

HIGH FREQUENCY GAS STORAGE OPERATIONS USING DOWNHOLE INSTRUMENTATION

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Abstract

Spectra Energy Transmission, a U.S. Gulf Coast natural gas storage operator, has installed downhole pressure-temperature probes in six storage caverns at two salt dome storage facilities. The pressure and temperature data collected at the center of each cavern is continuously transmitted into surface data acquisition, distribution and archiving systems, and provides operations and engineering personnel with real-time information to help operate the caverns safely and efficiently.

The benefits derived from the downhole instrumentation project are to the areas of gas inventory verification, cavern-wellbore system mechanical integrity testing, salt creep-closure rate analysis, and flow rate calculation. This information also provides the key elements of cavern integrity monitoring programs that are required under state and federal laws.

The probes were installed at the volumetric center of gas mass in each cavern as calculated at the expected maximum pressure and temperature conditions. This positioning provides for the collection of data during mechanical integrity testing that closely represents an integration of the gas pressure and temperature profile through the cavern interval at maximum conditions.

Observation of pressure and temperature data collected at high frequencies has provided evidence that cavern sizes may be altered temporarily in response to changes in pressures and flow rates. As a result, other topics to be studied are individual cavern response to gas flows and shut-ins, and local salt characteristics.

Due to the high sensitivity of the probes, small fluctuations in inventory calculations can be observed in a dormant cavern as the result of changing ambient temperatures.

Key words: Caverns for Gas Storage, Downhole Instrumentation, Downhole Gauges, High Frequency, Mechanical Integrity, Inventory Verification, Salt Creep Closure, Real Time Pressure Temperature Data, Real Time Monitoring, Tubing Enclosed Cable, Downhole Probes