

EFFECT OF FLUID PROPERTIES ON THE BLAST MITIGATION PROVIDED BY FLUID CONTAINERS

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ABSTRACT

External water-filled containers have the potential to reduce the effect of near-field explosive blast loading on armoured vehicles, as demonstrated in terms of reduced deformation to a steel plate in a previous study. In this investigation the effect of different fill materials on the deformation of a steel plate subjected to a blast load in the near-field has been experimentally investigated. The fill materials evaluated are: bulk water, aerated water; sand; expanded polystyrene (EPS); a combination of EPS and water; and a shear thickening fluid (corn flour and water). The varying properties of the materials were selected in order to explore their potential to enhance a number of mechanisms previously identified as key to the blast mitigation effect. The results indicated that none of the fill materials were able to outperform water (on an areal density basis) in reducing the peak dynamic deformation of the steel plate. However, the deformation-time history of the plate was found to be sensitive to the fill material, thus identifying the potential to reduce the velocity at which the plate deforms.