

APPLICATION NOTE

SODIUM AS A MONITORING TOOL FOR INDUSTRIAL CONDENSATES

Improved sensitivity to measure below 0.1 ppb, which is 100 times more sensitive than a conductivity measurement minimizing risks coming from water quality excursions

Application description

The condensates from combined steam and cogeneration boilers in heavy industry (chem and petrochem, pulp and paper, metal, etc.) can represent a large saving due to the high quality of the steam condensates used in the high pressure boilers. As the steam and/or the condensates are often used to transfer heat to the process, their recovery is subject to their level of quality. Any degradation of their quality is a sign of ingress of the process fluids into the condensate and consequently requires maintenance on the circuits.

In processes where caustic soda or concentrated sodium salt solutions are likely to be present in contact with the steam and/or condensates, the analysis of Sodium represents an alternative to the usual measurement of conductivity with a higher sensitivity for an early detection.

Conductivity of high pressure condensates are usually better than 1 μS and limits set for 5 to 10 μS to decide the recovery or not in order to avoid early exhaustion of the polishing demi-resins. Such conductivity corresponds to the presence of about 2 to 5 ppm of Sodium salt.

The actual quality of the standard demin-resins used in demin plants in most power or cogen plants produce water with sodium concentrations lower than 10 ppb in normal conditions. A raise from 1 to 10ppb is already significant and a raise from 10 to 100 ppb shows without any doubt a major problem requiring immediate intervention.

Sodium analyzers have been operating with full satisfaction and little maintenance over the past decade in most power plants with low ppb, and even ppt concentration levels in nuclear plants.

Conductivity measurement can reliably detect 2 to 5 ppm of Sodium while Sodium measurement detects 2 to 5 ppb, that's 1000 times lower. This sensitivity allows chemists to follow trend changes before any leakage requires major immediate action. This sensitivity advantage can be converted over time to analyze the origin of the leakage and to plan either a production reduction, or even to stop production far enough in advance to avoid costly, unexpected emergency shut downs.

The analyzer and installation

The analyzer requires a sample at low pressure (below 6 bar) and cooled below 40°C (104°F). Usually a sampling panel already exists for conductivity measurements and these samples can be used in parallel for the Sodium analyzer. Several local or international panel manufacturers are able to offer such systems. The Sodium analyzer sends an analogue 4-20mA signal to the DCS:

- A trend analysis over a given rolling time period allows a 'trend warning': if the rate of raise exceeds a pre-set value of, for example, 1 ppb per hour, then a warning is given independently of the absolute actual sodium value.
- A limit from the absolute value is set according to the accepted limit level of pollution, for example, 100 ppb or 1 ppm, where the 'sodium alarm' will be activated for immediate action.
- Both warnings and alarms can be combined if the rate of increase becomes too high showing a significant problem in the near term.

Material installed

- POLYMETRON 9245 Sodium analyzer
- Polymetron Conductivity Monec 9125 with sensor 8310 (as spare wheel!)

Comments

In several pulp mills in Scandinavia, Hach Ultra is in the phase of replacing many early Sodium analyzers with the new POLYMETRON 9245.

Most of these facilities, having old boilers, will be either closed or revamped with new cogeneration plants. These new modern cogeneration plants operate at a high pressure and require much higher levels of monitoring regarding the steam quality. These upgrades are linked to new demin-plants that produce high quality pure water in terms of conductivity and Sodium concentration.

This application is of interest for the pulp and paper industry (presence of white, green or black liquor), in some metal production (aluminum, zinc, all extractions using caustic solutions), in chemical plants producing or using caustic soda (sodium hypochlorite, Solvay process) as well as for the boilers located close to the sea and/or using sea or brackish water as cooling water.

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