BLAST INJURY PROTECTION THROUGH AQUEOUS FOAM MITIGATION OF IED BLAST

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To reduce the threat faced by individuals attempting to render safe an explosive device, aqueous foams have been employed to mitigate the blast effects from improvised explosive devices (IEDs), as well as, reducing the downfield noise. In particular, a previous study has demonstrated that the overpressure within a closed vessel could be reduced by a factor of 3 to 30 when the vessel was filled with water-based foams, as compared to air. Blast suppression foams are currently available as a tool for field operations to mitigate the blast of IEDs. The blast suppression agent deployed used for this work was SDF (Surface Decontamination Foam – developed by DRDC Suffield and distributed by Allen Vanguard). While the SDF foam has the additional benefit of decontamination of chemical/biological/radiological threat agents, the current work focused solely on the investigation of its blast suppression capabilities.

SDF was deployed in conjunction with an enclosure, in the form of a tent (referred to as the Universal Containment System), which is placed over a suspect device, and then filled with foam prior to forced detonation. The UCS is built from ballistic materials, and offers some protection from the fragments generated by IEDs, to personnel exposed to the detonation. The purpose of the present paper was to investigate the level of safety to personnel located in the vicinity of the explosive device surrounded by aqueous foam, within the UCS enclosure, upon detonation of C4 explosive charges ranging from 0.1 to 1.0 kg. More specifically, the pressure field was measured through reference gauges located from 1 to 10 meters away from the device (horizontal standoff distance), to determine potential for blast injury.

Comparing the results obtained with and without (baseline) the foam and enclosure clearly demonstrated the high blast suppression capability of the system, with reductions in peak blast overpressure in excess of 90% observed. The reference pressure gauge data was compared to various pressure-based injury thresholds to quantify the level of blast protection provided to personnel located in the vicinity of the tent in the event of an accidental or forced detonation. It was thus concluded that the SDF foam within the UCS enclosure, when properly incorporated in render safe procedures, provided considerable reductions in safe standoff distances from a blast overpressure perspective. High speed video also provided further evidence of the effectiveness of the system.