

Application Note

HYGROPHIL F 5673 & RVP-4

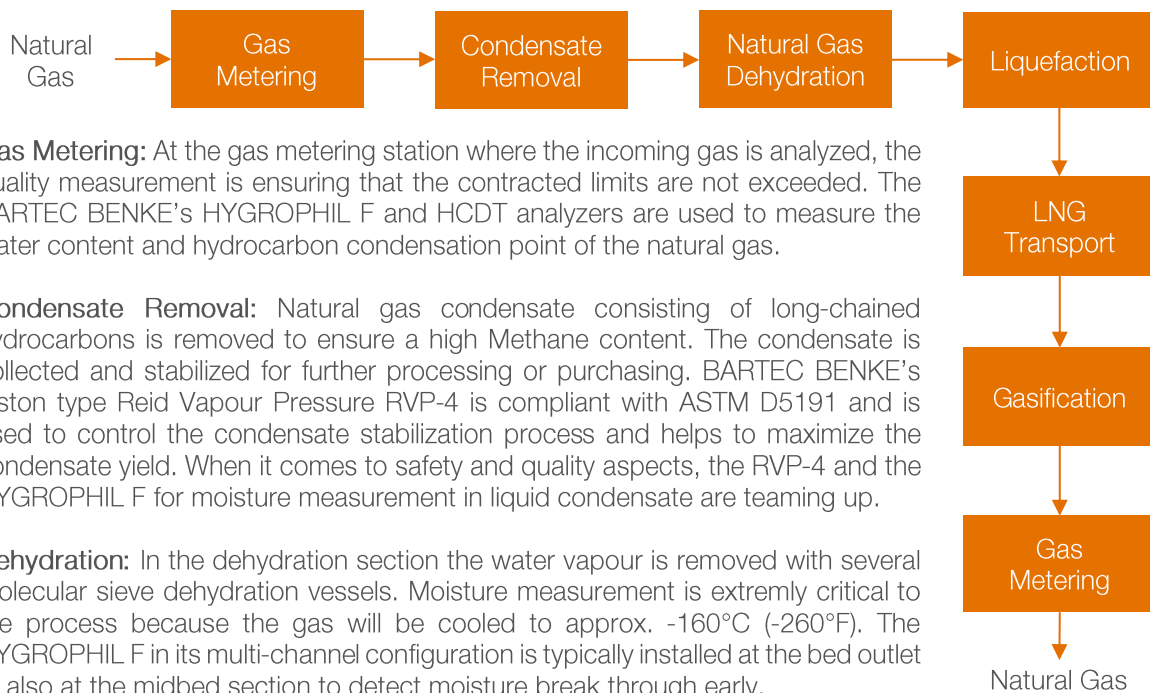
Process Trace Moisture Analyzer and
Reid Vapour Pressure Analyzer for LNG



APPLICATION NOTE

Measurement Solutions for the LNG Value Chain

The strong growing demand of natural gas requires distribution on a global scale. From shore to shore where pipelines can't be layed and where flexibility is required, LNG is the solution. The liquefaction of natural gas to LNG reduces its volume by approx. 600 times and allows the transport by ship and even by truck-trailer in an economic way. The process of converting the natural gas to a liquid and back to gas involves several steps. The BARTEC BENKE measurement solutions are contributing to safe, reliable and environmental friendly operation.



Gas Metering: At the gas metering station where the incoming gas is analyzed, the quality measurement is ensuring that the contracted limits are not exceeded. The BARTEC BENKE's HYGROPHIL F and HCDT analyzers are used to measure the water content and hydrocarbon condensation point of the natural gas.

Condensate Removal: Natural gas condensate consisting of long-chained hydrocarbons is removed to ensure a high Methane content. The condensate is collected and stabilized for further processing or purchasing. BARTEC BENKE's piston type Reid Vapour Pressure RVP-4 is compliant with ASTM D5191 and is used to control the condensate stabilization process and helps to maximize the condensate yield. When it comes to safety and quality aspects, the RVP-4 and the HYGROPHIL F for moisture measurement in liquid condensate are teaming up.

Dehydration: In the dehydration section the water vapour is removed with several molecular sieve dehydration vessels. Moisture measurement is extremely critical to the process because the gas will be cooled to approx. -160°C (-260°F). The HYGROPHIL F in its multi-channel configuration is typically installed at the bed outlet or also at the midbed section to detect moisture break through early.

Gas Metering after Gasification: Similar to the feed in metering station, the regasification plant is also equipped with a metering skid for quality and fiscal metering before the natural gas enters the pipeline again.

Reliable and robust process analyzer solutions by BARTEC BENKE

Gas Metering

- HYGROPHIL F (Trace Moisture Analyzer)
- HYGROPHIL HCDT (Hydrocarbon Dewpoint Analyzer)

Condensate Removal / Liquefaction

- RVP-4 (Reid Vapour Pressure Analyzer for Condensate and LPG)
- HYGROPHIL F (Trace Moisture Measurement in Condensate)

Dehydration

- HYGROPHIL F (Trace Moisture Analyzer)



APPLICATION NOTE

HYGROPHIL F – Trace Moisture Process Analyzer

The BARTEC BENKE HYGROPHIL F is a multi channel trace moisture analyzer with a extremely robust but accurate moisture sensor. The sensor calibration is optionally validated by an

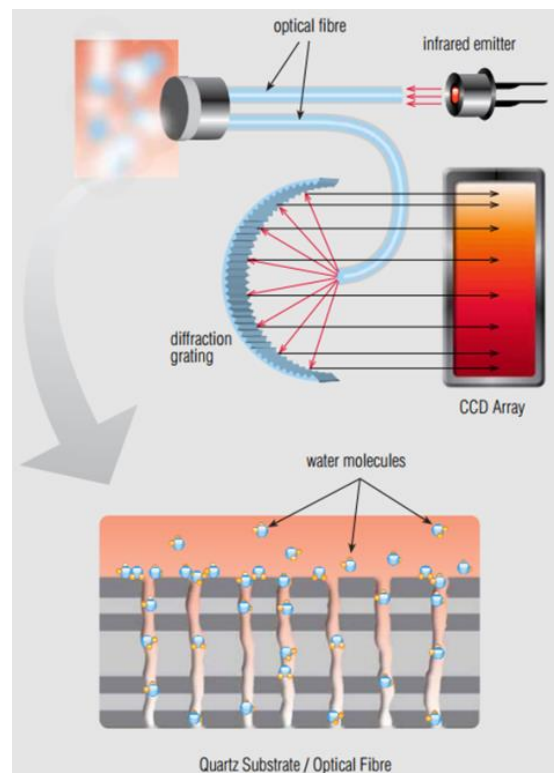
independent and accredited laboratory. In-line or at-line installations are possible with sensor retraction armature or customized sample conditioning systems.

The HYGROPHIL F is designed for the needs of the oil, gas and chemical industry.

The core element of the moisture sensor is an optical thin film element made of silicon dioxide and zirconium dioxide. The microporous stack of alternating high and low refracting optical layers is forming a Fabry-Pérot Interferometer with a distinctive and reliably detectable reflection minimum in the spectral range around 820 nm.

Selective to water, molecules can diffuse into the porous Fabry-Pérot element, which then performs a shift of the reflection minimum in proportion to the actual water vapour pressure. The spectral shift is detected and evaluated with a compact high-resolution polychromator, which is located in the evaluation unit together with the light emitting diode. The interconnecting fiber optic cable can be up to 800 m long because of the detection of an optical minimum instead of an intensity change.

The evaluation unit processes and calculates the present dew point temperature as well as other units such as water vapour pressure, parts per million, mg/m³ and further more. Several analog outputs, MODBUS, PROFIBUS RTU and via TCP/IP as well as relay contacts are equipped as standard for interconnection to the control system.



Schematic of the Measurement Principle

Thousands of installations worldwide prove the advantages of this measurement principle:

- Robust sensor construction for outstanding long-term stability
- Sensor validation at process conditions by accredited and independent laboratory on request
- Easy sensor cleaning and almost no maintenance required
- In-line installation with sensor retraction armature possible (fast response and emission-free)
- Flexible on-line solutions with customized sample conditioning systems
- Certified for safe operation in hazardous area (ATEX, IECEx, CSA, TR CU)

APPLICATION NOTE

RVP-4 – Vapour Pressure Process Analyzer

To remain competitive, today's refiners must employ all optimization and product control techniques available. The use of online physical property analyzers is one of the key features to reach those objectives because they measure important quality properties in the process directly. The vapor pressure is an indication of a

liquid evaporation rate and relates to the tendency of volatile components to escape from the liquid. To assure safe storage and transportation of petroleum products, minimize environmental pollution and assure proper functioning of combustion engines it is important to measure the vapor pressure.

Credible Solutions for the Oil and Gas Industry

The BENKE Vapor Pressure Process Analyzer RVP-4 measures the vapor pressure of various petroleum products. Due to its design it can be used for gasoline applications as well as for high pressure applications on natural gas liquids.

The rugged design of the measuring cell and minimized maintenance requirements due to temperature control and insulating system without oil bath/pumps makes the RVP-4 uniquely robust and reliable without any compromise on precision (typ. $r = 1.5 \text{ mbar} / 0.02 \text{ psi}$ for gasoline).

It is also the best choice for applications for viscous samples such as crude oil without the necessity of implementing additional wash cycles. It is also possible to measure the vapor pressure at different temperatures e.g. True Vapor Pressure (TVP) for storage tank application.

The RVP-4 is compliant with ASTM D5191 and DIN EN ISO 13016-1 and correlates with ASTM D6897 (LPG Expansion), ASTM D1267 (LP Gas) and many more.



RVP-4

Highest quality for the most reliable vapour pressure analysis in the field

- ASTM compliant cylinder piston design with 4:1 expansion
- Suitable for high pressure applications (LPG)
- No maintenance approach
- Integrated failure diagnosis and self-monitoring
- Integral temperature control unit
- Network and fieldbus communication