



FACTS AT A GLANCE

Company: Promech

Website:

www.promechengineering.com.au

Description: Promech is a multi-disciplinary engineering design and project management company that specializes in small-to-medium sized projects with particular focus on the alternative fuels, petrochemical, oil and gas, and mining industries. It caters for all stages of projects from definition and conception through to commissioning and operations handover.

Industry: Oil & Gas

Country: Australia

PRODUCTS USED

- CADWorx® Plant Professional
- CAESAR II®

KEY BENEFITS

- Ability to handle system with a large temperature differential
- Seamless integration between modeling and pipe stress analysis solutions
- Exceptional user interface

PROMECH DELIVERS UNDERGROUND COAL GASIFICATION PROJECT WITH CADWORX® PLANT PROFESSIONAL AND CAESAR II®

Pipe stress analysis package and 3D modeling solution successfully deliver system with a large temperature differential and significant space restrictions

IDENTIFYING GOALS

Promech is an Australian engineering design and project management company that delivers projects for a diverse range of clients across various countries and industries. One of these clients is Carbon Energy, an emerging global energy company with expertise in unconventional syngas extraction through the use of its proprietary keyseam® Underground Coal Gasification (UCG) technology.

Promech was engaged to complete the full plant design and project management of Carbon Energy's first commercial UCG project, the Haoqin Coal Field in Xiwuqi in Inner Mongolia, China. The commercial-scale UCG project is set to produce at least 30PJ per annum and is to be completed in three stages, with the first stage being the design, construction, and operation of a process characterization panel.

This project involved all engineering disciplines, and included concept development through to the production of issued-for-construction drawings and equipment specifications. Promech was required to deliver an upgraded, modularized, and containerized UCG facility design.

OVERCOMING CHALLENGES

Promech faced two major challenges in the execution of this project:

- Design conditions ranged from -40 degrees to 340 degrees Celsius. When such a large temperature differential exists, it is common engineering knowledge that due to thermal expansion of the piping material there is a natural tendency for the piping to grow and move once heated by the process fluid. Failure to manage a substantial temperature differential in the design phase of a project can lead to considerable issues when the system is operational.
- In order to firstly, reduce site installation time, and secondly, ensure that the modules were easily transportable to any location in the world, Carbon Energy set the design requirement that all modules had to be designed to fit into 40ft shipping containers. However, given the anticipated thermal expansion of the system during operation, this containerized modular design approach placed significant

restrictions on the amount of space afforded to the Promech design team to account for this thermal expansion.

Prior to the project, Promech carried out a review of the various solutions currently on offer in the market and based on the experience of various team members – particularly the lead designer on this project – the decision was made to utilize CADWorx Plant Professional® and CAESAR II®.

REALIZING RESULTS

In order to manage the 380 degree temperature differential, and to ensure the piping design was in full compliance with ASME B31.3, CAESAR II was utilized to conduct a thorough pipe stress analysis of the system.

“The large temperature differential combined with the significant space restrictions made conducting a thorough pipe stress analysis using CAESAR II a fundamental design requirement for the project,” said Promech Director, Ciaran O’Leary. “It is the leading pipe stress analysis solution on the market and it’s not hard to see why – CAESAR II performed excellently.”

Promech also had to undertake extensive piping design and analysis to produce modules that met all of Carbon Energy’s design requirements. As is standard practice for Promech, the design team took an iterative approach to the design process: the piping designers and mechanical engineers worked together using CADWorx Plant Professional and CAESAR II, with the engineering manager and other key project stakeholders joining them to complete 30 percent, 60 percent, and 90 percent design review gates to assess, validate, and refine the module designs.

“Iterative design requires seamless integration between software packages, so the bi-directional links between CADWorx Plant Professional and CAESAR II were a major selling point for us,” said O’Leary. “Rather than building two separate models, we were able to move a single model between each software package. This saved us an immense amount of time and minimized the potential for errors.”

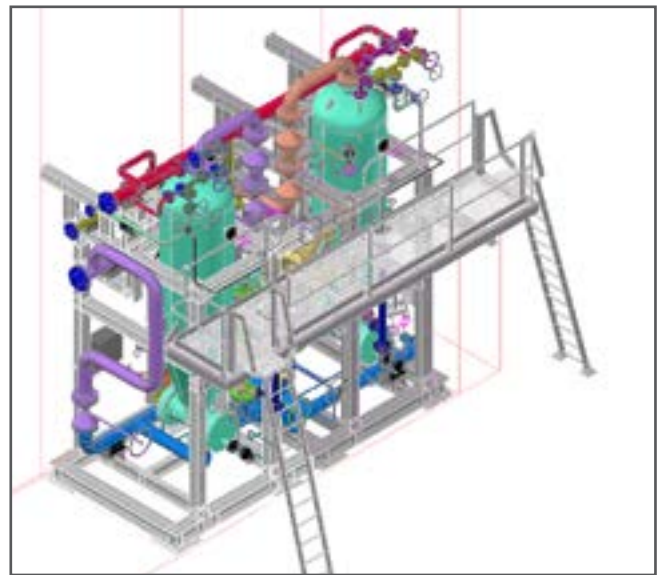
O’Leary also praised CADWorx Plant Professional’s usability, adding that the time invested up front can result in productivity gains towards the end of the project.

“If you are thorough at the start of the project when developing and inputting your piping specifications for the various materials and pressure classifications, you can save yourself a large amount of time at the end – when you need things to be easy,” O’Leary said.

“CADWorx’s exceptional user interface helps to minimize errors when designing the system, which allows you to complete your isometrics in a matter of hours and produce your final issued-for-construction drawings in very little time.”

MOVING FORWARD

Given the positive experience in delivering this project for Carbon Energy, Promech intends to use the combination of CADWorx Plant Professional and CAESAR II to deliver any detailed design projects going forward.



Module design for the Haoqin UCG project

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