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New Analyzer Speeds Moisture And Carbon Dioxide Sensing In Natural Gas

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Gas pipeline operators now have available a new gas moisture and carbon dioxide analyzer that lowers analysis costs, improves productivity and resources utilization and enhances health and safety measures while facilitating regulatory compliance. The analyzer employs tunable diode laser spectroscopy, the newest technology for moisture and carbon dioxide measurements.

The moisture and carbon dioxide content in pipeline natural gas are two of the many parameters that must be monitored as a part of controlling the quality of the gas. A few other parameters that are monitored include gas composition, heating value, and relative density (specific gravity). The moisture and carbon dioxide content in natural gas will vary for a variety of reasons. There are various methods used to control the amount of these constituents that are present in the gas. Many different instrument types can be used to ensure the effectiveness of the control methods.

New Analyzer

The Chandler Engineering Laser Chek 2100 series of gas analyzers are Tunable Diode Laser (TDL) absorption spectrometers operating in the near infrared wavelength region. Each analyzer contains a TDL light source and detector configured to allow high sensitivity in a compact package, microprocessor based electronics, and software incorporating advanced operational and data processing algorithms. This analyzer is field proven and rugged. The Laser Chek 2100 provides non-contact measurement, making it free from the interference or contamination effects typically associated with glycol, amine and methanol vapors present in the gas



stream. Some other features are: near zero maintenance, most accurate measurements available, the fastest speed of response and it is not dependent on flow rate.

Theory Of Operation

Both water and carbon dioxide are measured by monitoring the absorption of laser light at specific wavelengths in the near-infrared wavelength region near $2\mu\text{m}$. The human eye responds to light in the range of approximately $0.4\mu\text{m}$ (deep violet) to $0.8\mu\text{m}$ (deep red), but most molecules “respond” to light at longer wavelengths that are invisible to the human eye — the infrared region.

By using a laser that operates precisely at a wavelength where water and carbon dioxide absorbs, it is possible to accurately determine the amount of these molecules present by measuring the amount of light that is absorbed by these molecules.

By measuring the exact amount of light that is absorbed by the gas sample at each of the special wavelengths it is possible to directly determine the

amount of water or carbon dioxide by application of a simple absorption law called Beer's Law. There are no chemical conversions involved, and no sensor contact with the sample gas, which provides a direct and unambiguous measurement.

Features/Benefits

Non-Contact Measurement. The Laser Chek 2100 employs a non-contact measurement making it totally resistant to vapor phase contamination and unaffected by flow rate. This technique allows acidic, aggressive or contaminated gases to be continuously monitored and is insensitive to vapor phase amine, glycol and methanol contamination. Because the absorption signal is always normalized to the total laser power, and the laser emits power over such narrow wavelengths, the system can handle high levels of mirror contamination before there is any degradation of measurement sensitivity or accuracy.

While proper attention to the upstream sampling system and use of filtration is highly recommended, the Laser Chek 2100 can tolerate significant loss of reflectivity on the mirror. Should a failure of the filtration system occur and gross contamination take place (an event that would damage sensor-based analyzers), it allows access to the mirror for simple cleaning. This feature allows for a speedy return to service without the need for re-calibration of the system.

Speed of Response. This is a critical factor, particularly when monitoring at low levels of moisture.

The analyzer stabilizes in seconds even at low ppmv levels. A speed of response of 98% of step change in six seconds allows users to detect and rapidly recover from even short term “slugs” of very wet



TECH NOTES

gas that, up to now, have caused chemical-sensor-based analyzers to indicate the improper measurement reading or have resulted in hours of lost production while sensors "dry down" or recover.

On-line systems for natural gas have shown the Laser Chek 2100 speed of response can be up to 4-6 hours quicker to recover to tariff level after an upset in the dehydration process plant. This allows safe and efficient process monitoring and a return to normal production hours before other techniques recover.

Best On-Line Accuracy. With an accuracy of 2.0% of reading, the Laser Chek 2100 provides the best on-line accuracy available. A comparison of published accuracies between the Laser Chek 2100 and other on-line, sensor based analyzers available shows that the laser system produces a higher quality measurement. In addition, on-line accuracy is maintained better over time with lower maintenance costs as there are no consumable components or sensor elements that inherently drift over time.

Display Options. The Laser Chek 2100 displays the measured moisture content in three different units. Moisture content is displayed in Lbs/MMscf, Dew Point Temperature and in ppmv. The user can configure the outputs to be any one of the three units through simple set-up procedures with the keypad. Additionally, the units can be set up to display in either English units or SI units.

Multiple Power Options. The Laser Chek 2100 is equipped with either a universal power supply that will accommodate input power between 115 VAC @ 60 Hz and 240 VAC @ 50 Hz AC or a DC input, either 12 VDC or 24 VDC. So, the analyzer could easily be solar powered.

The current draw is low - only 1 amp maximum at 120 VAC. Should the analyzer lose power supply for whatever reason, the analyzer will automatically restart once the power supply is returned. All calibrations and set-up parameters are saved in non-volatile memory, utilizing EEPROM.

Multiple Outputs. The Laser Chek 2100 has the following outputs for each channel: An isolated 4-20 mA analog loop and

an RS-232 serial output. The RS-232 presents a string of data to a serial device. The serial device is typically a computer terminal running HyperTerminal or other serial port software. This data provides information useful for performance monitoring and/or troubleshooting.

Conclusion

The new Laser Chek 2100 provides a significant cost reduction for the user by reducing maintenance and operational costs. It eliminates the costs and downtime incurred by having to either return the analyzer to the manufacturer for reconditioning/calibrations or having to store spare sensors on the shelf.

Users will also experience an improvement in productivity of their measurement personal using the analyzer due to its ease of operation, quick response time and resistance to the vapor phase contaminants normally found in natural gas. Since the analyzer is immune to these contaminants the users productivity will increase due to zero downtime. **Circle #200 or click www.thru.to/pgj**