

Pressure Relief Device Capacity Comparison: Inspector's Point of View

Earl V. Harlow, PE

Background & History

- Paragraphs of Interest (Beginning with the 2007 edition)
 - NBIC Part 2, Paragraph 2.5.2(c)

“Verify nameplate capacity and, *if possible*, compare to system capacity requirements”
 - NBIC Part 1, Paragraph 4.5.4(f)

“The owner shall document the basis for selection of the pressure relief devices used, including capacity, and have such calculations available for review by the Jurisdiction”
- Historically inspectors verified capacity for Fired Units
 - Add the capacity of the relief valves, as applicable
 - Determine steaming capacity or maximum fuel input
 - Verify valve capacity exceeds boiler capacity



Capacity Comparison

- Water Heaters based on kW input converts to BTUs
 - Relief valve rated capacity ASME or CSA?
 - Clarification provided in the Winter 2014 Edition of the National Board Bulletin
 - ASME capacity for ASME stamped
 - CSA capacity for those not ASME stamped



Capacity Comparison

- Unfired Process Vessels are more challenging
 - Knowledge of the process is necessary to identify potential contingencies
 - API 520 / 521 used for capacity sizing
 - ASHRAE used for capacity sizing of chillers



Process Diagram

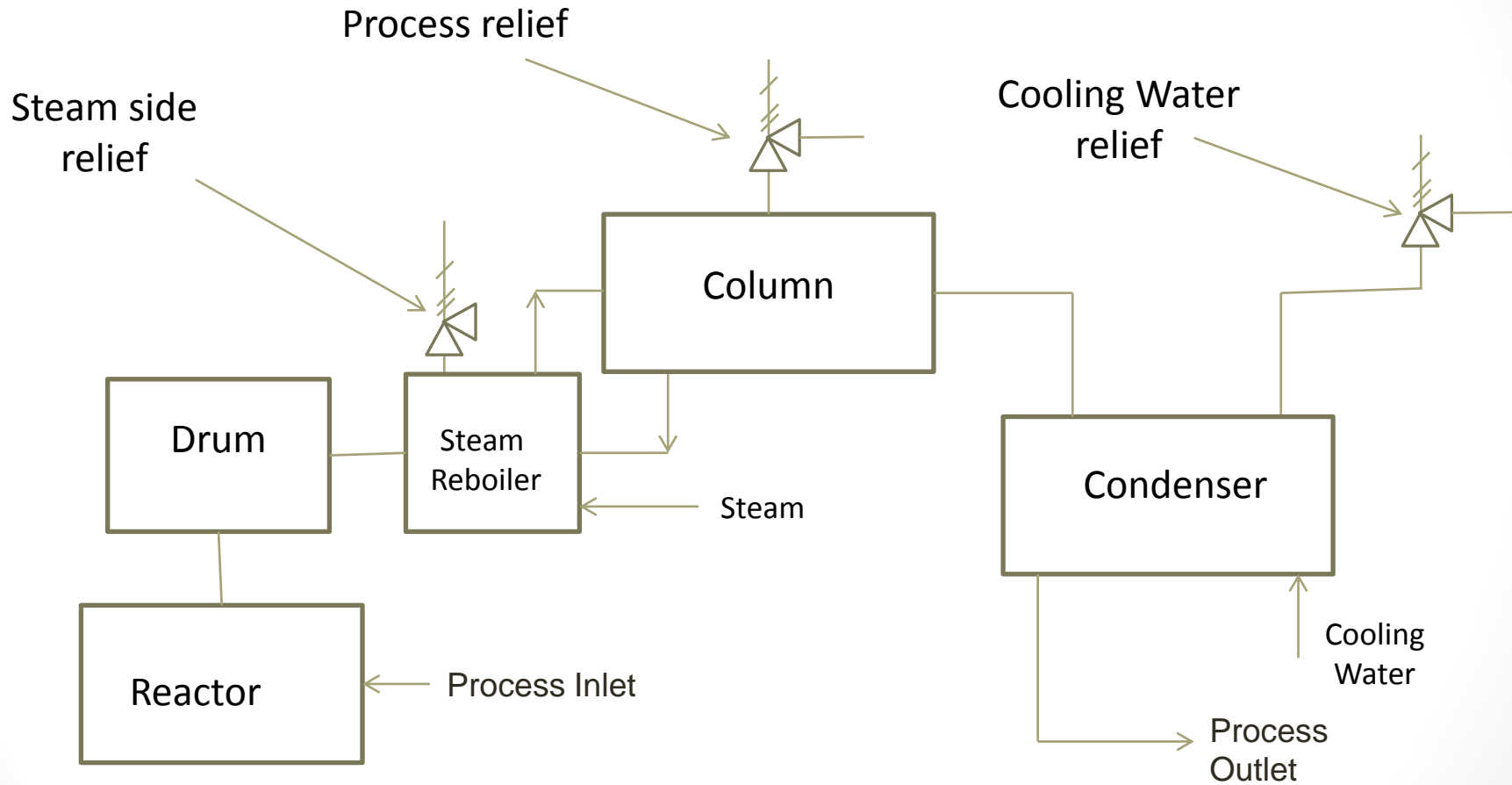


FIGURE 1: Simplified Process Flow Diagram

Contingency Analysis

- Looking at the condenser heat exchanger cooling water relief:
 - Possible contingencies
 - Fire Case
 - Blocked in pump discharge
 - Blocked in Thermal Expansion
 - Tube Failure
 - And others not listed
 - For our example let's address Fire Case as the controlling contingency.
 - Water is on the tube side, what area should be used for Fire Exposure?



Contingency Analysis Cont'd

- Very time consuming process for the inspector
 - Look for the summary sheet
 - Any process changes / plant expansions since the analyses
- Summary sheet required capacity
 - 10,000 lbs/hr
 - .982 in²
 - D Orifice
- Valve is stamped 25gpm
- Is the valve acceptable?
- Articles indicate the valve rating should be with the contents in the normal operating condition (In this case liquid gpm)
- Valve area API or ASME?



Capacity Comparison

- Summary sheet required capacity
 - 10,000 lbs/hr
 - .982 in²
 - D Orifice
- Valve Data
 - 25 gpm
 - .970 API area
 - .990 ASME area
 - D Orifice (Found in Model # or Serial #)



Inspectors Perspective

- Survey of inspectors indicated:
 - Not aware of the need to compare capacities for unfired
 - Indicated it was only initial requirement done by jurisdiction
 - Did not plan to do capacity verification for unfired
 - Didn't feel trained
 - No communication indicating the requirement
 - No time to do the additional work for the inspection
 - Inconsistent application inspector to inspector = unfair treatment of owners of equipment



Suggested Actions

- Get input from inspectors for the proposed changes to this paragraph
- Clarify intent for inspectors
 - initial inspection only?
 - Consistent inspections = fair treatment for equipment owners
- Develop a Management of Change process
 - Training on changes and how to perform this comparison
 - Communication of changes to inspectors

