

Cooling System for Level A Hazmat Suits

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When responding to a chemical spill or other hazardous cleanup operation, first responders must frequently wear a level A hazardous materials suit. These suits protect the first responder from chemical exposure by completely sealing the wearer against external vapors and liquids. Because the suits are sealed, a fresh air supply is required which is typically provided by a self-contained breathing apparatus (SCBA). In total, the SCBA/impermeable suit provides contaminant free air and a barrier to the chemical hazard. Unfortunately, because the suits are sealed, they quickly get very hot and humid. Given the fact that a first responder can be in the suit from 30-60 min, overheating is not just a source of discomfort, but is a real hazard to the health of the first responder. In addition, perspiration condenses on the inside of the faceplate obscuring vision, and the heat/humidity buildup in the suit severely limits the time that can be spent in the suit without risking heat exhaustion.

TDA Research, Inc. (TDA) is developing a lightweight, portable system that will both cool and dehumidify the air circulated through a hazmat suit. TDA uses a heat exchanger to transfer heat from the inside of the suit to the dirty environment, but keeps the clean and contaminated air streams separate. The dry (about 15% RH) clean air is cooled to about 80°F and returned to the first responder. The cool, dry air is distributed to the hands, head, and feet within the hazmat suit with an internal duct system. We have so demonstrated that a full scale prototype can remove close to 700 BTU/hr of heat from a cooling suit, while circulating dry air, aiding in sweat evaporation. Details of the system and results in the laboratory will be presented. TDA is currently working with hazmat suit manufacturers to integrate the heat exchanger into the suit. TDA is also working with experts to demonstrate the technology with firefighters.