

Effective ERS Design – Core Module I

Practical ERS Design

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Overview

The Practical ERS Design module serves as an ERS primer and focuses on industry codes/standards, regulatory requirements, ERS contingencies, calculation methodologies, and long-term ERS data management.

This module will help process/safety engineers and managers better understand, plan, and execute future ERS design work for plant projects such as PHAs, unit expansions, debottlenecking studies, etc.

Topics

- ◆ Codes and Practices
- ◆ Application of Pressure Relief Devices
- ◆ ERS Design Heuristic
- ◆ ERS Contingencies
- ◆ Steady State Design Calculations
- ◆ Relief Device Sizing
- ◆ Effluent Handling
- ◆ Operational Considerations and ERS Data Management

Participants

This module is ideally suited to process industry professionals involved in the design and review of emergency relief requirements for non-reactive systems.

Course Materials and Fee

Attendees will receive presentation summaries, exercises, and data for techniques currently employed in ERS design for non-reactive 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

Codes and Practices — 8:00AM to 9:45AM

An introduction to the importance of overpressure protection and the governing / relevant codes, standards, and best practices regarding ERS design. Topics include regulatory requirements such as OSHA's process safety management (PSM) standard (1910.119), design standards such as the American Society of Mechanical Engineers (ASME) Section VIII Pressure Vessel Code, and recommended practices such as the American Petroleum Institute (API) RP 520 and 521.

Application of Pressure Relief Devices — 10:00AM to 12:00PM

A discussion on the critical operation of pressure relief devices as the *last line of defense* in process plants. Topics include mechanical details of various types of relief devices (e.g., pressure safety valves, rupture disks, buckling pins, low pressure vents, etc.), the optimal application of each type, and installation considerations.

ERS Design Heuristic — 1:00PM to 2:45PM

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.

Overpressure Contingencies — 3:00PM to 5:00PM

A discussion on the most commonly occurring overpressure contingencies in process plants. Topics include source identification, pressure development, and situations that lead to equipment overpressure (e.g., fire exposure, overfilling, utility failures, and runaway chemical reactions).

Day Two

Steady-State ERS Rate Calculations-Part I — 8:00AM to 9:45AM

A discussion on the various calculation methodologies employed to generate steady-state relief rates for overpressure contingencies associated with fluid input from high pressure reservoirs. Topics include control valve failures, flow limitations by piping system capacities, and flow limitations by fluid driving equipment such pumps and compressors.

Steady-State ERS Rate Calculations-Part II — 10:00AM to 12:00PM

A discussion on the various calculation methodologies employed to generate steady-state relief rates for overpressure contingencies associated with abnormal heat input. Topics include the API-RP521, API-STD2000, NFPA-30, and ASHRAE-15 fire exposure calculations.

Steady-State ERS Rate Calculations-Part III — 1:00PM to 2:45PM

A discussion on the various calculation methodologies employed to generate steady-state relief rates for overpressure contingencies associated with other process abnormalities. Topics include split heat exchanger tubes, API-STD2000 inbreathing and outbreathing calculations, and overpressure contingencies associated with columns such as reflux failure.

Relief Device Sizing — 3:00PM to 5:00PM

A discussion on the most commonly employed methodologies for relief device sizing, selection, and installation. Topics include theoretical flow constraints (e.g., isentropic nozzle flow), modifications to these for use in practical applications, and inlet and outlet piping pressure drop calculations and implications.

Day Three

Effluent Handling — 8:00AM to 9:45AM

A discussion on design, safety, and regulatory / environmental considerations for effluent systems. Topics include atmospheric dispersion, piping collection systems, separation equipment, and flaring.

Operational Considerations — 10:00AM to 11:30AM

A discussion on the operation and maintenance of the emergency relief systems. Topics include relief valve inspection programs, management of change (MOC) requirements for ERS systems, and the benefits of maintaining ERS documentation in the long-term.

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