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Economical Mitigation of Explosion Hazards for Plant Siting

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ABSTRACT

The overpressure, impulse and ultimate damage resulting from a vapor cloud explosion are primarily a function of flame speed, flammable mass, and the distance to the target. Flame speed is determined by the inherent burning velocity of the gas or vapor, equipment congestion and confinement. Plant design criteria, including plant layout, process design, building design, unit operations, and maintenance are the ultimate governing criteria. This paper will evaluate risk mitigation decisions that are made during the plant design process as well as the mitigation of existing designs to reduce the probability and severity of damage from a vapor cloud explosion.

A vapor cloud explosion scenario will be presented which has several options for mitigation. These options include building spacing, building design, reduction of flammable mass through process changes or safety instrumented systems, and reduction in leak probability. Parametric comparisons will be made between each of these options as to the effect on explosion overpressure and impulse, building damage and cost of mitigation. WBE's proprietary technology, SafeSite 3rd Generation (SS3G), for explosion modeling and damage prediction will be used to conduct the analysis.