enventure

Engineering Excellence.
Building Trust.

Helping homes stay warm in winter with increased LNG processing reliability

Type of Project	Client Industry	Location	Project Duration	Tools Used
LNG Plant Pipe Stress Analysis	**EPC**	**USA**	**3** Months	Autoplant 3D+CAESER II+AutoCAD

Project Profile

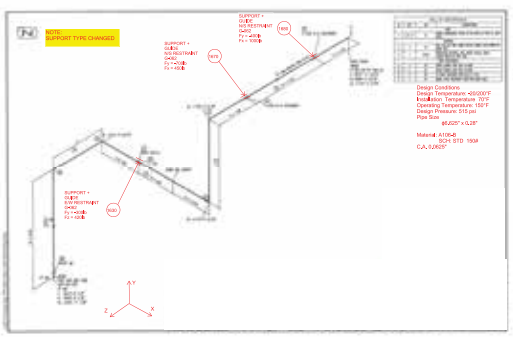
The Client is a US-based company ranked among the top 10% of the Top 400 Contractors by Engineering News-Record (ENR)

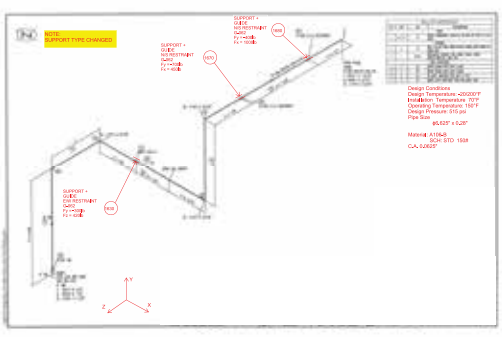
Team details

Project Lead: **12** Yrs | Piping Analysis Lead: **12 to 14** Yrs

Piping Designers: **4** to **6** Yrs | Analysis team: **5** to **7** Yrs

Structural Designer: **10** Yrs





This customer was an engineering services contractor named among the top 400 contractors by Engineering News Record (ENR). With prolific experience across the Americas and South East Asia, spanning front-end engineering design, turnkey engineering, and Engineering, Procurement and Construction (EPC) for oil and gas, and petrochemical facilities, and chemical plants, they had built a reputation for quality, ingenuity and innovation.

This project was a part of an ongoing engagement with the customer where Enventure was acting as a satellite engineering team to help it achieve its objectives of quality improvements, value engineering, and cost reduction.

As the bitter winter approached, this LNG plant established in the late '60s was undergoing scheduled maintenance. This plant supplied piped gas for residential furnaces and its reliability throughout the winter months was crucial, as disruption in production could be catastrophic for the population that it supported.

The objective of this project was to improve the plant's reliability and reduce maintenance operations. Plant Reliability improvements would directly impact the unscheduled downtimes and the risk of accidents.

- Adding a new natural gas pre-treatment system for the removal of mercury, water, mercaptans and CO2 to reduce liquid metal embrittlement in the heat exchangers
- Development of a single liquefaction train consisting of a mechanical drive combustion turbine, a Nitrogen expansion liquefaction process and a feed gas metering skid with coalescing filters
- Addition of several small natural gas-fired process heaters, a thermal oxidizer, a gas fired emergency backup generator, system controls and instrumentation, and various piping and support structures
- Conversion of the existing flaring system to an emergency backup and construction of a new flare and supporting equipment
- Installation of a boiler off gas ("BOG") compression system, fire detection and fire suppression systems

These additions were crucial in increasing the longevity, reliability and efficiency of the plant, thus making it capable of sustaining the demand for LNG during the long winter months.

Enventure Approach

Since Enventure had in an earlier project, helped the customer in a biogas digester recommissioning engagement, our capabilities were established, and the customer satisfied with the way we had handled the project. But past performances were not a guarantee of future success, so Enventure re-laid the foundations of a perfect execution with its REFR approach.

Responsive throughout the engagement – from requirements gathering to project management and communication

Efficient in estimation, program management, and bringing together the different workstreams under a unified Quality Oversight process

Fast in turnaround using reusable components, extensive libraries, Enventure's step-delay validation and quality approach and a 24x7 delivery model

Reliable in quality, reporting, documentation, and adherence to codes, standards, and industry leading practices

The project was complex and would typically require a six-month downtime if not more. Enventure realized the customer could not afford that kind of a downtime, and made an aggressive estimate of 5000 person-hours to complete.

Project/Solution Overview

The project involved analyzing over 1600 isometrics from the entire plant, followed by engineering, modeling, isometric extractions and pipe stress analysis for the facility.

Enventure established a 24x7 team for the project where shift three would also be the contact-point for the customer for queries, clarifications, and status updates. The shifts were structured with an overlap to facilitate collaboration and knowledge transfer in terms of changes, approvals, and corrections required. This facilitated a smooth and predictable execution chain.

Once the piping model was finalized the isometrics were extracted and segregated into stress categories, 1, 2, and 3, based on the extent, duration and frequency of stress. The pipe stress analysis was then performed based on ASME B31.1 Metallic Piping standards in CAESAR II. Using the step-delay approach, the stress analysis team worked in synchronization with the modeling team, where the modeling teams were on exactly a one-step delay ahead of the stress analysis team which in turn was a step ahead of the isometric extraction teams. Once a model was complete, the analysis team would pick it up, perform the analysis and revert with changes required, if any, or pass it on to the extraction team. With multiple models being processed simultaneously, none of the teams had to wait for the other to complete their work.

The stress analysis reports were collated and submitted to the customer along with the relevant calculations serving as justification. Routing suggestions, approvals and change requests were handled by the third shift, which then passed on the relevant information and instructions to the other shifts as needed.

Repeatability and proves maturity served as the foundational pillars, supporting the robust quality and program management processes that in-turn imbued efficiency, consistency, speed, and agility to the team delivering the project. Enventure was thus able to complete the project in a record three months, reducing down time and halving the plant's loss of production capability, and ultimately, revenue.

Customer benefits

In large-scale plant engineering engagements, pin-point precision in the timelines is crucial to a smooth execution. The customer was aware of Enventure's real-time project status reporting, and our ability to adhere to the timelines of the different phases of each project. This trust was crucial, as it allowed them to plan the required procurement and hiring operations to be in perfect harmony with the deliverables. It worked perfectly and resulted in:

- A massive 50% reduction in project timelines, allowing the plant to resume operations well ahead of the oncoming winter
- One-shot approvals of the plant's production readiness due to Enventure's value engineering and zero-defect turnaround across 1600 extractions
- Reduced cost of execution due to the fast turnaround as well as the precise models, which in-turn reduced rework and wastage of materials.

Conclusion

It was the second time Enventure was able to earn the reputation that the customer's trust in its capabilities was well placed. It was not an easy task, though. With numerous components requiring to work together in orchestral harmony, the fact that it was processing extremely flammable gas, the fact that it was also aggregating hazardous materials such as Mercury amalgams, Hydrogen Sulfide (H2S), which is lethal at just 100 PPM, and dealing with compressed Nitrogen and temperatures of -130° to -320° F. So HSE was not merely a compliance but a bare necessity. Having the customer's trust when it came to such crucial activities was testimony to our maturity as an Engineering Services provider.

Engineering Excellence.
Building Trust.