
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 which is applicable to the field of respiratory protection and 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.

"Validation of a Quantitative Fit Test for Dust/Fume/Mist Respirators: Part I" by S.G. Iverson, S.G. Danisch, H.E. Mullins, and S.K. Rudolph, *Applied Occupational and Environmental Hygiene*, March, 7(3):161–167, 1992

A test for quantitative fit testing of dust/mist and dust/fume/mist respirators has been developed. Currently, respirators with filters of these approval classes have to be modified so they resemble HEPA respirators before quantitative fit testing can be done. With the developed test, such modification is unnecessary. The test uses an aerosol which reduces filter penetration through the respirators while allowing leaks through the face seal to be detected and measured.

Comparisons are made with the Dynatech Frontier Model 264 quantitative fit test for a mannequin and for humans. Although the new test may be used with standard dust/mist respirators, surrogate respirators manufactured specifically for fit testing were used for comparison with the more traditional fit test. Corn oil and di-(2-ethylhexyl) phthalate (DEHP) aerosol challenges were employed in the study. Results show that the fit factors (representing face seal leakage) measured by the new test correlate well with the fit factors measured by the more traditional fit test.

"A Quantitative Fit Test for Dust/Fume/Mist Respirators: Part II" by S.G. Danisch, H.E. Mullins, and C.R. Rhoe, *Applied Occupational and Environmental Hygiene*, April, 7(4):241–245, 1992

Fit testing is an important aspect of any respiratory protection program. In the past, the only accepted method of fit testing respirators equipped with dust/mist filters was the saccharin qualitative fit test. Traditional quantitative fit testing requires respirators to be equipped with high-efficiency filters because of the small particle size used. Dust/mist respirators, including disposable models, can now be quantitatively fit tested without filter modification. This is possible through the use of a challenge aerosol having particles large enough that they do not significantly penetrate filter media, but small enough to penetrate face seal leaks. Consequently, detection of particles that enter the respirator cavity provides a quantitative indication of face seal leakage.

The purpose of this article is to compare results from saccharin qualitative fit testing with results from the new, large-particle, quantitative fit tests. The study evaluated four commercially available National Institute for Occupational Safety and Health/Mine Safety and Health Administration-approved dust/mist respirators. The results verify the importance of fit testing in general and demonstrate that the large-particle, quantitative face fit test and the saccharin qualitative fit test are both effective methods for fit testing dust/mist respirators.

"Method Development for Measuring Respirator Exhalation Valve Leakage" by S. Brueck, M. Lehtimäki, U. Krishnan, and K. Willeke, *Applied Occupational and Environmental Hygiene*, March, 7(3): 174–179, 1992

The wearing of respirators is an important means of protecting workers from excessive exposure to air contaminants. A properly functioning exhalation valve is crucial for an effective respirator. A fast "Respirator Integrity Test" was developed to be used as a quality assurance test before field use of a respirator. The purpose of the test is to assure that no leakage occurs through the exhalation valve nor any other potential leak source in the respirator, such as the seal between the respirator body and the air purifying cartridges. If a leak does occur through the respirator, its most likely cause appears to be the exhalation valve. Therefore, the new test method has been compared to a direct "Exhalation Valve Test." Exhalation valve leakage was measured in both new valves and field-used valves. Leakage through new valves was minimal in most cases, but one brand of new valves was found to leak significantly. Five percent of 67 field-used exhalation valves tested had unsatisfactory leakages, indicating that dust or debris on the exhalation valve or valve seat may compromise the proper functioning of the valves. The cleaning of both new and field-used exhalation valves with water caused leakage to decrease significantly, thus supporting the importance of a good respiratory cleaning program for industries.

"Breakthrough Time and Adsorption Capacity of Respirator Cartridges" by H.Y. Young and J.H. Nelson, *American Industrial Hygiene Association Journal*, May, 53(5):303-316, 1992

A model developed in previous studies was applied to investigate the respirator cartridge contaminant breakthrough of 121 different chemical compounds. Included in this set of 121 contaminants are representative examples of various types of organic compounds, (e.g., acetates, ketones, aromatics, alcohols, amines, alkanes, chlorinated hydrocarbons). Intrinsic to the model are two important parameters, k' (a rate constant) and t (50% breakthrough time). Values of the two parameters pertinent to an assault concentration of 1000 ppm were determined for each of the 121 organic compounds. These values were used to calculate the breakthrough time at specified fractional breakthrough as well as the respirator cartridge loading capacity under various conditions. An approach was presented that permits the determination of contaminant loading capacity (on carbon) as a function of breakthrough time at a specified assault concentration. The effect of contaminant assault concentration on the saturation capacity was investigated for various combinations of nine different compounds and three different types of respirator cartridges. Calculated saturation capacity data derived from application of the model compare favorably ($\pm 5\%$) with corresponding experimental data. Saturation capacities calculated by using the model addressed in this study were compared with corresponding results previously calculated by others using Dubinin adsorption isotherm