EVALUATION OF PRESSURE FROM SMALL CHARGES USING TIME OF ARRIVAL DATA – EXPERIMENTAL APPROACH

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In blast wave experiments, time of arrival methods can be used for obtaining the air blast wave peak overpressure. In this method, the blast front position in time is obtained experimentally and fitted to a curve. This curve can be analytically derivated to obtain shock velocity dependency on time. These shock velocities are then applied to Rankine-Hugoniots equations to calculate the overpressure.

The type of the equation chosen for the fitting of the experimental data affects the resulting overpressure. Furthermore, the forms of equations available in the literature seem to be chosen arbitrarily rather than based on basic principles defining the physical behavior. Thus, we decided to compare the overpressures obtained by applying several different fitting equations to our small-scale (50-1000 grams) cylindrical charge data as well as to the data from large-scale experiments published in open literature.

In addition, we tried to address the issue of sensitivity of this method of the overpressure determination on small variations of the fitting parameters. Results from the time of arrival measurement using high-speed video camera (see fig. 1) are compared with overpressures acquired from pressure gauges during the same experiment.

Figure 1: A) Frame from high-speed camera at 1.6 ms after trigger point
B) Subtraction result of frames at 1.7 ms and 1.6 ms after trigger point