BLAST WAVE IN A MODELED ROCK TUNNEL FROM A WATER MITIGATED EXPLOSION

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The propagation of blast waves along tunnels of uniform cross-section has been the subject of a number of investigations in the past. Most of them concern well defined flows in smooth tubes e.g. for a specific gas or a mix of air and gasses from an explosion. Such flows are today possible to predict numerically with Hydrocodes with high accuracy. Shock flow in tubes and tunnels with rough inner surfaces are less investigated, although some experimental results and analyze methods are reported.

The technique to reduce explosion effects by placing water in the vicinity of charges has been investigated by several researchers in the last decade. Although it has been demonstrated to work well in many cases, there are still some aspects of the technique not yet fully understood.

The paper describes experiments with a small scale model of a rock tunnel to an ammunition magazine where the water mitigation technique is applied. Pressure and flow measurements were made in a modeled tunnel with ca 10 mm wall surface roughness. A similar model with smooth walls was also tested for comparison. The cross-section of the models was ca 0.01 m^2 and their length 2 - 4 meters. Charges with 200 gram plastic explosive were detonated in the attached 0.045 m^3 explosion chamber.

The measurements indicate how the change in flow properties (with water mist added to the air and HE gasses) influences the wave propagation in a tunnel. Evaluated, these experiments can be useful for risk analyses when the water mitigation technique is applied in large scale for underground ammunition magazines.