Explosion Incident Recreation Methodology

Mark G. Whitney, 
EQE International, Inc. 
15600 San Pedro, Suite 400 
San Antonio, Texas 78232 
Tel: 210/495-5195, Fax: 210/495-5134 
mgw@eqe.com 

J. Keith Clutter, Ph.D. 
Analytical & Computational Engineering, Inc. 
P.O. Box 809 
Helotes, Texas 78023 
Tel: 210/681-1481, Fax: 210/681-1482 
clutter@texas.net 

ABSTRACT

This paper describes a successful explosion recreation methodology utilized in several past explosion incident investigations. The purpose of the recreation efforts is to answer specific questions on the sequence of events that occurred during and immediately after the explosion event. The effort is engineering and computational approach meant to quantify source energy, source conditions, and explain observed damages. Hence, this work is supplemental to root cause studies whose purpose is to determine the chain of events leading up to the incident and improper procedures that were the root cause of the incident.

The explosion recreation effort includes collection of data and measurements at the explosion site. This is important because an explosion leaves its “fingerprint” in terms of structural damage patterns and throw of missiles. Engineering analysis of the damage pattern often allows for quantification of important energy source characteristics such as explosion epicenter, explosion energy, and quantification of energy release rate. Computational modeling is also used to simulate possible explosion scenarios. We have used three-dimensional Computational Fluid Dynamic (CFD) modeling to track blast wave propagation through complex geometries and ventable surfaces in order to define loading for structural damage predictions. Such modeling has been able to eliminate some scenarios as not capable of producing the observed damage and home in on scenarios that are.

Such studies not only help to explain the incidents under investigation but also improve the scientific knowledge concerning explosions, their consequences, and design measures that can be taken to reduce their severity and impact on the surroundings.