Real-Time Monitoring of Total Inward Leakage of Respiratory Equipment Used by Emergency Responders

Purpose of Workshop: To evaluate and document the need for real-time monitoring of the respiratory intake of emergency responders; identify appropriate sensing technologies; and to initiate the development of a scientific strategy (employing both modeling and experimental validation) to determine optimal placement of sensors in respirator masks.

Background: Emergency workers depend on respiratory equipment for protection against hazardous gases and aerosols. Periodic fit testing and seal checks do not satisfy concerns about leakage during actual use, where jostling, sweating, and facial stubble affect face fit and heavy workloads may cause overbreathing. If conditions inside a self-contained breathing apparatus or respirator mask were monitored in real-time, the user could be alerted in the advent that the equipment fails to provide adequate protection due to inward leakage from poor face fit, exhalation valve leakage, or, in the case of air-purifying respirators, from inadequate filtration.

This is a challenging problem. The sensing technology must be adaptable to the geometrical and energy (e.g., battery life) constraints imposed by facemasks, but must still have suitable response times and limits of detection. Furthermore, respirator sensors must be positioned so that the readings accurately reflect respiratory intake. Placement of sensors at the intake through the mouth or nose may be representative, but this may not be practical and locating sensors within dead spaces and eddies will adversely affect response.

Potential Participants: Users (firefighters, Hazmat team members, law enforcement, EMS, and event commanders); representatives from regulatory (NIOSH) and standards committees (NFPA, etc.); industrial hygienists; toxicologists; scientists and engineers involved in the design of sensing technologies (e.g., "electronic nose devices) and respirators (Scott, 3M, MSA, Drager, ISi, Survivair, Interspiro).

Schedule and Location of Workshop: The workshop will be held on May 1, 2009 following the Annual Fire Conference (April 28-30) in Lecture Room B at NIST (located on the first floor in Building 101).

Contact Information: If you would like to participate in this workshop, please contact Kathy Butler (301-975-6673, kathryn.butler@nist.gov) or Marc Nyden (301-975-6692, marc.nyden@nist.gov)