NEXT GENERATION CB HAZARD PREDICTION AND CONSEQUENCE ASSESSMENT WITH MULTI-ECHELON DECISION SUPPORT APPLICATIONS

Chemical Agent Contamination Analysis In The Field Operation-environment Simulation Using A 50-cm Wind Tunnel And Hazard Prediction Model Engine

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To test and evaulate the performance of protection and detection equipment against chemical agents' exposure, the information is necessary on chemical agents' contamination concentration and decontamination level formed on the battlefiled following a chemical weapon attack. Usually, a laboratory-scale wind tunnel with test section of 5cm x 5cm has been used to study the agents' contamination/decontamination characteristics formed in the field along with a hazard prediction model engine. The small-scale wind tunnel can be easily installed in a chemical fume hood in a laboratory but it can provide data in a limited way. We have recently developed a larger-scale wind tunnel with a total lenght of 15m (length) and 4.3m (height) and a test section of 500mm (width) x 500mm (height) x 7,500mm(length). The wind tunnel was designed through turbulence model using computational fluid model (CFD) analysis to generate wind profiels with a variety of viscous (laminar) sublayers depending on the ground roughness. We have studied the contamination and decontamination of a chemical agent on environmental matrices such as sand, concrete, and asphalt using the specially designed wind tunnel. Profield of vapor concentration were obtained from the surfaces of the matrices using thermal desorber in combination with gas chromatograph (GC). The matrices were exposed to the chemical agent at different environmental conditions. A vapor emission test was performed after a decontamination process. The results showed that on sand, the agent spread laterally while forming vapor contamination profiles in a very short period of time. On concrete, the agent was absorbed immediately into the matrix while spreading and forming vapor contamination. However, the asphalt surface conserved the agent and slowly released parts of the agent over an extended period of time. Trace amounts of the residual agent present at the surface were released as vapor after decontamination, posing a threat to the exposed individual and environment. The scenario-based hazard prediction modelling was also presented for the chemical event using our own hazard prediction model engine.

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