United States
Environmental Protection
Agency

Air and Energy Engineering
Research Laboratory
Research Triangle Park, NC 27711

Research and Development

EPA/600/SR-95/063 June 1995

EPA

Project Summary

Evaluation of Barriers to the Use of Radiation-Cured Coatings in Can Manufacturing

Beth W. McMinn and Steven R. Church

The full report gives results of a study to investigate and identify the technical, educational, and economic barriers to the use and implementation of radiation-cured coatings in can manufacturing. The study is part of an EPA investigation of current industrial use and barriers to the extended use of radiation-cured coatings in Source Reduction Review Project (SRRP) and maximum achievable control technology (MACT) standards development categories. Among the important barriers were (1) an applied wet film thickness of >120 mg per can of ultraviolet (UV)-curable overvarnish needed on most trial runs; (2) lower than expected energy savings; (3) inadequate cure of overvarnish; and (4) ink "pick off" during the wet-on-wet application of the overvarnish to the inks. The report suggests projects that could help overcome technical, educational, and economic barriers identified. Among the opportunities discussed were (1) setting up a trial with a can manufacturer who is interested in using UV-curable inks and coatings; (2) conducting research on cationic inks and coatings, which have been billed as the next generation of UV-curable inks and coatings; and (3) working with Radtech, the trade association representing the radiation-curable coatings industry, to develop a UV-curable coating that could be approved by the Food and Drug Administration for direct contact with food.

This Project Summary was developed by EPA's Air and Energy Engineering Research Laboratory, Research Triangle Park, NC, to announce key findings of the research project that is fully documented in a separate report of the same title (see Project Report ordering information at back).

Overview

Section 4(b) of the Pollution Prevention Act (PPA) of 1990 requires EPA to review regulations of the Agency prior and subsequent to their proposal to determine their effect on source reduction. In support of the PPA, EPA established the Source Reduction Review Project (SRRP) to focus this review on pending regulations (and anticipated regulated industries) under the Clean Air Act (CAA), the Clean Water Act (CWA), or the Resource Conservation and Recovery Act (RCRA). One of the goals of SRRP tasks is to ensure that source reduction and multimedia issues are considered during the development of upcoming air, water, and hazardous waste standards.

One important set of regulations under the CAA, and a focus of SRRP, are the standards for maximum achievable control technology (MACT) to reduce emissions of hazardous air pollutants (HAPs). Promulgation of these regulations began in 1992 and will continue through the 1990s and into the next century. The MACT standards offer EPA an excellent opportunity to use SRRP to incorporate pollution prevention measures into the upcoming standards for specific source categories. Pollution prevention efforts offer economic and reduced health and ecological risk benefits to many sectors of society that are not available through traditional pollution control methods.

In support of the SRRP Program, MACT standards development, and the PPA, EPA is investigating pollution prevention opportunities for product and material substitutions that help industry to reduce waste. The objective of this project was to investigate the current industrial use and barriers to the extended use of waterbased and radiation-cured coatings in SRRP and MACT categories. Metal Cans (SIC 3411), an industry facing upcoming MACT standards, was selected as an industrial segment for study. When the MACT standards are developed, EPA will have a better understanding of which coating technologies are feasible pollution prevention alternatives for the industry.

The full report gives results of a study to investigate and identify the technical, educational, and economic barriers to the use and implementation of radiation-cured coatings in two-piece metal can manufacturing. This project involved preparing category analyses, identifying and classifying the use and implementation barriers, evaluating and assessing the environmental impacts, and identifying pollution prevention and source reduction research opportunities in the two-piece metal can industry. Information was collected for this project from a review of current technical literature, cooperation with industry leaders and the leading trade organization, and visits to three can manufacturing facilities. (One of the visits was to a three-piece can manufacturing facility; however, the report focuses on two-piece manufacturing.)

This project was initially intended to study both ultraviolet (UV) radiation-cured and waterbased screen printing inks as possible alternatives to solvent-based inks with high volatile organic compound (VOC) emissions. During the project, it became evident that the focus should be on UV-curable inks and coatings. The current industry standard is to use waterbased inks and coatings that contain 6 to 15% VOCs. UV-curable inks and coatings contain <1% VOCs and would significantly reduce emissions from two-piece can manufacturing operations.

In the can manufacturing industry, there is debate over the economic and process benefits that UV-curable inks and coatings offer. The Coors can manufacturing plant in Golden, CO, has been successfully using UV-curable inks and overvarnish to coat the exterior of its cans since 1976. The UV technology has provided Coors with a number of benefits including (1) reduced energy costs; (2) less downtime for maintenance and repairs; (3) less floor space occupied by the drying/curing oven; and (4) employee satisfaction with the reduced operating temperatures and simple procedures of the UV-curing oven. Coors claims that the benefits of a UV system, particularly the reduced energy costs, compensate for the higher material costs of UV-curable inks and coatings.

Ball Corporation had a different experience with UV-curable inks and coatings when it established a UV trial line at its Findlay, OH, plant in 1986-87. The company encountered several technological and economic barriers that prevented Ball from expanding its use of UV technology beyond the trial stage. Some of the important barriers were (1) an applied wet film thickness of >120 mg per can of UV-curable overvarnish needed on most trial runs; (2) lower than expected energy savings; (3) inadequate cure of overvarnish; and (4) ink "pick off" during the wet-on-wet application of the overvarnish to the inks.

The full report divides the barriers to implementing UV-curable inks and coatings into three categories: technical, economic, and educational. Each category is examined separately.

Beth W. McMinn and Steven R. Church are with TRC Environmental Corp., Chapel Hill, NC 27514.
***Carlos M. Nunez** is the EPA Project Officer (see below).*
The complete report, entitled "Evaluation of Barriers to the Use of Radiation-Cured Coatings in Can Manufacturing," (Order No. PB95-215810; Cost: $27.00, subject to change) will be available only from:
National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
Telephone: 703-487-4650
The EPA Project Officer can be contacted at:
Air and Energy Engineering Research Laboratory
U.S. Environmental Protection Agency
Research Triangle Park, NC 27711

United States
Environmental Protection Agency
Center for Environmental Research Information
Cincinnati, OH 45268

Official Business
Penalty for Private Use $300

EPA/600/SR-95/063

BULK RATE
POSTAGE & FEES PAID
EPA
PERMIT No. G-35