

## Management of Volatile Organic Compound Emissions by the Printing Industry in Florida

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The graphic arts industry is one of the largest industries in the world and one of the top four economically important industries in the United States. In Florida, there are more than 5,000 graphic arts plants. Many of the chemicals used in the printing industry contain volatile organic compounds (VOCs) which are emitted into the atmosphere. The level of emission depends on the types of solvents, press washes, and inks, and their VOC content. Air emissions also tend to vary with ink formulation and coverage, press size and speed, and operating time. Other chemicals that also contain VOCs are cleaners, fountain solutions, glues, and chemicals in color proofing machines. Once emitted, VOCs react with nitrogen oxides in the presence of sunlight to form ozone in the earth's lower atmosphere (Petersen, 1991). As the printing industry in this state grows, the possibility of an increase in VOC emission levels becomes a greater concern.

The Clean Air Act of 1970 was enacted by Congress to protect and enhance the quality of the nation's air resources, and its amendment in 1990 was to increase control and address new air pollution concerns (USEPA, 1992). With government regulations tightening and public awareness of health and safety issues growing, how to handle VOCs is a concern for both printers and for the various companies (known as converters) that manufacture and/or develop appropriate technologies to be used by the printing companies to reduce emissions (Renko, 1994). In order to comply with the new standards and regulations, the printing industry utilizes add-on emission control devices, process modifications, material reformulations, or substitutions to reduce VOC emissions.

A study was conducted using a survey instrument to determine the extent of emis-

sion control methods or technologies being used and the exact technologies that are being used in the facilities. The companies used in this survey were identified and selected from the Florida Department of Environmental Protection Air Resources Management System Emission Report by Facility for the years 1990–95. The data were collected using the mailed survey and telephone interview method and analyzed using Duncan's multiple range test. The method of printing was identified, as was the type of press, listed as flexographic, letterpress, lithographic, gravure, or other type of press.

The results in this survey indicate that nearly sixty percent (59.3%) of the facilities in Florida are lithographic (a printing process characterized by a planographic image carrier) and about one third (33.3%) are flexographic (printing using flexible plates and fast drying inks). The results also suggest that the majority (55.6%) of respondents do not use any add-on devices to control VOC emissions. Of those that use some type of add-on emission control devices, the majority of respondents (62.9%) did not use any of the add-on emission control devices listed in the questionnaire. The add-on control methods listed on the survey questionnaire for the printing facilities to choose from were: combustion, adsorption, condensation, or other. Nearly one quarter (23.1%) of the plants use combustion.

The printing facilities also provided information on which type of process modification they used to control or reduce VOC emissions. Nearly half (48.1%) of the facilities responded that they only used material reformulation or substitution. About one quarter (25.9%) of the facilities use a combination of processes to lower the levels of VOC emissions.

Over the six year (1990–95) period that was studied in this report, facilities using combustion add-on devices had the most significant ( $p < 0.05$ ) decrease in VOC emissions, while the other companies had fluctuations in their emission levels. It appears from this study that combustion add-on devices are more efficient in reducing VOC emission levels compared to the other types.

## References

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