

Can a general process simulator be used for flare system design and rating?

Client: Various clients

Process Ecology has worked with clients on various flare studies through the years and a question which occasionally comes up is whether a process simulator such as AspenTech HYSYS can be used for flare system design and/or rating.

In most cases, dedicated applications such as AspenTech Flarenet or Invensys Visual Flow are much better options for a number of reasons which are outlined here. The following description applies to HYSYS vs. Flarenet, although many of these items are more generally applicable to other simulators.

Accuracy at high velocities

Most importantly, results can be inaccurate at the conditions normally encountered in flare systems, with a bias to line sizes that are too small. At high velocities, Flarenet is more accurate as it includes the acceleration term in the pressure drop methods. Also, choked flow conditions are checked in Flarenet.

Flare header/lateral sizing calculations

Flarenet provides the ability to do design calculations, meaning that the required header and lateral sizes for the flare network are calculated, ensuring that system constraints such as valve backpressure and velocities are not exceeded. In HYSYS, this could only be done by trial-and-error.

Multiple scenarios

The ability to analyze multiple design/rating scenarios is a benefit of Flarenet. Various relief scenarios associated with a common flare network can be calculated concurrently. In HYSYS, this would require that multiple cases be maintained, and if there is a change in the flare network (e.g., a pipe length) it would have to be updated in all of the cases. In Flarenet, a change to the flare network would easily be applied to all scenarios.

Flexibility with calculation fidelity

With Flarenet, the user has the ability, where warranted, to simplify the calculations for quicker convergence. For example, assuming that the fluid is gas phase only can be significantly faster than using rigorous thermodynamic calculations and two-phase pressure drop methods.

Complex systems

Flare systems which have looped lines, jumpovers, or multiple sinks (flares) can be extremely difficult for HYSYS to solve. This is especially the case with looped lines where the direction of flow is not known in advance. In the figure below, there are many pipes where the direction of flow would be dependent on relative flowrates of the sources (valves):



Flare system simulators have been developed to address the unique requirements of flare studies - in most cases a general simulator will not do the job.