NUMERICALLY SIMULATED BLAST PROPAGATION PROCESSES IN SIMPLE TUNNEL SYSTEMS

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Knowledge of blast propagation in tunnel systems plays an important role in the design of underground shelters and of ammunition storages. If a special tunnel configuration concerning its attenuation effect on the blast wave is under discussion one usually performs field tests or laboratory experiments using a scaled model of this system. The aim of this paper is to analyze the undergoing fluiddynamic process. To this end one quality interprets shadow-schlieren visualization of shock tube experiments with generic tunnel systems, e.g. channels which bend under certain angles, channel bifurcations etc. In such runs simultaneously direct pressure measurements using gages are performed, and so plenty of data are available by which the analysis is enabled.

The process cannot be treated theoretically in a closed form, therefore, numerical tools have to be applied. The results of computer calculations will be presented which the SHARC-Code, a descendant of the HULL-Code, provides.

For some types of tunnel configurations an approximate analysis is made with the aid of Whitham's Theory for diffracted shocks in connection with the energy conservation law. This procedure yields the front pressure of the shocks propagation in the branches, and is confirmed by the measurements. The afterflow parameters, however, are not obtained in this way. These missing parameters can only be supplied by the computer analysis.Experimental data, data from the approximate theory and those from the codecalculations are compared to each other and discrepancies are discussed. The most reliable data are doubtless the measured ones due to the wide experience the Institute has in the experimental techniques.