brunswick, Maine, reduced VOC and HAP emissions from its bleacher coating operation from 50 tons per year to only 219 pounds per year.

With winter and high oil and gas prices looming, UV&EB offers energy savings through lower fossil fuel usage, which results in additional pollution prevention benefits. This is because UV&EB-curing processes inherently reduce greenhouse gas emissions through reduced reliance on the burning of fossil fuel. Due to line speed, rapid curing and low-process temperatures, UV&EB technology is highly energy efficient (E2) in addition to being P2.

UV&EB equipment is relatively cooler and smaller than that used in other methods, and materials can be cured at or near room temperature, in a matter of seconds or less. Moreover, solvents, when incinerated, generate additional greenhouse gases from combustion. Emissions of these tropospheric (ground-level) ozone precursors can be nearly eliminated with the use of UV&EB technology, and the ozone that may be emitted by the equipment itself is present at only negligible quantities. As a result, UV- and EB-curing processes achieve up to an 80% reduction in a facility's total energy usage level and a reduction of over 65% in greenhouse gas emissions.[1]

In addition to its P2 contribution to air quality, the use of UV&EB technology can lead to a reduction in the generation of hazardous waste prior to disposal. UV&EB-curing formulations, whether it is coatings, inks or adhesives, are typically managed as non-hazardous waste. UV&EB manufacturing and end-use processes are not known to generate any significant industrial wastewater streams or contaminants. Moreover, suppliers of UV lamps and equipment will often have active programs to accept bulbs back from customers for recycling at no charge. Even in the absence of these programs, the EPA has ruled that fluorescent lighting and, most recently, mercury-containing equipment, can be managed as "universal waste," and is not subject to strict hazardous waste storage and disposal restrictions, when destined for recycling. 70 Fed. Reg. 45507 (Aug. 5, 2005).

Generally speaking, mercury has come under increasing regulatory attention and is subject to initiatives to minimize its presence (and that of other heavy metals) in landfills. A consortium of states have launched the Interstate Mercury Education and Reduction Clearinghouse (IMERC) to help them implement these initiatives. While UV lamps and equipment need to be registered under several, but not

all, of these state laws, only Connecticut has rules that would limit the amount of mercury that lamps can contain. As the amount of mercury vapor used in a UV-irradiating bulb directly affects the bulb's performance, longevity and emitted UV spectrum, suppliers have the ability to request an exemption from what is effectively a product ban. The maximum concentration of mercury that will be allowed in a fabricated mercury product after July 1, 2006, is 100 milligrams. New states are joining IMERC on a regular basis so companies need to be alert to changing requirements.

Even in Connecticut, though, the overwhelming pollution prevention benefits of UV curing speak for themselves. A recent report by the Connecticut Department of Environmental Protection (DEP) describes Sikorsky Helicopters' changeover to UV-cured paint, in which Sikorsky reduced VOC and HAP emissions from 25 pounds per aircraft to zero (*http://www.dep.state.ct.us/wst/p2/p2casest/sikorsky.htm*).

Summary

When it comes to achieving P2 with UV&EB, think global, act local and *carpe diem* or seize the day! States continue to be the genesis of many new environmental initiatives, and practitioners of UV&EB technology will increasingly find that they are preaching to the converted.

References

1. Robert Brady et al., Evaluation of UV-Curable Coatings for Aluminum Can Production, National Industrial Competitiveness through Efficiency, Environment and Economics (NICE3) Project #DE-FG48-93R810499, June 9, 1997.

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