

Effective ERS Design – Core Module 2

Advanced ERS Design

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Overview

The Advanced ERS Design module covers complex design issues such as chemical reactivity, multiphase flow, dynamic modeling, effluent systems design, etc. Special emphasis is placed on balancing design and safety considerations with cost.

This module will help process / safety engineers and managers better understand the risks associated with runaway reactions and multiphase systems and provide guidance on ERS design requirements and best practices for such scenarios.

Topics

- ◆ ERS Design Heuristic
- ◆ Vessel Hydrodynamics and Two-Phase Flow
- ◆ Reactive System Characterization
- ◆ Runaway Reaction Contingency Analysis
- ◆ Dynamic Relief Calculations
- ◆ Plant-wide ERS Contingencies
- ◆ Effluent Handling Equipment Design
- ◆ Consequence and Risk Analysis
- ◆ Risk Based Applications

Participants

This module is ideally suited to process industry professionals involved in the design and review of complex emergency relief systems such as reactive, dynamic, and multiphase systems

Course Materials and Fee

Attendees will receive presentation summaries, exercises, and data for techniques currently employed in ERS design for reactive and complex ERS systems.

Fee: \$1,000

Fees for course includes lunch and refreshments. They do not include hotel accommodations or travel, which are each participant's responsibility.

Course Outline

Day One

ERS Design Heuristic — 8:00AM to 9:45AM

A discussion on a practical approach to ERS design that encompasses the full life-cycle starting from an assessment of needs, selection of appropriate protective devices and effluent handling systems, and ongoing operational and maintenance requirements. Topics include advanced subject matter such as incorporation of consequence and risk analyses.

Vessel Hydrodynamics and Two-Phase Flow — 10:00AM to 12:00PM

A discussion on two-phase flow considerations in ERS design. Topics include vessel hydrodynamics, nozzle flow and pipe flow models.

Reactive System Characterization — 1:00PM to 2:45PM

A discussion on runaway reaction system characterizations. Topics include reactive hazards screening techniques and adiabatic calorimetry.

Runaway Reaction Overpressure Contingency Analysis-Part I — 3:00PM to 5:00PM

A discussion on the methodologies available for analysis of runaway reactions with a focus on tempered systems. Topics include direct scale-up of adiabatic calorimetry data and complex dynamic simulation.

Day Two

Runaway Reaction Overpressure Contingency Analysis — 8:00AM to 9:45AM

A discussion on the methodologies available for analysis of runaway reactions with a focus on gassy and hybrid systems. Topics include direct scale-up of adiabatic calorimetry data and complex dynamic simulation.

Dynamic Relief Calculations — 10:00AM to 12:00PM

A discussion on other common dynamic relief rate calculations. Topics include depressurization and tube rupture involving high pressure compressible fluids and low pressure incompressible fluids.

Plant-wide ERS Contingencies — 1:00PM to 2:45PM

A discussion of common plant-wide ERS contingencies such as pool fires, utility failures etc. Additional consideration will be given to contingencies that pose risks and challenges to effluent handling equipment.

Effluent Handling Equipment Design — 3:00PM to 5:00PM

A discussion on the design considerations for various types of effluent handling equipment. Topics include atmospheric vents, gravity liquid-vapor separation, centrifugal liquid-vapor separation, seals, elevated flare tips, quench pools, and thermal oxidizers.

Day Three

Consequence and Risk Analysis — 8:00AM to 9:45AM

A discussion on consequence analysis, initiating frequencies, and risk characterizations for emergency relief systems. Topics include consequence models, probabilities of failure on demand, risk assessment, and application of safety-instrumented systems (SIS).

Risk Based Applications — 10:00AM to 11:30AM

A discussion on the application of risk-based criteria. Topics include quantitative risk analysis (QRA), layer of protection analysis (LOPA), relief device inspection intervals, and effluent handling system design.

Wrap-up Discussion — 11:30AM to 12:00PM