



Keeping Chemical Processes Safe

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With safer designs, E&Cs can reduce the time spent completing pressure relief analysis by designing, sizing and documenting pressure safety valves and rupture disks all within one integrated software environment. When safety is a priority, process engineers need to act now to adopt cutting-edge tools that help eliminate risk and maintain standards.

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Safety is the number one priority when designing a chemical process. Over-pressurisation of equipment or piping is a major concern for engineers, who must prevent dangerous bursts, explosions and fires in order to protect personnel.

Pressure relief valves are designed and installed to safely redirect any excess liquid or vapour to avoid pressure build-up and eventual vessel rupture. Since conditions vary significantly within processes, every pressure relief valve in a plant must be analysed independently to protect against all possible emergency scenarios. Next, the piping that transports the relieved fluid must be properly sized to ensure that the fluid will be directed to the disposal system while meeting appropriate pressure drop and velocity constraints. The results of the PSV sizing effort also influence the design of the flare tip, which is used to safely burn-off the relieved fluid. Finally, the results for all PSV and disposal system analyses must be

documented for regulatory and procurement purposes.

Traditionally, engineers have used rudimentary Excel spreadsheets produced internally to size the relief valves. This method is, however, open to human error because it is a manual and time-consuming process. Also, Excel spreadsheets fail to capture complex fluid behaviour across a relief device. From conceptual engineering through FEED, having the right tools to gain a deeper understanding of fluid characteristics means that engineers can mitigate the risk of potential hazards early in the process, when cheaper mitigation options are still available, in order to optimise asset effectiveness.

E&Cs who serve the owner-operators on projects need a robust set of integrated safety tools, which allow companies to fulfil engineering projects with greater accuracy and efficiency, as well as standardise their relief system calculation and documentation company-wide. A plant needs to be viewed holistically. Specialist safety engineering simulation software has built-in pressure safety valve sizing features, which use data from a process simulation to help automate PSV calculations all within one integrated workflow environment.

The aspenONE Engineering software suite is an industry standard integrated system that contains sophisticated tools, such as Aspen HYSYS, Aspen Plus and Aspen EDR. These tools have common user interfaces and help engineers intuitively deliver accurate results and produce significant economic gains on small and large-scale projects.

Reducing time

For E&Cs, the use of spreadsheets can cause problems and make the task more difficult. With specialist engineering safety software, pressure relief analysis can be accomplished by designing, sizing and documenting pressure relief devices within the same tool used to model the process, reducing the document management effort while increasing the accuracy of the results. Typically, engineers can reduce the simulation time from months to days. Companies can take advantage of more sophisticated software in order to meet the latest API standards in their pressure relief work.

Dynamic simulation provides a convenient and powerful way to ensure that the response of the control systems results in safe operation during planned events, like start-up and shutdown. Furthermore, since dynamic simulation allows engineers to explore the behaviour of

a process over time in response to unexpected events, it offers an excellent means of rigorously determining the required relief load for complex over pressure scenarios, like loss of cooling or power failure.

At the conceptual level, there are many variables to manage when designing a chemical process. A fast and robust simulation tool allows engineers to consider more factors in the design while reducing the design time, which gives engineers confidence that they are delivering the best option for clients. For example, an engineer may have a fluid with which he may or may not have previous experience, and this can impact the design of the plant. Leading process simulators enable the engineer to rapidly prototype the process plant, while optimising the design simultaneously for energy, cost and safety.

Integrated system sets the standard

Engineering problems are becoming increasingly more complex. For many E&Cs, pressures on engineers today mean that engineers are being asked to do more with less resource. There is a growing need for answers to problems in shorter time frames whether in the upstream, downstream or chemical industries.

AspenTech has taken great strides to address this issue and make its engineering tools more robust and intuitive for users of all levels. The aspenONE Engineering software suite is an industry standard integrated system that contains sophisticated tools, such as Aspen HYSYS, Aspen Plus and Aspen EDR. These tools have common user interfaces and help engineers intuitively deliver accurate results and produce significant economic gains on small and large-scale projects. The tools themselves also capture a lot of process knowledge, whereby engineers can create models that document a plant system. This knowledge can be shared for next generation engineers to use on future projects.

Accepted industry standards API 520, 521 are implemented in AspenTech's aspenONE Engineering suite, providing engineers with process safety software that will enable them to analyse their pressure relief systems during all stages of the plant lifecycle – conceptual design, FEED and revalidation. With AspenTech's process safety software, manual data transfer between sized relief devices and flare network analysis is eliminated. Pressure relief analysis results generated within Aspen Plus and Aspen HYSYS can be automatically exported to Aspen Flare System Analyzer and relief scenarios from simulation can be mapped to specific flare scenarios to create a detailed and rigorous flare network.

With process safety software tools, E&C engineers gain enormous benefits, including the ability to:

- Save engineering time by up to 50%
- Reduce mistakes and manual transfer to ensure data accuracy
- Increase ability to integrate results into flare system models
- Increase scope of relief load calculations
- Avoid unnecessary capital investment through under designs or overdesigns
- Avoid the consequence of inaccurate pressure safety valve sizing
- Uphold quality safety standards
- Ability to model multiple scenarios
- Automate regulatory reports and documentation for compliance
- Ease of use tools support engineering knowledge

Eliminating risk

For many owner-operators, running safe operations and optimising existing assets is crucial to squeeze as much value from the plant and achieve overall operational excellence. For engineering companies, this presents

opportunities to add value and be a leading-edge solution provider.

Having a deeper understanding of plant conditions is, therefore, vital to produce efficient designs. Eliminating the possibility of equipment becoming hazardous or breaking due to over-pressurisation is a high priority. With safer designs, E&Cs can reduce the time spent completing pressure relief analysis by designing, sizing and documenting pressure safety valves and rupture disks all within one integrated software environment. When safety is a priority, process engineers need to act now to adopt cutting-edge tools that help eliminate risk and maintain standards.

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