Podium Session 110: Exposure Assessment Strategies Modeling I: Bayesian, Mathematical, and More

Papers 67–72

67.
IMPLEMENTATION OF BAYESIAN DECISION ANALYSES (BDA) TOOLS FOR COMMUNICATION AND DATA ANALYSIS IN A MANUFACTURING FACILITY.

M. Nunnally, 3M Co., Cordova, IL.

Utilization of Bayesian Decision Analysis (BDA) is an extremely useful tool when validating exposure assessments with air sampling data. Using the AIHA Exposure Assessment and Management Model, the Bayesian's probabilistic outputs drive exposure control banding with synergy. The probability of a "decision statistic" falling into one of the exposure control bands is clearly communicated graphically using the exposure control bands recommended in the AIHA Exposure Assessment and Management Strategy. When assessing multiple process tasks with accompanying task based sampling data and then communicating exposure risks to various levels in a facility, BDA is a powerful tool for the plant industrial hygienist. The presentation will cover basic applications of BDA for use by industrial hygienists in a manufacturing environment.

68.
COSHH ESSENTIALS CASE STUDY: METHYLENE CHLORIDE, ISOPROPANOL, AND ACETONE EXPOSURES IN A SMALL PRINTING PLANT.

R. Bowen, University of North Carolina, Chapel Hill, NC; M. Harper, NIOSH, Morgantown, WV; J. Brooks, University of Alabama at Birmingham, Birmingham, AL.

The use of deterministic models is gaining in popularity to estimate occupational exposures to airborne chemicals in the workplace. The UK Health and Safety Executive developed a risk management tool that estimates toxicological hazards and includes a deterministic chemical exposure assessment model. This tool is called COSHH Essentials. This paper presents a case study evaluation of the COSHH Essentials deterministic exposure assessment model. Retrospective personal measurements of methylene chloride (dichloromethane; CAS 75-09-2) and prospective personal measurements of isopropanol (propan-2-ol; CAS 67-63-0) and acetone (propan-2-one; CAS 67-64-1) were compared with the COSHH Essentials predicted exposure ranges. The model's ability to adequately protect worker health and to adequately assign appropriate engineering controls was evaluated. The model adequately described employee exposures for methylene chloride and isopropanol but fell short in describing the acetone

exposures. The estimated probability of an employee's average exposure exceeding the upper limit of the COSHH Essentials predicted range was less than 0.05 for the methylene chloride and isopropanol exposures, but the estimated probability of exceeding the upper limit was greater than 0.05 for the acetone exposures. For acetone, the model suggested the implementation of local exhaust ventilation, and for isopropanol the model suggested the implementation of containment, in both cases with the aim of further reducing exposures, even though exposures were well controlled below applicable standards by general dilution ventilation alone.

69.
VALIDATION OF THE USE OF CARBON DIOXIDE AND SULFUR HEXAFLOURIDE AS A TRACER GAS IN DETERMINING AIR CHANGE RATES IN A SINGLE-ZONE SPACE WITH FEWER THAN 10 AIR CHANGES PER HOUR.

M. Weeks, C. Simmons, F. Boelter, Boelter & Yates, Inc., Park Ridge, IL.

A series of air change rate studies were performed in single-zone spaces using both carbon dioxide and sulfur hexafluoride as tracer gases. Testing methods were based on ASTM Method E741-00, Standard Test Method for Determining Air Change in a Single Zone by Means of a Tracer Gas Dilution. Sulfur hexafluoride is often called the "gold standard" for performing air change rate studies because it is easily detectable, nontoxic, and inert. However, the technology available for reliably detecting sulfur hexafluoride, as well as the gas itself, is expensive when compared with the cost of other common tracer gases. Using carbon dioxide as a tracer gas poses the potential problems of high ambient concentrations and the presence of additional generation sources. Air change rates were calculated for eight single-zone spaces using both gases. Results show that in situations where there was an air change rate fewer than 10 air changes per hour and no additional or unaccounted sources of carbon dioxide were present, air change rate results using carbon dioxide and sulfur hexafluoride were consistently within 1 or 2 air changes of each other. This indicates that although using carbon dioxide as a tracer gas can be difficult because of the presence of confounding factors, in many cases it can appropriately be used to determine air change rate in a single zone. Higher variation occurred with ventilation rates greater than 10 air changes per hour. The variation in results and possible causes of the variation will be discussed, along with the practicalities of applying the method to the two-zone model in work areas with low air change rates. The conclusion is that for single-zone work areas with low air change rates and no confounding factors, the less expensive carbon dioxide tracer gas correlates well with the sulfur hexafluoride gold standard.

70.
A FULL-SCALE EXPERIMENTAL APPARATUS TO STUDY MDR-TB TRANSMISSION.

S. Parsons, CSIR, Pretoria, South Africa; P. Jensen, C. Wells, CDC, Atlanta, GA; M. First, E. Nardell, Harvard University, Boston, MA; K. Weyer, L. Roberts, MRC, Pretoria, South Africa; E. Mathews, North-West University, Potchefstroom, South Africa.

Tuberculosis (TB), one of the world's greatest killers, is predominantly spread by the airborne route. Multidrug-resistant TB (MDR-TB) has emerged as a global public health threat despite effective drugs and disease control strategies. Little is known about MDR-TB transmission and the efficacy of

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