

# GASCADE relies on PSI network control system



Modern large-customer system for long distance pipeline operators

At the beginning of 2013, PSI AG was contracted by GASCADE Gastransport GmbH to modernise the ten year old GAMOS network control system as part of the Transport Management Gas Network Project (TMG-N). The new *PSIcontrol* Gas system has been in operation since the end of 2014 and is working to the complete satisfaction of GASCADE. This project used the most up-to-date large-customer system based on PSI's Gas Management Suite with the *PSIcontrol* Gas, *PSIganesi*, *PSIreko*, *PSItransport*, *PSIcomcentre* and *PSItase.2* applications.

As one of the largest natural gas transport companies in Germany, the GASCADE Gastransport GmbH operates a transportation grid of about 2 400 km (up to 100 bar). The pipeline network of GASCADE is a hub for European natural gas transport: with eight border crossing points, it connects five European countries with one another directly and will also guarantee a secure energy supply for Germany and Europe in the future.

## **24/7 Uninterrupted monitoring and control**

Since gas production is declining within Europe and consumers will be even more dependent on imports in the future, the GASCADE network is becoming increasingly important. With its pipeline system, which is based on the highest technical standards, the independent transmission system operator offers customers competent and comprehensive transport services.

GASCADE focuses on security of supply. In the network control centre in Kassel, dispatchers and planners ensure that the natural gas supply companies in Germany deliver gas to their customers at fair market prices, on time and at the correct location. Natural gas can be fed into the transport network at 14 points. At up to 80 discharge stations, the natural gas reaches final consumers, municipal utility companies, distribution companies as well as domestic or foreign gas network operators. In order to ensure that the gas flow is always reliably guided through the

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pipeline network (with nine compressor stations and a total of 28 compressor units) in the contractually agreed amount and direction, the dispatchers in the dispatching centre monitor and control the network around the clock—24 hours a day, seven days a week, with no interruptions.

The hardware infrastructure was provided by GASCADE according to a joint specification. It comprises three identical site systems which consist of highly redundant multi-computer systems. The site systems comprise a productive network control system in Kassel, a replacement network control system at the replacement site and a test system. Each site system is designed fully redundant. This site concept allows the master control to be transferred between the two sites for the network control centre in a controlled way, and thus meets all requirements for a high-availability and disaster-tolerant system. In this project, the particular challenge lay in supplying technical data to the sites in parallel, synchronising operator actions and ensuring that commands were given only by the network control system currently selected.

### **Highly automated handling of gas processes**

The servers of the systems are operated with the operating systems Linux and Windows. They are connected to the telecontrol network via multiple redundant telecontrol heads with the IEC 850-5-104 protocol.

GASCADE places high demands on the highly automated handling of the gas processes using the user and system functions of the new network control system; PSI met these demands with its proven standard products. Any necessary project-specific, low-level modifications were developed and implemented jointly. The modifications were designed so that they can also be used for further TSOs in the future. GASCADE had some very clear requirements: absolute security in the operational management, high ergonomic standards and compliance with binding GASCADE IT security guidelines. The new *PSIcontrol* Gas network control system is integrated in the GASCADE infrastructure and takes the GASCADE security requirements into account. It is divided into different security zones and groups, which are connected with each other and with the GASCADE VLAN network via site-specific firewalls.

### **Migration and commissioning**

The system was tested extensively before and during commissioning with comprehensive test regulations. A detailed migration and commissioning concept, developed together with GASCADE, regulates the process of the highly automated transfer of the data model, the plant and network images, the calculation rules and the reconstruction and simulation network model. As GASCADE still had to perform extensive network extensions and modifications during commissioning, the time during which parallel data maintenance was required in the old and new system was reduced to a minimum by various special measures.

The integrated simulation package *PSIgenes* calculates the current network conditions and presents the results in process images or in the topological world view. The predictive simulation variants—automatic or manual on a cyclical basis—allow a view into the future of the network. Automatic leak analyses support operations.

### **Administration and accounting in the overall concept**

With its range of standard functions, *PSItransport* covers time series management, schedule management as the basis of the GASCADE business process along with cooperation partners in

the GASPOOL market region, and the network balancing process. The integration into *PSIcontrol* Gas provides a joint use of the danger and alarm display, the event log, the M42 applications and the control system visualisation.

In the overall concept, *PSItransport* acts as the integrating component. It is responsible for the following: administration and accounting for the data of the external forecast, schedule management, control value specifications from the GASCADE external contract system, submission of the online allocation data and further diverse accounting results, as well as the supply of data to fulfil disclosure obligations.

### **Integrated gas quality reconstruction**

A particular highlight is the integrated gas quality reconstruction with *PSIreko*. A graphically defined station value accumulation function was integrated in the system to allow input data to be determined. As part of the network model, station quantity values are considered historically correct for the reconstruction calculations. *PSIreko* tracks all measured gas qualities and compares the results with the measurements at the reference measuring points. Based on the gas qualities calculated and measured at the reference measuring points, there is a corresponding comparison of the K-numbers. Depending on the parametrisation, the K-number is calculated in accordance with AGA8-DC92 and/or SGERG88.

Due to modified regulations, in the realisation phase, the design approval by the German National Metrology Institute (PTB) and the calibration by the weights and measurements verification body in Hesse had to be brought forward to 2014. Thanks to the highly qualified experts at GASCADE and PSI and good coordination, this goal was achieved despite a very tight time schedule.

### **Integrity beyond the system boundaries**

The customer's in-house systems and external partner systems are connected using *PSIcomcentre* and *PSIbase.2* in the form of a single, robust and extremely efficient system solution. Technical aspects such as the integrity beyond the system boundaries and across different data models are taken into consideration, as well as technical safety requirements for transparent, clear data communication that meets IT security directives. Parallel to the commissioning of the control system, the dispatching centre was also relocated to the GASCADE main building. With a long-term service contract with PSI, GASCADE ensures smooth operation and realtime support for future challenges in the context of the network control system. The customer has been using the system productively since the autumn of 2014 to their complete satisfaction and with a very high level of availability. GASCADE proudly stated: "Our control centre is one of the most modern gas monitoring and control systems supporting us in our current and future tasks with a high level of efficiency".

In 2015, PSI was contracted to deliver additional functions after the successful implementation of the solution in everyday operations.