Open Grid Europe GmbH (OGE), with 1,450 employees and a natural gas pipeline network of around 12,000 km, is Germany’s largest long-distance network operator. In addition to the management and marketing of capacities, OGE’s core activities include the design and construction of plants and pipelines. In addition, the network is controlled and monitored, including maintenance and repair. Digital tools play the most critical part toward this.

 Basically, a company like Open Grid Europe is to be understood as a logistics company - if German companies or municipal utilities have purchased a quantity X of gas somewhere in Europe, the transport of the gas from A to B is likely to take place via the OGE network. To this end, the company must maintain an efficient infrastructure - compressor stations, measurement and control technology, pipelines (Figure 1).

For the planning of such infrastructures, engineers have been working with CAD/CAE tools for years and manage the planning data, mostly still today, in various spreadsheet programs. More and more, however, planning on the basis of 3D models is gaining ground (3D is

Engineering Tool for Planning and Operation of Gas Networks

Cadison in action at Open Grid Europe GmbH

Figure 1: Open Grid Europe, headquartered in Essen, Germany, is the largest long-distance network operator in Germany with a pipeline network of around 12,000 km.

Picture: Open Grid Europe
becoming the leading format and is gradually replacing 2D, including the possibility of creating 2D derivatives). But even the tools currently used by plant planners are not immediately applicable to all industries. For example, the planning of compressor stations, often junctions in the transport networks, is by no means trivial, but challenges these engineering tools with their special features, as Julien Fourier, System Manager for the Plant Information System at OGE, reports (Figure 2).

In concrete terms, Open Grid Europe uses specific pipe classes in plant construction which are defined and standardized to meet specific requirements and which therefore do not provide a planning tool without further ado. A “pipe class” is the combination of all pipe components that are used depending on the required design pressure and temperature level. The pipe classes to be used are already defined in the draft planning and should be available to the project engineers in the corresponding libraries in the further planning steps. Should the requirements or the underlying standards change, it should be possible to adapt or extend the standardized pipe classes.

The QA functions of the planning tool then ensure that only the approved pipe class is used in the planning.

These were also taken into account when defining the strategic requirements for the plant information system and documented in a comprehensive catalogue of requirements. An essential requirement for the system to be selected was consistency throughout the planning, construction and operation phases, i.e. the entire life cycle of the plants, in just one tool. According to OGE, this is the only way to prevent the usual loss of data during phasewise transitions.

In addition to secured and low-administration data management, the planning of process engineering, pipe design and 3D modelling was to be based on current and redundancy-free data.

In addition to being used by the company’s own employees, external project participants should also be provided with secured and high-performance access to the system, thus creating a scalable and quality-assured project environment.

SEE WHO FITS THE BEST: INTENSIVE SELECTION PROCESS

Why did you choose Cadison? There was a comparison of different tools and finally (besides the costs) the fact that Cadison already has functionality in the following standards that the company considers important was decisive:

- Extensive 3D functions in all planning phases for all required specialist techniques, flexibly configurable according to the necessary standards
- Creation of drawings and isometrics from 3D planning
- Document management with the possibility to implement workflows
- Extensively configurable piping, process engineering and electrical engineering functionalities
- Problem-free extension of libraries by own specific objects in the database.

It is also of great importance for the OGE planners to be able to map functional relationships between components with Cadison – this makes engineering simpler and safer. Once all this has been achieved – this is by no means trivial and cannot be achieved in a short time, as Julien Fourier points out – a new Cadison system with the stored parts and components can be planned extensively and safely; and projects that have already been implemented can be reused for conversion at low cost.

In particular, the aspects HSE (Health, Safety and Environment), quality, deadlines and costs have to be considered as target values in all our projects. Cadison supports the achievement of objectives by planning together in a planning database with several specialist techniques. The collision of plans in the various specialist trades, questions of occupational safety, questions

**Figure 2: Julien Fourier, Coordinator of the Plant Information System AIS at Open Grid Europe**

Picture: Open Grid Europe
The existing MEGAL natural gas compressor station in Rothenstadt (Figure 3) was extended by a new compressor station with three compressor units. Gas turbines with a total output of 45 MW are used as the drive. Natural gas coolers, station input filters, measuring sections and flow control equipment were also newly built.

MEGAL (Mittel-Europäische Gasleitung) GmbH & Co KG is a joint venture of the transmission system operators Open Grid Europe and GRTgaz Deutschland. MEGAL’s gas pipeline network runs from Waidhaus on the German-Czech border to Medelsheim on the German-French border.

The planning of a new compressor plant, as in Rothenstadt, is carried out in several successive phases: Parallel to the development of the network development plan, the gas transmission companies are investigating the technical possibilities of the expansion as part of a feasibility study. According to the regulatory specifications for construction, the plant is fundamentally planned in basic engineering. Modern CAD tools such as Cadison enable a digital 3D examination of the plant already in the early planning phase (Figure 4). In the following detail engineering, the execution of the construction is planned in every detail and the corresponding materials are ordered. During the final commissioning of the plant components, a large part of the installed investment is no longer visible: the plant piping, pipes with a diameter of up to 1,100 mm, is largely underground after installation.

Figure 3: The compressor station MEGAL Rothenstadt went into operation in 2018. Picture: Open Grid Europe

Figure 4: The compressor station MEGAL Rothenstadt as 3D model in Navisworks with partial models from Cadison. Picture: Open Grid Europe

of ergonomics, such as the accessibility of control elements and planning errors can be recognized very early on when a 3D overall model of the plant for Navisworks is created from Cadison and can even be virtually walked through by the project team in the future,” says Fourier.

Last but not least, the company was keen to ensure that the support by the provider was easily accessible; local proximity in Germany is crucial for intensive communication and also for customizing and further developing the software. Over several years, the support team has accompanied the technical experts at OGE during the introduction and adaptation of the system to OGE requirements. For example, in cooperation with iTandFactory, very complex, standardized ‘typicals’ for process instrumentation have been developed. The project planning data for the process control system can now also be generated automatically from these.

The decision was also based on the fact that at the time of selection another long-distance network operator had successfully planned a large compressor station using Cadison.
DEPICTION OF THE COMPLETE ENGINEERING WORKFLOW

Cadison has been on the market for 20+ years as an object-oriented and integrated engineering solution for plant construction and combines the complete engineering workflow from quotation planning to process engineering, installation planning, piping planning, electrical engineering and instrumentation.

By the way, external service providers today use Citrix (a virtual desktop) to plan directly in the OGE environment (they access the centrally maintained Cadison database from any workstation, even with a laptop, and thus process both the data and the 3D models). "Working with Citrix is an enormous help and support in working with external service providers and planners," explains Fourier. The external service providers can work with Citrix in the environment defined by the company and there are no more technical hurdles, in the form of different interfaces, etc. Open Grid Europe now has the option of checking the planning status at any time and thus ensuring the quality of the planners providing the services. In addition, administration of the Cadison environment is simplified by centrally managing only one Citrix image.

A system fully recorded in Cadison and depicted in 3D in the As-Built will in future be the reliable basis for all modernization or expansion measures. In future, the plant structures with all components from Cadison will also be used for maintenance and servicing management, which naturally means that any asset changes will also be maintained in Cadison. Planning, construction, operation - the company plans to use the engineering tool Cadison for all these phases.

PLANT INFORMATION SYSTEM: STANDARDIZATION OF DOCUMENTATION

Julien Fourier is coordinator of the Plant (Anlagen) Information System at OGE. In addition to the engineering tasks, AIS is mainly concerned with the management of inventory data and the documentation of the entire technical equipment of the plants. Cadison is the most important component of the AIS and provides the interface to a document management system in which the standardized "technical paper memory" in the form of PDF files is preserved. The goal is to map all documentation digitally and in a standardized way.

Why the standardization of data and documentation is so important for the company is partly due to the fact that the current 30 compressor stations have grown historically. Of course, the documentation of such plants is quite different: "Documentation that has been created over decades, created according to new standards, and digitized in such a way that it harmonizes with modern plants, is a challenge," reports Fourier. The aim is to be able to call up the same information for maintenance and integrity management for older plants as for a modern, planned new plant. Ultimately, the AIS will map the entire infrastructure centrally and digitally. Digitalization, with constant maintenance for changes, supports continuous integrity assessment, i.e. the analysis of the technical condition of individual components, in order to assess influences on the integrity of the asset - taking into account the operating parameters - and to initiate planned measures to maintain integrity.

Digitization also provides the basis for testing the hydrogen suitability of plants, a major topic of the energy turnaround at Open Grid Europe.

Conclusion: Cadison at OGE has been successfully integrated despite initial hurdles in implementation and data filling in recent years. During planning and digitization, the company benefits from the extensive system configuration according to its own specific requirements. In Cadison, the basis for the future digital mapping of the plants is now being created.

Once the first goal of the digital illustration and digital documentation of all plants and networks is reached, the next step is surely the linkage of technical information with the commercial, thus paving path into the Building Information Modeling (BIM). Cadison can already provide the technical information today and Julien Fourier is certain that Open Grid Europe will build on this in the future.

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