Process Modeling Requirements for the Safe Design of Blowdown Systems –
Changes to Industry Guidelines and How This Impacts Current Practice

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ABSTRACT

Safe design of pressure relief and blowdown systems requires that safety valves, relief orifices, flare piping and knockout (KO) drums are all sufficiently sized, to ensure that the process is protected from over-pressurization and that emergency depressurization can be executed rapidly and effectively. An essential design step is to ensure that temperatures resulting from auto-refrigeration are sufficient to avoid the risk of brittle fracture in both the process equipment and flare system.

However conventional calculation methods rely on a number of assumptions and approximations. In particular, calculations of safe design temperatures and relieving rates for complex blowdown segments are typically based on analysis of a single pseudo-vessel with simplified representations of the fluid’s thermodynamics and heat transfer.

Best-practice in engineering and operating companies when assessing risks in pressure relief and blowdown systems now increasingly involves the application of high-fidelity dynamic simulation techniques. For example:
- rigorous, distributed blowdown system models are used to assess the risks of cold temperature brittle fracture during process depressurization
- analytical methods are used when performing pool and jet fire evaluations.

Evolving industry guidelines necessitate a change in the way all oil and gas companies approach process safety, in particular the design and analysis of pressure relief and blowdown systems. This presentation discusses how industry practice, and the tools and methods that support it, are beginning to evolve due to recent guideline changes.