Advanced Gas Management System

Increasing demands for reliable, safe, and efficient operation of natural gas networks cause network operators to require software of growing sophistication. The first comprehensive operational platform for gas, joining all users and applications on one common network model and one user interface, is in development by Schneider Electric and a large European gas transmission system operator. Advanced Gas Management System is based on the proven and award winning Schneider Electric ADMS technologies.
Product

At Schneider Electric, we are aware of the complexities and costs of deploying and maintaining a number of different software solutions that manage critical operations of a utility such as a transmission or distribution system operator. In the field of control systems for electrical power grids, we have witnessed and driven the recent Smart Grid initiatives and convergence of utility IT and OT systems, resulting in the electrical utility market moving in the direction of large and sophisticated software products that cover all the business processes in the control room and outside it. Schneider Electric ADMS, a comprehensive operational platform for power grids offering SCADA, DMS, EMS, OMS and mobility features, has made and kept us technology leaders in the past years.

Natural gas TSOs and DSOs are yet to go through such a transformation of the software ecosystem, driven by the evolving regulation and increasing demands for efficient and safe operation in today’s and tomorrow’s green world. We find that control rooms, planning departments, and field operations in gas utilities run a large number of heterogeneous software systems, resulting in excessive cost of ownership, unsatisfactory user experience, and ultimately inefficiency and errors. Starting in 2015, in co-development with a large European gas TSO, we have developed AGMS (Advanced Gas Management System). AGMS is based on reuse of ADMS proven foundations and incorporates all of our knowledge and experience collected during many years of ADMS research and development. However, it is still a product natively built and strictly targeted for natural gas pipelines. It is a modern, network model based SCADA product with numerous advanced gas management functions. It forms the basis of an enterprise solution that easily integrates with other expert systems, simulators, corporate IT, etc.

Since they are built on the same software platform and infrastructure, and follow the same usability principles and business procedures, ADMS and AGMS together form a unified utility management system for companies that operate both electricity and natural gas networks.

The entire AGMS product suite shares the same single network model database, which means less effort in data management, less cost in integration build and testing, and more robust running. The model is either maintained via AGMS user-friendly graphical tools or imported from external sources such as a GIS using standards-based integration included in the product, and then used to drive the functionality of the entire system. All the applications share the same single user interface, which allows better and more consistent user experience and more efficient and less error-prone operations. A service-oriented architecture saves integration costs and the fully supported software development kit (SDK) allows to integrate the product with other enterprise systems and develop customizations on top of it.
Advantages

**SINGLE SOFTWARE PLATFORM**
that reduces cost and effort of system administration

**SINGLE DATA MODEL**
which reduces the cost of maintenance in utility and reduces inconsistency from operation point of view

**SINGLE USER INTERFACE**
that enables easier and less error-prone usage

**SINGLE POINT OF INTEGRATION TO EXTERNAL SYSTEMS**
that reduce number of integration nodes in the enterprise

**FULLY DIGITALIZED BUSINESS PROCESSES**
enhanced efficiency and less paperwork

**BUILT-IN NETWORK MODEL**
real-time topological analysis, and integration to simulation packages allow new and innovative features like validation and simulation of all operations

**CONFIGURABLE OPERATIONAL SECURITY**
and system security based on Microsoft technology

**HIGH LEVEL OF PERFORMANCE**
scalability, redundancy and system high availability
Gas SCADA
Modern, network model-based SCADA system

Network Visualization and Navigation

AGMS offers the most innovative user interface in the market. Network is viewed in an arbitrary number of schematic views of more or less complexity, and the geographic view which includes landbase layers for satellite imagery and street and other maps. All the information available to the system can be visualized in network views using any customer-defined symbology. Navigation is user friendly, with possibility to locate assets always one click away. Searching is possible by asset name, ID, or location like address, intersection or field marker. Decluttering and visibility profiles allow for easier viewing and better situational awareness.
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Network Model Management

A detailed model of all pipeline and station assets is kept within the AGMS product. Tools for efficient and user-friendly management of the network data, which require a minimum learning curve, are included in the product. Most companies already have a large amount of useful network data in an electronic form in their GIS systems, so the product also provides GIS importer tools to import this data and keep it up-to-date. Job-based model management with configurable workflows allow the process of data entry and promotion to production to be flexible and safe. The detailed model in AGMS is sufficient to feed any integrated simulation product.
Gas SCADA
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Network Monitoring
Data acquisition from the field or external systems is performed by using standard SCADA protocols like IEC 60870-5-104 and IEC 60870-6 (ICCP/TASE 2). The scalable and performant SCADA front-end can support the largest networks with millions of telemetered points. Multiple value sources are allowed, such as telemetry, manual, estimation, calculation and external. Data processing includes alarming, based on an arbitrary number of high/low limits, rate of change, flatline, creep, instrument failure, uncommanded change, abnormal state, etc. Advanced alarm management-like alarm suppression, inhibit, maintenance mode, and limit sets are included. Trend charts are based on past, current, and future values and flexible in terms of data processing and visualization.
Gas SCADA
Modern, network model-based SCADA system

Network Control
Supervisory control of all discrete and analog values is integrated into all the views of the network, as are all the standard operations like manual override, tag and note placement, etc. All user actions are checked against roles and permissions, as well as assigned areas of responsibility. Then, they are logged in the event database for reporting and auditing purposes. A flexible logbook is provided for operators’ manual entry of important information.
Gas SCADA
Modern, network model-based SCADA system

Calculation Engine
A generic calculation engine allows customers and project implementers to write calculation routines based on C# language, which take any value from the AGMS system as an input, including model values. User-defined routines can also be used to generate alarms and events or issue commands depending on customer-specific logic.
Gas Transport Management
Advanced applications for gas network modeling, planning and operation support

Flow Forecast

A proven artificial intelligence algorithm used in both AGMS and ADMS provides a fast and accurate forecast of flow (demand) on all ends of the network based on historical flow data and weather forecast (temperature, cloud cover, wind, humidity). Nominated flows are used instead of the forecast, where available. The flow forecast results are used daily to efficiently create correct and accurate dispatch schedules for the gas transmission networks.
Gas Transport Management

Advanced applications for gas network modeling, planning and operation support

Topology Processing

Hosting both the network model and real-time data, AGMS is able to determine the real-time as-operated network state and keep it up to date during all the operations. Topology processing offers a series of features to end users: a flow direction indication - detection and alarming of closed-in areas (areas of the network with no connection to an entry or exit point), and topological tracing which allows for efficient and reliable navigation through the network to the points of operator interest.
Gas Transport Management

Advanced applications for gas network modeling, planning and operation support

Gas Types and Compound Tracking

AGMS network model and topology processing are aware of different types of gas products transported via network, as well as blending of different gases found in complex transmission networks. Provided the estimated values, AGMS offers dynamic coloring based on configurable gas types and calorific values. Visual tracking of the concentration of different gas compounds, often used in networks with varying gas quality, can be used for short-term planning and disturbance tracking.
**Balance and Linepack**

Due to the compressibility of the gas and the inert nature of the gas transport process, linepack is a value which needs to be monitored during daily operations and actions are often decided depending on the value or trend of the linepack. Similarly, balance between the inflow and outflow of the natural gas gives the transmission network operators information about whether network buffer is increasing or decreasing. Balance and linepack are calculated in near real-time and reported for the entire network and per smaller network parts. Reports also include the past and future values of balance and linepack, allowing operators to monitor trends and react timely.
Gas Transport Management

Advanced applications for gas network modeling, planning and operation support

Pig Tracking

Pipeline inspection and cleaning is an important part of transmission network operations. AGMS streamlines the processes of pipeline pigging by allowing an arbitrary number of user-defined pig routes and tracking the pigs based on the network topology and estimated or telemetered gas speed values.