

RISE Structural Design Uses Innovative Technology for Methanol Plant's Pipe Stress and Structural Analysis

AutoPIPE[®]-STAAD[®] Integration Increased Productivity and Maintained Project Schedule

GAINING EXPERIENCE IN STRUCTURAL DESIGN AND PIPING ANALYSIS

Based in Tokyo, Japan, RISE Structural Design, Inc. specializes in structural design and analysis for overseas plant, building, and piping design. Known for its work in seismic diagnosis, the company identifies situations and formulates proposals based on its broad experience in providing safe and durable structural design and piping analysis.

RISE took on a pipe stress analysis project at a methanol plant in Japan and was contracted to perform pipe stress analysis on the pipes near the plant's furnace, which produced heat ranging from 300 to 900 degrees Celsius. The organization was responsible for delivering accurate assessments and reducing costs for steel materials. Among the challenges was installing spring supports to ensure the piping system's flexibility to react to the furnace's extreme temperatures. Establishing effective coordination across various design teams, such as structural and piping, is critical to avoid delays. Traditionally, each discipline involved in a project conducts their analyses independently as well as uses in different conditions. This method makes it nearly impossible to create 3D data and increases analysis time. The traditional, disconnected workflow would not work for RISE.

SEARCHING FOR AN EFFICIENT SOLUTION

RISE sought a solution that would remove productivity barriers between departments, enabling each department to link the piping models. The coupling of piping and framework models allows a more accurate understanding

of the behavior of frameworks that are connected to piping supports. This is highly effective for selecting the spring hangers and constant hangers. The combined effects enable designs that are simpler, safer, and more economical.

Consolidating models, however, came with challenges. The design team had to consider the thousands of intersections and connections from the different departments' models.

INCREASING DESIGN ANALYSIS SPEED

To keep the design's progress on schedule, the project team used Bentley's AutoPIPE, which can manage thousands of nodes and segments. The application's quick processing speed enabled the design team to analyze more complex models in less time. Additionally, the team used STAAD's pipelink function to create conjoined models of the piping and framework. The application also automatically joined the beams at support points, which will help reduce carbon dioxide emissions. While the design team used AutoPIPE to conduct the coupling analysis, users could easily transfer the results of the piping load analysis to STAAD for structural analysis.

"We used pipelink's integration function between Bentley's AutoPIPE and STAAD to create piping and framework models in a short amount of time, which results in a substantial reduction in design costs," said Nobuaki Koremoto, technical consultant with RISE Structural Design. "Since our company had analysis departments for both piping and frameworks, with extremely low barriers between them, we have an outstanding process for coupling analysis."

PROJECT SUMMARY ORGANIZATION

RISE Structural Design, Inc.

SOLUTION

Process and Power Generation

LOCATION

Japan

PROJECT OBJECTIVES

- ◆ To perform pipe stress analysis and deliver accurate assessments to meet the owner's safety and cost requirements.
- ◆ To deliver synchronized structural and piping analysis and design through multidiscipline collaboration and data sharing.

PROJECT PLAYBOOK

AutoPIPE, STAAD

FAST FACTS

- ◆ Establishing effective coordination among the multidiscipline design team was critical to avoid delays.
- ◆ RISE used STAAD's pipelink format to create linked models of the piping and framework, automatically joining the beams at support points.
- ◆ Spring supports ensured that the piping was flexible enough to react to extreme temperatures.

ROI

- ◆ Bentley applications reduced coupling analyses by 10 times, compared to using other software options.

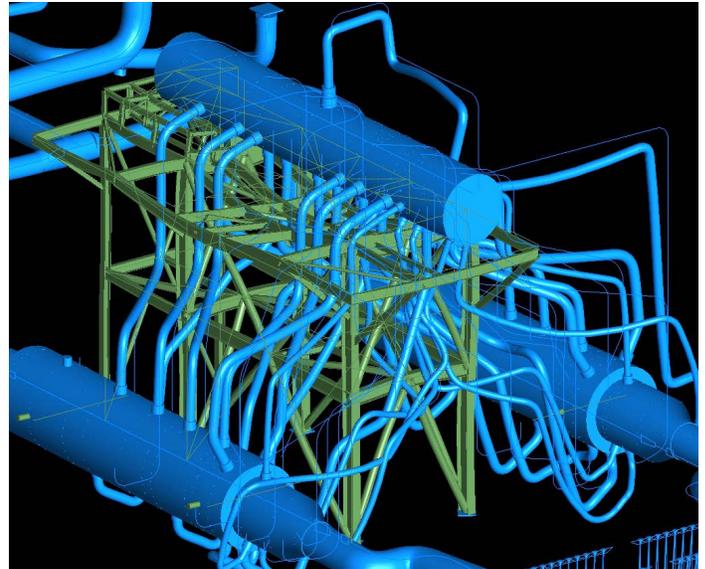
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ELMINATING INEFFICIENT WORK PROCESSES

Using Bentley’s integrated structural modeling (ISM) solutions for coupling analysis, RISE reduced inefficient work processes. These processes included checking differences in design policies between departments, adjusting schedules, and reducing project delivery costs. Integrating the models helped improve analysis efficiency, which might have fallen behind if the project team had used traditional, disconnected data workflows. This decision led to a decrease in design costs.

When RISE’s pipe stress analysis teams use software from a different company to conduct similar coupling analyses, both time and cost increase by 10 times than when Bentley applications are used. “We are convinced that by overcoming, one by one, the practical and organizational issues faced by various engineering companies, making coupling analysis the standard design method will bring immense benefits to the plant engineering and construction,” said Koremoto. Moving forward, the team plans to perform coupling analysis with Bentley applications to provide quality designs. “We hope to use these strengths to continue actively conducting coupling analysis in the future and make coupling analysis the standard design method,” said Koremoto.



Piping and framework models allow a more accurate understanding of the behavior of frameworks that are connected to piping supports.