DIACON MOISTURE ANALYZER
Model 1482

The DIACON ANALYZER provides reproducible and reliable service for continuous measurement of dissolved moisture (soluble water) in non-polar liquids, vapors or gases. The stability of the analyzer has permitted effective application to quality control of product purity, process efficiency and corrosion control.

The analyzer responds to variations of a few parts per million (ppm) of moisture in these materials with continuous indication or recording as may be required.

In liquid service, the DIACON ANALYZER functions directly with the sample in the liquid phase at line pressure without a vaporizer or carrier gas. Unaffected by variations in flow rate, the analyzer sample stream is often obtained by a pressure drop across a control valve or pump, the effluent sample thereby being returned to the process line.

The DIACON principle of operation is based on measuring the capacitance of the analyzer's moisture cell. For process measurement purposes, an insulated cylindrical plug acts as one plate of the condenser, and a grounded cylinder acts as the other plate. A desiccant material occupies the space between the plates. A change in the moisture content of the material between the plates will alter the electrical capacity and provides the basis for measurement.

This system permits measurement of moisture in non-polar materials under extremely difficult environmental conditions, since the only contact with the material is the rugged cell (Fig. 4). A change in the electrical capacity of the system is electronically detected, amplified and converted to a 0-10 millivolts signal to operate a wide variety of recorders, controllers or transducers for ma signals.

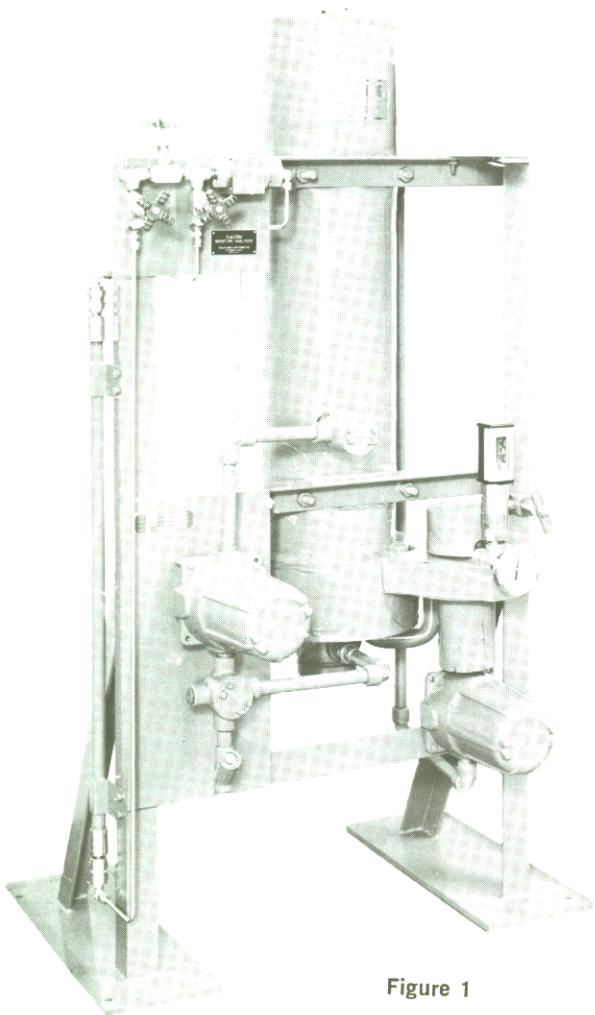

Figure 1

ADVANTAGES

(1) Accurate and reliable measurement of moisture in the ppm range, ± 2% accuracy over the full range
(2) Simplicity of design
(3) Durable construction
(4) Proven applications
(5) Output used for control, indication or recording
(6) Adjustments for span and zero made from control center
(7) Analyzer field section designed for Class I, Group D., Division I

APPLICATIONS

A few of the liquids in which dissolved moisture is being measured are: hexane, butadiene propane, isobutane, silicones, freon, ethylene, propylene, gasoline, kerosene, transformer oils and benzene. Currently there are approximately 400 DIACON systems in service with full scale ranges from 10 ppm in hexane to 500 ppm in benzene.

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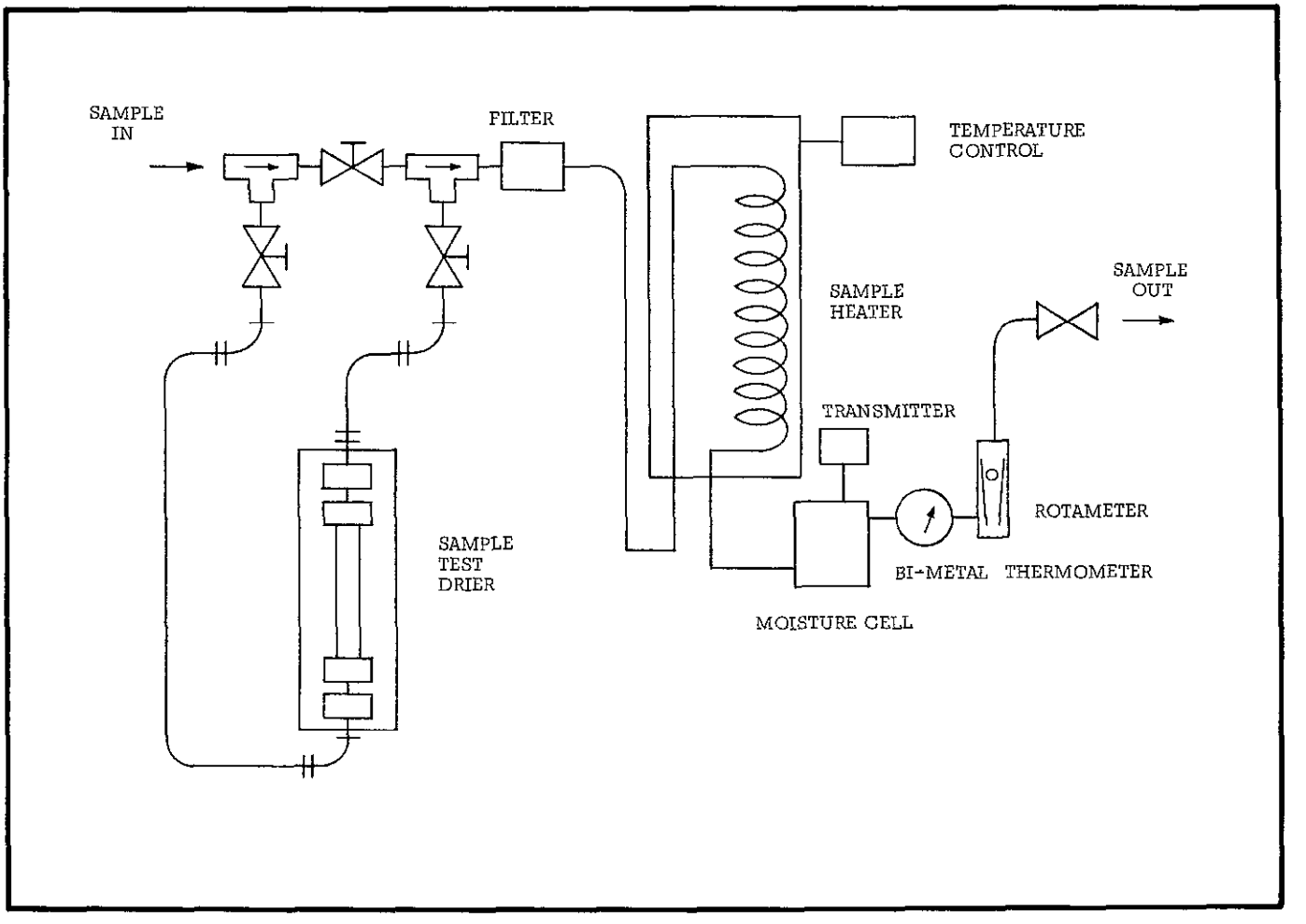

Figure 2

PRINCIPLE OF OPERATION

The moisture sensing element is arranged as a concentric plate capacitor. A solid member of circular cross section is centrally positioned within, and electrically insulated from, a surrounding stainless steel cylinder. The annulus, established by the two concentric surfaces, is filled with a granular desiccant about 1/10 ounce in weight.

Porous stainless steel end-plates retain the measuring chamber, while permitting the sample fluid to pass through the annulus in contact with the desiccant.

The exchange of moisture between a fluid in any state, and the solid desiccant is a reversible, equilibrium action. At such time as the moisture content of the stream (percent of saturation as established by cell temperature with liquid; by pressure and temperature with gas) decreases, the excess moisture will transfer from the desiccant to the sample stream to establish the new lower equilibrium condition.

Variation of moisture in the desiccant changes its dielectric constant. With all parameters in steady state except the moisture content, an exact relation between capacitance of the cell and stream moisture is obtained.

The change in electrical capacitance of the system is electronically detected, amplified and converted to a 0-10 millivolt signal to operate a recorder, controller or transducer for milliamp signals.

The life of the desiccant fill is determined by the amount of foreign matter present that could plug its pores and reduce the absorbing area of the desiccant. Therefore, suspended matter in the stream is removed by a 10 micron sintered stainless steel filter. Desiccant life is usually on the order of months.

The transmitter section is an isolating and switching device which alternately connects either a temperature-stable capacitor of fixed known value at the transmitter, or the analysis cell, to the electronic section. This action occurs 5 times a second at the command of the electronic section.

The capacitance value of the cell and the reference capacitor are measured as a voltage signal at a frequency of 15 kilohertz. The signals are amplified, rectified and separately stored in two capacitors in the electronic section.

The difference between these two capacitor voltages is the output of the analyzer, a function of the moisture content of the desiccant in the analysis cell.

The standard output signal is 0-10 millivolts dc and with transducers 1-5, 4-20 or 10-50 milliamps dc.

DETAILED DESCRIPTION:

Analyzer Section:

(Fig. 1) Designed for Class 1, Group D, Division 1 service. Free standing for economical installation. Includes the following major components. Test dryer: Filled with any desiccant which can be regenerated in a shop or laboratory, this element is used for a zero check during calibration. May also be used to check analyzer response at any time during operation.

Sample Heater: The sample is kept at a constant temperature through use of a water filled heater. Temperature control is provided and maintained by a 1500 watt heater element activated by a solid state proportioning temperature controller. Sample flow may be stopped without altering the temperature control.

Flow Meter: Armored rotameter.

Sample System: Stainless steel construction for 1000 psig operation.

Cell Housing (Fig. 4): Cell is shown with the porous metal and teflon discs which support the inner capacitor plate. The annulus between the plates is filled with the dessicant.

Transmitter: Contains the diode switching circuits and the reference capacitor. Connected by a coaxial cable to the electronic chassis. Two manually selected fixed capacitors permit electronic calibration and system circuit check when desired.

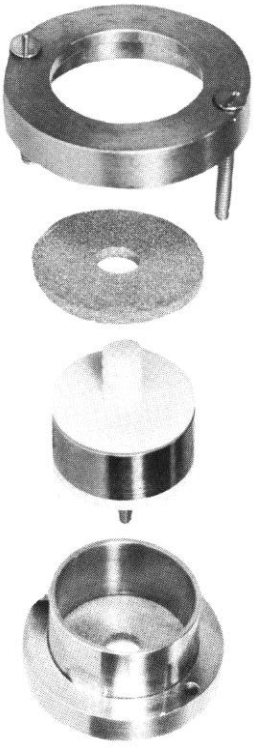

Figure 4

Electronic Chassis Section:

(Fig. 3): Normally mounted in a general purpose area. Consists of an oscillator, amplifier, chopper relay, and analyzer zero and span controls. Indication and alarms may be provided with this section.

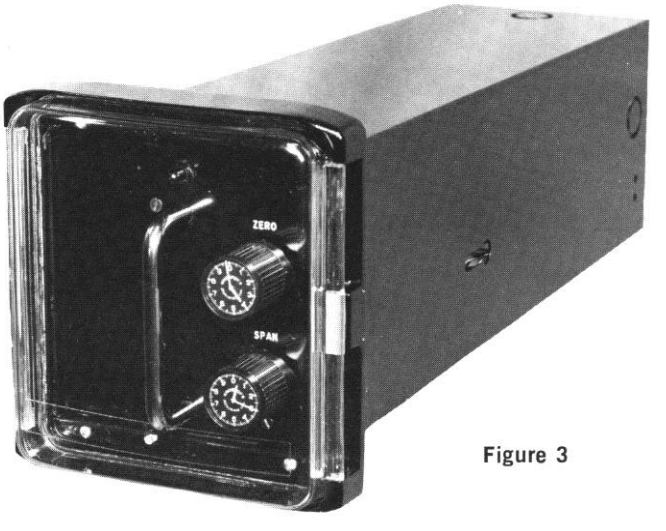

Figure 3

GENERAL SPECIFICATIONS

Range: Depending on sample, 0-10 ppm (by weight) to 60% of saturation or solubility at cell's temperature.

Accuracy: ± 2% of full range.

Response time: 2 minutes for 63% change at analyzer inlet @ 10 GPH.

Maximum Inlet Pressure: 1000 psig.

Maximum Pressure Drop through Analyzer: 10 psig.

Maximum Inlet Temperature: 100°F, sample cooler required for higher temperatures.

Materials of Construction: All metal parts in contact with the sample are stainless steel.

Sample Inlet/Outlet Connections: Inlet ¼" NPT; Outlet ½" NPT.

Electrical Connections: RG 62/U coaxial cable between analyzer and electronic chassis (not included as standard component).

Flow Rate through Analyzer: 2-10 gallons per hour, 0.2-1.0 SCFM gas.

Output at Electronic Chassis: 0-10 mv standard, 1-5 ma, 4-20 ma, 10-50 ma dc as specified, with transducer.

Dimensions: Analyzer section, 34" wide x 26" deep x 66" high.

Electronic Chassis Panel Cutout: 6⅛" x 6⅛" with a depth of 18".

Net Weight: 350 lbs.

Shipping Weight: 600 lbs.

Utilities: 115 volts, 60 hz or 50 hz (specify).
At analyzer section: 115 volt, fuse for 20 amps.
At electronic chassis: 115 volt, fuse for 1.0 amps.

Current Installations on the Following Products:

Air	Cumene	Hydrogen Gas	Natural Gas
Alkylation Feed	Cyclohexane	Hydrogen Sulphide Gas	Propane
Ammonia Gas	Ethylene Gas	Isobutane	Propylene
Benzene	Ethyl Chloride	Isopentane	Reformer Charge
Butenes	Freon	Jet Fuel	Silicones
Butadiene	Gasoline	Kerosene	Transformer Oil
Butane	Hexane	Naptha	