STUDY OF SOME PARAMETERS CONNECTED WITH THE 1-D PROPAGATION OF BLAST WAVES

HEILIG,W.; SCHLAEPFER,D.; ANET,B.; BINGGELI,E.

The propagation properties of free blast waves in 3-D are apparently well known according to the bibliography. The data originate from the many tests performed in the past, either on test-sites or as laboratory experiments, and from numerical simulations. Relevant literature are the Military Manuals (e.g. [1]) but also data banks of recent issue [2]. These sources inform about all important parameters, e.g. the speeds of the primary and reflected waves, pressures, densities, impulses, etc. in the scaled presentation after Hopkinson's Scaling Law.

In contrast to this, knowledge of the parameters of the 1 -D blast wave propagation is rather poor. A priori, one must assume that their trends are different from those in 3-D. For example, the side-on impulse in 1 -D is space dependent; it increases smoothly with the length of the straight tunnel, which can be proved theoretically and confirmed by numerical simulations. In 3-D, the impulse decreases - except very close to the detonation source. On the other hand the impulse of the dynamic pressure in 1 -D decreases with distance. Apparently a similarity law other than Hopkinson's has to be applied with blast wave propagation in straight tubes.

In this paper these findings will thoroughly be discussed with the aid of the results of numerical simulations using the SHARC code. Parameter studies for various incident front strengths of the blast wave and for various wavelengths as initial conditions will be presented showing the rate of change of the parameters along the tube. The numerical results will also be compared with experimental results from tests in which the blast wave is generated by a spherical charge fixed either at one closed end of the tube or placed on its axis outside of the open tube.