Case study

Technip ensures the reliability of its calculations using PTC Mathcad

Technip

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Sylvain Routeau,
Subsea Structures and Equipment Dept Head, Technip

The oil services industry deploys considerable technical and financial resources for its offshore extraction operations and for bringing the extracted materials to shore. Colossal equipment, such as pipelines several kilometers in length, are developed in design offices, such as those of Technip, world leader in project management, engineering and construction for the energy industry.

Yet to optimize the design of its installations and meet the needs of the oil and gas giants, the contractor uses PTC Mathcad, a technical calculations software enabling the Technip Subsea division design office to considerably enhance the reliability of its calculations.

Contractor in the field of oil services, Technip sells turnkey projects to clients in the oil and gas industry. With bases in 48 countries worldwide, Technip possesses cutting edge industrial infrastructures and a fleet of vessels specialized in the installation of pipelines and underwater construction. From the deepest subsea developments to the most extensive and complex offshore and onshore infrastructures, the 36,500 employees of Technip propose the best solutions and most innovative technologies to address the global energy challenge. The engineering company constructs subsea worksites, designs and supplies piping networks, and sells fixed or rigid pipelines to companies with onshore and offshore needs.

In charge of one of the engineering departments (Subsea Structures and Equipment Dept Head), Sylvain Routeau and his team of thirty engineers are responsible for designing equipment to be fixed to the pipeline in order to provide the necessary functionalities. For example, on a flexible tube it is necessary to check the behavior of the pipe and its curvature. The department designs equipment such as the curvature limiter, the stiffener and the suspension for the pipe riser from the seabed to the surface, sometimes extending over more than one kilometer. “We also design other equipment such as underwater buoy systems, and hose clamps that need to absorb forces that may range from two to 90 tons,” explains Sylvain Routeau. “We also produce foundations and structures on the seabed.”

In this work context, it is essential to develop systems with maximum reliability on account of what is at stake, in both financial terms and with regard to the safety of persons. To this may be added heightened pressure in terms of design deadlines. This is why the design office equipped itself over 15 years ago with PTC Mathcad, the technical calculations software developed by PTC.

Controlling calculations thanks to a high degree of transparency

Especially dedicated to calculations, Mathcad's first mission was to reduce operations to a minimum. Previously, equation data were produced and copied manually then entered into Excel, thereby generating many errors. Now, the analytical calculation takes place automatically. "The software has also enabled us to adapt far more quickly to the many developments in calculation over the past 20 years," says Mr. Routeau. It is indeed possible to aggregate all data in order to constitute a history of operations. "Above all, PTC Mathcad offers the advantage of providing high transparency and perfect legibility for all operations carried out, which is not the case with Excel, for example."

The presentation capacities of Mathcad have therefore made it possible to obtain a high degree of calculation transparency and therefore enabled simple and efficient verification.

Saving time and increasing calculation reliability

The "documentation" aspect of Mathcad, as so well described by Sylvain Routeau, is translated into access to the mathematical formulation: "You can see the equation," sums up the design office manager. The calculation processing of PTC Mathcad makes it possible to accompany the formulation with text, preserve all the written data and add notes which can then be reused. This documentation also proves highly useful in terms of a log in the event of auditing, particularly in the area of quality control. The database system provides a wealth of information and annotated calculations. The work carried out can therefore be genuinely capitalized upon. "Over the years, we have added and accumulated generic calculation notes for calculating given parts according to the various successive projects. We did all this with PTC Mathcad, thereby allowing us to save considerable time," Mr. Routeau recalls. This capitalization has naturally made it possible to save time, in particular on information and calculation research, by avoiding having to repeat operations that have already been previously carried out. "We reuse many calculation notes: this is a feature that is particularly highly used."

PTC Mathcad enables reliable documentation of engineering calculations thanks to access to the entire mathematical content in thoroughly transparent fashion. The system also has an efficient analytical and numerical resolution capacity, while automatically managing all measurement units and providing the possibility of making annotations and adding comments and graphs. For Sylvain Routeau, PTC Mathcad represents an ideal package.

Automatic management of calculation verifications and units

PTC Mathcad offers many other advantages for Sylvain Routeau and his engineers. As well as the transparency of the calculations and the wealth of its database, Mathcad is capable of resolving analytical or numerical systems, thereby making it possible to dispense with unwieldy and meticulous post-calculation checks. With regard to calculation checking, PTC Mathcad is far quicker: "... when compared to the classic systems. We can draw up calculation notes in double-quick time, but the main difference is with regard to proofing and verification. This stage takes on average three times less than with Excel, representing a clear gain in productivity," Sylvain Routeau points out.

The system is also capable of managing different measurement units. It should be said that in the Oil & Gas activity, a sector involving global players all around the planet, the engineers are used to having to juggle between imperial measurements and the metric system. It is therefore necessary to convert automatically different units incorporating inches, miles, kilograms, etc. For example, you can add together feet and meters directly with the system.

The benefits of the system

Technip has been using PTC Mathcad since 1997, and it has undergone many changes since then in order to keep pace with the requirements of the engineers. Furthermore, thanks to its user-friendliness and the wealth of its documentation, PTC Mathcad also facilitates the training of new recruits in the engineering department. "This software is so easy to use. There's no need for any particular training. I'm in charge of 30 or so engineers, and they all picked it up really quickly. PTC Mathcad is a tool that you can get to grips with easily and which is just as accessible to beginners as to personnel who have been working here for a long time." Here again, the transparency and precision of the calculations, the integration of the different units and the speed of proofing and verification play a major part in this ease of use.

For further information about the PTC Mathcad technical calculations software, go to: http://www.ptc.com/product/mathcad/