UNDERWATER EXPLOSIONS
Part 3.
EFFECTS OF THE RDX INCREMENTS TO THE SHOCK, GAS HEAVE AND TOTAL ENERGY VALUES OF TNT

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ABSTRACT

Underwater explosions have been used several decades for the determination energy content of explosives. It's the only test method by which shock and gas heave energy values can be determined separately. The total energy is a sum of these two partial energies. This test method enables us to develop explosives for different purposes; the military high explosives should contain more shock energy whereas the gas heave energy is a very important feature for the blasting explosives. The method also enables us to observe the changes and to adjust the energy content of an explosive as a function of increments of one or more energetic component.

The goal of this study was to find out the reproducibility of the test method for the homogenous explosive charges and to estimate the effects of RDX (Hexogen) increments to the shock, gas heave and total energy values of TNT. The charges were cast in five different chemical compositions; TNT 00/100, HT 40/60, HT 50/50, HT 60/40 (Comp. B-3) & HT 70/30 (RDX/TNT). The weight of an average shot was approx.17 kg.

The relative standard deviations (s%) for gas heave energy measurements were approx. 0,3-0,5%, for shock energy measurements approx. 3-4% and for total energy measurements approx. 1-3%. Therefore the reproducibility of the measurements was observed to be about ten times better for the gas heave energy measurements than for the shock energy measurements.

The RDX-increments were observed to effect to the gas heave energy, but only a very little. When the composition of the explosive changes from TNT (00/100) to HT 70/30 (RDX/TNT), the relative gas heave energy increases linearly about 3% whereas the increase of the shock energy was observed to be about 30% at the same time. Therefore the RDX-increments seemed to affect only the shock energy value and therefore the total energy value, which is the sum of these two partial energies.

The total energy values for TNT and Hexotol 60/40 RDX/TNT (Comp.B-3) explosives were observed to be at a little lower level than presented in literature. The length of the measuring cable was 70 m. It was obviously too long and caused some signal damping during the shock energy measurements. However the signal damping didn't effect to the gas heave energy measurements, because the calculations based on the time, which passes from the front of the shock wave peak to the first bubble peak.

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