



Research and Development

Application of Pollution Prevention
Techniques to Reduce Indoor Air Emissions
From Aerosol Consumer Products

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FOREWORD

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APPLICATION OF POLLUTION PREVENTION TECHNIQUES TO REDUCE INDOOR AIR EMISSIONS FROM AEROSOL CONSUMER PRODUCTS

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Abstract

Aerosol consumer products potentially are amenable to pollution prevention strategies that reformulate or redesign products, substitute raw materials, or improve consumer use procedures. A basic understanding of the behavior of aerosol consumer products is essential in the development of pollution prevention strategies, which may reduce occupant exposures and guide manufacturers in the development of more efficacious, less toxic products. This research project was undertaken to develop tools and methodologies to measure aerosol chemical and particle dispersion through space. EPA's National Risk Management Research Laboratory sponsored a cooperative agreement with the Georgia Tech Research Institute (GTRI), and the University of Illinois (UI) to develop tools and methodologies to measure aerosol chemical composition and particle dispersion through space. These tools can be used to devise pollution prevention strategies that could reduce occupant chemical exposures and guide manufacturers in formulating more efficacious products. The GTRI researchers built an Aerosol Mass Spectral Interface (AMSI), which is interfaced with a mass spectrometer (MS), that chemically characterizes aerosol consumer products through space. The UI researchers developed techniques for measuring aerosol movement indoors by tracking particle size changes via particle velocity measurements using particle image velocimetry (PIV). A group of Industry Partners participated in this research project to ensure that the technologies developed would be useful to industry.

The AMSI was designed, constructed, and optimized to transfer a focused beam of aerosol particles into a mass spectrometer for chemical analysis. It was shown experimentally during this project that the AMSI can quantitatively detect compositional changes as the aerosol travels through space. These data provide important information for the formulating of aerosol consumer products for pollution prevention strategies. The PIV system demonstrated a correlation between the material properties of the aerosol components and the spray pattern. These data were used to develop a model for prediction of the major characteristics of aerosol spray patterns. The model can be a useful guide for developing pollution prevention strategies.

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