

## RESPIRATOR ARTICLE ABSTRACTS

We review the articles published in the American Industrial Hygiene Association Journal and the Applied Occupational and Environmental Hygiene Journal for information that is applicable to the field of respiratory protection; we then publish abstracts of these articles. We appreciate the cooperation of the American Industrial Hygiene Association and the American Conference of Governmental Hygienists in allowing us to do this.—Ed.

"A Lightweight Ambient Air-Cooling Unit for Use in Hazardous Environments," by Yasu Tai Chen, Stefan H. Constable, and Susan H. Bomalaski, *AIHA Journal*, January 58: 10–14, 1997

Recent research demonstrated (a) the effectiveness of intermittent conditioned air cooling during rest breaks to significantly reduce cumulative heat storage and (b) that longer work sessions were possible for individuals wearing chemical defense ensembles. To further advance this concept, a strategy for implementing continuous air cooling was conceived; ambient air cooling was added during work cycles and conditioned air cooling was delivered during rest periods. A compact battery-powered **beltpack** cooling unit (3.9 kg) designed and made at the U.S. Air Force Armstrong Laboratory was used to deliver 5.7 L/sec filtered ambient air during work cycles: 4.7 L/sec to the body and 1 L/sec to the face. Five experimental cycles were conducted in a thermally controlled chamber under warm conditions (32°C, 40% relative humidity) with (1) no cooling-intermittent work, (2) intermittent cooling, (3) continuous cooling during intermittent exercise, (4) no cooling-continuous work, and (5) ambient air cooling during continuous exercise. Intermittent, conditioned, and continuous air cooling resulted in significant reductions in rectal temperature, mean skin temperature, and heart rate as compared with the no-cooling trials. The continuous air-cooling trial significantly improved thermal comfort and sweat evaporation. Results suggest that ambient air delivered during work cycles by a lightweight portable unit (in conjunction with conditioned air delivered during rest periods), can definitely improve personal comfort, reduce skin temperature, and decrease the cumulative fatigue common to repeated work/rest cycles in selected military and industrial applications in which individuals work in chemical defense ensembles.

"Cognitive Performance During Long-Term Respirator Wear While at Rest," by David M. Caretti, *AIHA Journal*, February 58: 105–109, 1997

Cognitive performance was studied in six male and three female subjects exposed to two randomly administered 10-hour measurement periods, a control condition without a **respirator**, and a respirator wear trial requiring continuous wear, under nonexercise conditions. Reaction time and decision-making speed were assessed using a series of simple and choice reaction time tasks at the start of each test iteration and after hours 2, 4, 6, 8, and 10 of testing. Subject anxiety levels were assessed along with reaction time measures. Visual tracking ability was measured after each hour of testing. Reaction time and decision-making speed did not differ significantly between control and respirator conditions at any time throughout the 10 hours of testing. Female volunteers exhibited significantly faster reaction times and decision-making speeds than males independent of respirator wear conditions and time of measurement. Subject anxiety increased significantly from initial measurements after 8 hours of testing for each condition, but no differences were observed between conditions at any time. Respirator wear did not detrimentally influence visual tracking ability. These findings suggest that respirator wear over a relatively long time period under nonexercise conditions should not significantly inhibit cognitive function.

**"An Evaluation of Respirator Maintenance Requirements,"** by Lisa M. Brosseau and Kris Traubel, *AIHA Journal*, February 58: 116–120, 1997

A telephone survey was developed as part of a pilot study to evaluate the inspection, cleaning, maintenance, and storage aspects of respiratory protection programs (RPP). Regulations and consensus standards such as those published by the Occupational Safety and Health Administration in the *Code of Federal Regulations* (CFR) or the American National Standards Institute (ANSI) require or recommend that RPP contain elements that ensure respirators provide proper protection. A great deal of research has been done to evaluate the effectiveness of new respirators; however, little research has been conducted to evaluate how respirators behave over time in real industrial settings. Respirator inspection, cleaning, maintenance, and storage are significant factors in determining how well a respirator continues to perform. The telephone survey was developed by reviewing the requirements and recommendations of CFR 1910.134 and ANSI Z88.2-1980. Approximately 30 companies were selected based on their use of negative air-purifying respirators. Most of the companies represented the hardgoods manufacturing or service industries. Although the majority of companies were meeting requirements, responses indicated that the following improvements in RPP were necessary: (1) inspection of all respirator parts should be carried out before and after each use, (2) replacement parts should be made readily available on site, (3) regular cleaning should be performed, and (4) more hands-on practice with respirators and their maintenance should be incorporated into training sessions.

**"Quantitative Fit Testing Techniques and Regulations for Tight-Fitting Respirators: Current Methods Measuring Aerosol or Air Leakage, and New Developments,"** by Don-Hee Han, Klaus Willeke, and Craig E. Colton, *AIHA Journal*, March 58: 219–228, 1997

Until a few years ago, only two quantitative fit testing (QNFT) techniques were available and accepted by U.S. Occupational Safety and Health Administration (OSHA) regulations. In the 1980s and 1990s, several new and fundamentally different QNFT methods were developed. Two of the newer methods are commercially available and are accepted by OSHA as suitable alternatives. In this article the principles of operation of the OSHA-accepted and of some newly developed but not yet approved QNFT techniques are explained, and each technique's major advantages and disadvantages are pointed out. Emphasis is given to negative-pressure air-purifying respirators, as they are in most frequent use today. The requirements and recommendations for fit testing positive-pressure respirators are discussed as well. Finally, the presently available QNFT standards and regulations are summarized to assist the user in making fit testing decisions.