INVESTIGATION OF THE ATTENUATION OF A SHOCK WAVE PASSING THROUGH A WATER SPRAY

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Buildings can be submitted to explosion's damages due to accidents, war or terrorists' attack which can harm materials and humans. In this study, the fire suppression devices are envisaged to reduce the strong pressure impulse and to improve safety. We carried out experimental and numerical investigations in order to attenuate a shock wave by a well characterized cloud of droplets.

The experimental investigations are undertaken in a vertical shock tube (Jourdan et al. 2004) presented in Fig 1. The shock wave initially propagates in air upwards of the tube whereas the water mist is released downwards by a water droplets generator. Pressure evolution and interaction visualization of the shock wave with the water mist are recorded. The well characterized cloud of water is formed by calibrated droplets of 100 m, 250 m and 500 m in diameter which can interact with shock waves with a Mach number ranging from 1.1 to 1.8.

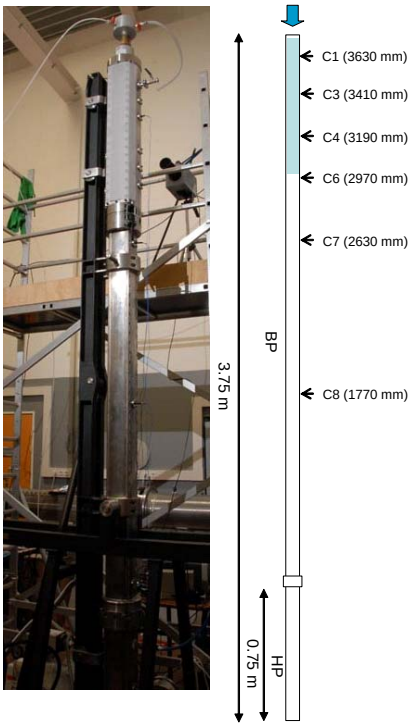

Figure 1. Experimental set-up with the T80 shock tube in vertical orientation.

To support this experimental work, a numerical part is also developed, based on an Eulerian/Eulerian approach which represents two-phase dilute flow. The 1D unsteady calculations include heat transfer and drag force between both phases. The drag coefficient is calculated by a quite recent correlation (Jourdan et al. 2007).

The shock wave attenuation was measured experimentally and compared with the numerical results. During the symposium, all the results issued from this study will be presented.

References

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