11.

CONSTRUCTION FATALITIES: HOW THEY ARE MEASURED AND WHAT THEY DON'T TELL US. R. Rinehart, U.S.

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occupational fatalities recorded in 2001 by the Bureau of Labor Statistics (BLS) were in construction, even though construction represented only 8% of the workforce. The construction fatality rate, or risk of dying on the job, is more than three times the national average for general industry. The construction fatality rate has remained this high for at least ten years. Industrial hygienists working in high-hazard work environments, like construction, should be cognizant of fatality data, its uses, and limitations. While construction is used as the case example, the information presented is applicable to other industries as well. Both the BLS and the Occupational Safety and Health Administration (OSHA) collect fatality data. BLS collects data through its Census of Fatal Occupational Injuries program and OSHA through fatalities it investigates. The OSHA fatality data are a subset of the BLS data, but the two databases are not directly comparable and cannot be linked. This presentation describes how fatality data are collected by the BLS and OSHA and highlights the differences. It also discusses limitations with the current fatality data, which do not adequately describe risk factors associated with fatal events, and what is being done by OSHA to improve the situation.

Podium 103. Sampling and Laboratory Analysis and Successfully Achieving AIHA Laboratory Accreditation

Papers 12–18

12.

METHOD DEVELOPMENT FOR THE SIMULTANEOUS DETERMINATION OF THREE AMINES IN THE WORKPLACE. C. Ostiguy, J. Lesage, IRSST, Montreal, PQ, Canada; S. Tranchand, H. van Tra, Universite du Quebec a Montreal (UAQM), Montreal, PQ, Canada.

Objective. Explore the feasibility to develop a new analytical method for the simultaneous determination of amines of different chemical classes. Three different amines have been chosen: ethanolamine, which is an alcohol amine; aniline, a primary aromatic amine; and dimethylamine, a secondary aliphatic amine. These very different amines have been selected with the goal of eventually developing a unique method applicable to all 43 amines regulated in Quebec. **Method.** Amines are sampled in a cassette containing two glass fiber filters in series. Each filter is impregnated with 5-dimethylaminonaphtalene-1-sulphonyl chloride. The use of a co-solvent increases the collection efficiency. The derivatives are desorbed in acetonitrile before analysis by high performance liquid chromatography using a fluorescence detector. The method developed for these three amines has been compared in the laboratory to the validated NIOSH method 2002 for the determination of aniline. **Results.** The amine recovery by the sampling system is 100% ±6% for each of the three amines. The detection limits are approximately 1000 times lower than the recommended ACGIH TLVs. **Conclusion and future work.** The developed method is specific, with a high sensitivity, and will be evaluated with additional amines, then validated in the workplace.

13.

EVALUATION OF A NEW FLUOROMETRIC METHOD FOR AMMONIA ANALYSIS IN AMBIENT AIR. W. Groves, D. Agarwal, M. Chandra, Penn State, University Park, PA; S. Reynolds, Colorado State University, Fort Collins, CO.

A fluorometric method for analysis of ammonia in ambient air has been developed and tested. The approach is based on modifications to an existing method for analysis of ammonium in marine and freshwater samples to enable measurement of low concentrations of ammonia in ambient air. Optimal results for the new method were obtained using a tube containing 100 mg of acid-treated silica-gel for sample collection, and an analytical protocol which entailed a 30-minute desorption of samples in 80 mL of DI water, an addition of 20 mL of fluorometric working reagent, and a 2-hr room temperature incubation. Samples were quantified using a digital filter fluorometer with excitation and emission wavelengths of 365 and 420 nm, respectively. A dynamic test-atmosphere generation system was used to prepare atmospheres containing 1.01 ppm of ammonia and side-by-side samples were collected so that results for the fluorometric method could be compared to those obtained from an outside laboratory using NIOSH Method S-347. Sample time and flow rate were adjusted to account for different method sensitivities—samples for analysis by the NIOSH method were collected at 200 mL/min for 240 minutes while two samples for fluorometric analysis were collected sequentially at 50 mL/min for 120 minutes to span the 240 minute sample period. A total of 13 runs was conducted over a period of one week resulting in 26 samples for fluorometric analysis and 13 for the NIOSH method. The average ammonia concentration for samples analyzed using the fluorometric method was 1.06 ± 0.03 ppm versus 0.978 ± 0.09 ppm for samples analyzed using NIOSH S-347. Average percent errors relative to the expected concentration were 4.7% and –11% for the fluorometric and NIOSH methods, respectively. Results demonstrate excellent accuracy and precision for the new method which should be useful for measuring low concentrations of ammonia.

14.

COMPARISON OF IMPINGER AND IMPREGNATED FILTER SAMPLING TECHNIQUES FOR PMDI DURING THE APPLICATION OF SPRAY FOAM INSULATION. J. Lesage, C. Ostiguy, IRSST, Montreal, PQ, Canada; J. Stanley, McGill University, Montreal, PQ, Canada; W. Karoly, Huntsman Polyurethans, West Deptford, NJ.

Isocyanates are used in many types of industries and may be hazardous for the people who work with them. In particular, overexposure can cause respiratory problems. Since the 1980s, isocyanates have been found to be an important cause of occupational asthma in Quebec. As a consequence, studies were initiated to identify, evaluate, and control exposures to reduce the number of new cases. Foamers in the construction industry who spray foam insulation are at risk of being exposed to isocyanates above the occupational exposure limits. Currently, few studies have been done to document their level of exposure.

This study was designed to compare the collection efficiency of airborne MDI between impinger and several impregnated filter paper sampling methods. Parallel samples were taken during the foaming process at six different locations. The data show that the filter paper sampling methods underestimated results by 35% from the impinger method. To help understand this underestimation, particle size distribution data of the airborne MDI was obtained at two different locations using an eight-stage Anderson cascade impactor. Results show that about 85% of the particles are larger than 1.55 µm.

15.

AN INTERCOMPARISON OF THREE METHODS FOR MEASUREMENT OF PERSONAL EXPOSURE TO AIRBORNE WATER-MIX METALWORKING FLUIDS. A. Howe, S. Bradley, Health & Safety Laboratory, Sheffield, United Kingdom; D. Breuer, Berufsgenossenschaftliches Institut für Arbeitssicherheit, Sankt Augustin, Germany; R. Glaser, NIOSH, Cincinnati, OH.

Water-mix metalworking fluids (MWFs) are applied to the work piece in processes such as grinding, drilling, and cutting to provide lubrication and cooling. They contain mineral oils, emulsifiers, corrosion inhibitors, biocides, etc. Metalworking processes result in the generation of aerosols, inhalation of which causes irritation of the eyes and respiratory tract. An elemental marker method was therefore developed and validated by the Health and Safety Laboratory (HSL) to measure personal exposure to airborne water-mix MWFs. Details of this method were presented at AIHce 2001. Two other methods for water-mix MWFs have also been developed in recent years. The

Berufsgenossenschaftliches Institut für Arbeitssicherheit (BIA) have published an FTIR method for samples collected on a filter and back-up XAD-2 cartridge; and the American Society for Testing and Materials (ASTM) has described a gravimetric method for samples collected on a filter, either by direct weight gain or by difference after extraction using a ternary solvent mixture of dichloromethane, methanol, and toluene (1:1:1). This paper describes an exercise carried out to compare the performance of the methods. Three types of MWFs were tested at three sample loadings. MWF aerosols were generated from 5% (m/v) working strength solutions and six replicate samples were collected for each test using a multiport sampling device. Results showed good agreement between all methods at high sample loadings (<10% RSD), although the BIA method could not be used at this or any other loading for the 'synthetic' fluids. At medium to low sample loadings, HSL and BIA results were again in good agreement for 'conventional' and 'semi-synthetic' fluids (<10% RSD). However, results obtained with the ASTM method were lower, probably due to losses in transport, prolonged storage, and an additional dessication step, and could not be reported for low level 'semi-synthetic' and 'synthetic' fluids because of high laboratory media blanks.

16.

PROPER SELECTION OF WIPE MEDIA FOR HEXAVALENT CHROMIUM. M. Eide, U.S. DOL/OSHA, Salt Lake City, UT.

Skin adsorption from contaminated workplace surfaces may be a significant route of exposure for hexavalent chromium (Cr(VI)). Laboratory results for samples taken from such surfaces can be low if the wrong media is used. Typical media used for wipe testing, Whatman smear tabs, Whatman 42 filters, and dissolving wipes, cannot be used to sample for Cr(VI) as they react with the Cr(VI) to form Cr(III). Three types of media have been found to collect Cr(VI) in air samples: PVC filters, binderless quartz fiber filters, and NaOH coated binderless quartz fiber filters. These three filters can also be used to take wipe samples. There are differing interferences from each type of workplace which determines the optimal media. The PVC filters are the less rugged, and may tear when wiping a rough surface. The binderless quartz fiber filters are more sturdy—these may be used for either paint or welding operations. Samples taken from chrome plating operations should be stabilized with a bicarbonate buffer until they can be analyzed. For chrome plating operations, the NaOH coated binderless quartz fiber filters are the best. These may be used for paint operations, but should not be used for welding operations, as the NaOH coating catalyzes the reaction between Cr(VI) and Fe(II).

17.

MEASUREMENT OF HEXAVALENT CHROMIUM IN WORKPLACE AIR—A CONTINUING PROBLEM! A. Howe, Health & Safety Laboratory, Sheffield, United Kingdom.

Water-soluble hexavalent chromium compounds are used extensively in electroplating and in the manufacture of a wide range of products such as pigments, dyestuffs, tanning agents, wood preservatives, etc. Similarly, sparingly-soluble and insoluble hexavalent chromium compounds are used as pigments in paints, varnishes, oil and water colours, printing fabrics, rubber, etc. However, industrial hygienists continue to face difficulties in obtaining accurate measurements of the exposure of workers to hexavalent chromium in the air they breathe.

For many years, the method most widely used for measurement of hexavalent chromium in workplace air has been to sample on polyvinylchloride filters, extract the hexavalent chromium under appropriate leach conditions, and analyse the resulting sample solutions by spectrophotometric determination of the magenta chromagen (λ max = 540 nm) formed by reaction with sym-diphenylcarbazide in acid solution. However, published methods have their shortcomings, and it is timely to examine these now that ACGIH has established new TLVs for a range of hexavalent chromium compounds.

The presentation will give an overview of the problems that persist in the sampling and analysis of hexavalent chromium, with reference to the results of studies carried out in the author's laboratory and by other researchers. In particular, the difficulty of obtaining stable samples of chrome plating mist will be explored, highlighting the importance of selecting an appropriate sampling medium and the potential losses that can occur by reaction with dust and other oxidizable material collected along with the sample. The various methods for measurement of hexavalent chromium in air that are currently in use in the United States and elsewhere will be compared and an outline will be given of the procedures described in an International Standard that is currently under development. Conclusions will be drawn about the current state of the art and recommendations for future research work will be made.

18.

PREPARING FOR, EXPERIENCING, AND SUCCESSFULLY ACHIEVING AIHA LABORATORY REACCREDITATION ADHERING TO THE REQUIREMENTS OF THE INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO) POLICY ISO/IEC 17025. C. Gosselin, The Hartford Loss Control Laboratory, Hartford, CT; A. McClure, The Hartford, Hartford, CT.

Situation. Every three years, AIHA accredited laboratories must undertake a reaccreditation process in order to maintain certificatic In 2001, AIHA updated their policies, whicl included many revisions designed to bring accredited laboratories into compliance witl the International Organization for Standardization (ISO) policy ISO/IEC 1702 This case study examines how The Hartford Loss Control Laboratory addressed the man new requirements so as to achieve reaccredi tion. **Problem.** Each laboratory undergoing reaccreditation must review and comply witl current Laboratory Quality Assurance Progr policies in order to submit a completed appli cation to AIHA. With the updated policies, every laboratory seeking reaccreditation will be challenged to revise and/or amend their cu rent practices with the aim of incorporating tl expanded requirements. At a minimum, each laboratory faces the new requirements of: measurement of uncertainty, documentation o traceability, detailing of personnel training an education records, and documentation of deal ings with subcontractors. The means by whicl The Hartford's Loss Control Laboratory met these challenges will be discussed and detailed. **Resolution.** The Laboratory manage and the Laboratory supervisor/quality control coordinator of The Hartford's Loss Control Laboratory worked jointly to prepare the laboratory for reaccreditation. The success of this partnership was crucial for the achievement of lab reaccreditation. To fulfill the expanded requirements, the laboratory management approved many new procedures and practices, including the revision of the Quality Assurance Manual and the institution of Standard Operating Procedures. **Sharing.** Sharing the hands-on experience of laboratory reaccreditation will afford the audience a look at the many facets of the laboratory reaccreditation process. The aim of the case study is to share our experience in anticipation of lessening the burden faced by other laboratories experiencing the newly updated requirements.

Podium 104. Community Environmental, Health & Safety, and Social Concerns

Papers 19–27

19.

IS OSHA UNDERFUNDED? J. Nash, Occupational Hazards Magazine, Washington, DC.

The question posed by the title will be explored using two methods of comparison: international and historical. First, I will compare recent data on the amount of money spent by OSHA per worker covered with that spent by the comparable job safety agency in other industrialized nations. Results for 1997: Denmark, $22.28 per worker; U.K., $12.26 per worker; Sweden, $11.18 per worker; Ireland,

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