

Poster Session 401

Papers 230-244

Exposure Sampling and Sample Analysis

Papers 230-241

230.

NEW DESIGN CONCEPT FOR AN IMPULSE NOISE DOSIMETER. C.

Kardous, NIOSH, Cincinnati, OH.

Occupational and health professionals assume that if they operate noise dosimeters according to the manufacturers instructions, accurate and valid data will result. However, commercially available noise dosimeters do not perform properly in impulsive noise environments because they suffer from instrumentation limitations and lack metrics that characterize impulse noise. In this paper, a new design concept is proposed for an impulse noise dosimeter to address the current dosimeters' limited capabilities and to measure the various parameters that can appropriately be used to assess and evaluate exposures to impulse noise. The design concept is based on the accurate acquisition, storage, and analysis of the original impulse waveform. National Institute for Occupational Safety and Health researchers developed a prototype impulse/universal noise dosimeter that consisted of a Bruel&Kjaer 4136 microphone and a Panasonic Digital Audio Tape recorder. Data analysis was performed using MATLAB software routines to calculate equivalent and peak levels, time durations, kurtosis, energy, frequency, and octave band spectra. The prototype dosimeter was used to measure and calculate "impulse noise metrics" from small firearms at indoor firing ranges. The results demonstrated the capability of the new design to accurately measure impulse noise and evaluate its potential hazards to the auditory system.

231.

DEGRADED PERFORMANCE IN PORTABLE INSTRUMENTATION DUE TO RADIO-FREQUENCY

INTERFERENCE. R. Feldman, U.S.

DOL/OSHA, Cincinnati, OH.

Degraded performance caused by electromagnetic fields can severely alter the operation of portable industrial hygiene instrumentation. This can range from subtle deviations in readings to gross errors, alarming, and even complete shutdown of the instrument. Some primary sources of these interfering electromagnetic (EM) fields are radio-frequency fields generated by walkie-talkies, cellular telephones, broadcast antennas, motor commutators, RF heat sealers, and even the ignition system of automobiles.

This degraded performance is called electromagnetic susceptibility (EMS). As a result of a determined effort by OSHA's Cincinnati Technical Center, much has been done during

the past seventeen years to make industrial hygiene instruments less susceptible to these radio-frequency electromagnetic fields. During this time, the CTC's work has influenced many manufacturers to change their instrument designs, introduce shielding, and submit their IH instruments to testing laboratories with the purpose of making these instruments less susceptible to interfering EM fields. However, the IH instrumentation community still has much to do in addressing the EMS problem. Instrument standards are significantly lacking in addressing EMS, defining what is tolerable, and citing adequate criteria for EMS testing of IH instruments. Because of the lack of sufficient standards, many instrument manufacturers do not take EMS sufficiently into account while they are designing new instruments.

The industrial hygiene instrument community and users of industrial hygiene instrumentation can learn much from OSHA's experience and initiate steps to ensure that both national instrument standards and instrument manufacturers adequately address EMS-related problems.

232.

VOLATILE ORGANIC COMPOUNDS GENERATED FROM ARTIFICIAL BUTTER FLAVORS IN MICROWAVE POPCORN PRODUCTION. R. Boylstein,

C. Piacitelli, G. Kullman, NIOSH, Morgantown, WV; A. Grote, NIOSH, Cincinnati, OH.

Artificial butter flavors are suspected to contain the etiologic agent(s) associated with the fixed obstructive airways disease seen among microwave popcorn workers. Inhalation toxicological studies have shown severe respiratory effects in rats exposed to artificial butter flavor. We investigated the volatile organic components from flavorings manufactured by several companies to gain a better understanding of worker exposures as a basis for control and prevention.

Bulk samples of 13 different artificial butter flavors were collected from four different microwave popcorn facilities. These bulk samples were heated to approximately 50°C and the emissions were analyzed by gas chromatography with a mass selective detector. The flavorings were found to contain a complex mixture of over 150 different volatile organic compounds. Diacetyl, a known respiratory irritant, is a significant component in most artificial butter flavors and was detected in all of the flavor samples analyzed. Predominant compounds found in these samples included diacetyl, acetoin, and butyric acid. The complexity of these flavoring agents impedes the identification of an etiologic agent(s) for fixed airways obstruction and substitution control efforts. Administrative, engineering, and personal protective controls are recommended for worker protection at microwave popcorn plants and other facilities using heated, artificial butter flavorings.

233.

SIDE-BY-SIDE EVALUATION OF A SEQUENCE OF INHALABLE AND RESPIRABLE DUST SAMPLING

DEVICES. C. Dowell, W. Carter, The University of Findlay, Findlay, OH.

American and International size-selective dust sampling criteria devices have been established for aerosol sampling devices. Manufacturers have developed and tested in laboratory conditions dust sampling devices that are 100% efficient for particles in all fractions of the dust size distribution. The criteria. The ability to correctly identify the fractional concentration they were designed to sample. Sampling and analysis were conducted according to NIOSH criteria. The results. I used as a basis for control and particle size distribution analyses of bulk samples of the dust were conducted. The air sample results were compared to calculated fractional percentages of the arena bulk dust samples. Respirable dust sampling devices were found to significantly understate the fractional concentration when compared to the calculated fractional percentage of the bulk dust sample. Inhalable sampling devices met the expected fractions, within the 95 percent confidence interval, when compared to the calculated fractional percentage. However the devices did show tendencies to under or over report the particle concentrations at the 90 percent confidence interval. The ability to correctly sample the fractional concentration decreases as the particle sizes decrease as a result of confounding factors. The study identified some confounding factors that may prevent the theoretical representative fractions from being properly sampled in the field.

234.

PORTABLE MINI-CHAMBER FOR SIDE-BY-SIDE COMPARISON OF ACTIVE

AND PASSIVE SAMPLERS. C. Manning, F. Posey, Assay Technology Inc., Pleasanton, CA.

Diffusive samplers, cost-effective and convenient, are desirable in air-sampling applications provided evaluation testing has been conducted. Standard evaluation parameters (ANSI/ISEA 104-1998, ASTM D6246, and EN838), while rigorous, assess sampler performance under laboratory conditions and may not anticipate challenges posed by field conditions. Thus, ANSI/ISEA 104-1998 states: "...confirmation of sampler performance under field conditions is desirable when there is a likelihood that environmental factors not studied (in the laboratory) may be encountered..." From a scientific point of view, direct comparison of methods exposed to identical air samples under actual field conditions would have higher validity (at lower cost) than lab evaluation were it not for the difficulty of obtaining "identical air samples." Those performing field

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