



Drifting moisture sensors – a risk for every industrial plant!

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After a convincing long-term test, TOTAL Raffinerie Mitteldeutschland GmbH now very successfully applies the fibre-optical trace moisture measurement instrument HYGROPHIL F 5672 made by BARTEC in order to protect the moisture-sensitive catalysts within the reactor of the reformer plant. Compared to the aluminium oxide sensors used so far, this new solution offers some decisive advantages in terms of long-term stability and reproducibility and it provides improved plant safety and availability.



In 1997, TOTAL Raffinerie Mitteldeutschland GmbH started the productive operation. It is the youngest of 14 refineries in Germany as well as one of the most modern industrial complexes in Europe. With an annual capacity of 11 million tons of crude oil the enterprise with its 650 highly-qualified employees is one of the top-ranking companies in terms of turnover in the Eastern part of Germany and has decisively contributed to maintaining the chemical industry site Leuna in Saxony-Anhalt. The refinery comprises a crude/ vacuum distillation, a reformer, desulphurisation plant, crackers, sulphur recovery systems, visbreakers, alkylation, a methanol plant as well as a power plant.

What does a reformer do?

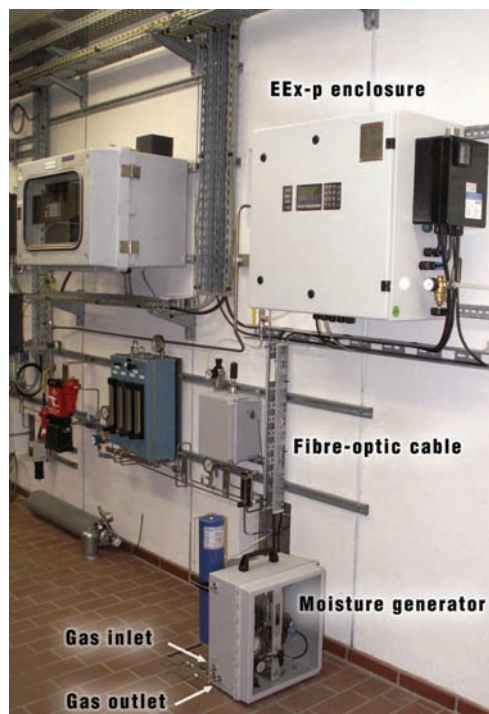
Gasoline, which is used as fuel for motor vehicles, has a type-dependent minimum octane rating which is a measure for the antiknock properties and consequently for quality.

In the reformer plant (also called reformer, powerformer or platformer), a high-octane (=knock proof) product, the so-called reformat, is produced from low-octane (=less knock proof) heavy gasoline in four series-connected reactors by means of platinum catalysts.

Why is moisture measurement so important?

The moisture content in the hydrogen-rich recycle gas of the reformer is an extremely critical process variable. This is why the monitoring of the moisture plays a decisive role both for the process optimisation and for plant safety and availability.

A water content below 10ppm results in



the decrease of the performance of the chemical reactions taking place in the reformer and therefore in a reduced productivity.

A moisture value of more than 50ppm is much more critical. If the moisture content in the catalyst is too high, Chlorine is washed out. The washed out chlorine causes the formation of Hydrochloric acid which in its turn causes an increased corrosion of the system parts of the catalyst.

Previously applied measurement methods and resulting problems

The application conditions for the moisture measurement in the reformer are a gas temperature of about 20° - 50°C, atmospheric pressure and, as already mentioned, a moisture content of 10ppm - 30ppm. The main components of the recycle gas are Hydrogen H₂ (c. 88-92%), hydrocarbons (C₁ - C₅) and traces of Hydrogen Chloride gas HCl, which is washed off the catalyst with water.



So far, the moisture in this process has been measured by means of aluminium oxide sensors installed in an analysis/sample system. Following problems occur:

- The residual amounts of HCl have an impact on the durability of the sensors, i.e. the sensors fail at an earlier point of time, which results in high consequential costs caused by the replacement of sensors
- Due to the principle-related drift of the aluminium sensors in this application, there has to be a recalibration approximately every 3 months, which in its turn results in high maintenance expenses

The decisive point however is the fact that with this sensor type it cannot be definitely ascertained whether the moisture in the process really reaches a critical value which would require a reduction of the throughput of the reactor, or whether the sensor simply starts to gradually drift away. It has been tried by means of a moisture generator to check the precision of the sensors in short but regular intervals and to re-adjust them if necessary.

How does BARTEC contribute to solving these problems?

The fibre-optical moisture sensor L1660 of the HYGROPHIL F 5672, which for construction-related reasons is not subject to drift, was placed in close vicinity to the existing aluminium oxide sensor. By means of the BARTEC moisture sensor, the operators of the system are able to determine in a long-term stable and reproducible way the exact moisture within the process. Another positive factor is that due to its high-quality materials the sensor is



resistant to the aggressive components of the gas. Even after 1 year of highly intensive trial operation in the production process now, the sensor L 1660 did not have to be checked, maintained or recalibrated.

It is possible to detect clearly within a short time an increase or a decrease of moisture within the reformer system and to take the necessary measures for the plant safety and consequently increase the plant availability if required.

The measurement system provided by BARTEC was installed as follows

The connection between the sensor and the evaluation unit is made by means of a fibre-optic cable delivered and pre-cut to size by BARTEC. In other applications, this optical connection can be up to 800m long. The evaluation unit HYGROPHIL F 5673-31 was installed close to the existing measurement in the same analyser house. The transfer of the measured moisture value to the existing process control system takes place as a standardised 4...20mA signal. On the first level, the use of the serial RS 232 interface which is also integrated in the evaluation electronics has been dispensed with for the time being.

In accordance with the explosion protection document submitted pursuant to the operation safety ordinance, the interior of the analyser house is an explosion-prove area. The operator stipulated the following specifications: Zone 1, Gas Group IIC, Temperature Class T3. As the evaluation electronics HYGROPHIL F is general purpose, it was installed in the overpressure encapsulation system APEX 2003 also developed by BARTEC. Due to the long years of experience of the BARTEC engineers, the requirements to the system in terms of explosion protection were successfully fulfilled without any problems. At the same time, the system can always be excellently operated and configured during operation due to its sophisticated casing construction.

On the operator's request, the sensor was installed in a BARTEC moisture generator. This moisture generator can be operated with dried process gas (= recycle gas) and consequently makes possible to check the sensor on request in the moisture ranges 20 – 50ppm.

Problem analysed – solution found

Due to the excellent cooperation of the BARTEC specialists for measurement technology and sensor technology as well as for explosion protection, they succeeded in developing a solution which enables the operator to cope with the required tasks of the moisture measurement in the recycle gas in a long-term-stable and reproducible way under complex process conditions. The system realised by BARTEC is characterised by a very good price-performance ratio. BARTEC does not deliver components only but due to long years of experience provides a single source solution from planning to start-up.

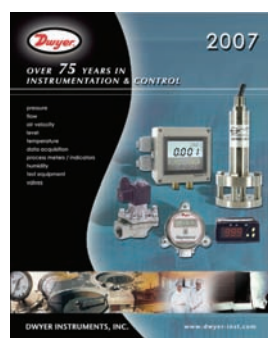
DMA 35N Ex Petrol: Intrinsically Safe and Portable Density Meter for Petrochemicals



Anton Paar (Austria) has launched a new model of the explosion-proof portable density meter DMA 35N Ex Petrol. The instrument is protected with a special housing resistant to petrol and similar organic solvents. Accredited to the ATEX marking II 2 G EEx ib IIC T5, the DMA 35N Ex Petrol is ideally used for QC checks in filling and loading stations, tankers, refineries and storage sites. The DMA35N Ex Petrol can be set to display the API number, specific gravity, density in g/cm3 or density in kg/cm3 for the product groups A, B or D (crude oils, fuels or lubricants), referring to a reference temperature of 15 °C or 60 °F. The instrument stores up to 1024 data points. Their download to a computer saves on paper work and guarantees a valid record of the correct quality of the measured samples.

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New 2007 Full Line Controls & Guages Catalogue



Dwyer Instruments, Inc. (USA) has released its new 2007 Catalogue – packed with thousands of innovative value added products.

The 2007 Dwyer Catalogue continues Dwyer's commitment to its customers with a convenient and easy-to-use format. Product ordering information is complete and includes schedules for discounts.

Ordering from Dwyer's website has never been easier. Check your order quantity, model number, schedule/shipment and tracking information with the "Check Order Status". View listings of open and closed orders for the past 30 working days – online, anytime.

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On-line Viscometer Holds up Under Pressure

When flow assurance consultants **Asphwax** (USA) were looking for an on-line viscometer capable of dealing with high pressures, they naturally turned to **Hydramotion Ltd** (UK).

Hydramotion designs and manufactures on-line viscometers for any fluid under any conditions, including Hazardous Area processes. The company also produces the Viscolite® portable viscometer for instant viscosity measurement in the lab, field or plant.

AsphWax, Inc. provides oil and gas operators with innovative solutions to asphaltene, wax and hydrate problems. The company offers technical advice, flow assurance simulation and laboratory services to industry engineers worldwide, while the KostaTech division manufactures and markets a series of state-of-the-art asphaltene, wax, emulsion and hydrate inhibitors, dispersants and solvents under the InSol brand. In their highly specialised laboratory, AsphWax need to measure the viscosity of crude oils sampled in the field. These measurements are important for flow assurance and for determining equipment specifications. But the samples are taken at high pressure and the viscosity measurements have to be made under comparable conditions.

For some years, AsphWax had been using the Hydramotion Viscolite® in its lab with great success. Familiar with the company's sturdy, reliable technology, AsphWax asked Hydramotion if it could supply an on-line instrument capable of withstanding oilfield conditions. The answer was an instant "yes".

High pressures present no challenge to the Hydramotion XL7 on-line viscometer. The sensor is a single solid probe whose unique architecture imposes no theoretical limit on pressure. Hydramotion has supplied numerous instruments to leading oilfield services providers, including the measurement of heavy crude at 5000 psi and 100°C (345 bar at 212°F). The viscometer supplied to AsphWax is rated much higher, at 20,000 psi (1380 bar), and even higher ratings are possible.

Hydramotion worked closely with the client to design a truncated, narrow-probe instrument with a tapered metal-to-metal high-pressure fitting suitable for installation in its custom-built pressure vessel. "Hydramotion was the only company that could supply what we were looking for," commented Dr Kosta J Leontaritis (otherwise known as "Dr Wax"), AsphWax President and CEO. "With this viscometer we can now get the data we need to tune our mathematical models and correlations and increase the accuracy of our viscosity predictions."

The Hydramotion XL7 viscometer can measure any viscosity range at temperatures up to 400°C in pipes of any diameter or tanks of any capacity. When hooked up to a temperature sensor, the instrument can display either "live" viscosity or viscosity corrected to a reference temperature. With no moving parts to wear out or fail in service, the XL7 is a "bolt-on-and-go" device requiring no on-site calibration and virtually no maintenance.

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