



FACTS AT A GLANCE

Company: Safe S.p.A

Website: www.safegas.it

Description: Since 1975, SAFE has been 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.

Employees: 75

Industry: Oil & Gas

Country: Italy

PRODUCTS USED:

- Intergraph® CADWorx® Plant Professional
- CAESAR II®

KEY BENEFITS:

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

SAFE CHOOSES INTERGRAPH® CADWORX® AND CAESAR II® FOR BETTER MECHANICAL RESPONSE ANALYSIS

Oil & gas station manufacturer avoids fatigue failures with improved natural frequency analysis



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. Since 2007, SAFE has been working together with GE Oil & Gas Nuovo Pignone to package, sell, and service GE High-Speed Reciprocating Compressors worldwide. Presently, SAFE has an oil and gas product portfolio which 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.

Currently, SAFE is involved in the design and production of four gas compression skids for onshore and offshore applications in southern Italy and Congo.

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.

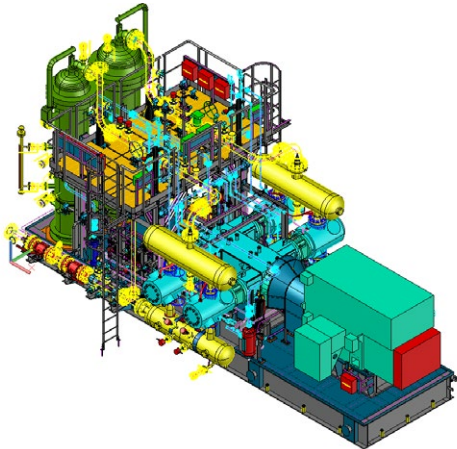
This kind of pulsation can cause excessive vibrations and cyclic stresses for the skids. Therefore, SAFE quickly realized that a mechanical response analysis of the system was necessary to keep the vibration and cyclic stress levels within allowable levels to avoid fatigue failures during the early stage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

REALIZING RESULTS

SAFE chose Intergraph CAESAR II to perform mechanical response analysis according to the API 618 standard to avoid these challenges. CAESAR II was chosen due to its modal and harmonic analysis, and it has proven to be 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 Intergraph CADWorx Plant Design Suite for its ease of use, flexibility, and interoperability with analysis programs. SAFE used CADWorx Plant Professional to easily create compressor skid 3D models, including piping lines, steel structures, and equipment.

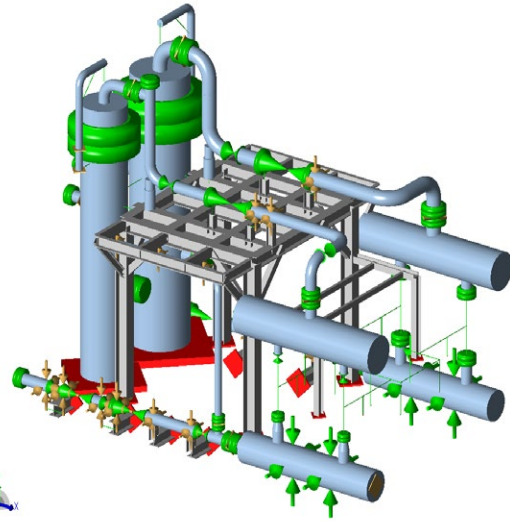


Compressor skid: 3D CADWorx model

The bi-directional data exchange capability between CADWorx and CAESAR II positively affected the project outcome and provided SAFE with:

- 70% time savings in calculation model generation due to the automatic generation of the CAESAR II model from the 3D CADWorx model.
- Less error-prone model building due to accuracy of CAESAR II.
- 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 possible new solutions to deal with the problems induced by high pressure pulsations.

The combination of Intergraph CADWorx and CAESAR II allowed SAFE to consider all of 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.



Compressor skid: CAESAR II model

MOVING FORWARD

Currently, SAFE is working with Intergraph staff to further improve CAESAR II 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 Intergraph analysis solutions in all of its future compressor projects that they perform for the oil and gas industries.

ABOUT INTERGRAPH

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