Abstract Book

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May 21-26, 2016 → AIHce2016.org

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have not been obvious using typical testing techniques.

Lessons learned: The use of DQO processes in siting NRT or Real Time air monitors provides for optimal placement in the protection of workers needing immediate notification of potential exposures.

P0122
Breathe Easier: Something for Everyone
Thursday, May 26, 2016, 8:00 AM - 11:00 AM

SR-122-01
Respirator Probe Bias Evaluation Using the Advanced Headform Respirator Test System
M. Bergman, A. Rizor, E. Brochu, Z. Lei, and Z. Zhuang, CDC/NIOSH/NPPTL, Pittsburgh, PA

Objective: Our lab has successfully used advanced manikin headforms in several studies to simulate respirator fit on humans. However, sampling probes may yield biased measurements due to imperfect mixing of test agents or streamlining within a respirator. This study used advanced headforms under different test conditions to evaluate factors that affect respirator probe bias in filtering facepiece respirators (FFR) and elastomeric half-mask respirators (EHR).

Methods: Three N95 FFR models, one P100 FFR model, and one P100 EHR model were tested on two sizes of static headforms (medium and large) connected to a breathing simulator. Respirators were probed with a flush probe. Three samples of each model were tested. Sodium chloride aerosol was used as the challenge agent. Two PortaCount® units (model: 8038+; TSI, Inc.) were used to measure manikin fit factor (FF_{man}) of the respirator (mask location) and FF_{man} at a location directly downstream of the headform (reference location). Three test conditions were evaluated: 1) cyclic breathing only (CB); 2) cyclic breathing with heated/humidified exhaled air (100% RH, 34.5 ± 2 C) (H1); and 3) cyclic breathing with heated/humidified exhaled air and heated PortaCount sample lines to reduced humidity condensation (H2). Each test condition was conducted at two different minute ventilations (25 and 40 L/min), each for one minute. Analysis of variance (ANOVA) was used to test independent variables (HF (i.e., headform size), CONDITION, FLOWRATE, CLASS (i.e., N95 or P100), and STYLE (i.e., FFR or EHR) and their interactions for significant effects on probe bias. Duncan's Multiple Range Test was used to test significant differences in mean probe bias for each independent variable.

Results: Significant ($P < 0.05$) variables and interactions were: CLASS, STYLE, CONDITION, HF*STYLE, CONDITION*STYLE, and CONDITION*CLASS. The mean bias for the condition CB (1.2%) was significantly different than H2 and H1 which were 3.2% and 3.6%, respectively. The significantly different mean biases for CLASS were -2.1% and 5.8% for P100 and N95 classes, respectively. The significantly different mean biases for STYLE were -0.1% and 3.5% for EHR and FFR styles, respectively.

Conclusions: The test procedures evaluated show small probe bias (< 4%) and may be considered as candidates for developing standardized test methods using advanced headforms.

SR-122-02
Field of View Respirator Certification Standards Comparison
K. Coyne, US Army, Aberdeen Proving Ground, MD

Objective: Visual field may be decreased while wearing an air-purifying respirator (APR). The United States' National Institute for Occupational Safety and Health (NIOSH), the European Standard (EN136), and a committee draft (CD) International Standards Organization (ISO) method use the same equipment to assess visual field, but each analyzes the results differently. NIOSH uses a Visual Field Score grid with 110 points along 10 meridians. NIOSH requires a minimum Visual Field Score (VFS) of 90 to pass certification for commercial chemical, biological, radiological, and nuclear (CBRN) APRs. The CD ISO standard adds 8 additional points to the NIOSH VFS grid and requires that 96 of those points be within the peripheral isopter. Additionally, this draft standard identifies the four points on the 85° meridian as critical points and requires that a minimum of two critical points be included in the visual field. For EN 136, the effective field of vision and effective overlapped field of vision are expressed as a percentage of the natural field of vision and overlapped field of vision, respectively. A passing score requires an effective field of vision greater than or equal to 70% and an overlapped field of vision of 80%. The goal of this effort was to assess and compare the visual field of eleven NIOSH certified CBRN APRs using the NIOSH, EN 136, and CD ISO standards.

Methods: Each respirator was mounted on the headform that accompanies the apertometer and the headform placed in position. The eye lights were illuminated and the shadow on the apertometer was checked to ensure that it was symmetric about the origin. The outline of the shadow on the apertometer was recorded and the field of view was determined according to each method. The overall score for a respirator was determined by averaging the scores for three separate fittings of each respirator.

Results: As expected, all respirators exceeded the NIOSH minimum. Three respirators failed the CD ISO standard due to the fact that less than two of the critical points were within the peripheral limits. Two of these respirators had dual eye lenses. These three respirators also failed the EN136 standard as did one additional respirator. The additional respirator had a single lens.

Conclusions: A respirator that passes the NIOSH standardized test may not pass the CD ISO or EN 136 standards. The EN 136 standard was the most stringent of the three certification standards.

CS-122-03
Comparison of Methods Suggested in 29CFR1910.134 for Determining Change Schedules for Air Purifying Respirators
G. Wood, Consultant, Los Alamos, NM; C. Manning, Assay Technology, Livermore, CA

Situation/Problem: An employer desires to use an air-purifying respirator (APR) to protect workers against organic vapors,