

# (Complete) Compression Service Technology

CST grows from small service provider to full compression system engineering company in 15-year span

BY ROBERTA PRANDI

**C**ompression Service Technology (CST) was founded in Florence, Italy, in 2002. The company, staffed initially with four people, worked as a service-engineering provider mainly to Nuovo Pignone (now Baker Hughes, a GE Company) for reciprocating compressors.

The first turnaround for the company happened in 2004 when Alessandro Traversari, who had just retired as the general manager for rotating machines at Nuovo Pignone, joined CST. He then started the process of transitioning the company into an independent service-engineering provider.

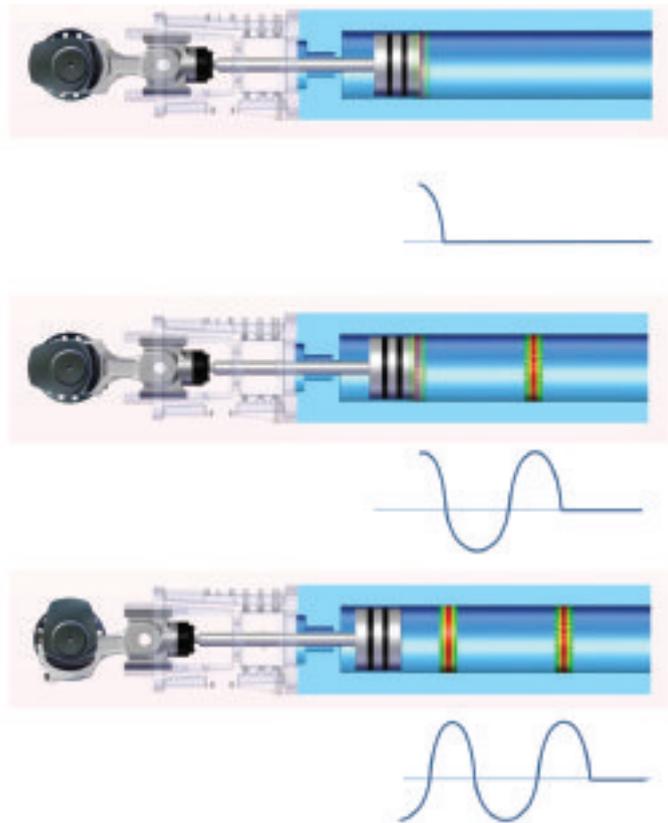
One of Traversari's first endeavors was to set up a remote monitoring and diagnostic service for reciprocating compressors. Then, in 2005, CST started with its own design of machine components, mainly for reciprocating compressors. A few years later, the company designed its first compression package for storing natural gas underground.

At first, CST used existing simulation software for designing components. In 2010, however, the company developed its own proprietary software for performance simulation, followed by software for pressure pulsation, vibration and rotordynamic analyses (including torsional, lateral, modal and stability analysis). Today, the company's software arsenal includes finite element analysis (FEA), computational fluid dynamics (CFD), fluid-structure interaction (FSI), failure mode analysis, acoustic studies, bearing stress analysis and virtual prototyping.

Alessandro Traversari, now CST's managing director, said that another milestone came in 2011, when the company started its consultative services and troubleshooting for turbomachinery.

"This includes centrifugal compressors, steam and gas turbines and centrifugal pumps, which soon brought us also to the design of machine components for centrifugal compressors," he said. "The latest step was to add to the company's competences the design and execution of complete compressor system projects."

CST's complete compressor system projects is a comprehensive service including engineering, with piping acoustical and structural studies, instrumentation and control, up to material requisition, procurement specification,



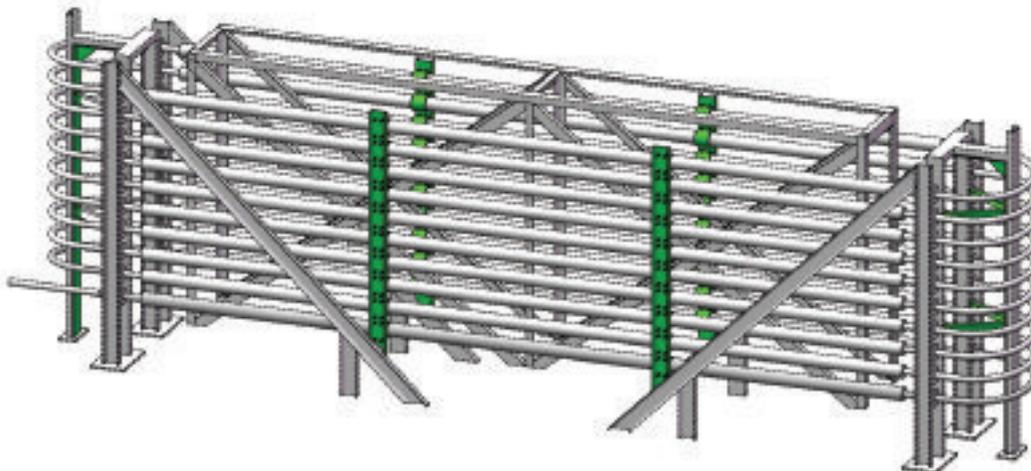
■ The operation of reciprocating compressor systems generates reciprocating forces and pressure pulsations. These can lead to vibration issues with potential failures.

bill of material (BOM), balance of plant (BOP), testing and supervision and total project management.

"Our company is divided into four main divisions: Machine Design, System Engineering and Construction, Service and Remote Diagnostic, and Research and Development," Traversari said. "Thanks also to the integration with highly qualified partners, technical universities, high-performance computing centers and international regulatory bodies, nowadays, CST is capable of offering full-scope customer support from the conceptual design to the final project execution, and on to troubleshooting, remote monitoring and diagnostic, revamping, conversions, upgrades, asset life-cycle management, site service and field supervision."

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■ To solve vibration issues at an LDPE plant, CST carried out an intervention to the cooler and the piping system near it. Shown here are the modifications introduced to the cooler structure after FEM analysis.



One recent example of the comprehensive industrial approach that CST adopted was solving a serious vibration issue that occurred at a low-density polyethylene (LDPE) plant.

At the plant, high vibration issues were breaking pipes and causing welding failures, actions that would occur every three to four months over several years. Vibrations occurred on a high-pressure line that normally operated at around 14,500 psi (100 Mpa), and reached values around 3.9 ips (100 mm/s) root mean square (rms) on the piping system and even more than 7.9 ips (200 mm/s) rms on the cooler structure.

CST started with an on-site survey, analyzing the piping system, collecting data and analyzing the failure history. The company discovered that the interstage cooler and nearby piping were the most susceptible to vibration.

The proposed solution had to be implemented during the next 10-day plant maintenance outage, which ruled out any drastic changes in the plant's layout. CST's solution covered two main areas: the piping system near the cooler and the cooler itself.

CST, using the results of a dynamic forced response finite element method (FEM) analysis, studied the feasibility of new supports and soon determined their optimal positions. The company also used the vibration measurements to find the areas where stiffer supports were necessary. Many of the existing supports needed reinforcements. High damping rubber pads were also added between the supports and piping. In order to achieve the highest damping effect, CST applied the appropriate tightening torque on the support bolts.

Additionally, CST also reinforced the cooler structure and foundation. The FEM analysis encouraged CST to design a new stiffening structure for the cooler and inject a flowable fill concrete into the foundation.

At the end of this set of corrective actions, a frequency vibration measurement campaign took place to verify the effectiveness of the modifications. The study showed significant positive outcomes. First, the overall vibration on the cooler was reduced up to 90% in the most critical points.

Nearly all of the vibration values on the piping system also fell below the recommended correction values. Lastly, the new measured values were very close to the predicted vibration values from the FEM analysis.

In the span of 15 years, CST has transformed from a local maintenance-engineering provider into an international player for critical machine applications in oil & gas and other industrial sectors. At the start, CST saw about 90% of its sales occurred in Italy. This year, the 50-person company expects 50% of sales to come from foreign markets. [CT2](#)



■ Italy-based CST expects to reach this year 50% of sales from foreign markets. Its international team has the capability of intervening quickly for any project all around the world.