KETERS

Gas pipeline control, forecasting and optimisation

For procurement control, predefined set point schedules for total procurement are read in automatically in the form of Excel tables and transmitted to the flow regulation valve of the substation. The procurement set points can be entered up to seven days in advance.

A linear regression model on an hourly basis is used as the forecast method, with day type and temperature as influencing factors. Forecasts can also be calculated up to seven days in advance and form the basis for any procurement optimisation which may be necessary.

Procurement optimisation is based on the following input parameters:
- Forecast output
- Current gas volume in the pipeline network as calculated by GANBEO
- Procurement set points from the set point schedule

The task of storage monitoring is the cyclic simulation of storage processes, monitoring of store limits and verification of future procurement processes specified in the set point schedule.

Status monitoring and leak detection in the gas pipeline network

To monitor gas pipeline networks, which can be meshed in any manner, the generally non-stationary flow process in the pipeline network is calculated. To do this, the ProCoS control system delivers node pressure and flow rate measurands as well as valve positions at equidistant measurement intervals from the current process image to the GANBEO program, which calculates the current flow conditions in the pipeline network in combination with the data of past calculation cycles. The calculated results from GANBEO are passed to ProCoS for visualisation, leak detection and storage simulation by comparison with the actual values.

Process control system with gas pipeline network calculation

The ProCoS control system manufactured by Kisters can be built-up using terminal servers as a redundant server system with work stations in the control room and office work stations. Process integration generally takes place via a network using telecontrol protocol IEC 60870-5-104 (more rarely -101) in addition to the standard SCADA functions. ProCoS offers numerous valuable functions for gas applications, such as:

- Status monitoring and leak detection
- Control and monitoring of the contractually defined gas supply
- Gas forecasting, procurement optimisation and storage monitoring

Visualisation of leak detection in the ProCoS control system

Reliable supply
Telecontrol in the gas network
Natural gas is currently one of the most important energy sources. Ensuring environmentally compatible and extensive supply is no easy task. The network must adapt to continuous growth and the resulting changes. New network areas are being opened up to do this. The European distribution network is becoming better and better thanks to investment in new transport systems, and redundant supplies are being set up to increase security of supply.

Telemetering technology is thus a matter of life and death. It is the responsibility of the control centre to ensure maximum security. If a gas supply should be interrupted for technical reasons, the effects can sometimes be catastrophic. So it is very important to ensure that the gas supply is established as quickly and reliably as possible.

However, the sheer volume of data to be transmitted is a problem. The data must be transmitted at the right time, without any errors and quickly, in order to maintain the security of the gas supply. The development of efficient transmission media is therefore a priority. The data is transmitted to the control centre and further processed there. It can then be easily retrieved at any time.

How does the data get to the control centre?

All current transmission media can be used for data transmission to the control centre according to IEC standards 60870-5-101 or -104. We can offer you concepts for using your own cables and fibre optic channels and autonomous radio systems. If no dedicated infrastructure is available, public GPRS and GRPS connections can also be used.

As replacement or secondary routes sometimes do not perform as well as the main route, priorities can be assigned to the data. If the main route fails only the most important information is transmitted; low-priority events are stored on an SD memory card on site and can be retrieved at any time.

Thanks to the ability of our systems to be combined in any desired manner, very complex systems with different transmission routes can be built up. The advantage of this is: everything comes from one system family, from one single source.
Telecontrol technology in the gas network

Natural gas is currently one of the most important energy sources. Ensuring environmentally compatible and extensive supply is no easy task. The network must adapt to continuous growth and the resulting changes. A new network architecture is being opened up to do this. The European distribution network is becoming better and better thanks to investment in new transport systems, and redundant supplies are being set up to increase security of supply.

As replacement or secondary routes sometimes do not perform as well as the main route, priorities can be assigned to the data. If the main route is the only route, the most important information is transmitted; low-priority events are stored on an SD memory card on site and can be retrieved at any time.

Thanks to the ability of our systems to be combined in any desired manner, very complex systems with different transmission routes can be built up. The advantage of this is: everything comes from one system family from one single source.

How does the data get to the control centre?

All current transmission media can be used for data transmission to the control centre according to IEC standards 60870-5-101 or -104. We can offer you concepts for using your own cables and fibre optic channels and autonomous radio systems. If no dedicated infrastructure is available, public G3G and GRPS connections can also be used.

To ensure the most efficient use of the public network, the data is transmitted via a protocol router. It connects the network to the public network and also ensures that the data reaches the control centre securely. A protocol router is used to connect to the public network. If the main route to the control centre fails, an alternative route is activated and the data is transmitted via this route to the control centre. The alternative route can be a mobile radio network (eg. via mobile radio, GPRS, GPRS, Tetra) or a wireless LAN (eg. via wireless LAN, Wi-Fi).

The data is then processed by the control centre. If the main route to the control centre fails, the data is transmitted via an alternative route to the control centre. The alternative route can be a mobile radio network (eg. via mobile radio, GPRS, GPRS, Tetra) or a wireless LAN (eg. via wireless LAN, Wi-Fi).

Technology for gas applications

Transfer stations, block valve stations, reducing stations and gas pressure regulator stations are monitored with our telecontrol systems. Faults in the UPS installation or in the volue converters can be detected if a pressure measurement failure and transmitted to the control centre immediately. The flow rates can be detected, transferred and if required buffer-stored as standard and operating parameters. Applied metered values can be processed repeatedly and parameterised individually. For example, the 3-minute value and the hourly value can be used in parallel. If main and check metering are available, it is of course possible to compare the values and produce a message in the event of deviation.

Typical messages:

• Safety shut-off valve tripped
• Filter pressure difference
• Power failure
• Odourising failed

Typical measurands:

• Input pressure
• Output pressure
• Odour concentration
• Differential pressure of filters
• Flow rates

When the natural gas is expanded in the gas pressure regulator station, it cools. The gas must be preheated to avoid damage to regulators and pipelines. This is done using classical gas boilers or combined heat and power stations. To determine the thermal output required, the volumetric flow and the input and output pressures are taken into account as well as the gas temperature. The parameters can be read in and the required thermal output can be determined with the aid of calculated values supported by self-t or the PLC function in our telecontrol installations. A separate PLC is not necessary for this.

All the required information of the available systems can be received via a serial interface. Gas chromatographs, volume converters and flow rate meters for example are often equipped with a Modbus or Profibus interface. The data is integrated into the process image of the telecontrol station and is available there for further processing.

The process can be visualised and the control variables can be entered on site via a recessed display.

We will work with you on a solution which meets your needs for secure remote data transmission. Because safety has top priority, the transmission route can also be built redundantly. Our systems can then also supply spatially separate network control centres with selected data.

Examples of redundant system construction

Redundancy

An example of a redundant system construction. A separate PLC is not necessary for this.
Technology for gas applications

Typical measurands:
- Pressure
- Temperature
- Flow rate
- Differential pressure of filters
- Output pressure
- Odour concentration
- Differential pressure of filters
- Flow rate

The monitoring of gas pressure regulator stations is hugely important for a secure gas supply. Fault-free functioning of the gas-pressure regulator stations is monitored with our telecontrol systems. Faults in the UPS installation or in the network control centres with selected data. As replacement or secondary routes sometimes do not perform as well as the main route, priorities can be assigned to the transmission routes. The process can be visualised and the control variables can be entered on site via a recessed display. The process can be visualised and the control variables can be entered on site via a recessed display. The process can be visualised and the control variables can be entered on site via a recessed display.
**Process control system with gas pipeline network calculation**

The ProCoS control system, manufactured by Kisters, can be built up using terminal servers as a redundant server system with work stations in the control room and office work stations. Process integration generally takes place via a network using telecontrol protocol IEC 60870-5-104 (more rarely -101) in addition to the standard SCADA functions. ProCoS offers numerous valuable functions for gas applications, such as:

- Status monitoring and leak detection in the gas pipeline network
- Control and monitoring of the contractually defined gas supply
- Gas forecasting, procurement optimisation and storage monitoring
- Status monitoring with leak detection

Gas procurement control, forecasting and optimisation

For procurement control, predefined set point schedules for total procurement are read in automatically in the form of Excel tables and transmitted to the flow regulation valve of the substation. The procurement set points can be entered up to seven days in advance.

A linear regression model on an hourly basis is used as the forecast method, with day type and temperature as influencing factors. Forecasts can also be calculated up to seven days in advance and form the basis for any procurement optimisation which may be necessary.

Procurement optimisation is based on the following input parameters:

- Forecast output
- Current gas volume in the pipeline network as calculated by GANBEO
- Procurement set points from the set point schedule

The task of storage monitoring is the cyclic simulation of storage processes, monitoring of store limits and verification of future procurement processes specified in the set point schedule.

**Visualisation of leak detection in the ProCoS control system**
Process control system with gas pipeline network calculation

The ProCoS control system manufactured by Kisters can be built-up using terminal servers as a redundant server system with work stations in the control room and office work stations. Process integration generally takes place via a network using telecontrol protocol IEC 60870-5-104 (more rarely -101). In addition to the standard SCADA functions, ProCoS offers numerous valuable functions for gas applications, such as:

- Status monitoring and leak detection in the gas pipeline network
- Control and monitoring of the contractually defined gas supply
- Gas forecasting, procurement optimisation and storage monitoring

**Status monitoring with leak detection**

To monitor gas pipeline networks, which can be meshed in any manner, the generally non-stationary flow process in the pipeline network is calculated. To do this, the ProCoS control system delivers node pressures and flow rate measurands as well as valve positions at equidistant measurement intervals from the current process image to the GANBEO program, which calculates the current flow conditions in the pipeline network in combination with the data of past calculation cycles. The calculated results from GANBEO are used in ProCoS for visualisation, leak detection and storage simulation by comparison with the actual values.

**Gas procurement control, forecasting and optimisation**

For procurement control, predefined set point schedules for total procurement are read in automatically in the form of Excel tables and transmitted to the flow regulation valve of the substation. The procurement set points can be entered up to seven days in advance. A linear regression model on an hourly basis is used as the forecast method, with day type and temperature as influencing factors. Forecasts can also be calculated up to seven days in advance and form the basis for any procurement optimisation which may be necessary.

Procurement optimisation is based on the following input parameters:

- Forecast output
- Current gas volume in the pipeline network as calculated by GANBEO
- Procurement set points from the set point schedule

The task of storage monitoring is the cyclic simulation of storage processes, monitoring of store limits and verification of future procurement processes specified in the set point schedule.

**Gas control technology in the gas network**

Reliable supply

Telemetering in the gas network