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Shockwave Interaction with a Cylindrical Structure PHILLIP

MULLIGAN, Dagaz Technologies — An increased understanding of the shockwave interaction with a cylindrical structure is the foundation for developing a method to explosively seal a pipe similar to the Deepwater Horizon accident in the Gulf of Mexico. Shockwave interactions with a cylindrical structure have been a re-occurring focus of energetics research. Some of the most notable contributions of non-destructive tests are described in “The Effects of Nuclear Weapons” (Glasstone, 1962). The work presented by Glasstone examines shockwave interaction from a 20-megaton bomb with a cylindrical structure. However, the data is limited to a peak overpressure of less than 25 psi, requiring several miles between the structure and the charge. The research presented in the following paper expands on the work Glasstone described by examining the shockwaves from 90, 180, and 270-gram C-4 charges interacting with a 6-inch diameter cylindrical structure positioned 52-inches from the center of the charge. The three charge weights that were tested in this research generated a peak overpressures of approximately 15, 25, and 40 psi, respectively. This research examines the peak pressure and total impulse from each charge acting on the cylindrical structure as well as the formation of vortices on the “backside” of the cylinder surface. This paper describes the methodology and findings of this study as well as examines the causality and implications of its results on our understanding of the shockwave interaction with a cylindrical structure.

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