A SINGLE POINT PRESSURE APPROACH AS INPUT FOR INJURY MODELS WITH RESPECT TO COMPLEX BLAST LOADING CONDITIONS

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Blast injury models, like Axelsson and Stuhmiller, require four pressure signals as input. Those pressure signals must be acquired by a Blast Test Device (BTD) that has four pressure transducers placed in a horizontal plane at intervals of 90 degrees. This can be either in a physical test setup or in a numerical environment.

However, using a BTD for blast injury assessment can be very cost inefficient since a BTD only predicts injury for one specific location. For an injury prediction at other positions a new simulation or experiment must be performed. The small size of the BTD in comparison with its surroundings may require a long calculation time because of the fine grid needed.

The Weathervane model removes the need for a BTD by using the free field pressure to estimate what the pressure would have been at the four gauges if a BTD had been present. However, this approach is seen to give incorrect results for the individual gauges in the case of complex blast waves, for example due to the blast wave reflecting off a wall.

In this paper, case studies have been performed for different charge weights ranging from 5 to 5000 kg. Distances were chosen to yield pressures and impulses which correspond to free field lung injury threshold levels and 50% survivability levels respectively. In particular, the influence of reflecting surfaces was studied.

Based on the case studies, a new single point pressure approach has been proposed. Furthermore, a comparison between the new approach, the BTD-method and the Weathervane model has been carried out.