"Cation and Degassed Conductivity"

Guest Article - by R.W. Lane, P.E

History

In 1953, the Condensate and Steam Purity Analyzer was developed and patented by Dr. T.E. Larson and R.W. Lane. They were determining steam purity because it would affect the results of water treatment they were responsible for in State of Illinois institutions. It is significant that results from this Condensate Analyzer became known as cation conductivity, a commonly used term for describing the quality of condensate and high purity water.

Essentially, the technique involves passage of condensate through a hydrogen ion exchange cartridge, and determining the conductivity at an accurately controlled temperature (25°C Å 0.5°C) and flow rate. By this process, positive ions are all ex changed for hydrogen ions, resulting in elimination of the amine interference in determination of mineral salts and in increasing the sensitivity of the measurement of mineral salts (Clå, SO4å) by 4 to 5 times. The Steam Purity Analyzer determined steam purity by measuring the conductivity at atmospheric boiling water temperature, thus eliminating carbon dioxide interference and the temperature control problem.

In 1981 patents were awarded for the present Condensate and Feedwater Analyzers (known as Larson-Lane Condensate-Reboiler, manufactured by Rosemount Analytical, Inc.), which similarly enabled the more exact determination of mineral salts by inclusion o f an electric reboiler and estimation of carbon dioxide by comparing the cation and reboil conductivities. In addition, performance was enhanced because of improvements in sample temperature and flow control, and in microprocessor based analysis instruments. The analyzer has since been considered a dependable and precise measuring instrument, necessary in all electric generating and industrial power plants. (The recently revised ASTM D4519 describes the technique in detail.)

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Application

This instrument has been found useful in the precise measurement of condensate purity and air inleakage. When conductivity is used for measuring the purity of return condensate or steam, carbon dioxide can be a serious interference. By estimating the CO2 and actually removing it, a much more accurate indication of actual mineral salt contamination from boiler carryover or condenser leakage is obtained.

Five to ten years ago, condensate conductivity of 0.5 uS/cm was considered acceptable; however, 3/4 of this variable conductivity was likely CO2. By eliminating CO2 interference with the Condensate-Reboiler, the condensate values of 0.1 uS/cm now being obtained are much more meaningful.

The instrument has been found to aid the control of return condensate contamination in the following ways:

1. Heat exchanger leaks are identified by high specific conductivity (CO2, SO4å or Cl).

2. Very low levels of hard water contamination are indicated by a small increase in specific conductivity, and a sharp rise in CO2+ SO4å or Clå.

3. Broken condensate lines or condenser air inleakage are indicted by high CO2.

4. High SO4å or Clå may indicate dealkalizer exhaustion or boiler carryover.

5. The degree of CO2 is helpful in determining the desired neutralizing amine dosage.

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