337

ALTERNATIVES TO CHLORINATED SOLVENTS: THE USE OF 1-BROMOPROPANE (N-PROPYL BROMIDE) IN SPRAY ADHESIVES. C. Reh, NIOSH, Cincinnati, OH

For many years, 1,1,1-trichloroethane and methylene chloride were used in various industries. Due to international concerns of stratospheric ozone depletion, production of 1,1,1-trichloroethane was banned in 1996. Also, OSHA recently promulgated regulations on methylene chloride exposures and use. Considering this, suitable alternatives are being considered for the solvent vehicles in spray adhesives.

A potential alternative that is becoming popular is 1-bromopropane (1-BP). There are no NIOSH, ACGIH, or OSHA exposure criteria for 1-BP. A literature review yields little health effects and toxicological information, especially when considering worker exposure or epidemiologic studies. A 1-BP manufacturer recommends a full-shift exposure guideline of 100 ppm. This limit is based on data from a 90-day inhalation study in rats. An EPA review found that workplace exposures in the 50-100 ppm range may be protective.

NIOSH recently conducted an exposure study at a facility using 1-BP-based spray adhesives in the manufacture of aircraft seats. The facility has four departments; the covers and assembly departments use the adhesive, while workers in the saw and sew departments were secondarily exposed. The mean 1-BP full-shift exposure for all workers was 168.9 ppm (n = 69), and these ranged from 60 ppm to 381.2 ppm. All but two were above the manufacturer's guideline of 100 ppm. The highest exposures were in covers department (mean of 197 ppm), followed by assembly (169.8 ppm) and saw (117.1 ppm). Area air sampling in the sew department found a mean 1-BP concentration of 128.1 ppm.

This study indicates that high exposures can occur during the use of 1-BP-based spray adhesives. Recommendations were provided to the employer for the proper design of spray booths, and for the proper selection of personal protective equipment.

338

REAL-TIME EXPOSURE MONITORING OF CELLULOSSE INSULATION INSTALLERS. R. Hall, NIOSH, Cincinnati, OH

NIOSH is conducting an exposure assessment of cellulose insulation (CI) applicators. Airborne particulate concentration data were collected with filter cassettes (NIOSH Method 0500) and a real-time hand-held aerosol monitor (HAM). The HAM, coupled with a video recording instrument to collect data for video exposure monitoring (VEM), was used to evaluate personal breathing zone-relative air contaminant concentrations during attic insulation and truck support activities (dumping bags of cellulose insulation into a hopper).

VEM data were analyzed to identify sources of worker exposure and to address issues such as how worker exposure may vary among different components of the job. Particle size data were collected with a Grimm Dustcheck™ Model 1105 real-time light-scattering aerosol spectrometer. Particle size data indicate that the majority of the particulate mass is in the large particle size range (>15 μm in diameter). Less than 2% of the particulate mass is in the respirable size range during truck and attic activities.

The aerodynamic mass median diameter (AMMD) for the cellulose particulate data collected in the truck and attic was 57.4 μm and 28.7 μm in diameter, with geometric standard deviations of 2.8 and 2.4, respectively. The sample collected in the truck revealed a total dust concentration of 7.1 mg/m³, and the HAM measured relative particulate concentration peaks greater than 60 mg/m³, with the highest relative concentrations occurring during work activities that involved dumping bags of cellulose material in a hopper.

The sample collected in the attic indicated a total dust concentration of 28.5 mg/m³, with relative particulate concentration peaks (measured by the HAM) greater than 120 mg/m³. The highest relative particulate concentrations were observed when the worker was blowing cellulose material into the small spaces of the attic (the edge) and in close proximity to his body.

These results indicate a potential for workers to be exposed to particulate concentrations exceeding applicable exposure criteria.

339

NIOSH WORKPLACE HAZARD SURVEY FOR THE NEW MILLENNIUM. J. Boiano, NIOSH, Cincinnati, OH

NIOSH's long range vision of a comprehensive nationwide system for surveillance of occupational illness, injury, hazards, and health and safety activities was recently described in its Strategic Surveillance Plan. One important component of this surveillance system that best lends itself to the primary prevention of illness and injury is hazard surveillance.

Several hazard surveillance initiatives are presented in the plan, including an ongoing survey of health and safety hazards in U.S. workplaces. The foundation for the ongoing hazard survey lies in three previous NIOSH surveillance efforts: the 1972-1974 National Occupational Hazard Survey (NOHS), the 1981-1983 National Occupational Exposure Survey (NOES), and the 1984-1989 National Occupational Health Survey of Mining (NOHSM).

The primary objectives of these surveys were to develop national estimates of the number of workers potentially exposed to chemical, physical, and biological agents and to describe the distribution of these potential exposures by various factors such as occupation, gender, and industry. The findings of these surveys have been used to support or prioritize regulations to control hazards, establish research priorities, track temporal changes in the use of controls, and to assess exposures in epidemiologic studies.

Using input from federal stakeholders and representatives of academia and the private sector, the proposed hazard survey will build on lessons learned from the previous efforts. The survey will be designed to incorporate existing data from other sources, cover an expanded set of industrial classes and hazards, and incorporate qualitative exposure assessment of hazards. Since the previous survey was centered in the early-to-mid 1980s, our planning will take advantage of advances in data gathering, computer processing, and dissemination technology.

Planned components of the hazard survey include a management questionnaire to obtain administrative data, policies, practices, and overall perspectives on H&S issues; site walk-throughs to characterize and qualitatively assess job-specific hazards; and a questionnaire survey of workers to obtain their perspectives on H&S policies, programs, and issues.

340

A SURFACE SAMPLING PORTABLE CORDLESS VACUUM METHOD FOR RHODAMINE 6G. Y. Shen, S. Que Hee, J. Froines, UCLA, Los Angeles, CA

Rhodamine 6G is used as a pigment in pulp and paper manufacturing, as a laser dye, and as tracer in water pollution studies. It is a suspected cardiovascular or blood toxicant. In this study, a new portable cordless vacuum method was developed for the surface sampling of Rhodamine 6G. The sampling probe was Tygon® (5 cm in length and 8 mm inner dimensions, cut at a 45° angle). It was affixed to a three-piece sampling cassette connected to a portable cordless personal sampling pump.

A weight of 10 mg Rhodamine 6G was applied onto a sampling surface inside a template of 10 cm2 inner dimensions. Five consecutive sampling passes were performed. Seven different sampling rates ranging from 1 L/min to 3.5 L/min were tested. The optimum sampling rates in terms of recovered mass balance were from 1.5 L/min to 3.5 L/min. The sampling efficiencies after five passes ranged from 93% to 118%, with standard deviations from 1% to 27%. For the sampling rate of 1 L/min, the sampling efficiency after five passes was only 64%±25%.

The method is therefore suitable to sample and clean surfaces after small spills of solid chemicals onto hard surfaces.

341

ASSESSING COMPARATIVE RISKS USING ECONOMIC INPUT-OUTPUT LIFE CYCLE ANALYSIS. D. Kelly, I. Miller, M. Shelly, P. Jonmaire, Ecology & Environment, Inc., Lancaster, NY; R. Harbison, Center for Environmental/Occupational Risk Analysis & Management, College of Public Health, University of South Florida, Tampa, FL

The claim of voluntary vs. involuntary risks associated with environmental chemical exposure often fails to consider the individual contribution to the risk of others caused by ordinary consumer purchases. Consumption decisions induce a complex sequence of economy-wide production interactions that influence the exposure and possible risks to both those consumers acting as demand catalysts and other populations.

Recently, the interdisciplinary quantitative technique called economic input-output-life cycle analysis (EIO-LCA) has been refined and used to link resource consumption and production by manufacturers to identify and measure economy-wide chemical releases. This approach was used to study the extent to which consumers unwittingly contribute to the assumption of involuntary risks associated with select discretionary spending choices involving relatively nonessential products. The economy-wide environmental discharges associated with purchases of toys, certain household appliances, recreational transport equipment, and other products were quantified.

EPA's Toxic Release Inventory and AIRS Data database, and input-output tables developed by the U.S. Department of Commerce, were used in this analysis. The impacts generated from a hypothetical $10,000 increase in final demand for select consumer items were examined, and the total economic and environmental impacts associated from the final demand for the commodities were estimated.

The analysis revealed that voluntary purchases of relatively nonessential consumer products create significant environmental burdens in the form of chemical releases and criteria air pollutant emissions. Furthermore, unbeknownst to the consumer satisfying this urge to spend, the releases and emissions associated with these discretionary purchases contribute potential risks to both the consumer and select populations involuntarily exposed to these discharges.

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