

Measuring moisture in pipeline natural gas

Summary

Natural gas is distributed through a network of pipelines and stored in tanks, underground caverns and spent oil wells. The presence of excess moisture in natural gas results in liquid water condensing or ice formation in cold climates or when gas is decompressed due to Joule-Thompson cooling. Excess moisture combined with high pressure leads to the formation of solid hydrates. Ice and/or hydrate formation can restrict or even block the flow in the pipeline. In addition, the moisture content of the gas adversely affects the heating value (BTU) of the gas, thus lowering the quality and value of the product. Water also combines with acid gases such as Carbon Dioxide and Hydrogen Sulfide and accelerates corrosion. In order to meet gas quality requirements and protect the pipeline and storage infrastructure the moisture content must be continuously monitored.

Application

The distribution of natural gas must comply to specifications for the maximum moisture concentration referred to as the tariff. In the United States the tariff is 7 lbs H₂O/MMSCF natural gas (pounds water per million standard cubic feet natural gas) and in Europe the maximum recommended level is -8°C dew point at 70 Bar(a). Other countries and localities have similar specifications for the maximum amount of water in natural gas. Suppliers who exceed the maximum levels may be shut in for non-compliance. A shut-in is a loss of revenue for gas suppliers.

Challenge

Early detection of an increase in the moisture content allows the operator to quickly respond to prevent catastrophic blockages, leaks due to corrosion, or loss of revenue due to a shut-in at a custody transfer point. Most gas distribution and compression facilities are challenged with fewer operation and maintenance personnel and higher reliance on automated data acquisition and control systems.

Benefits:

- Multiple moisture measurement technologies
- Systems designed to meet your technical requirements
- Complete turnkey systems: just connect power, gas sample and output signal
- Laser-based analyzers eliminate need for regular maintenance and calibration



This means that the instruments must be low maintenance and have the reliability to operate unattended 24 hours a day. Today Big Data collection is showing benefits by using intelligent processing to implement control, corrective action and to predict maintenance.

Solutions

Installing Panametrics time proven Aluminum Oxide trace moisture sensor offers great value. HygroPro transmitters offer a local display and a 4-20mA signal for lbs/MMSCF, dew point temperature, or ppmv (parts per million by volume). For natural gas applications, the HygroPro is installed in a sample system designed to filter contaminants, regulate the pressure, and indicate flow while giving the added option to control temperature.

The moisture.IQ is a multifunction and multichannel analyzer which connects to (6) AlOx trace moisture probes, (6) oxygen sensors and (12) analog inputs. The analyzer is programmed via a color touch screen or remotely via ethernet (TCP/IP). It provides digital and analog outputs and is equipped with an internal data logger. The moisture.IQ has a built-in intrinsic safety scheme enabling connection to sensors in hazardous areas. These instruments are ideal for facilities with multiple measurement points or where redundant measurement is required. It is available in 19" rack mount, wall mounted weatherproof and in an explosion proof enclosure.

The PM880 is a portable battery-operated intrinsically safe analyzer which is ideal for spot checking and data logging. It can be used to verify the moisture content at various locations in pipeline infrastructure.

The Aurora TDLAS (Tunable Diode Laser Absorption Spectrometer) moisture analyzer provides definitive moisture measurement by using a fully non-contact measurement sensing technology. The cost of installing an Aurora provides significant long term savings because there is no need for field calibration or sending sensors out for recalibration. The Aurora uses the fastest responding trace moisture measurement technology and therefore quickly alerts to process upsets and confirmation of dry gas. The Aurora provides a local display, 4-20mA signals, RS232/485, and Ethernet with MODBUS. The Aurora TransPort is a batteryoperated portable analyzer, assembled in a high impact case which is perfect for spot checking and where portable and fast responding measurement is a priority.

Application specifications

- USA: 0 – 25 lbs H₂O/MMSCF natural gas (0 – 525 ppmv) with alarm at 7 lbs
- Europe: -40 to 0 °C frost point at 70 Bar(a) with alarm at -8 °C frost point
- Options for display of moisture in lbs H₂O/MMSCF, dew point temperature or ppmv
- Analog outputs
- Local display
- Options for weather-proof and heated enclosures
- Options for sample conditioning systems
- Certification for hazardous area operation: Explosion proof and intrinsically safe

