



ROSEMOUNT ANNUBAR FLOW METER ACHIEVES EXCEPTIONAL MEASUREMENT ACCURACY IN A CRITICAL FLOW APPLICATION AT LNG UNDERGROUND GAS STORAGE FACILITY

Customer

An underground gas storage in western China is used strategically to maintain stable gas supply. It acts as a back up to compensate seasonal peak demand and activates as a contingency should an emergency arise.

Application

Flow measurement of underground gas storage at injecting wells in LNG field.

Challenge

One of the most significant problems related to the underground storage of cryogenic material is the need to prevent leakage of liquid and gas from the containment system to the rock mass caused by tensile failures due to shrinkage of the rock mass around the caverns. The customer was designing a new skid for bidirectional flow measurement and experimented with a few technologies including averaging pitot tube, but couldn't achieve the necessary accuracy required. The biggest challenge is to measure the LNG flow with high accuracy, at critical low flow rate, bidirectional flow and exceptional high pressure that is up to 42MpaG. Users require a complete set of metering skid for wellhead flow meters to measure the bidirectional fluid.

Solution

With averaging pitot tube (APT) technology, the impact pressure is sensed on the front of the device as the flow initially approaches the obstruction which creates the pressure difference. The biggest difference between a Rosemount™ Annubar Flow Meter and a pitot tube is that an Annubar™ takes multiple samples across a section of a pipe or duct.

Results

- Saved 200,000 cubic meter of LNG in the process
- Reduced installation and operation costs by 50%
- Achieved a highly accurate measurement with great stability



Rosemount 3051S
MultiVariable™ Transmitter



Rosemount 585
Annubar Primary
Element

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In this way, the Annubar averages the differential pressures encountered accounting for variations in flow across the pipe. A pitot tube will give a similar reading if the tip is located at a point in the pipe cross section where the flowing velocity is close to the average velocity.

Having assessed and accepted APT (Averaging Pitot Tube) as an option, the customer adopted the test skid that included Rosemount 585 Annubar Flow meter with Rosemount dual 3051S MultiVariable™ Transmitter (3051SMV). A measurement skid was designed to 42Mpa pressure and equipped with bidirectional fluid measurement function.

The Rosemount 3051S MultiVariable Transmitter measures differential pressure, static pressure, and process temperature in a single device while dynamically calculating mass flow 22 times per second within the transmitter.

The Rosemount 3051S MultiVariable Transmitter can measure the changing characteristics of the velocity flow profile across the full diameter of the pipe and internally calculate a fully compensated mass flow improving the measurement accuracy and reducing process uncertainty and complexity.

A few other flow meters such as ultrasonic flow meter, external clamp-on ultrasonic, channel and target flow meter were also tested in the same operating condition concurrently.

The customer declared that the Rosemount Annubar with 3051SMV proved to have the highest accuracy and stability in two-phase fluid measurement and in low flow. The advantages of Rosemount 585 Annubar includes a symmetrical design for bidirectional flow measurements and has good anti-seismic and high-pressure resistance capability.

Emerson's Rosemount DP Flow solution was able to minimize pressure drop to save energy and perform real-time mass and energy flow measurements with integral temperature design, thus helping users to reduce wastage and maximizing economic benefits.

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ROSEMOUNT™

"The Rosemount 3051SMV together with 585 Annubar achieved good performance on site. We have achieved reliable and stable measurement in extreme high-pressure conditions, while improving process safety."

*-Instrument manager
Gas Storage Facility*



Top: Rosemount 3051S Multivariable transmitter fitted with impulse lines and Rosemount Annubar mounted on the yellow pipe carrying LNG in the underground facility

Bottom: Customer's LNG skid with Rosemount 3051S MultiVariable Transmitters and Rosemount 585 Annubar

