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Kaypear Safetember 2021

"PRESSURE SAFETY/PROCESS SAFETY INTERACTIONS: CLOSE COOPERATION?"

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"A Show of Hands" (Getting to Know Our Audience)

1. **Consulting or EPC Firm**
2. **Manufacturing / Operations**
3. **Regulatory Inspector**
4. **Other**

PRESSURE SAFETY/PROCESS SAFETY INTERACTIONS

- **Marksmen (ERS designers):**
  - ***Success is largely measured by "hitting the target"***

- **Fishermen (Process Safety and Loss Prevention Engineering)**
  - ***Success is largely measured by the ABSENCE of an incident or loss event (Implies being able to recognize what is "hidden")***

PRESSURE SAFETY/PROCESS SAFETY INTERACTIONS

- **Agenda:**

  - ***5 Slides with ERS activities or stages. ERS Side then with Process Safety & Loss Prevention Engineering (PS&LPE) comments***
  - ***6 Slides with OSHA guidance. ERS Side then with PS&LPE comments***
  - ***Audience Commentary – This presentation is intended to be "interactive" with the audience***

PRESSURE SAFETY/PROCESS SAFETY INTERACTIONS

- **Over pressure scenarios (ERS designers):**
  - ***DEFINE*** **applicable scenarios**
  - **Include assumptions and process basis**
  - **Explain basis for N/As**
  - **Review PHA notes for high or low pressure guide word analyses and insight**
  - **Any channel for feedback to PHA team?**
- **Over pressure scenarios (PHA Team)**
  - **Are the assumptions, limitations and basis DOCUMENTED?**
  - **How is the "Fire Case" determined to be credible or not?**
  - **What PHA Technique is being used to identify overpressure scenarios?**

Fire Case Determinations: Does your facility have "Fire Hazard Area" Plot Plans and Use API 2218 to characterize Fire Hazard Areas?

- Vessel located in a Fire Hazard Area?
- Flammability properties and operating conditions
- Maximum credible leak rate
- Drainage capability
- Protective measures in place, such as waterspray protection and structural fireproofing

PRESSURE SAFETY/PROCESS SAFETY INTERACTIONS

- **Pressure levels (ERS designers):**
  - Operating pressures
  - Relief device set pressures
  - Vessel/equipment MAWPs
  - Maximum allowed relief pressures for each scenario
  - Maximum allowed pressure in piping (or other connected pressure-containing items
- **Pressure levels (PHA team)**
  - Who reviews and validates this ERS design basis info? Key stakeholders must be engaged!!
  - Who provides any information regarding UNIQUE cases/considerations where maximum allowed relief pressure should be < the normal ERS assumptions?

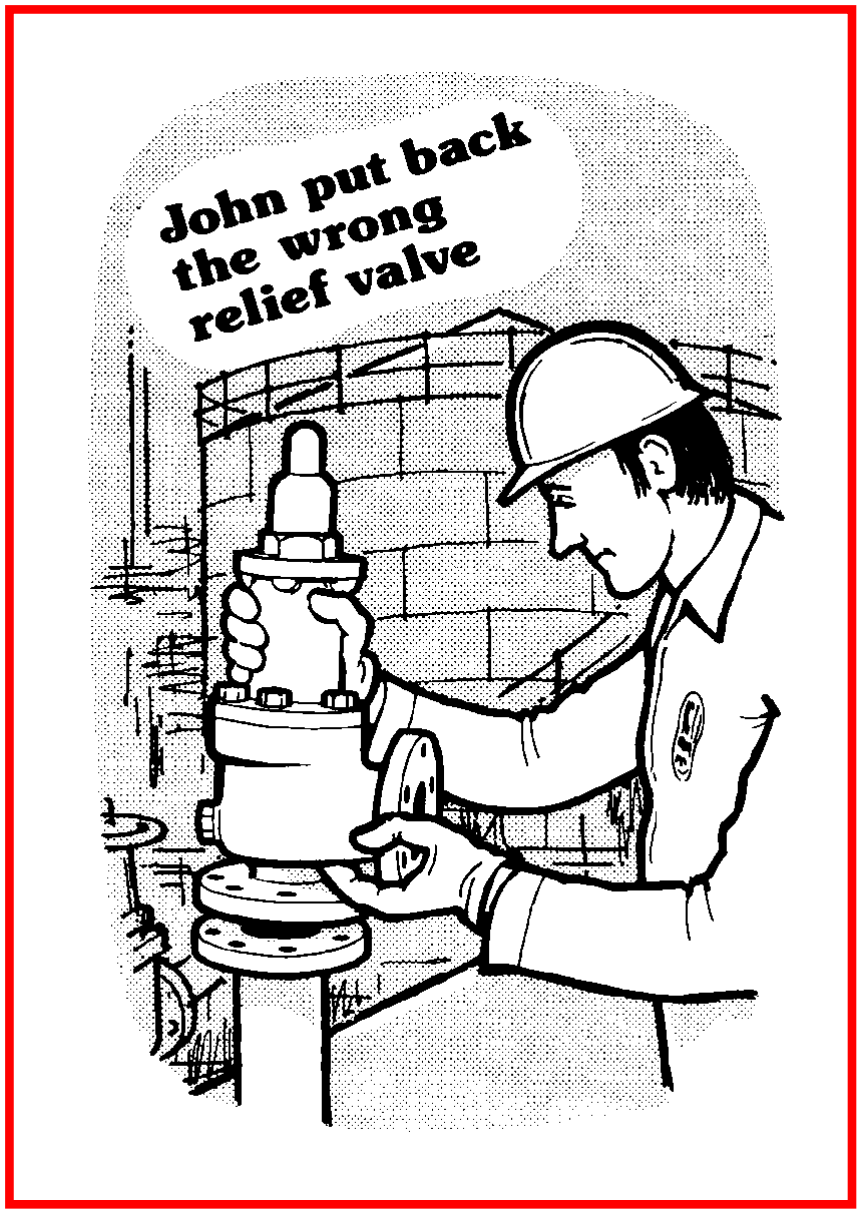
PRESSURE SAFETY/PROCESS SAFETY INTERACTIONS

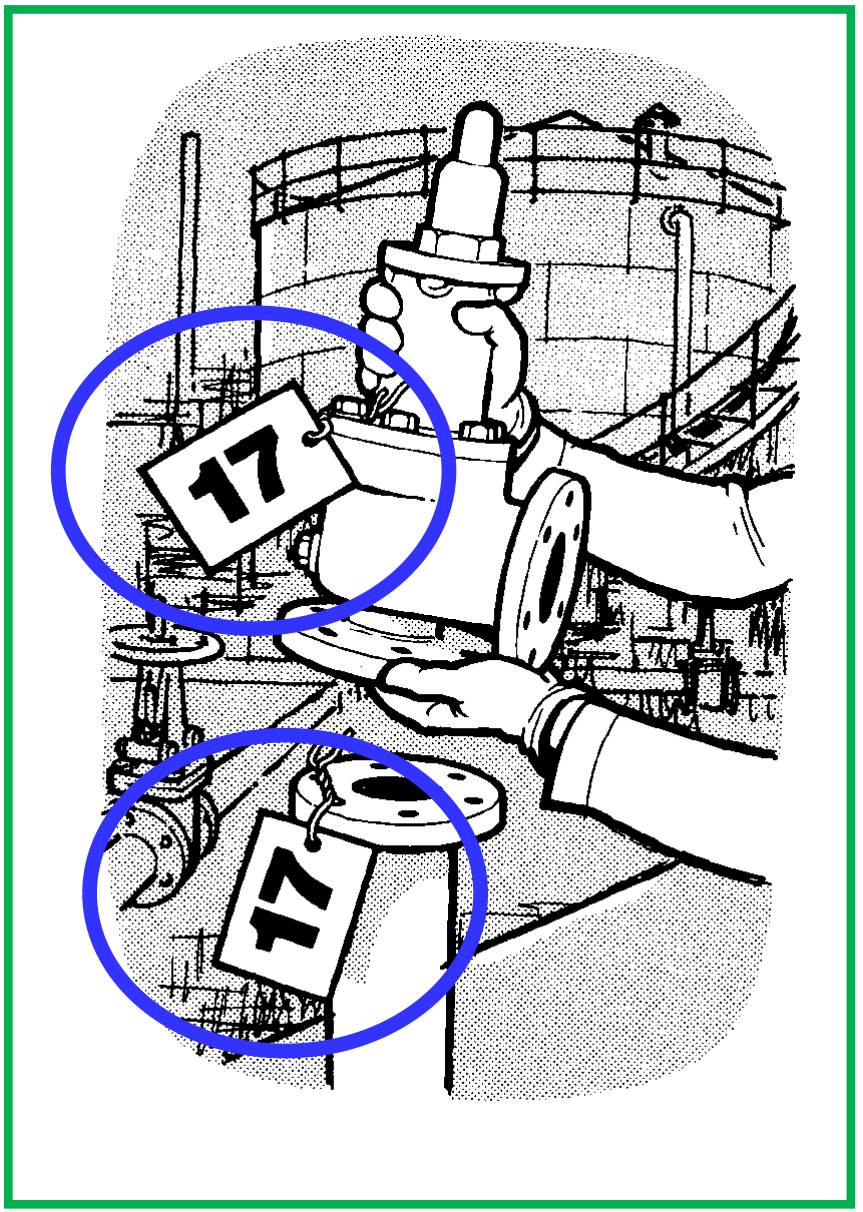
- **Relief device type (ERS designers):**
  - Operating pressures
  - Relief device set pressures
  - Reclosing vs non-reclosing types
- **Relief device type (PS&LPE)**
  - Has your PS&LPE provided insight/considerations to guide ERS design device specifications?
  - There are many types of ERS devices, each with special installation, inspection, testing and PM requirements.

ERS Device Installation Considerations

- Relief Device Installations in Corrosive, Fouling or Plugging Service
- Relief Devices that vent to atmosphere
- Relief Devices that vent to headers
- Inspection, Testing and PM Strategies

Management System for ITPM of ERS during Turnarounds/Outages





PRESSURE SAFETY/PROCESS SAFETY INTERACTIONS

- **Calcs (ERS designers):**
  - Required capacity for each applicable scenario Vs ERS system capacity
  - Relieving pressure for each vessel in pressure system
  - PSV stability
- **Calcs (PHA team with the PS&LPE)**
  - Reviews ERS design reports, findings & relieving pressures
  - Have “global” scenarios leading to large flare loads been considered; (cases with BUBP > 50% and accumulation > 10%). Is a Safety Instrumented System (SIS) required?
  - Considers cases with high vibration energy or thrust

AVAILABILITY of Emergency Relief Devices

How is the required Availability of an ERS determined at your organization?

In other words, how do you determine the Maximum Allowable Probability of Failure on Demand (PFD_{avg}) for the ERS device or Safety Instrumented Function (SIF) for the scenario of concern?

PRESSURE SAFETY/PROCESS SAFETY INTERACTIONS

- **Calcs (ERS designers):**
  - Discharge system hydraulics vs. allowed limits
  - Discharge system design such as flare system design
  - Other effects in effluent handling (reaction, corrosion, plugging)
- **ERS reports (PHA team and PS&LPE)**
  - Considers discharge location
  - Discharge different than process: state, conditions, composition, toxicity, flammability
  - This one is significant: when does the risk analysis get done considering what the ERS team learned about what is released? (Seveso, Bhopal)

The ERS "Lifecycle"

MANAGEMENT OF CHANGE

MOC Programs MUST be used to evaluate the impact to ERS arising from:

- **Changes in Operating Conditions**
- **Changes in Piping Configurations**
- **Changes in Process Material Compositions and Constituents**
- **Changes in Inspection and Testing Findings**
- **Others?**

OSHA VPP Application Supplement for PSM Regulated sites

Revised 2014

Part I on MOCs

Part II on PRS Design

PRESSURE SAFETY/PROCESS SAFETY INTERACTIONS

- **OSHA Part I MOC:**
  - MOC identifies all potential safety impacts?
  - MOC team includes a member who understands enough ERS theory to accurately guide this decision?
- **MOC (PHA team)**
  - How are potential MOC pressure safety issues identified?
    - Conduct a Preliminary Hazard Review EARLY, before process engineering begins
    - Involve key stakeholders and work in collaboration

PRESSURE SAFETY/PROCESS SAFETY INTERACTIONS

- **OSHA Part II PRS in MOCs Design Guidance:**
  - change in unit throughput (for example)
- **MOC (PHA team)**
  - The PHA team **MUST** assess the adequacy of the existing RSD wrt the throughput change
  - Recognizes PHA team doesn't do the calcs, but requires the PHA team to evaluate and consult with ERS designers (in other words, PHA team has to take the **LEAD to make sure this happens**)

PRESSURE SAFETY/PROCESS SAFETY INTERACTIONS

- **OSHA Part II PRS: How does facility document RSD and design basis?**
  - ERS designers: all aspects of ERS design
  - All aspects of ERS effluent handling
- **RSD (PHA team)**
  - How does your facility address the reliability of valves and the reliability of Admin Controls to keep necessary valves open
    - Develop and implement an ITPM Program (Inspection, Testing and Preventive Maintenance)
    - Conduct routine, planned facility inspections to identify Safety System Impairments to ERS

PRESSURE SAFETY/PROCESS SAFETY INTERACTIONS

- **OSHA Part II PRS: Open Vents:**
  - **ERS designers: model flows and relieving pressures**

- **RSD (PS&LPE)**
  - **The site Process Safety and/or Loss Prevention Engineer must assess the dispersion effects for atmospheric releases (e.g., PHAST)**

PRESSURE SAFETY/PROCESS SAFETY INTERACTIONS

- **OSHA Part II PRS: PSV Bonnet Vents:**
  - **ERS designers: properly specify bellow style PSVs with needed bonnet vents**

- **RSD (PHA team)**
  - **Installations must be such that the risk of personnel exposure from bonnet vents has been minimized**
  - **Routine, planned facility inspections must ensure these vents are not plugged, remain open, and oriented to vent in a safe direction**

PRESSURE SAFETY/PROCESS SAFETY INTERACTIONS

- **OSHA Part II PRS: Lots more for future discussion**

- **Audience:**
  - **Your chance to comment about how these interactions do or don't work at your facility.**
  - **Questions of the presenters on how to improve on both sides of this discipline?**