CASE STUDY

D2RT engineering gains increased standardization and productivity in the planning and implementation of EPC projects

Key facts:

Company: D2RT Engineering

Website: d2rt.eu

Industry: Oil & Gas

Country: Poland

Octave products used: Aspect Pipe Stress *(CAESAR II),* Aspect Pressure Vessel *(PV Elite),* BricsCAD, Forte 3DWorx *(CADWorx Plant Professional),* Forte ReviewWorx *(CADWorx Design Review),* Forte StructureWorx *(CADWorx Structure)*

Key benefits:

- Greater efficiency in design and project execution phases
- Short learning curve and fast adoption of solutions due to ease of use and user-friendliness
- Solutions easily interfaced with other vendor software solutions
- Ability to carry out rigorous analysis of the system by means of finite element analysis

Identifying goals

D2RT Engineering is a Polish engineering services company operating in industrial settings since 2013 with a focused team that covers process, mechanical and civil engineering parts of projects. The company was selected by Baker Hughes (formerly BHGE) for the Propane-Propylene Fraction (PPF) splitter revamp project at the oil refinery ORLEN Lietuva (OL).

Adhering to standards and ensuring efficiency and safety is key to D2RT Engineering, which allows the company to remain the competitive provider of engineering services in the region.

To maintain cost-effective and on-time delivery of complex and challenging projects, the main goal of the company was to adopt digital solutions. This would help enable speedy engineering and design processes while having verified detailed project plans in place. With an engineering team that covers different aspects of projects, having user-friendly digital tools that integrate and are flexible is essential. This would allow increased productivity and performance in the different design and project phases, enabling the oil refinery revamping and implementation of a PPF splitter to be executed faster. Additionally, this would provide greater time efficiency and economic project management with error-free designs for the client's project.

Overcoming challenges

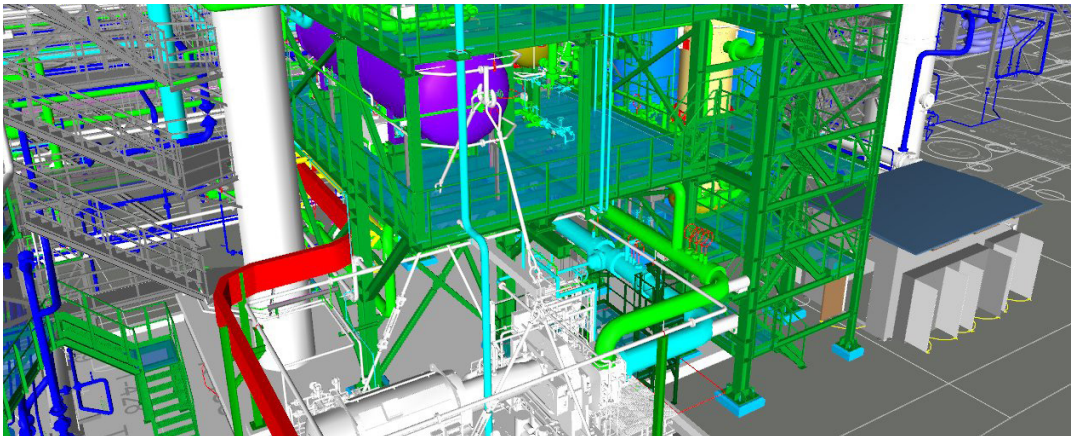
Due to increasing demand for propylene, OL considered the implementation of PPF splitter, which would help to increase variable margin and improve their competitive position. An economical evaluation review of installing a new PPF splitter was considered an unattractive financial option. Therefore, a smaller unit, based on the existing gas plant equipment, was selected as the best way forward.

To lower CapEx costs for the installation of the PPF splitter, D2RT Engineering's client wished to utilize and revamp the existing mothballed gas plant and reuse as much of the existing equipment as possible.

The refinery was built in the 1980s, and most of its equipment/piping remains unchanged. To reuse and utilize as much of the existing equipment as possible involves reassessment services of existing equipment with the aim to determine if the equipment is fit for service.

"Even with a small team, when having the right tools in place, one is capable of building a complex unit that involves multiple design stages and rigorous evaluation."

Jevgenijus Dudko,
Deputy Director,
D2RT Engineering



An example of an initial pipeline ISO

Reassessment services require a comprehensive analysis to evaluate and monitor equipment for continued operation. Common evaluation "by formula" in this particular case is too conservative, which usually results in high stress levels of piping and equipment systems that are outside the limits for the materials as defined in the applicable codes. Therefore, FEA modeling and analysis have to be utilized, which in most cases, is too complicated and time-consuming. As a result, complicated, time-consuming operations were avoided when utilizing Octave's solutions for complex tasks.

For this project, the D2RT Engineering selected:

- **Forte 3DWorx** for its plant design and automation capabilities, as it is the most complete DWG file-based solution with a range of tools for effective plant design.
- **Forte StructureWorx** for its effective structural design capabilities.
- **Aspect Pipe Stress** to execute code checks while integrating with Forte 3DWorx and to provide further pipe flexibility and stress analysis tests within the project.
- **FEATools**, a companion product to Aspect Pipe Stress to improve the accuracy of the k-factors, SSIs, and SIFs used in piping design and pipe stress analysis with minimal effort.
- **Aspect Pressure Vessel** to execute comprehensive design and analysis of pressure vessels acc. to European codes.
- **Forte ReviewWorx** to assemble separate drawings into a single 3D model for review.
- **NozzlePro**, an add on solution to perform Level 1, Level 2, and Level 3-Type API 579 calculations (Fitness for Service) of nozzles, saddles, pipe shoes, etc.

These solutions were chosen due to the ability to seamlessly transfer information and files between different applications for further analysis and project progress.

Realizing results

The starting point of the project involved using the Forte 3DWorx design environment to model existing and new piping, equipment and steel structure for the PPF splitter. From there, the Aspect Pipe Stress file of the piping was exported for further stress evaluation before moving forward with the final approved file. Once the Aspect Pipe Stress file was ready, the FEATools enhancement was applied to all relevant branch connections and the elbows in order to make the design more accurate and simultaneously safer.

Additionally, piping loading values on the faces of the equipment nozzles were taken from Aspect Pipe Stress and used within Aspect Pressure Vessel for further evaluation. If case nozzle loading conditions did not meet the requirements, i.e., greater than specified allowable loads or greater than defined in the codes, either piping redesign was implemented, or further analysis within NozzlePro environment would be carried out. The NozzlePro application enables further analysis utilizing Finite Element Analysis (FEA) of individual pressure vessels and components with an automated code compliance reports for ASME Section VIII – Division 2 stress categories.

Throughout the project, all relevant files (.dwg) were stored on a server. Each equipment and piping file had a separate, individual .dwg file, which was then assembled into a single 3D model by the Project Manager using Forte ReviewWorx, to produce the final design for the implementation. All related .dwg files together with 3D scanned files added up to 20 GB.

The D2RT Engineering team quickly adopted the new Octave solutions with the help of the Forte ReviewWorx training course. In just one week, the project team gained a basic underlining knowledge of Forte 3DWorx. The Aspect Pipe Stress training only took two weeks, learning from the easy to use training and online resources.

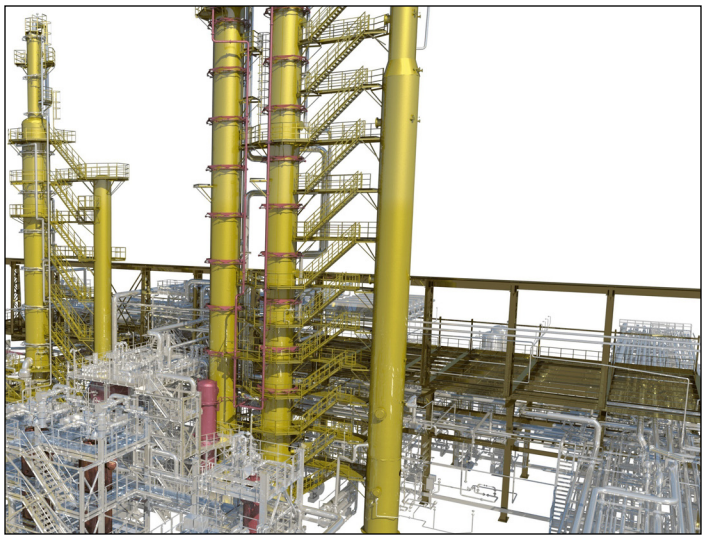
Moving forward

Octave solutions were chosen because of their ease of use, quick adoption by the team and ability to accurately and quickly perform a range of different tasks required within the client's project. D2RT Engineering was able to carry out a detailed design of the client's PPF splitter in under a year, taking into consideration multiple changes during the later stages of the project.

The most significant benefit has been the optimization of work processes with the new solutions enabling a quicker project outcome due to increased efficiency and integration.

Greater time savings have been achieved with the ability to easily export/import files through the different solution applications. D2RT Engineering can now provide shorter project time frames and faster execution of the projects.

D2RT Engineering will continue using Octave solutions in its upcoming projects to ensure productivity and quality, with error-free designs.



An example of a model taken from a Forte 3DWorx environment

About Octave

Octave is a leader in enterprise software, turning data into decisive action and intelligence into your edge. Our software solves for and simplifies complexity, from the design and build to operations and protection of people, property, and assets– for any scope, at any scale. For decades, we've partnered with customers to sharpen performance, elevate efficiency, and amplify results. From factory floors to entire cities, our solutions are tuned to scale up what's possible from day one onward.