Development and use of an anthropomorphic headform with realistic simulated breathing patterns for standardized evaluation of respiratory protective devices

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Humans are the best test platform for measuring protection from a respiratory protective device (RPD) when performance in use is to be understood. However, variations in facial shape and breathing rates make it difficult to measure consistent performance parameters when setting standards or evaluating modifications to RPD design. Anthropomorphic headforms of various shapes and sizes with realistic breathing patterns could permit the simulation of aspects of respirator protection performance, without requiring the use of human subjects and with greater parameter control. Anthropometric headforms based on human scans were designed using the five facial size classifications obtained from the NIOSH/ISO Principal Component Analysis respirator test panel [ISO/TS 16976-2:2010(E)]. A process was used to produce five headforms that had the approximate pliability of human skin surface and underlying features. The breathing parameters taken from an ISO standard were used to create breathing waveforms at different work classes [ISO/TS 16976-1:2007(E)]. The application of the headforms to a variety of standardized evaluations has been demonstrated, and the presentation will discuss the benefits of their use.