The Development of a Methodology to Measure Simulated Workplace Protection for High Performance Military Respirators

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This paper describes the development of a methodology to monitor the simulated workplace protection for military respirators. The measurements of the protection offered by high performance respirators for military use are a complex matter. The protection requirements are more severe than for civilian respirators and therefore a very sensitive method is needed.

A man-mountable evaluation system is used to collect the measured data. The system is equipped with two detectors based on the Condensation Nuclei Counter (CNC) technology to measure real-time in-mask and ambient aerosol concentrations. To achieve a high sensitivity of the method a challenge of Shell Ondina oil aerosol is generated from Laskin aerosol generators. Since the CNC instrument must be operated in the dynamic range of the detector a passive dilution stage has been connected to the ambient sampling detector. In addition to protection data, the system is capable of recording (i) movement of the head/respirator in the *x, y* and *z* planes, (ii) internal respirator pressure, (iii) audio and video data and (iv) subject position (GPS). The different sensors are connected to the respirator and helmet assembly and the CNC instrument and the data logging system is fitted inside a rucksack.

In line with the development of the methodology, effort has been given to develop a Standard Military Protocol (SMP) involving laboratory and military activities. The SMP is performed by test persons in a high aerosol challenge inside a shelter and is designed to stress the respirator in different ways e.g. equipment compatibility, elevated work rates etc. Macros to analyse the data is able to break up the SMP in order to calculate the protection for each specific exercise.