DEPLOYABLE PARTICULATE SAMPLER (DPS)

A NEW COST-EFFECTIVE, SIMPLE-TO-OPERATE PORTABLE PM SAMPLING SYSTEM

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This submission is pertinent to the Conference theme: "Emerging Global Health Issues: Meeting the Challenge through Preventive Medicine" because it presents a newly developed deployable particulate sampling system that is highly suitable for monitoring PM exposure of military personnel deployed in various regions.

Background: Particulate matter (PM) monitoring is an important component in assessing potential exposure that may affect the health of deployed personnel.

Objective: The objective was to develop a PM measuring system that improved upon existing non-Federal Reference Method (non-FRM) systems and met requirements such as accuracy, portability, simple operation, and quick deployability.

Methodology: The Deployable Particulate Sampler (DPS) System was developed and tested. A compact inertial impactor (Fig. 1, U.S. patent pending), comprised of a PM2.5 or PM10 inlet, outlet, and 47-mm filter cassette, was designed to accurately collect PM2.5, PM10, or PM coarse. Its removable filter cassette can be preloaded and incorporates replaceable impaction substrate for simple operation. The system's battery-operated pump provides a constant 10.0 L/min flow rate to ensure accuracy during monitoring up to 24 hours. All components fit in a 47 x 35.7 x 17.6 cm case weighing 6.1 kg and take only a few minutes to deploy (Fig. 2).

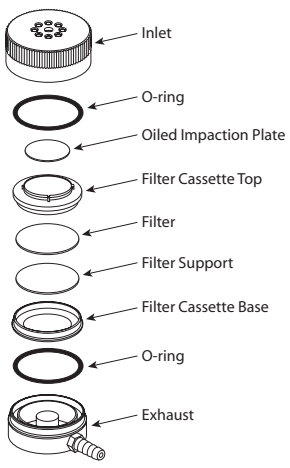

Figure 1. Schematic of DPS Impactor

Figure 2. Deployable Particulate Sampler

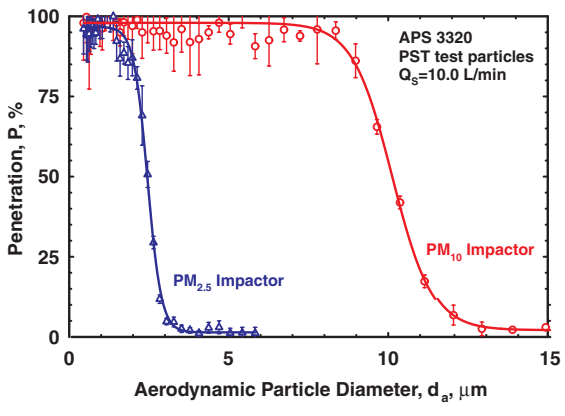

Figure 3. Calibration of PM2.5 and PM10 Impactors

Results: The DPS PM2.5 and PM10 impactors were calibrated in the laboratory (Fig. 3) using an APS 3320 (TSI Inc.). The field test included comparison of the 24-hour ambient PM10 concentration from collocated DPS (SKC Inc.), MiniVol (Airmetrics, Inc.), and FH 62 C14 continuous ambient PM monitor (Thermo Andersen). Field data, including monitoring PM exposure of military personnel in Kuwait, revealed good agreement between the DPS System and other collocated non-FRM samplers (Fig. 4 and 5).

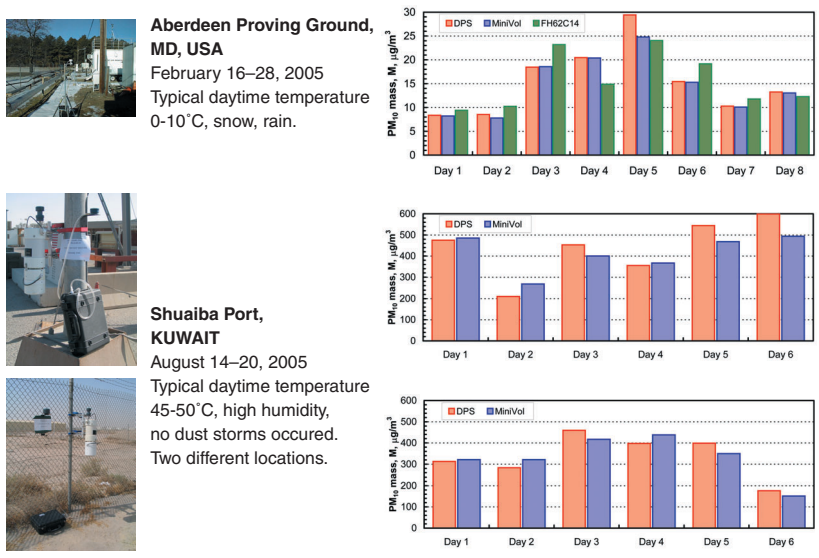

Figure 4. Comparison of 24-hour PM10 mass concentrations from collocated samplers

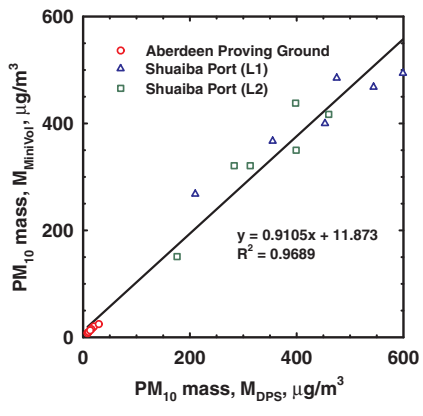

Figure 5. Comparison of PM10 mass from DPS and MiniVol

Discussion/Conclusion: Results of this study show DPS System performance is comparable to existing non-FRM systems for monitoring PM exposure of military personnel deployed in various regions.

Recommendation: Because of the DPS System's demonstrated effectiveness in monitoring PM exposure, it is recommended that the DPS System be considered an accurate system that improves upon the portability, deployability, and operation of existing non-FRM systems.