of this work were supported by the U.S. EPA Interagency Agreement DW75921973-01-0.]

11:00

3aNS8. Measuring, rating, and comparing the real ear attenuation at threshold of four earplugs. William J. Murphy, Mark R. Stephenson, and David C. Byrne (Hearing Loss Prevention Team, NIOSH, 4676 Columbia Parkway MS C-27, Cincinnati, OH 45226-1998, wjm4@cdc.gov)

The effect of training instruction, whether presented as the manufacturer's printed instructions, a short video training session, specific to the product, or as a one-on-one training session, was evaluated using four hearing protection devices with eight groups of subjects. The Howard Leight Fusion and Airsoft premolded earplugs and the Moldex PuraFit and EAR Classic foam earplugs were tested. Naïve subjects were recruited and tested using three different forms of training: written, video, and individual training. The differences between group averages for A-weighted attenuation were not statistically significant when compared between the video or the written instruction conditions, regardless of presentation order. The experimenter-trained A-weighted attenuations were significantly greater than the written and video instruction for most of the protectors and groups. For each earplug, the noise reduction statistic for A-weighting (NRSA) and the associated confidence intervals were calculated for the 90th and 10th percentiles of protection. Across subject groups for each protector, the differences between NRSA ratings were found to be not statistically significant. Several comparisons evaluating the order of testing, the type of testing, and statistical tests of the performance across the groups are presented. [Portions of this work were supported by the U.S. EPA Interagency Agreement DW75921973-01-0.]

11:15

3aNS9. ANSI S12.42-2010 measurements of impulse peak insertion loss for passive hearing protectors. Kevin Michael (Michael & Assoc., Inc., 2766 W. College Ave., St. 1, State College, PA 16801, kevin@michaelassociates.com) and Jeff G. Schmitt (ViAcoust., Austin, TX 78745)

Until recently, a standardized measurement procedure to determine peak insertion loss for hearing protectors was not available. This has led to confusion and uncertainty for hearing protector users who commonly use the devices in impulse noise, such as gunfire. Released in 2010, ANSI S12.42-2010 defines a test method and analysis procedure for measuring hearing protector impulse peak insertion loss. The required test fixture has recently become commercially available and laboratories are gaining experience making these measurements. Impulse peak insertion loss data will be presented for a variety of hearing protector types along with a description of the measurement procedure.

11:30

3aNS10. Real-ear attenuation of custom-fit earplugs with the communications earplug (CEP). Elmaree Gordon and Efrem R. Reeves (USAARL, Acoust. Branch, 6901 Farrel Rd., P.O. Box 620577, Fort Rucker, AL 36362-0577, elmaree.gordon@us.army.mil)

Hearing loss is one of the most common occupational injuries in the Department of Defense. One reason is limited access to adequate hearing protection during combat operations. Even if traditional pre-formed foam earplugs are used during combat, approximately 15% of the military population remains unprotected because the pre-formed earplugs do not adequately fit extremely small ear canals, extremely large ear canals, or ear canals with sharp turns. Custom-fit earplugs provide a potential solution for this hard-to-fit population. However, producing traditional wax-dipped custom-fit earplugs in a combat environment is not always practical. Fortunately, methodology exists to scan ear impressions to create a digital data set, transmit this data to a remote manufacturer via the Internet, and fabricate a set of custom-fit earplugs. The purpose of this study was to investigate how the attenuation provided by custom-fit earplugs created using the digital scanning technique compares to the attenuation provided by custom-fit earplugs created using the traditional wax-dipped technique when used with the CEP. Results show the digitally scanned custom-fit earplugs provide significantly poorer attenuation than the traditional wax-dipped custom-fit earplugs. Comply Canal Tip foam earplugs were also evaluated and shown to provide significantly greater attenuation than custom-fit earplugs manufactured by either method.

11:45

3aNS11. Noise surveys and hearing protection at the Royal Canadian Mint plant. (Jimmy) Jianping Yan (Corporate Eng., Royal Canadian Mint, 320 Sussex Dr., Ottawa, ON, K1A 0G8, Canada)

Royal Canadian Mint is a Crown Corporation to produce circulation and non-circulation coins for Canada and other countries. Noise measurements have been conducted regularly for production environment and before any new equipment operation in Royal Canadian Mint, and to protect our employee from hearing loss is one of our health and safety issues applied in whole plant. The formula used in the noise measurement is introduced in this paper, and the noise calculations are also discussed for the continuous noise sources, intermittent noise sources, and the combinations of individual noise sources. Some noise survey results are listed and analyzed, and the related hearing protective methods in our plant are also described.

WEDNESDAY MORNING, 2 NOVEMBER 2011 ROYAL PALM 3/4, 7:45 A.M. TO 12:00 NOON

Session 3aPA

Physical Acoustics: Theoretical and Computational Advances

Bonnie Schnitta, Chair
SoundSense, LLC, 46 Newtown Ln., Ste. 1, East Hampton, NY 11937

Contributed Papers

7:45

3aPA1. Formulation and applications of an integral-equation approach for solving scattering problems involving an object consisting of a set of piecewise homogeneous material regions. Elizabeth Bleszynski, Marek Bleszynski, and Thomas Jaroszewicz (Monopole Res., 739 Calle Sequoia, Thousand Oaks, CA 91360)

The paper presents the formulation and selected applications of the surface integral equation approach for finding pressure, displacement, and traction fields in a complex object consisting of a set of piece-wise homogeneous regions characterized by different Lame' material parameters. Representative applications of the approach are presented, which involve finding pressure field distribution inside human inner ear treated as an inclusion embedded in the surrounding inhomogeneous material. (the embedding region is treated with volumetric integral equations with suitable coupling to the inclusion). The method uses a set of coupled elastodynamics integral equations for two unknown fields: displacement and traction at each interface, which allow us to find displacement and traction field distribution inside a