

RESPIRATOR ARTICLE ABSTRACTS

We review the articles published in the American Industrial Hygiene Association Journal (*AIHJ*) 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.

"The Effect of Evaporative Cooling of Respiratory Protective Devices on Skin Temperature, Thermal Sensation, and Comfort," by S. H. Fox and A. B. DuBois, *American Industrial Hygiene Association Journal*, December, 54(12):705-710, 1993.

The high skin temperature of the face is a major source of discomfort while wearing respiratory protective devices. In this paper theoretical considerations of thermal exchange between the face and the environment with and without a mask are discussed to elucidate factors that may improve the design of masks to increase their acceptability. Comfort thresholds have been related to skin temperature for both resting and exercising subjects. Skin temperatures below 34.5°C at rest, and 31°C during exercise, are rated as comfortable. A previous study determined that evaporative cooling could reduce skin temperature and decrease discomfort in a dummy mask. In the present study, evaporative cooling of a more sophisticated dummy mask and a modified Scott model 66 twin-cartridge respirator was tested in resting and exercising subjects. Skin temperature was significantly reduced when wet felt covered the surface of both masks, and at rest, the masks were rated as significantly more comfortable than with dry felt on the outer surface. It is concluded that evaporative cooling of an existing face mask can reduce skin temperature to the comfort threshold in resting subjects. Data suggests that similar results are attainable for exercising subjects.

"The Effect of Respirator Dead Space and Lung Retention on Exposure Estimates," by William C. Hinds and Peter Bellin, *American Industrial Hygiene Association Journal*, December, 54(12):711-722, 1993.

This paper develops, tests, and applies equations that predict the magnitude of the effect of lung retention and respirator dead space on average inhalation concentration and other related quantities. The equations were validated by numerical simulation and experimental measurement with a respirator on a mannequin connected to a breathing machine. Experimental data are presented verifying the applicability of the equations. The authors present applications of the equations and procedures to various types of respirator performance measurements and to a predictive respirator performance model. Graphs are presented giving correction factors. In all cases the correction factors are less than 2. Under typical conditions of workplace protection factor measurement with half-mask respirators, average inhalation concentration will be 105% to 125% of full-cycle average concentration.

"Respirator Mask Design Modules and Their Interactions," by Arthur T. Johnson and Corey M. Grove, *American Industrial Hygiene Association Journal*, December, 54(12):749-751, 1993.

The respirator performance rating table (PRT) has been offered as a way to organize physiological information to be useful for mask design. Designers do not usually deal exclusively with one kind or another of mask physiological effect. This paper presents normal mask design modules and how they relate to mask physiological effects as given in the PRT.

"Estimating Service Lives of Organic Vapor Cartridges," by Gerry O. Wood, *American Industrial Hygiene Association Journal*, January, 55(1):11-15, 1994.

Procedures were developed for estimating service lives of air-purifying organic vapor respirator cartridges, including methods for untested compounds and use conditions (concentration, temperature, and airflow rate). Correlations of adsorption capacities and adsorption-rate coefficients based on equilibrium and breakthrough curve data were reviewed. These correlations were combined using the Reaction Kinetic (modified Wheeler) equation to estimate breakthrough times. The proposed estimation procedure showed 95% confidence intervals up to +50% when no breakthrough data were assumed. It is shown how even limited breakthrough curve data for one vapor/carbon combination can be used to substantially improve the accuracy of the estimation. Only dry conditions (below 50% relative humidity) have been considered so far.

