ioMosaic®
Minimizing risk. Maximizing potential.®

IoVIEW

Risk-Based Approach – Explosions and Blast Loading

Risk-Based Approach

Issue

Methods, Tools, and Resources

Introduction to Explosions and Structure Blast Loading Phenomena

The major concerns for anyone involved with risk assessment related to explosions is to estimate the explosion wave shape and the overpressure and impulse as a function of distance from the explosion. This paper introduces the fundamentals of explosions and reviews different types of explosions; i.e., physical explosions, vapor cloud explosions, condensed phase explosions, confined explosions with reactions and dust explosions. Additionally, this paper is focused on blast loading phenomena to structures, which is a key input to consider when performing structural response predictions by using the Single Degree of Freedom (SDOF) approach.

Online Training

PHA/HAZOP Leader Course

Gain a thorough understanding of the essentials of leading PHAs using industry methodologies via online training and a Webex® live instructor-led workshop.

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KnowlEDGE: Analysis of PRV Stability in Relief Systems

This module examines why PRV instability occurs and the key concepts affecting PRV installments.

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Pressure Relief and Flare System Design Basic

Acquire a foundation in essential key concepts, issues, and methodologies relating to effective pressure relief and flare system design.

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Lessons Learned: Safety Data Sheets

This module informs on the purpose of SDSs, what information is required, and the OSHA penalties for inaccurate or missing information.

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Introduction

An explosion is a sudden and violent release of energy. The violence of the explosion depends on the rate at which energy is released. There are several kinds of energy which may be released in an explosion. Three basic types are: (1) Physical Energy, which may take such forms as pressure energy in gases, strain energy in metals or electrical energy; (2) Chemical Energy; which derives from a chemical reaction; and (3) Nuclear Energy, which is out of the scope of the Chemical Process Industry (CPI). Explosions in the process industry can be classified as follows:

- Physical Explosions; e.g., Boiling Liquid Expanding Vapor Explosions (BLEVEs), RapidPhase Transition Explosions (RPTs)
- Vapor Cloud Explosions
- Condensed Phase Explosions; e.g., high explosives, ammonium nitrate, organic peroxides, sodium chloride
- Confined Explosions with Reaction (runaway reactions); e.g., explosion involving vaporcombustion, reactor explosions, other explosions involving liquid phase reactions
- Dust Explosions

Physical Explosions

A pressure vessel contains stored energy due to its internal pressure and represents an explosion hazard. If the vessel is pressurized beyond its mechanical strength, or the vessel integrity is lost, the energy is released suddenly and significant damage can result. The damage is caused by the pressure wave from the sudden gas release which propagates rapidly outward from the vessel. This pressure wave may be a shock wave, depending on the nature of the failure.

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Deconstructing Runaway Reactions Using Dynamic Modelling

Incident Introduction

A vapor leak involving a polymerization runaway reaction occurred in May 2020 at the M/s LG Polymers Pvt Ltd in R. R. Venkatapurm, Vizakhapatnam district, India. The plant had been closed as part of a national lockdown to prevent the spread of COVID-19. One of the styrene monomer tanks, whilst inhibited, was involved in a runaway reaction spread of COVID-19. One of the styrene monomer tanks, whilst inhibited, was involved in a runaway reaction with several fatalities and many hundreds of hospitalisations.

Reaction Modelling

The suspected runaway reaction scenario was modelled using Process Safety Office® SuperChems™. Using experimental data, depletion models can be developed for the inhibition of the styrene and applied to ioMosaic's qualified styrene thermal polymerization kinetic model. This method can This method can be applied to

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We Can Help

Emergency Relief System Design Services

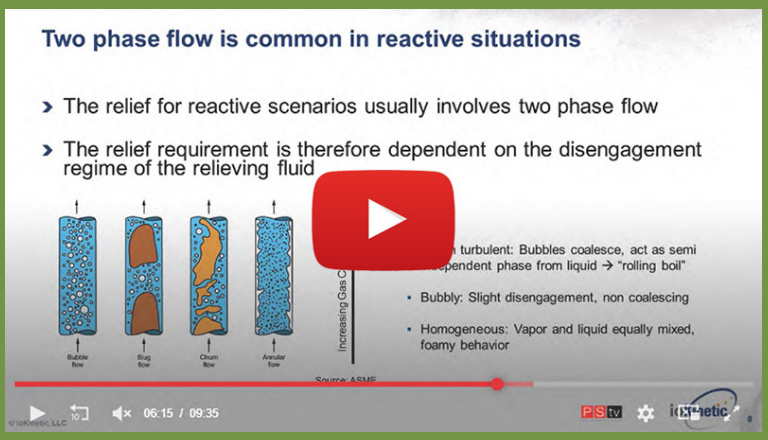
ioMosaic provides a total ERS solution with our comprehensive design services, from reactivity testing for design basis determination to calculations for Z-axis deflection from dynamic loads.

Learn How We Can Help

Facility Siting Services

According to OSHA, a facility siting study should be updated and revalidated at least every 5 years. Identify risks to personnel, equipment, and buildings from fire, explosion, and toxic hazards and mitigate them with a properly performed facility siting study from ioMosaic.

Learn How We Can Help



PStv® Safety Moment on Pressure Relief Design for Reactive Chemicals

Watch this PStv® video to learn more about PRS design challenges posed by reactive chemicals, the importance of understanding the dynamics of runaway reactions, and migration options.

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