UNITED ELECTRIC CONTROLS

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ViewPoint

Natural Gas Storage — Pressure Switch Upgrade

After 3 years of testing, a major natural gas storage company in Italy standardized on UE's One Series smart electronic switch to provide shutdown functions for their gas collector compressors and treatment plants. The One Series is used for upgrading mechanical switches at 9 gas storage sites and was chosen for its long term set point stability over widely ranging ambient temperatures. Additional reasons for choosing the One Series include integral digital process display, internal diagnostics and fully adjustable deadband switching.

Keywords: One Series, electronic pressure switch, plant upgrade, diagnostics, digital, adjustable deadband, natural gas storage, compressor, treatment plant, safety, voting logic, temperature stability, inlet pressure, United Electric Controls, faults, failsafe, natural gas compression, natural gas treatment, dehydration columns

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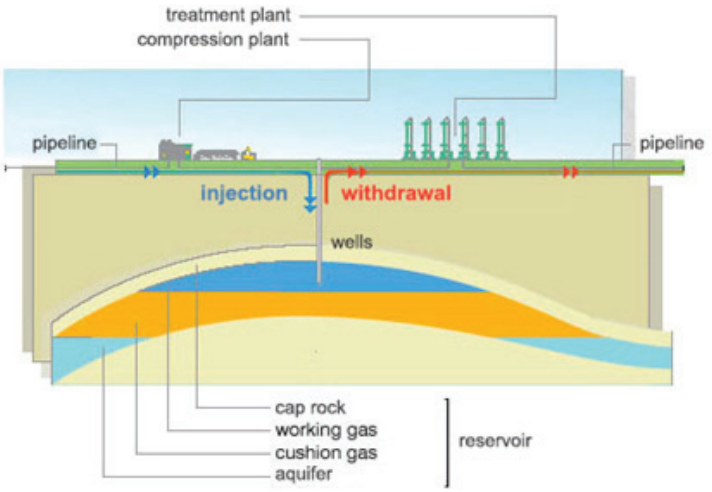
Natural Gas Storage

The storage of natural gas is a process whereby gas is injected into the porous rock of depleted reservoirs. In the gas supply chain, storage is particularly important because it compensates for the differences between supply and demand for gas and ensures continuity of supply. Once the gas has been injected it can be withdrawn, depending on demand, and used to ensure a sufficient supply of natural gas to industries and for heating in winter.

A natural gas storage reservoir is not a tank, a deposit or a cave full of gas, but a structure of porous rock in which the gas is stored under the same safety conditions as nature provided for millions of years. Natural gas storage involves an integrated infrastructure system made of reservoirs, wells, treatment plants and compressor stations, as shown below.



A major gas storage company located in Italy operates 9 reservoirs and is the largest gas storage company in Europe. At a maximum depth of 1,500 meters (4,900 feet), the company stores up to 16 billion cubic meters (565 billion cubic feet) of natural gas.

Testing the One Series

The company tested the One Series smart electronic switch model 1XSWLL by United Electric Controls (UE) over a period of 3 years at one of their compression sites. Three switches were arranged in a 2 out of 3 (2oo3) voting logic scheme to provide shutdown functions on the compressor station's gas delivery collector. Set at 140 bars (2,030 psi) rising, the company achieved excellent results regarding long term set point stability with the One Series.

The Solution

In 2015, the company's engineering department standardized on UE's One Series 2-Wire electronic switch for upgrading all mechanical pressure switches as part of an internal project for technical innovation. The One Series solid-state technology is used at the compression plant for natural gas injection and in the treatment plant when gas is withdrawn for transportation. While set point stability over wide-ranging temperatures was the impetus to upgrade from mechanical switches, many other benefits were realized. The company regards process upsets and detected faults as equally undesirable events. The One Series will force the switch to the failsafe state if either event occurs, providing this vital information to the control system. The product's digital display provides process and switch status and allows maintenance workers to verify the settings. Operating on the same 2 wires and control scheme as the mechanical switches being replaced, The One Series provided and easy and cost-effective upgrade path for the company.

Natural Gas Compression

The compression plant takes natural gas from the supply pipeline at 75 bar (1,088 psi) and increases the pressure to 180 bar (2,611 psi) using centrifugal compressors powered by gas turbines. The One Series monitors for high and low gas pressures on the compressor's suction and discharge and performs a third stage shutdown if the values are out of range.

Natural Gas Treatment

To ensure quality compliance, the gas withdrawn from the gas storage reservoir must be treated before entry into the transportation pipeline network. Dehydration columns perform liquids separation to remove water and hydrocarbons using glycol, pressure and temperature. The One Series monitors the collector columns for low pressure ranges between 20 – 24 inches H2O, the treatment columns for low and high pressures and the delivery collectors for high pressures.

Conclusion

After a lengthy test period of three years, this natural gas storage company has standardized on the One Series electronic pressure switch for replacing all mechanical switches that process natural gas for underground storage. The One Series was chosen because of its set point stability over a wide temperature range, integral digital process display, self-diagnostics and adjustable deadband. The electronic switches are arranged in 2 out of 3 voting logic schemes for monitoring the inlet and exhaust pressures on the natural gas compressors to ensure safety and to minimize nuisance trips.