CASE STUDY

Lloyd's Register meets quick deadline with superior analysis from Octave Aspect Pipe Stress and Aspect Pressure Vessel

Key facts:

Company: Lloyd's Register Asia

Website: www.lr.org

Industry: Chemical, Petrochemical, Oil & gas

Country: Sri Lanka

Octave products used: Aspect Pipe Stress *(CAESAR II),* Aspect Pressure Vessel *(PV Elite),* NozzlePRO

Identifying goals

Lloyd's Register (LR) frequently performs third-party design appraisal review of complex equipment. It was awarded a project to review the piping stress analysis as per ASME B31.3 and B31.4 and equipment as per ASME Sec. VIII Div. 2.

A complete LPG storage and terminal facility was constructed and needed design review of 13 pieces of static equipment in addition to about 100 critical lines in the piping system. The project included large LPG spheres, propane spheres and other allied static equipment.

Overcoming challenges

The piping system had quite complex construction because it involved piping from the jetty to the tank farm and piping of the tank farm with wind loadings, and both with and without insulation. On top of all that, the client had a strict deadline within which they wanted to have the design review in place for the piping system and equipment. This was a new client and it was a large initial order. The equipment was also complex because it is a spherical tank with braced leg support and with a lot of external loading – external platform loading, railing loading and spray-water system loading.

It was easier to determine the loads for the equipment end connections since pieces were evaluated by Aspect Pressure Vessel software. The team could experiment with various options for the equipment nozzle load – including the anchor option, Welding Research Council (WRC) option and entering the flexibilities of the geometry by external evaluation. Using Aspect Pipe Stress LR was able to highlight some of the major non-compliance issues to the client, which their team greatly appreciated. Non-compliance issues included failure of nozzles in local load criterion and overstress in leg support.

Key benefits:

- Accommodated design changes even with a quick turaround
- Performed multiple opening checks for the large quantity of nozzles on the equipment
- Accurately evaluated the flanges with external piping loads
- Created reports with a single click

The team could review the complete equipment as a whole in an integrated approach using Aspect Pressure Vessel. LR could model and simulate the complete equipment with leg support and bracing, external platforms and nozzles. The cyclic loadings in the sphere could be easily reviewed. Data integration was simple since Aspect Pressure Vessel was used for the equipment and Aspect Pipe Stress was chosen for the piping.

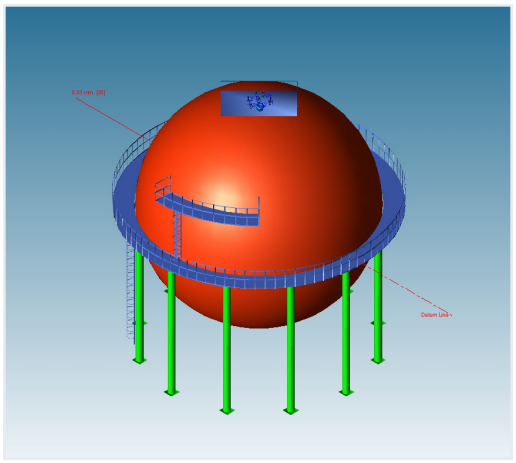
Many nozzles had pipe loadings that LR could quickly evaluate. Yet for some of the nozzles, WRC was not applicable, so the team needed to perform finite element analysis. With the combined harmony and synchronization of Aspect Pressure Vessel and NozzlePRO, it could quickly perform the FEA. The flanges could be analyzed as well under the external loads of piping.

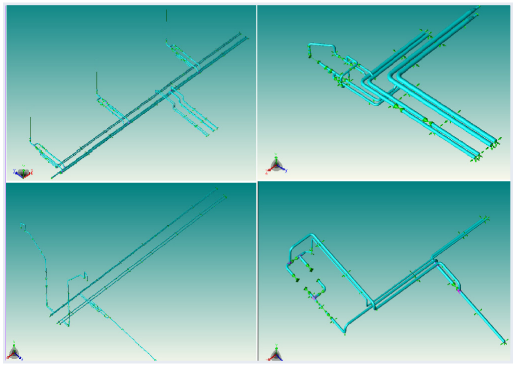
In between the initial request and final delivery, the client had modified some of the inputs of the equipment (including changes in nozzle loads, location and orientation), but with the PV Elite model in place, the team could quickly accommodate the changes.

LR had to perform its own calculations and perform its own calculation report, which is an auditable document, as part of the group's activity. Aspect Pipe Stress helped LR instantly prepare its own calculation reports.

Realizing results

With software from Octave, LR could easily deal with design changes even with a quick turnaround. It was simple to perform multiple opening checks on the large quantity of nozzles on the equipment. The team could accurately evaluate the flanges with external piping loads. LR was able to determine the loads for the equipment end connection.





The combined loading calculation and review would have been a major challenge with this equipment, which the team cannot imagine performing in the absence of Aspect Pressure Vessel. Its own report preparation would have been erratic without Aspect Pressure Vessel, which offered a single-click auditable document.

LR was able to save lot of work-hours for the equipment and for the piping, thanks to the use of Aspect Pressure Vessel and Aspect Pipe Stress.

About Octave

Octave is a leader in enterprise software, turning data into decisive action and intelligence into your edge. Our software solves for and simplifies complexity, from the design and build to operations and protection of people, property and assets – for any scope, at any scale. For decades, we've partnered with customers to sharpen performance, elevate efficiency and amplify results. From factory floors to entire cities, our solutions are tuned to scale up what's possible from day one onward.