

Unexpected Results Obtained During Hydrogen Cyanide and Cyanogen Chloride Testing of Military Carbons

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In order to assess accurately the performance of respirator canisters with hydrogen cyanide [HCN] and cyanogen chloride [CICN], it is necessary to understand how the usage conditions affect filter performance. Ultimately, testing should be carried out under conditions that challenge filter performance most severely, that is, the conditions that result in the least amount of protection to a user. It has been generally accepted that the test protocols in carbon and filter canister performance specifications represent such “worst-case” conditions.

To gain a better understanding of the mechanisms involved in the removal of HCN and CICN, complete breakthrough curves have been experimentally measured wherever possible for several Whetlerite carbons (ASC, ASC/TEDA, ASZM, ASZM/TEDA) for both of these gases under different conditions of pre-humidification and test humidity. Analysis of the experimental breakthrough data showed unexpected results for both gases, to the effect that historically accepted “worst-case” conditions of high humidity level pre-equilibration and testing are not the most challenging by any means. Relatively rapid breakthrough was observed for certain carbons under dry conditions. These results have significant implications in filter design, user guidelines, establishing test methods and interpreting the results. A hypothesis to explain the observations is being developed.