Process Application Note AN-PAN-1016

Power Plants: Analysis of Silica in boiler feed water

Silica, known as silicon dioxide, comprises more than 10% by mass of the earth's crust. It is used in a variety of applications from microelectronics (in wafer production) to components used in the food industry. In the power industry, silica is not so appreciated and is considered one of the major impurities to cause boiler scale and deposits on steam turbine blades. Boiler scale is caused by impurities precipitating out of the water and forming deposits on heat transfer surfaces. As the scale builds up over time, it reduces heat transfer rates. This leads to local hot spots which cause the boiler tubes to overheat and rupture, resulting in costly boiler outages. In addition, untreated boiler scale lowers the boiler efficiency by heat retardation and increases running costs by unscheduled and more frequent boiler blowdowns. Scaling on stator turbine blades causes changes in steam flow velocities and a reduction in pressure that decreases the efficiency and output capacity of a steam turbine.

Due to increasing industry demands for more efficient energy production and the increase in operating pressures in modern boilers, the necessity to measure and control silica concentrations is more crucial than ever. Boiler feed water is the most critical monitoring point, and the higher the pressure in the boiler, the lower the concentration of silica should be. Other sampling points can be inside drum boilers and water returning to the boiler from the condenser to ensure silica limits are within specification. Silica also plays an important process control role at the demineralization plant where demi-water is produced and polished from groundwater or surface water. An increase in silica concentration or a breakthrough of silica indicates an exhausted ion-exchange bed and a control indicator for timely regeneration. We offer a wide range of online process analyzers to monitor the amount of silica depending on the range from low ppb to high ppm level. Our analyzers can be combined with smart, versatile systems for multi-parameter requirements: namely hardness, chlorine, chloride, sodium, ammonia, pH, conductivity, and metals like iron, aluminium and copper to name a few.

Application: Silica is determined by differential photometry using a leading edge thermostated cuvette module for non-sample contact at the detector.

Typical Ranges: Silica: 0–50 µg/L; 0–1 mg/L or higher

Keywords: silica, power industry, boiler feed, cooling water, high purity water, scale, turbine

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