

Gas Mask Protection Factor Measurements and Limitations**Brian Harrison and Septimus Liang**

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ABSTRACT

The measurement of protection factors for military respirators, and negative pressure respirators used by First Responders to protect against chemical, biological, or radiological weapons involved in a terrorist attack, require instrumentation that can measure protection factors in the range of 10-50,000. For many years corn oil aerosol chambers have been used to accomplish this. More recently, TSI PortacountsTM are becoming common place in many facilities, and are being used for these measurements. We have found that Portacounts can give quite different results than a corn oil chamber and have investigated the reasons why this occurs. By eliminating the penetration that occurs by normal leakage paths (face-seal, canister, and outlet valve), we have been able to quantify the number of particles that are exhaled by the test subjects during activities such as normal breathing (NB), deep breathing (DB) and talking (T). As the number of exhaled particles is different individually and for the three exercises mentioned above, it is not a simple exercise to obtain a "true" Portacount protection factor after subtracting these exhaled particles. Thus, comparison of these results with the protection factor obtained via the corn oil chambers cannot be made. We have also found that a period where the subject clears his/her lungs before the measurement is important and have looked at the importance of increasing the challenge dust concentration to minimize errors. Furthermore, we have found that talking (e.g. reciting the Rainbow Passage) produces exhaled particles that can significantly affect the protection factor measurement and are recommending it be removed from the test protocol when a Portacount is used in the measurement. The results of this project have been a series of recommendations to the Canadian Forces and the Canadian First Responder Community on the correct use of a Portacount.