

UV/EB Technology

A Way to Reduce Greenhouse Gas Emissions

This article was written by members of RadTech's Technical Committee.

The environmental benefits of using ultraviolet/electron beam (UV/EB) technology to cure coatings, inks and adhesives are well documented in the areas of volatile organic compounds (VOCs) and hazardous air pollutants (HAPs) emissions reductions. With new efforts to reduce greenhouse gas emissions on the immediate horizon, businesses can rely on UV/EB technology as an integrated part of their total environmental solution.

There is a growing body of evidence that suggests that human activities, primarily the burning of fossil fuels, increase the concentrations of these "greenhouse" gases in our atmosphere and cause our planet to become warmer.

Why the Attention on Greenhouse Gases?

The accumulation of greenhouse gases in the Earth's lower atmosphere functions like a blanket, trapping some of the sun's energy and preventing it from being radiated from the Earth's surface to escape into space. There is a growing body of evidence that suggests that human activities, primarily the burning of fossil fuels, increase the concentrations of these "greenhouse" gases in our atmosphere and cause our planet to become warmer. While the need to reduce these emissions is subject to public debate, several voluntary and government initiatives to do so are already underway.

Ratification of Kyoto Protocol Prompts U.S. Attention

Russia's ratification of the Kyoto Protocol in late 2004 put the United Nations' Framework Convention on Climate Change into action. Although the United States is not a party to the Convention, many U.S. companies have facilities abroad that must comply with new rules that limit carbon dioxide (CO₂) emissions. The European Union (EU) has the world's largest multi-country, multi-sector greenhouse gas emissions trading scheme, which took effect on January 1, 2005. Steel and paper mills, power and oil refineries, glass and cement manufacturers, and any installation with combustion plants having a thermal input over 20 megawatts in the EU are subject to CO₂ emission limits. Aluminum and chemical producers may be regulated at a later date.

In the U.S., several states have enacted or are considering greenhouse gas reduction laws. The New England Governors and Eastern Canadian Premiers have established a Climate Change Action Plan, which calls for emission reductions of greenhouse gases. The Plan has been adopted in Massachusetts and passed by the Connecticut state legislature.

Additionally, the U.S. Environmental Protection Agency's (EPA) Climate Leaders Program now has 58 corporations voluntarily participating to achieve greenhouse gas reduction

targets. Their revenues add up to more than 6% of the United States' gross domestic product. Emission reduction goals have already been established by 27 of the 58 Climate Leaders Partners. The EPA estimates a total reduction of 7.5 million metric tons of carbon equivalent per year. Participating companies agree to report emissions of the six major greenhouse gases from all on-site emissions of greenhouse gases, and emissions related to the electricity they purchase. Companies may also report emissions and reductions from a number of activities, including investments in "offset" projects such as renewable energy generation.

UV/EB technology can be a one-stop shop for businesses that need to keep up with state, national and international requirements. Adoption of UV/EB processes can assist compliance with U.S. regulations as well as with those that businesses face abroad.

VOCs, Greenhouse Reductions and UV/EB

The EPA and local air districts agree that UV/EB is good news for the environment. The overwhelming majority of UV/EB coatings, inks and adhesives contain little or no volatile solvent. Solvents, when incinerated, generate additional greenhouse gases from combustion. Emissions of VOCs, which are tropospheric (ground-level) ozone precursors, can be nearly eliminated with the use of UV/EB technology. Ground-level ozone is estimated by the EPA to be the third largest contributor to climate change.

Greenhouse Gas Reductions from UV/EB Processes Validated by Industry

As one example of the savings that has already been achieved through the use of the technology, a major industry study¹ of a UV can-coating process line found an over 65% reduction in

greenhouse gas emissions. The study compared UV curing to a water-borne coating line equipped with incineration. There was also a documented 80% reduction in the total amount of energy used by the facility's UV can-coating process, compared to a conventional thermal system. As a result of these energy efficiency advances, the study noted that the energy savings offered by UV/EB technology translated into 62 billion BTU/year for the company, and achieved as much as a 55% reduction in capital and installation costs over thermal curing.

While the benefits of UV/EB technology may vary depending on the particular facility and the intended use of the technology, this study and the experience of this industry demonstrate that EB and UV curing may be used to achieve meaningful voluntary reductions of greenhouse gas emissions.

In Complete Compliance with UV/EB

The use of UV/EB-curing processes can inherently reduce greenhouse gas emissions by reducing reliance on the burning of fossil fuels. UV/EB technology is highly energy efficient, utilizing equipment that is relatively cooler and smaller than that used for other drying methods. In addition, it can cure materials at or near room temperature in a matter of seconds or less. For these reasons, the total energy used in UV/EB-curing processes can be significantly lower than the energy needed for thermal drying, resulting in energy savings and reduced reliance on the burning of fossil fuels that contribute to greenhouse gas emissions.

As the greenhouse gas debate progresses in the U.S., companies who adopt UV/EB processes will be at the forefront of greenhouse gas pollution prevention. The use of UV/EB-curing systems to apply coatings, inks and

adhesives inherently leads to the reduction of these emissions. To that end, RadTech strongly encourages companies to consider the use of UV/EB-curing technology and is confident of the technology's ability to meet mandated greenhouse reductions. ▀

Acknowledgements

The members of RadTech's Technical Committee gratefully acknowledge the assistance of Alan Weissberg, Maureen Waite, Ron Golden, Jeffrey Ross, Catherine Paik, RadTech's Director of Government Affairs Rita Loof, and Martha Marrapese of Keller and Heckman in reviewing this article.

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.