

STUDY OF BLAST WAVE – STRUCTURE INTERACTION USING EXPLODING WIRES TECHNIQUE

O. Ram, O. Sadot

*Shock Tube Laboratory, Protective Technologies R&D Center, Department of
Mechanical Engineering, Ben-Gurion University of the Negev, Beer-Sheva, Israel*

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Over the last decades there has been an ever increasing effort to better predict the load developed on a structure in explosion events. During the passing time, the computational abilities dramatically improved and the ability to predict quantitative results for complex scenarios became achievable. However, the need to validate the obtained numerical results became a necessity. The validation can be done by means of two approaches: (a) large-scale field test approach; and (b) small-scale laboratory test approach. There are advantages and disadvantages to each of these approaches and the preferable approach depends on the problem and the available resources. In the present study we present an experimental tool to help validate the numerical simulations in term of the blast-structure interaction phenomenon. The experimental tool is based on an exploding wire technique to generate small scale blast waves. The advantages of this approach are: (a) safe operation, (b) high repeatability; and (c) the use of advanced diagnostic systems. Since the load is developed by electrical means and not by explosive, the energy produced by the system was calibrated to an equivalent TNT charge. To evaluate the system performance a small scale test model was constructed. The experiments were done utilizing high-speed visualization technique and a set of pressure transducers to monitor the wave propagation and pressure history. The same configuration was tested by numerical means using the M.S.C. Dytran commercial solver. Both setups were two-dimensional. It was found that at early times the agreement between the two obtained results is very good. However, at later times discrepancy appears. The interpretation of the obtained results will be discussed and extension to three-dimensional configurations will be presented.