NOVEL APPROACH TO A BLAST SIMULATOR SHOCK TUBE

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Shock tube experiments are a reliable way of studying the effects of blast waves. However, conventional shock tubes fail to accurately reproduce pressure profiles similar to those caused by free field explosions. This study focuses on the design of a detonation driven shock tube that reproduces free field blast pressure profiles. The shock tube consists of a steel tube with an open end, on the downstream side. The upstream driver section is filled with a detonable mixture.

The design is evaluated for its ability to produce a Friedlander pressure profile. Evaluation criteria are the amplitude and duration of the generated impulse, as well as the presence of a negative phase in the pressure profile. Numerical simulations are accomplished to investigate the effects of different parameters on these criteria.

The pressure profile produced at the exit of the tube is found to be highly dependent on the size of the driver section. As the detonation propagates away from the closed end, a Taylor expansion wave is formed behind the leading shock, serving as a first step to achieving the Friedlander profile. To add the volumetric expansion necessary to obtain a negative pressure phase, a series of vents are added near the end of the tube. Vents allow for the presence of the negative pressure phase while maintaining a modular shock tube design, increasing the flexibility in applications of the apparatus.