The connecting element

Gascade designs and builds natural gas pipelines across Europe. Five neighboring countries benefit from state-of-the-art engineering and a deeply integrated plant planning solution with open system architecture.

Construction site of the VS Radeland 2 project in 2020. The enhanced efficiency in project handling is remarkable – see also text

The plant engineering industry is sometimes accused of being too hesitant when it comes to digitalization – however, this is by no means the case, at least at Gascade Gastransport GmbH ('Gascade'), headquartered in Kassel, Germany: Gascade is a renowned transmission system operator for natural gas with its own engineering department, which has been using the integrated planning solution Cadison from ITandFactory GmbH, Bad Soden Germany, since 2009. In the meantime, all modules of the object-oriented Cadison open system architecture are in use: Project Engineer, P & ID Designer, 3D Designer, Electrical Designer, Matpipe, Steel Layout, Pipe-Support-Modeler, Project-Navigator, as well as the interfaces Rohr2 and IFC – so there's a lot to report.

With its 450 employees, Gascade operates a long-distance pipeline network covering 2 in Germany. Partner pipelines include NEL with 441 km and OPAL with 472 km (1). The design pressure is between 80 and 100 bar; in 2019, a total of around 109 billion m^3 of gas were transported through the pipelines.

Air eyeshot on VS Radeland 2

Largely parallel to the route of the existing Opal pipeline, the 480-km European Gas Link Pipeline (Eugal) was built from 2018 to 2021 from Lubmin in the German state of Mecklenburg-Western Pomerania on the Baltic Sea coast to Deutschneudorf in the state of Saxony and from there on to the Czech Republic. Gascade is the project owner of this pipeline with a 50.5% share. The pipeline consists of two strings along almost the entire route, the first of which has been in operation since January 1, 2020. According to (2) the second EUGAL line is scheduled for completion this year (2021).

Flagship 'project handling'

A few facts will help to give an idea of the extensive use of Cadison software at Gascade. Let's take the current project compressor station (VS) 'Radeland 2' with three compressors of 22 MW each as an example. The built-up area amounts to approximately 10 ha. Site construction started in spring 2019, and it will be in commercial operation soon.

The pressure-bearing area was designed with Cadison: A total of about 10 of pipe with tees from 1 to 56 inches. In addition, there are water-bearing pipes as well as supply and disposal lines underground. The database contains 2 fittings and 1 measuring points. The majority of these are mapped in 96 assemblies and expandable assemblies as well as 19 2D/3D objects. The Cadison Equipment Simplifier tool, for example, was used to dramatically reduce data of a gas cooler: In the course of data reduction, 8 objects, such as screws or washers, were deleted, 10 holes were removed, and 98 surfaces were converted. In this way, 256 MByte became only 30 MByte file size, which could be easily positioned as a DWG drawing in the Cadison project.

The pipeline projects already use process flowsheets with database objects and create piping and instrumentation diagrams (P & IDs) based on them. For 3D planning, the designers use Cadison objects for simple assemblies consisting of a graphic, a representation and a drawing type, as well as expandable assemblies comprising different graphics with different drawing types. "For this purpose, we analyzed and clustered the assemblies used according to their common features. This significantly reduced the number of extensible assemblies that needed to be created. Using the Cadison Object Manager, we then structured them according to function, medium flowing through, and pipe classes," says Florian Jess, GNA – Engineering Technology with Gascade.

Photo-realistic view of filter assemblies in 3D. Note the textures on the filter elements

Plant model created in Cadison 3D Designer

CAD-CAE value chain

For the functional validation of the components, Gascade's engineering uses a number of expert tools: the thread finite element calculation tool ROHR2, the shell finite element calculation tool FEZO, the flow pressure difference calculation tool SINETZ, and the strength calculation tool PROBAD with integrated material database. Together with both vendors, the ROHR2 interface was practically redeveloped under the leadership of ITandFactory, so that now 90 % of the information can be transferred to the strength and elasticity calculation without any loss. Only information on materials and wall thicknesses has to be added manually, because there can be deviations between the planned components and those actually delivered to the construction site. In the future, it will also be possible to transfer information such as the pipe wall thicknesses used in the calculation back to Cadison.

Autodesk NavisWorks is used for project verification, such as clash checking. Drawing lists, material extracts and other listings, such as for the number of pipe supports, are generated using the Cadison report function. Steel construction and layout plans are derived from the 3D model, and isometrics are automatically generated directly from database objects and recorded as drawings using Isogen. The planners also use redlining techniques in documents, so that changes to P & IDs, layout plans or isometrics are traceable for all project participants.

Close cooperation to enhance productivity

How has the deployment of ITandFactory technologies developed in the EPC part of company over the years? With spontaneous enthusiasm that can still be felt today? Or more like a marriage of convenience that gradually won everyone over? Christian Manshausen, Principal Consultant for design / CAD / engineering technologies with Gascade, presents 3D models of the VS Radeland 2 showcase project and speaks with pride of the considerable increase in efficiency in the use of the integrated planning solution that has been achieved over the years: "See here, this plant was modeled in less than 24 months! We had very good experience with Cadison's advanced assembly technology." Two plants of a similar type and another one on a slightly smaller scale were planned with three employees, supported only by three to five experts in part-time positions. This impressive efficiency could only be achieved because the work packages were carefully structured in advance. Mr Manshausen outlines the process: "During the lead

time, we gave a lot of thought to what had not gone quite right in the projects before. There were additional challenges because VS Radeland 2 was not only about planning the gas pipelines, but also about the underground supply, for example, the laying of water pipes and the power supply. Cadison provided us with excellent services here."

VS Radeland 2 was completely modeled in 3D: With transmitter boxes, wind , drainage systems, cable routes, lights, and also video camera systems, these at least as interference edge models. However, not all geometries were stored in the Cadison database. Mr Jess explains: "It was important to ensure the completeness of the representation in order to provide our operations department and our suppliers with consistent information. For instance: 'When replacing lamps, please move only in this area'. In this way, HSE specifications can be met exactly,and exploration of the situation and an accurate briefing can be made possible in advance."

But how were projects reorganized in the spirit of the lessons learned alluded to earlier? Mr Manshausen gives us a look behind the scenes: "Assembly manufacturers make parts according to an engineering manual. We digitized their methodologies by storing the corresponding parametric components 1:1 with spatial information in a library – exactly in the form that corresponds to the manual. We were aware that surveying errors always occur, especially when it comes to determining heights. Therefore, we have also modeled the foundations with the corresponding height adjustability in order to exclude such errors. Furthermore, when the foundations are set down, the construction mesh coordinates are read into the Cadison object." The foundations are therefore now no longer specified by the assembly, but result from library data.

The catalogs were created as a service by ITandFactory. In addition, an editable initial view window was added in the course of the implementation so that, for example, the foundations can be adapted to the current installation situation in no time at all. Mr Manshausen: "We developed the idea of the initial view window for foundations within the application together with ITandFactory. This made it possible to reduce the error rate to practically zero. In this way, a flexible standard was created that is also binding for assembly." By the way, quick views are also available for steel components, fittings, and bearings.

The Electrical Designer module is used to transfer data from Cadison to Eplan. Currently, this is still done with an MS Excel parts list. The plan for 2021 is to make this data transfer more convenient via a direct interface between the two applications. Eplan will continue to be the leading system for electrical project planning, as Mr Manshausen assures us. However, the integration has even more advantages, says Mr Jess: "Even if users have little experience in working with Eplan, they can still access electrical engineering information via Cadison Navigator. Access restrictions on the part of the navigator ensure that objects are not modified by mistake."

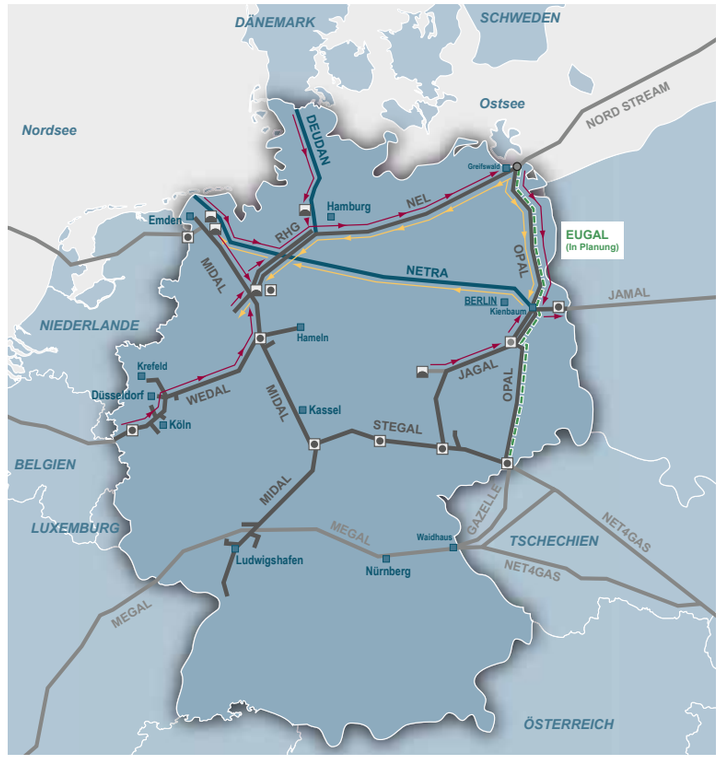
Christian Manshausen

Our interview partners during the briefing session

Florian Jess

EUGAL stands for "Europäische Gas-Anbindungsleitung" (European Gas Link). It creates connections for a secure energy supply within Europe

Source: eugal.de



BIM in plant engineering – the next big thing?

Gascade is entering new territory with the Cadison IFC interface. This is now to be introduced into the daily planning process. The intention is to import steel structures and buildings as IFC files. Mr Manshausen also wants to import equipment such as machines, which are typically created in Autodesk Inventor or PTC Creo as IFC files. However: "With IFC, it is necessary to keep the file size in mind. The last MAN compressor had 650 as a STEP file and could be compressed to 85 with Cadison Equipment Simplifier. The question is what file quantities are present after the IFC import," warns the CAD expert. A major advantage is that changes from other disciplines can be accurately tracked with IFC.

A partnership for B2B life

Both interview partners were very impressed by the performance of the Cadison database and its openness, for example because data from other systems can be stored without any effort. The admin area is very user-friendly, and there is a number of easy-to-use tools for data maintenance. ITandFactory as a digitalization partner is also cooperative and flexible overall. Questions are dealt with in the shortest possible way to Gascade's satisfaction. And so the success story goes on. (bv)

References

(1) „Wir versorgen Deutschland. Und verbinden Europa", company publication 2020, www.Gascade.de/fileadmin/downloads/broschuerenGascade_Imagebroschuere_2020.pdf

(2) www.eugal.de; www.gascade.de