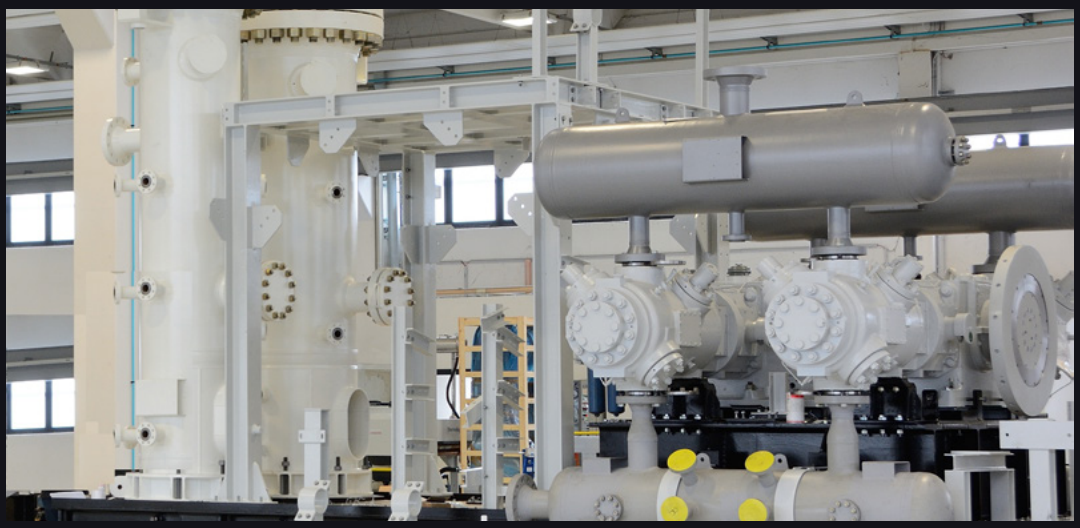
CASE STUDY

Oil & Gas station manufacturer avoids fatigue failures by leveraging Octave's design and analysis solutions



Key facts:

Company: SAFE S.P.A

Website: www.safegas.it

Industry: Oil & Gas

Country: Italy

Octave products used: Forte 3DWorx *(CADWorx Plant Professional)*, Aspect Pipe Stress *(CAESAR II)*

Since 1975, SAFE has actively engaged in various areas of natural gas treatment and compression. Today, SAFE designs, manufactures and assembles CNG, oil & gas and biogas stations with a manufacturing and supply capacity of more than 500 compressors per year.

Identifying goals

Since 1975, SAFE has been a key player in the Italian oil and gas industry with its proprietary design and production of compressors – producing tailored and optimized solutions for the market. SAFE has been working together with GE Oil & Gas Nuovo Pignone to package, sell and service GE High-Speed Reciprocating Compressors worldwide since 2007. Presently, SAFE has an oil and gas product portfolio that ranges from a few kW to 5000 kW machines. SAFE's own proprietary design and production compressors are used for small and medium applications, while GE HSR compressors are packaged for larger services.

Overcoming challenges

While working on the project, the engineers at SAFE quickly noticed that fatigue failures of main piping and small-bore attachments, as well as piping supports degradation, were common problems associated with compression skids. This is due to high vibration levels caused by pulsation-induced forces.

This kind of pulsation can cause excessive vibrations and cyclic stresses for the skids. Therefore, SAFE quickly realized that a mechanical response analysis of the system was necessary to keep the vibration and cyclic stress levels within allowable levels to avoid fatigue failures during the early stage of the design process.

Key benefits:

- 70% time savings in calculation model generation
- Less error-prone model building due to the accuracy of Aspect Pipe Stress
- Easy management of wide and complex piping systems from both design and calculation points of view

Realizing results

SAFE chose Aspect Pipe Stress to perform mechanical response analysis according to the API 618 standard. The solution was chosen due to its modal and harmonic analysis capabilities, and its reputation as an efficient tool to evaluate the mechanical natural frequencies of the system (MNFs) as well as the vibration and cyclic stress levels caused by dynamic forces induced by pulsation.

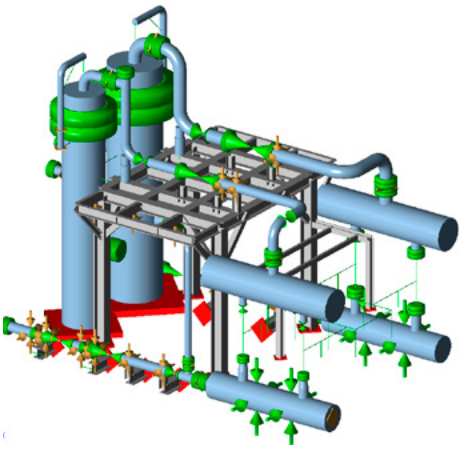
Originally an AutoCAD® Plant 3D user, SAFE also decided to adopt Forte 3DWorx Design Suite for its ease of use, flexibility and interoperability with analysis programs. SAFE used Forte 3DWorx to easily create compression skid 3D models, including piping lines, steel structures and equipment.

The bi-directional data exchange capability between Forte 3DWorx and Aspect Pipe Stress positively affected the project outcome and provided SAFE with:

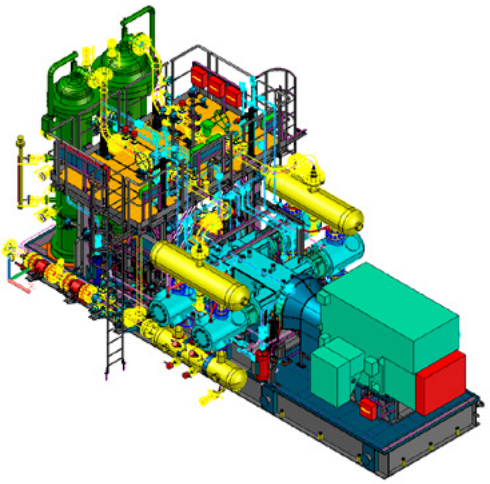
- 70% time savings in calculation model generation due to the automatic generation of the Aspect Pipe Stress model from the 3D Forte 3DWorx model.
- Less error-prone model building due to the accuracy of Aspect Pipe Stress.
- Easy management of wide and complex piping systems from design and calculation points of view.
- The ability to perform both conventional pipe stress and pulsation analysis within a single solution.
- The possibility to easily evaluate new solutions to deal with problems induced by high pressure pulsations.

The combination of Forte 3DWorx and Aspect Pipe Stress allowed SAFE to consider all the internal and external factors affecting the MNFs of the piping systems, such as flexibility and stiffness of structures and pipe supports, as well as nozzle flexibilities.

SAFE also worked with Octave to further improve Aspect Pipe Stress capabilities for pulsation studies according to the API 618 standard to make the software even more user-friendly and to satisfy SAFE's remaining complex and specific needs. SAFE plans to use Octave's design and analysis solutions in all of its future compressor projects that they perform for the oil and gas industry.



Compressor skid: Aspect Pipe Stress model



Compressor skid: Forte 3DWorx model

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.