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# Using Intrinsically Safe Portable Hygrometers to Measure Water Dew-point in Natural Gas

## Application Background

Natural gas extracted from underground sources is saturated with liquid water and heavier molecular weight hydrocarbon components, which necessitates several stages of processing to meet the requirements for a clean, dry wholly gaseous fuel suitable for transmission through pipelines and burning by end users. The removal of entrained liquids from the gas followed by drying to reduce water vapour content are two of the first processes which take place at a natural gas production facility both on- and off-shore. The dehydration of natural gas is critical to the successful operation of the production facility, and the whole distribution train through to the end user.

The presence of moisture vapour in concentrations above a few 10s of parts per million has potentially disastrous consequences. The lifetime of a pipeline is governed by the rate at which corrosion occurs, which is directly linked to the available moisture in the gas. In addition, the formation of methane hydrates as crystalline solids can reduce pipeline flow capacities, even leading to blockages. Break-away fragments can also potentially damage process equipment downstream.



Such hydrates are the combination of excessive water vapour with liquid hydrocarbons, which may condense out of the gas in the course of transmission, to form emulsions which, under process conditions are solid masses.

The most common process for drying natural gas [after the mechanical separation of gas from liquids] is glycol dehydration. Here the gas flows up through a tower, where it is exposed to a mist of glycol – acting as a liquid desiccant. The glycol mist adsorbs the majority of the water vapour, and migrates out towards the wall of the tower, where it is collected. Such glycol contactors are specified to achieve a moisture content of less than 3 lb/MMSCF (pounds of moisture per million standard cubic feet of gas) under normal operating conditions.

## Measurement Technique

Performance of glycol contactors is usually monitored by means of an on-line moisture analyser, such as a Michell Instruments Promet Eexd or Promet I.S.

Often it is also important to verify the moisture content of such systems, frequently in a variety of sample locations – given the dispersed nature of such installations. This is when portable hygrometers become useful, as the necessity to measure at a number of different points becomes important. The Michell Instruments MDM300 I.S. provides high speed measurements of water dew point in natural gas, in a compact and easy to handle package, which is specifically designed for ease of operation in the field.

Pre designed case-mounted sampling systems are available specifically for this application, with appropriate filtration for use in natural gas (coalescing, when the sample is likely to contain entrained liquids, membrane for 2<sup>nd</sup> stage liquid protection and glycol for glycol removal).

Due to its fast response, the MDM300 I.S. can be used to verify more sample points in a day than any other portable, and can potentially improve the efficiency of many spot checking operations.



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