New Person Portable Gas Chromatograph for Harsh Environments – Design Criteria, and Verification Testing

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Torion Technologies and Smiths Detection have developed, designed and fielded the next generation field portable gas chromatograph–mass spectrometers (GC-MS). Based on the Toroidal MS technology employed in the Torion GUARDION®-7, the new instrument has been designed for use in harsh environments, improving the performance, operational simplicity and expanding the applications. The GC-TMS system is capable of operating in temperatures ranging from zero to 45oC and has been sealed for use in chemically contaminated environments. The system has been ruggedized to withstand transport, handling and for use in harsh environments, illustrated, for example, by operation at drill rig sites, rapid environmental site assessment at hazardous waste sites, and use by deployed troops and first responders. Meeting the challenges of size and weight reduction, while maintaining operational capabilities and improving performance, required detailed attention to all aspects of the design. Managing internal temperatures and meeting the design criteria for size and weight were the prime challenges faced during the design process.

The use of computer aided design tools for heat management and ruggidization provided for rapid simulations that helped guide the design process. Verification that design criteria were met required that extensive testing be performed. Test criteria and results for the following will be discussed in this presentation:

1. Environmental
    a. Temperature - operational and storage
    b. Humidity and rain
    c. Sand and dust
2. Physical
    a. Shock and vibration
    b. Chemical contamination and decontamination
3. Performance
    a. Gas chromatograph
    b. Mass analyzer
    c. Total System