Natural Gas Cavern with Added Reliability

Technological leap for higher availability through Ethernet-APL

At a Glance

- Maximum protection of the process plant against external attacks thanks to stainless steel enclosures with cylinder locks and locking systems
- Optimized cybersecurity and integration of functional safety
- Simplified engineering and maintenance through end-to-end digitalization with Ethernet-based communication
- Comprehensive remote diagnostics for increased plant availability through proactive and accelerated maintenance
- New company-wide standard for all infrastructure components for accelerated engineering and maintenance tasks



The Application

The process control system of a natural gas cavern storage facility, which had been in use for many years, needed to be upgraded to the latest technological standards. The client was a leading energy supplier. They wanted to take the opportunity to implement Ethernet-APL to achieve transparent communication between the control system and a multitude of sensors.

A cavern storage facility is an artificial cavity carved out of a solid salt dome. The salt serves as a gas-tight environment for the temporary storage of natural gas. Storage facilities of this type are an essential component to secure an uninterrupted gas supply.

The Goal

For an energy supplier, maximum availability of the entire facility for filling and withdrawing natural gas is paramount. Therefore, communication to with the individual field junction boxes is designed with media redundancy.

The upgrade project implemented by Pepperl+Fuchs enhances this inherent plant security with improved protection against cyberattacks by equipping all enclosures and control cabinets with cylinder locks for increased access control. Several measures were also implemented to simplify workflows and engineering.



The Solution

The requirement was seamless communication across various signal types, such as 4-20 mA, HART, Profibus PA, and Profinet via Ethernet-APL. Furthermore, significantly improved maintenance and servicing were to be achieved to ensure plant availability even under critical operating conditions.

The integration of Ethernet-APL switches, and remote I/O in a single enclosure solution provided crucial prerequisites. The fully digital communication path not only enables seamless remote diagnostics but also the implementation of proactive maintenance concepts.

Technical Features

The existing process plant control system is a Siemens PCS7 with a CPU 410-5H. A ring-redundant cabling infrastructure throughout the entire site contributes significantly to the overall plant availability. For reliable signal transmission over long distances in outdoor areas, fiber optic cables with pluggable SFP modules were used in the switches. These ensure complete immunity to electromagnetic interference.

At the customer's specific request, Pepperl+Fuchs supplied stainless steel enclosures for all infrastructure components with cylinder locks as accessories. Furthermore, special components such as heaters with thermostats were incorporated, particularly in outdoor areas.

The power supply to the components can be individually disconnected, especially in hazardous areas, thanks to safe isolation using MF-T type terminals. To ensure functional safety, I/O modules were integrated into the ready-to-connect enclosure solutions.

Added Benefits

A consistent standard for infrastructure components was developed, which will be used company-wide for all geographically distributed communication networks in the future. This ensures uniform handling during installation and maintenance, simplifying and accelerating work processes.

This includes a standardized field distributor, which facilitates device replacement and simplifies engineering for minor system expansions.

Remote diagnostics with Ethernet to the field not only supports accelerated fault detection, but also ensures rapid response times, thus contributing significantly to maximum plant availability.

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