Indoor Pollutants Emitted by Electronic Office Equipment

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Introduction

The last few decades have seen major changes in how people collect and process information at work and in their homes. More people are spending significant amounts of time in close proximity to computers, video display units, printers, fax machines and photocopiers. At the same time, efforts to improve energy efficiency in buildings by reducing leaks in building envelopes are resulting in tighter (i.e., less ventilated) indoor environments. Therefore, it is critical to understand pollutant emission rates for office equipment because even low emissions in areas that are under-ventilated or where individuals are in close proximity to the pollutant source can result in important indoor exposures.

Materials and Methods

We reviewed existing literature reports on pollutant emission by office equipment, and measured emission factors of equipment with significant market share in California. We determined emission factors for a range of chemical classes including volatile and semivolatile organic compounds (VOCs and SVOCs), ozone and particulates. The measured SVOCs include phthalate esters, brominated and organophosphate flame retardants and polycyclic aromatic hydrocarbons. Measurements were carried out in large and small exposure chambers for several different categories of office equipment. Screening experiments using specific duty cycles in a large test chamber (~20 m^3) allowed for the assessment of emissions for a range of pollutants.

Results and Discussion

Results from the screening experiments identified pollutants and conditions that were relevant for each category of office equipment. In the second phase of the study, we used a smaller test chamber (~1 m^3) to measure pollutant specific emission factors for individual devices and explored the influence of a range of environmental and operational factors on emission rates. The measured emission factors provide a data set for estimating indoor pollutant concentrations and for exploring the importance of user proximity when estimating exposure concentrations.