On-line Salt In Crude Analyzer for continuous measurement of the concentration of salt in crude oil

- Variable measurement ranges of up to 0-400 PTB (0-1000 mg/lt.)
- Rapid analysis cycle of 6 minutes or less
- Superior repeatability of 2% of scale
- Reliability better than 99% uptime
- Micro sample analysis reduces solvent consumption
- Precise bi-directional cell temperature control
- Incorporated rinse/flush system
- Optional validation sample system
- Remote diagnostics over IP

The Model P-600 Salt In Crude Analyzer is the result of combining the latest, state-of-the-art technology with over 20 years of industry experience. The result is an unsurpassed, high-quality Salt In Crude measurement system that produces the process control signal required to perform in today’s optimized and cost-driven petroleum market place.

Using a simply constructed, yet rugged, measurement chamber and sample delivery method, operational cost savings have been realized without complicating the analytical system. The P-600 demonstrates the optimization of the fluidics paths by employing components and materials that allow for a rapid measurement cycle without limiting accuracy, repeatability or reliability.
APPLICATION

In certain areas of the world, crude oils with high level of salts exist. This crude oil must still be transported and refined and the high levels of salt pose problems if left untreated. De-Salting technology is well established but to be utilized effectively the need for quick and accurate measurements of the level of salt concentration is necessary. The immediate response of an on-line analyzer allows the operator to use De-Salters as efficiently as possible.
OPERATING PRINCIPLE

The P-600 Salt In Crude analyzer’s measurement cycle is based on the ASTM Method D 3230. This is done by using a digitally controlled syringe sample handling system, micro-volume solenoid valves and a measurement chamber equipped with a high-resolution conductivity probe, stirrer and temperature control.

First, the sample chamber is emptied by opening the sample drain and the measurement chamber pressure valve. By utilizing the purge gas, any remaining fluid and vapors are removed. This is followed by a measurement chamber rinsing sequence, where the chamber and stirrer are rinsed and cleaned with Naptha at programmed times.

Second, the Crude sample loop solenoid is actuated, bringing a precisely measured amount of crude oil into the tubing path to the measurement cell. Then using the digitally controlled syringe, a precise volume of Xylene is drawn from a solvent chamber and it is then pushed through the crude sample loop into the measurement cell. Then a precise volume of Alcohol is drawn from a solvent chamber and it is then pushed through the crude sample loop into the measurement cell.

Prior to the measurement phase, the stirrer is activated and operated for the duration of the analysis cycle, in order to shorten the analysis time. The measurement chamber temperature is monitored and held at a programmed level (normally 45°C to 50°C). The analysis is completed once the sample temperature equilibrium is reached and the conductivity signal has met its stabilization criteria.

Once stabilized, the conductivity measurement is made, the Salt In Crude level is calculated and reported. Then the sample is flushed from the cell and a rinse cycle is initiated to keep the measurement cell clean. After the rinse cycle the next cycle can then be started immediately. A delayed mode of operation can also be used to save on the consumption of solvents.

By continuously tracking the conductivity and temperature signals during the analysis cycle, the diagnostic function checks the system for abnormal events. The VisioGraph advanced diagnostic routine not only provides end users with immediate knowledge of the condition of the analyzer, it also offers suggestions for troubleshooting.

To further enhance the precision and usefulness of the Model P-600 SIC Analyzer, an optional validation/grab sample system can be added. This allows the end user to either introduce a reference solution or an unknown sample for immediate analysis. This feature provides a simple system verification or a quick analysis of a non-automated sample stream.

DIMENSIONS inch (mm)
**SPECIFICATIONS: MODEL P-600 SALT IN CRUDE ANALYZER**

### ANALYSIS PERFORMANCE
- **Measurement Cycle Time:** 6 minutes or less
- **Measurement Range:** 0 to 400 PTB, 0 to 1000 mg/liter (selectable)
- **Repeatability:** ± 2% of scale or better
- **Reproducibility:** ± 1% of scale
- **Resolution:** ± 0.5% of scale
- **Conductivity Accuracy:** ± 0.5% of full scale
- **Temperature Accuracy:** ± 0.1°C (± 0.2°F) of full scale

### SAMPLE REQUIREMENTS
- **Sample Bypass Flow Rate:** 2.0 L/min
- **Sample Return Pressure:** Atmospheric
- **Sample Pressure:** Min. 60 psi (4.0 bar) – Max. 210 psi (14.0 bar) – optional sample conditioning system
- **Sample Temperature:** Min. 50°F (10°C) – Max. 140°F (60°C)
- **Sample Conditions:** Homogenous, single-phase sample without water

### ENCLOSURE/INSTALLATION REQUIREMENTS
- **Dimensions:** Width 37.0 in (940mm) – Height 71.0 in (1803mm) – Depth 30 in (762mm)
- **Weight:** Approximately 600 lbs (228 kg)
- **Operating Temperature:** Min. 40°F (5°C) – Max. 105°F (40°C)
- **Area Classification:** CSA-CUS Class 1 Div 1 Group B, C + D
- **Power:** Auto-selecting 100 to 120 VAC or 200 to 240 VAC (± 10%), 50/60 Hz, single phase, 5A
- **Optional Vortex Gas Supply:** Clean, Dry Instrument air at Min. 80 psi (5.5 bar) – Max. 120 psi (8.2 bar)
- **Cell Purge Gas Supply:** Clean, Dry Instrument air at Min. 50 psi (3.4 bar) – Max. 90 psi (6.2 bar)

### END USER CONNECTIONS
- **Analog Output Signal:** Single isolated 4-20 mA output (optional second output available), selectable for sample SIC values, analyzer system/maintenance warning or analysis measurement indication
- **Relay Output Contact:** Three SPDT Relays with contacts rated at 3A resistive load at 250VAC selectable for sample SIC value alarm, analyzer maintenance warning or analyzer fault alarm
- **Serial Input/Output Signal:** TCP/IP or Serial/RTU ModBus output available

### SOLVENT REQUIREMENTS
- **Xylene:** Per ASTM D843
- **Alcohol Mixture:** 37.63 mix of Absolute Methanol and n-Butanol (reagent grade)
- **Naphtha:**

### HOW TO ORDER
**ANALYZER SYSTEMS**
- Catalog Number P-600-1400: Orb Model P-600 Salt In Crude Analyzer, CSA-CUS Class 1 Div 1 Group B, C & D
- Catalog Number P-600-1500: ORB Model P-600 Salt In Crude Analyzer, ATEX Zone1 II B + H2 T6

**OPTIONS**
- Catalog Number 700858: MODBUS TCP/IP Protocol

**ACCESSORIES**
- Catalog Number 700228: Sample Recovery System (for pumping flash sample from atmospheric drain back to process pressures)
- Catalog Number 700641: Sample Conditioning System
- Catalog Number 700642: 1-Year Spare Parts Kit
- Catalog Number 700644: 2-Year Spare Parts Kit

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