

Sweating Manikin Testing of a Cooling System for Level-A Hazmat Suits

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First responders frequently wear Level-A Hazmat suits when responding to chemical emergencies (Figure 1). These suits protect the first responder by completely sealing the wearer against external vapors and liquids. Because the suits are sealed, breathing air is supplied from a self-contained breathing apparatus (SCBA). In total, the SCBA/impermeable suit provides contaminant free air and a barrier to the chemical hazard. However, because it is sealed, the environment inside the suit quickly becomes very hot and humid, and since a first responder can be in the suit from 30-60 min, overheating can lead to heat exhaustion or heat stroke. In addition, perspiration condenses on the inside of the faceplate obscuring vision.

TDA Research, Inc. (TDA) has developed a lightweight, portable cooling system for Level-A Hazmat suits that bathes the occupant in cooled, dehumidified air. The device uses a heat exchanger to transfer heat from the inside of the suit to the dirty external environment while keeping the clean and contaminated air separate. Dry (~15% RH) clean air is cooled to about 85°F and circulated around the first responder using tubing inside the suit. The natural, self-regulating mechanism of sweat evaporation cools the occupant. We have recently completed a test with our first cooling system prototype with a sweating manikin at NIOSH and are refining the design of the cooler and air distribution system based on those results (Figure 2). The second series of testing with NIOSH is scheduled for September, 2014. We are also working with a Hazmat suit manufacturer to commercialize the technology.



Figure 1. Sweating manikin testing of TDA's Hazmat suit cooling device at NIOSH

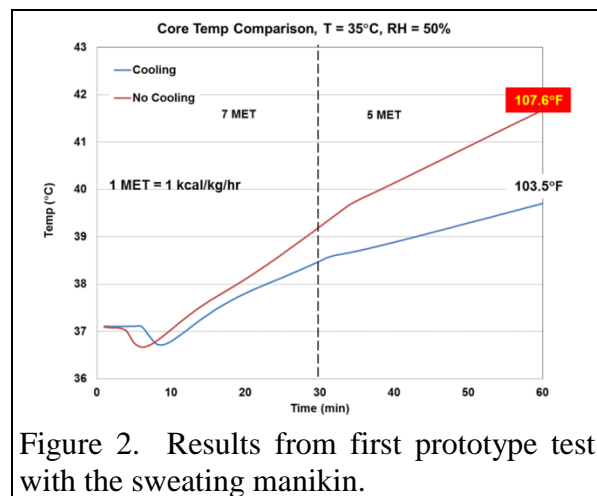


Figure 2. Results from first prototype test with the sweating manikin.