PERFORMANCE OF BREATH-SYNCHRONISED, POWERED, AIR-PURIFYING RESPIRATOR UNDER SIMULATED USAGE CONDITIONS

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Certification tests for Powered Air-Purifying Respirators (PAPR) evaluate respirators according to a limited number of criteria which may not include actual usage criteria such as comfort cost and ease of wear. More extensive evaluations have been performed on two types of PAPRs under simulated workplace conditions: Breath-synchronized PAPRs (BS-PAPR) were compared to conventional constant-flow PAPRs (CF-PAPR) in a welding fume environment where their airflow rates total inward leakage and maximum operating times were measured. The BS-PAPRs have an electronically controlled mechanism that synchronizes the fan s airflow rate with the wearer s breathing rate. These recently developed PAPRs mitigate several problems of conventional PAPRs that are due to the conventional PAPRs high constant flow rate supply: high exhalation resistance frequent filter replacement and the need for a heavy battery. During the tests a newly developed breathing machine simulated the inhalation and exhalation flows of individual welding workers whose breathing patterns were determined in a manufacturing facility for heavy machinery. While the total inward leakage of the BS-PAPRs was very low similar to that of CF-PAPRs the test data prove that BS-PAPRs use substantially less total airflow thus extending the service life of the battery and filter by several times relative to the CF-PAPRs. This results in increased breathing comfort while providing high respiratory protection through use of a lightweight battery and a filter that is replaced infrequently.