

Monitoring Silica in Boilers & Cooling Towers

AN #: 12_003_07_001

Subcategory: Silica Monitoring

Market: Boilers/Cooling

Product: HI96705

Description:

Silica, one of the most abundant elements found in the earth's crust, may occur in groundwater from the dissolution of quartz (crystalline SiO_2) from bedrock formations. In natural waters, silica is typically found in concentrations between 5 to 25 mg/L. However, some areas, including the southwest United States of America, southern Europe, Latin America, and the Pacific Rim have higher concentrations of silica (50 to 100 mg/L) present in the groundwater. Water high in silica and other minerals can result in the formation of scaling in plumbing systems, which occurs when minerals precipitate out of solution as insoluble salts. In boiling and cooling towers where water is evaporated at a high rate, scaling can accumulate rapidly if the water contains dissolved minerals, which results in a reduced heat transfer capacity and overall efficiency. For this reason, water used in boiling and cooling towers is usually treated for mineral removal by an ion exchange or reverse osmosis process. Typically, scaling is the result of calcium and magnesium salts, but silica can also contribute to scale formation. While other types of scaling are moderately easy to remove from boilers and cooling towers by either boiler blowdown or dissolving the scale with a weak acid, silica scaling is extremely difficult to remove. This type of scale can be as hard as porcelain, and removal requires hazardous chemicals, such as hydrofluoric acid. Because of the potential complications from silica scaling, boiler feed water is closely monitored for silica, especially in areas with high concentrations in the source water.



Application:

A customer located in an area with high groundwater concentrations of silica was looking to measure reactive (dissolved) silica after treatment by ion exchange. The customer was looking to monitor the water after a mixed bed for breakthrough of silica due to the exhaustion of the resin. The concentration of silica after the mixed bed should always be negligible, where readings greater than 0.5 mg/L indicate the ion exchange unit needs to be serviced. The **HI96705** portable silica photometer was recommended for the application. The **HI96705** is based on ASTM method D859 in which silica reacts with the reagent to develop a blue hue in the sample. It is important to note that phosphate in concentrations greater than 60 mg/L will cause a negative interference and the reading will be lower

than actual. Phosphate is commonly used for corrosion inhibition but should not be an issue for this customer since the test is being performed after the ion exchange process. The **HI96705** has a range of 0.00 to 2.00 mg/L and an accuracy of ± 0.03 mg/L $\pm 3\%$ of the reading. The **HI96705** offers the Cal-Check feature in which secondary standards can be used to check the meter and if needed, to perform a calibration. The **HI96705** also features a built-in timer that makes it easy to ensure the correct 3-minute reaction time.

