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Project Summary

Alternative VOC Control Technique Options for Small Rotogravure and Flexography Facilities

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The Control Techniques Guidelines (CTGs) for the graphic arts industry was published in December 1978. It defined Reasonably Available Control Technology (RACT) for volatile organic compounds (VOCs) emitted from publication and packaging rotogravure and packaging flexography. Subsequent EPA guidance limited the applicability of RACT requirements to sources that emit 91 tonnes/yr or more of VOCs. The Clean Air Act Amendments of 1990 (CAAA) now require RACT for VOC sources that emit as little as 9 tonnes/yr in extreme ozone nonattainment areas. Therefore, states are now required to establish and implement RACT for these smaller sources as well. This document identifies Available Control Techniques (ACTs) for states to use as a reference when implementing RACT for graphics arts facilities that are covered by the CTGs, but emit less than 91 tonnes/yr of VOCs.

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).

Introduction

Emissions of VOCs from rotogravure and flexographic printing facilities arise from the evaporation of solvents during ink drying. These emissions can be reduced by conversion of solvent-borne ink systems to waterborne ink systems, or by capture of the solvent vapors and use of a control device such as thermal or catalytic incineration systems or carbon adsorption systems. Limitations are associated with each approach and individual circumstances, including the type of product produced, the customer base, and the type of ink used, which will affect the applicability of different technologies.

Conversion to waterborne inks can reduce VOC emissions by about 80%. Uncertainties in retrofitting existing presses for waterborne inks exist; required modifications are site-specific. Drier systems and, in some cases, ink-supply systems must be modified. Gravure cylinders must be replaced. Waterborne inks can eliminate the problems of designing and testing capture systems. In some cases, it is difficult to achieve the same level of gloss with waterborne inks as with solvent-borne inks. Where waterborne inks are suitable, conversion to waterborne inks may be the most cost-effective solution. Due to the site-specific nature of conversion costs, no generalized cost estimates can be developed.

Properly operated carbon adsorption systems with total enclosures or efficient capture systems can reduce VOC emissions by 95%. Solvent can be recovered for reuse on site or sold to a reclaimer. Carbon adsorption systems are incompatible with certain inks and are most suitable for facilities with a predictable, long-term production schedule. Facilities using a wide variety of inks to print numerous small jobs are not likely to be able to use carbon adsorption systems. Activated carbon has a solvent capacity which varies for different organic components. Cost estimates have been developed on the basis of toluene as the design solvent. In some cases, other solvents which are present in some inks may require larger and, thus, more expensive systems.

Properly operated catalytic incinerator systems with total enclosures or efficient capture systems can reduce VOC emissions by up to 98%. Solvents are destroyed in these systems. Catalytic incinerators provide an energy savings over thermal incinerators, but they are not compatible with all inks. Incinerator specifications must be written with specific reference to the type of ink to be used. Small facilities may avoid catalytic incinerators because of higher initial capital costs than thermal incinerators, and the desire to maintain flexibility to print a wider variety of jobs.

Properly operated thermal incinerator systems, with total enclosures or efficient capture systems, can reduce VOC emissions by 98%. Thermal incinerators are compatible with most inks used in rotogravure and flexography, but these systems are relatively energy intensive. Cost-effectiveness data for these control devices are summarized in Table 1. The cost of total enclosures must be added to these costs.

Table 1. *Cost Effectiveness of Control Technologies for Small Rotogravure and Flexography Facilities*[a]

	Cost Effectiveness ($/ton)		
Plant Size[b] *(ton/yr)*	*Thermal Incineration*	*Catalytic Incineration*	*Carbon Adsorption*
10	$3,200 to $4,300	$3,200	$3,100
25	$1,800 to $2,900	$2,000	$1,280
50	$1,200 to $2,200	$740 to $1,500	$660 to $680
100	$820 to $1,800	$520 to $1,200	$420 to $430
1000	$170 to $480	$150 to $310	$110 to $120

[a] *1991 dollars, exclusive of total enclosure or capture devices. Control efficiencies assumed to be 95 to 100%. Capture efficiencies are assumed to be 100%. For conversion purposes, 1 ton = 0.907 tonnes.*
[b] *Total solvent use including solvent present in purchased ink and solvent added by facility.*

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The complete report, entitled "Alternative VOC Control Technique Options for Small Rotogravure and Flexography Facilities," (Order No. PB93-122307/AS; Cost: $17.50; subject to change) will be available only from:
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