Measurement of Silica in the Power markets

Application background

To generate power, a steam electric power plant needs to supply and maintain high purity steam to its turbines that power the electric generators. The plant typically uses a demineralizer to provide the high purity makeup water to maintain adequate steam supply to the turbines. One of the important elements to monitor in the water supply loop is for dissolved Silica.

Water and steam are in constant contact with metal surfaces. Silica volatizes in steam and is carried into the turbine. Once in the turbine, silica can leave the vaporous phase and even at low levels can start to form solid deposits on any relatively cool surfaces of the turbine blades, the resulting solid deposits can have catastrophic effects on the turbine balance.

Purpose of the measurement

The monitoring and control of Boiler water, feed water and steam condensate using process instrumentation allows higher reliability of plant operation and increased protection against formation of deposits and thus reducing operating costs and costly down time.

Principle of operation

The sample is pumped into the reaction cell, reagents are added, a change in color occurs if silica ions are present. The color change intensity of the solution is measured with a built-in colorimeter. Results are converted to units of silica (SiO_2) and displayed on the LCD readout.

The standard Hetropoly blue method is employed. Silica reacts with ammonium molybdate under acidic conditions to produce Hetropoly acids which are then reduced to form a blue color. Phosphate interferences are masked with the addition of an acid reagent. The blue color formed is directly proportional to the silica concentration.

The system is designed for both accuracy and economy. The analyzer typically consumes less than one liter of each reagent per 45 days of continuous operation at a frequency of four analysis per hour. The reagents are easily replenished without interrupting operation. The system provides automatic reliable analysis unattended with programmable automatic calibrations with defined accuracy and repeatability. A menu-driven interface makes it easy to set all functions.

The Silica analyzer provides an affordable and reliable tool to monitor early detection of changing silica levels enabling the operator to quickly implement process corrections, thus reducing down time and costly repairs.

Silica Method of Analysis

The chemistry is based on the molybdosilicic acid and its reduction to the molybdenum blue. Colorimetric Method as found **in *Standard ASTM Methods, Silica in Water***.

Key features include

- Uses a standard ASTM method with only three reagents.
- Minimized reagent volume per analysis, thus providing one of the lowest operating cost.
- Heated reaction cell to maintain full temperature control of reaction.
- Stable and long life optics using LED technology.
- Programmable frequency of analysis and Automatic calibration.
- Data logging and trending, can be reviewed without interrupting operation.
- Auto blank feature to eliminate interference from sample background color fluctuations.
- Minimal maintenance requirements to maximize up time.
- Large LCD graphical display with clear readability under different light conditions and simplified keyboard with RUN and STOP operational keys.
- Multi-language available in English and Chinese

Easy To Maintain

Using pinch valves and peristaltic pumps, only the tubes come into contact with the sample, thus minimizing maintenance. All tubing, parts, and reagents are visible, accessible, and easy to replace when necessary. Minimal reagent consumption and user serviceability result in a low cost of ownership. Each monitor is pre-piped and pre-wired, requiring only field connection to service points. A clear layout of all liquid processing components allows for easy access and all controls are manageable from the front of the unit.

Software and Graphic Display

All functions are controlled with intuitive user interface software. The systems are operated with menu-driven convenience, and results displayed on the large LCD display.

User Interface

The operation of the monitor is made straightforward through tactile membrane keypad controlling the complete operation of the analyzer. There are two isolated current outputs provided as standard with a serial RS-232. The unit can also be controlled to RUN or STOP using remote dry contact closure.

Installation

The monitor is designed for easy wall mounting, indoors. Adequate clearance must be allowed at the sides and bottom of the instrument case for plumbing and wiring connections.
The monitor fluidics enclosure is constructed of low-weight, corrosion resistant material (fiberglass) and the various assemblies are modular in design for serviceability and ease of maintenance.

General Specification

Suspended solids	< 60 microns
Sample connections Inlet Outlet	1/4 inch OD flexible tubing
Sample Inlet Pressure	1 to 5 psi
Sample temperature	5 to 50C (40 to 122F).
Sample Flow Rate	20 to 1000 ml/min
Sample Concentration	0 to 500 PPB (SiO_2)
Reproducibility	0.5 PPB or +/- 2% of value (whichever is greater)
Relay outputs	Four programmable alarm relays (Potential-free) 5A @ 240 V, resistive load
Dimensions	27” x 15” x 6 ” (700 mm x 400 mm x 160 mm) H x W x D
Display	Graphical Backlit LCD
Power	100-230 VAC, 50/60 Hz or optional 24V
Interface	Dual Isolated Current output (0/4-20 mA) RS232.
Cycle Time	15 minutes (selectable and fully programmable).
Fault indicator contact	Assignable to any of the four programmable relays
Ambient temperature	5 to 45C (41 to 113F)
Operating Maximum Humidity	90% at 104° F (40 °C) non condensing
Drain Connection	3/8 inch OD flexible tubing
Mounting	Wall, Panel
Shipping Weight	Approx. 40 lbs (18 kg)
Certification	CE, UL, CSA, (cTUVus)

260 Bear Hill Road Waltham, MA 02451 USA www.roems.com