

(called microfibrinous materials) are a composite of bound particulate (ca. 10 to 300  $\mu\text{m}$  particle size) using a sinter-locked microfibrinous carrier. The microfibrinous carrier comprises approximately 2 vol% of the media and can be of micron diameter metal, ceramic, or polymer fibers (ca. 2 to 20  $\mu\text{m}$  diameter). The advantages of microfibrinous materials over conventional packed beds are high contacting efficiency, low pressure drop, and the flexibility to be tailored to multiple applications and environments. The production of these media is done using high speed and low cost wet-lay processes which facilitate the entrapment of fine particulates.

The range of applications to be discussed in this paper includes stand-alone trace contaminant removal and PPE enhancement to help satisfy CBRN standards. When used alone, microfibrinous materials have the ability to provide greater than 5-Log filtration in a thin layer (ca. 1 mm) until 95% of the saturation capacity is attained. These materials can also be combined with conventional packed beds in what is termed a "composite bed." The composite bed synergistically combines the volume loading of the packed bed sorbent and the overall contacting efficiency of the "polishing sorbent layer," thereby eliminating the inefficiencies normally associated with the critical bed depth of the larger particle-packed bed. These materials have also been used to significantly extend the gas life of packaged gas mask canisters (i.e., 50 LPM with 3000 mg/m<sup>3</sup> DMMP) while maintaining greater than 5-Log filtration.

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**PERMEATION OF A STRAIGHT OIL METALWORKING FLUID THROUGH NITRILE GLOVES.** W. Xu, S. Que Hee, UCLA, Los Angeles, CA.

In 2000, over 10 million U.S. workers were exposed to metalworking fluids (MWFs). To minimize dermal exposure, NIOSH recommends nitrile gloves. Compared with chemical-resistant gloves, disposable gloves have worse protective properties, but provide greater dexterity and user comfort. The aim of this study was to evaluate permeation of a commercially-available MWF through both kinds of nitrile gloves. The MWF was a straight oil type. The disposable glove had a thickness of  $0.113 \pm 0.004$  mm ( $n = 8$ ), and the chemical-resistant type had a thickness of  $0.285 \pm 0.010$  mm ( $n = 12$ ), after they were conditioned overnight at room temperature and  $55 \pm 1\%$  relative humidity. The American Society for Testing and Materials (ASTM) F-739 method with an ASTM-type I-PTC-600 permeation cell was used with hexane collection for up to 10 hours at  $35 \pm 0.3^\circ\text{C}$ . Aliquots of 0.1 ml were taken every hour for analysis by gas chromatography-mass spectroscopy. After each run, the glove materials were reconditioned, and their weight and thickness changes measured. The thickness and weight of the chemical-resistant glove did not change significantly. The weight of the disposable glove also did not change significantly,

but it swelled by 3% ( $P < 0.05$ ). No MWF permeated through the chemical-resistant glove. The breakthrough time for the disposable glove was between 1.5 and 2 hours. The lag time was  $1.38 \pm 0.22$  h, and the calculated diffusion coefficient was  $(1.57 \pm 0.23) \times 10^{-5}$  cm<sup>2</sup>/h. The cumulative MWF amount in the collection solution at 2 hours was  $12 \pm 2\%$  of that at 7 hours. While the chemical-resistant glove protected from this type of MWF for at least 10 hours, the disposable glove protected for up to 1.5–2 hours. The disposable glove should be doffed at the first break, and a new pair donned after the break.

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**A CANADIAN NATIONAL STANDARD FOR OFFICIAL FIRST RESPONDER CBRN PPE.** U. Bickis, T. Beardall, Phoenix OHC Inc., Kingston, ON, Canada; E. Dickson, B. Harrison, Royal Military College of Canada, Kingston, ON, Canada.

U.S. agencies are rapidly developing standards for personal protective equipment (PPE) to be worn by first responders (FR) in terrorist-induced chemical, biological, radiological, nuclear (CBRN) events. For several reasons, these are not appropriate, on the whole, for application in Canada. A team based at the Royal Military College of Canada, in collaboration with the Standards Development Organizations CSA and CGSB, and under the auspices of the Canadian Federal CBRN Research and Technology Initiative, is developing a unique standard that is intended to be adopted by regulatory agencies in all 14 Canadian jurisdictions. In parallel, various investigations into the efficacy of existing FR PPE are being undertaken. Perhaps being driven less by litigious considerations, the Canadian standard under development does not espouse the traditional usage of IDLH, and mandates the use of *optimal* protection, considering both the demonstrable protection factors of the equipment and the performance requirements of the user. This presentation summarizes the rationale, highlights the differences, and tracks the progress of this standard.

## Podium Session 123: Computer Applications

*Papers 173–179*

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**IH SURVEYS WITH PDAS AND AN ENTERPRISED DATABASE.** B. Hroch, U.S. PHS/Indian Health Service, Window Rock, AZ; D. Buchanan, U.S. PHS/Indian Health Service, Rockville, MD.

Various industrial hygiene survey activities benefit from immediate calculations, interpretations of findings, and database storage. Survey examples include indoor air quality ventilation, hazard control ventilation, and medical radiation protection. The programs "VentSurv" and the Computerized Radiation Survey Program (CRSP) are PDA-based programs that utilize an

enterprised database and a SQL server that provide these features.

VentSurv is used to perform ventilation surveys of various health care environments including: patient isolation rooms, intensive care units, operating rooms, nitrous oxide equipped rooms, radiographic darkrooms, and laboratories. CRSP was developed to perform medical radiation protection surveys of mobile/portable X-ray equipment. Above-Table and Dental unit survey programs followed, with plans for Fluoroscopy and C-Arm programs. An additional program benefit is the relative convenience of modifying the "in-house" program by as needed due to standards, regulations, or recommended practice changes. Object Oriented programming is used to execute the program functions such as air changes per hour, half-value layer, standard deviation, and coefficient of linearity.

The program will also assist to increase survey efficiency, standardize data collection, standardize survey reporting, and allow agency-wide data analysis. The PDA will allow the surveyor to conduct surveys in a paperless format. This collection method eliminates extra steps and potential errors involved with the paper data collection process. The PDA is then synchronized with a notebook equipped with database software, where the data is then transmitted to a SQL server. This presentation will include the development environment, server synchronization, reporting, data analysis, field testing, and other possible applications. These programs were developed by United States Public Health Service Environmental Health Officers in the Indian Health Service. The opinions expressed in this abstract and presentation are those of the author(s) and do not necessarily reflect the views of the USPHS or the IHS.

## 174

**USING COMPUTER APPLICATIONS TO ENHANCE OCCUPATIONAL SAFETY AND HEALTH IN CAREER-TECHNICAL EDUCATION.** J. Palassis, NIOSH, Cincinnati, OH.

Site visits to many high schools in different states indicated the lack of a safety and health program in place and the need for such a program for schools that would be ready to organize a S&H committee, conduct hazard analysis and safety inspections, and comply with safety, health, and environmental regulations. To address these needs, NIOSH has undertaken a four-year developmental effort to organize such a program for school teachers, administrators, and even students to reduce injury risk by increasing safety and health awareness and safety education. NIOSH, in conjunction with the Environmental Occupational Health Sciences Institute of N.J., developed an occupational and environmental safety checklist program. The program contains instructions on how to establish, implement, and maintain an occupational safety, health, and environmental program within a school. The main strength of this program is its 82 safety checklists that

cover occupational and environmental hazards found at schools. The program helps the user prepare for and participate in OSHA- and EPA-type compliance inspections and identify occupational safety and health and environmental hazards and areas that need improvement. The program can be utilized by teachers and students to help them learn about government regulations pertinent to their shop and workplace. The computer-based program is free and available in CD-ROM format from NIOSH (publ. #2004-101). The program provides technical assistance, resources, and many links to OS&H websites, and guidance to ensure that the school is safe and meets compliance with occupational safety and health and environmental regulations. Almost 30,000 copies were distributed to schools and professionals, and numerous school districts have implemented it in their system.

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**DEPARTMENT OF DEFENSE OCCUPATIONAL AND ENVIRONMENTAL HEALTH READINESS SYSTEM (DOEHRs).** K. Wisniewski, S. Monk, U.S. Army CHPPM, Aberdeen Proving Ground, MD.

The Department of Defense (DoD) is a multifaceted conglomeration with a worldwide presence in over 146 countries encompassing 6000 locations, 5.3 million employees, and 30 million acres of real estate. Also, each DoD service is self governing and therefore provides industrial hygiene services differently to meet the needs of their service and comply with host nation regulations. Not surprisingly, each DoD service differs in how they apply industrial hygiene practices. Further compounding how industrial hygiene services are provided is that each DoD service has developed its own automated occupational data management system to track services provided, hazards abated, and manpower requirements.

In an effort to standardize and increase efficiency of industrial hygiene practices within the DoD military services, the DoD has developed The Department of Defense Occupational and Environmental Health Readiness System-Industrial Hygiene (DOEHRs-IH), which integrates proven practices from the Army Health Hazard Information Module, the Navy Industrial Hygiene Information Management System, the Air Force Command Core System, and the DoD Exposure Assessment Module, which is based on the American Industrial Hygiene Association's strategy for assessing and managing occupational exposures.

DOEHRs-IH will be useful in capturing, storing, and analyzing longitudinal exposure profiles of civilian and military personnel throughout their work career. DOEHRs-IH will ensure consistent and comparable data collection for DoD as it will allow development of a comparable set of metrics throughout DoD.

## 176

**A WEB-BASED TOOL FOR THE MANAGEMENT OF THE TOXICOLOGICAL RISK OF CHEMICAL MIXTURES IN WORKPLACE.** D. Drolet, F. Lemay, G. Truchon, M. Baril, IRSST, Montréal, PQ, Canada; A. Vyskocil, C. Viau, R. Tardif, D. Bégin, M. Gérin, University of Montréal, Montréal, PQ, Canada; G. Lapointe, N. Gagnon, CSST, Montréal, PQ, Canada.

Workers are commonly simultaneously exposed to multiple chemical agents. The regulation in Québec, similarly to the ACGIH<sup>®</sup> approach, prescribes that "*where two or more substances are present in the work location and where they have similar effects on the same organs of the human body, the effects of these substances are considered to be additive, unless it is established otherwise.*" This project was undertaken to develop a computer tool allowing the identification of possible interactive effects of mixtures present in the work environment. In the first phase of the project, standard general literature references were used to compile critical data such as target organs, health effects, mechanism of action, and toxicokinetic characteristics for each regulated chemical substance. The results of the first phase allow the prediction of potential additivity among components of a mixture. In the second phase, the type of interaction for mixtures most likely to be found in workplaces and for which primary literature data are available were specified. The toxicological data were evaluated only for realistic exposure concentrations up to the STEL or ceiling value or five times the 8-h TWA PEL in humans and up to 100 times the 8-h TWA PEL or ceiling value in animals. In total, 675 studies were evaluated for 209 binary mixtures of substances. For the majority of cases where potential additivity was identified in phase 1, there is a lack of supporting toxicological data in the primary literature. In these cases, the results of the first phase will be useful for prevention purposes. A Java applet computer tool (available on the IRSST website) now integrates the results from both phases of the project and allows the user to easily find if there is potential additivity or interaction among components of a mixture.

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**A COMPUTER TOOL TO "VAMPIRIZE" SOME OCCUPATIONAL HEALTH AND SAFETY WEB SITES.** D. Drolet, IRSST, Montréal, PQ, Canada; A. St-Jacques, S. Simard, Centre de santé Cloutier-du-Rivage, Trois-Rivières, PQ, Canada.

Québec regulations (RROHS) include a provision on the adjustment of permissible exposure values for chemical substances to unusual work schedules. To facilitate their application, a free computer utility was developed three years ago and made available to occupational health professionals. A regional occupational health team expressed the need to adapt this tool to some of their practices. Regional information,

with its particular needs, was added to the database supporting this file, namely the regional medical intervention thresholds (MIT), and the application of the adjustment principle to MIT for calculating an adjusted MIT as well as the RROHS standards and applicable notations.

Since much validated scientific information already exists on the Internet, we have added self-modifiable hyperlinks to the utility's Microsoft Excel<sup>®</sup> version that access the deep structure of the substance data sheets for a given website. These links are possible due to the card indexation mode on websites. With the new version of the tool, called VEMPire (the acronym "VEMP" means TWA in French), the following sites can be "vampirized:" toxicological data sheets and the danger-free maternity cards of the CSST's (Commission de la santé et de la sécurité du travail) toxicological index; INRS toxicological data sheets; International Chemical Safety Cards and the NIOSH Pocket Guide; IDLH (immediate danger to life or health) cards and specific medical tests of the Centers for Disease Control; and finally hazardous materials transportation data sheets from the Ministry of Transport of Canada. The VEMPire file, currently available on the Internet, is a constantly evolving file. It is a tool whose time has arrived . . . this free file contains no new information, with its originality based instead on the bridges that it attempts to create towards the results of the work of scientists in many countries.

## 178

**A REMOTE CONTROL SYSTEM FOR AN EIGHT-CHANNEL CASCADE IMPACTOR.** W. Liu, California State University, Northridge, CA; P. Sung, W. Hinds, J. Froines, UCLA, Los Angeles, CA.

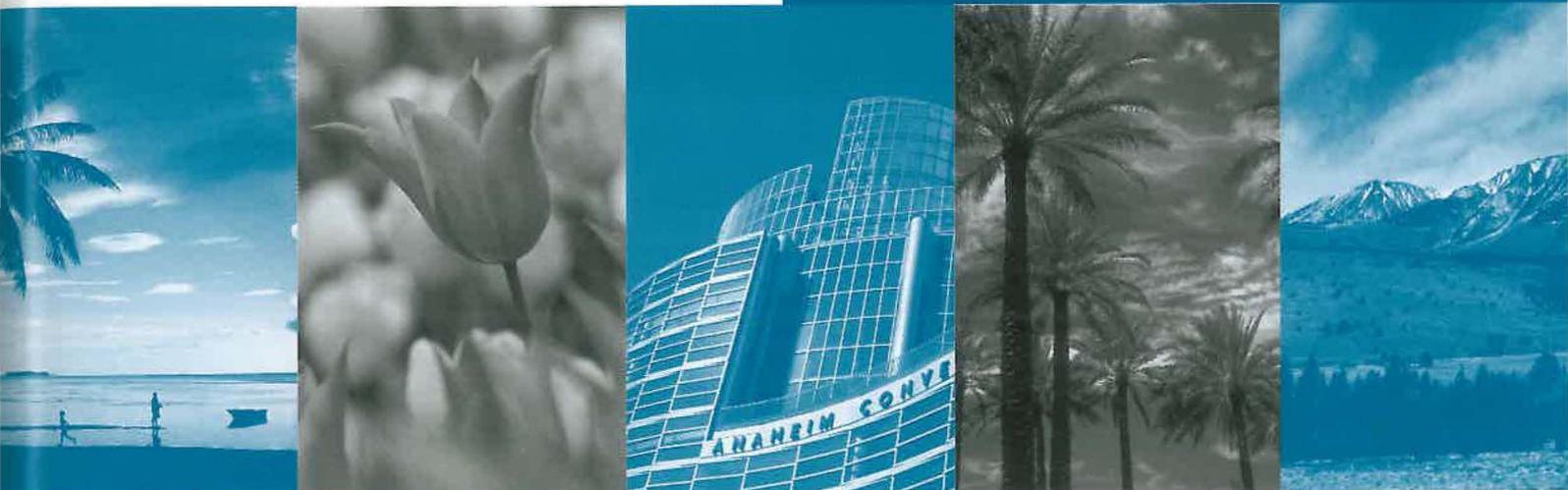
A remote control system has been developed to control a two-stage eight-channel cascade impactor. The control device consists of two computers, a signal amplification circuit board, two stepping motors, and a sampling pump. One of the computers is a PC-104 embedded computer connected to the circuit board. The motors are attached to the shafts of the two stages of the cascade impactor. The air sampling pump is connected to the second stage of the cascade impactor. This PC-104-embedded computer is programmed to receive messages from the second computer, a desktop, a laptop, or another embedded computer. Communication between these two computers can be accomplished wirelessly through either Internet or intranet.

Having obtained the information, the PC-104 computer sends control signals through a parallel printer port to the stepping motors and to the air sampling pump. The stepping motors control the sampling channel of the cascade impactor. The signal to the air sampling pump turns the pump on and off. A program stored in the PC-104 computer keeps track of the impactor channels that were used during sampling and the on and off time of the pump.

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