Case Study

Optimisation of silica control in a sugar factory

Problem

A sugar factory discovers that they have problems with the formation of calcium silicate deposits in its production facilities. These calcium silicate deposits can build up on the surfaces of tanks and pipes and thus impair the efficiency of sugar production.

The presence of silica in sugar also affects the quality of the product. Too much silica can affect the colour, taste and solubility of the sugar.

Solution

Regular monitoring of equipment and planned maintenance are crucial to minimise the build-up of calcium silicate deposits. This could include the implementation of a monitoring system that provides early warning of signs of deposits and a maintenance schedule that includes regular inspections and cleaning. Operators are trained to understand the importance of silica control and to effectively implement the new process optimisation measures.

Benefits

By implementing these measures, the sugar factory has succeeded in significantly reducing the formation of calcium silicate deposits. This leads to improved process stability, less downtime and maintenance work and an overall increase in the efficiency and profitability of the plant.

Background

After internal analysis, the R&D team determined that the main cause of the deposits is the high concentration of silicic acid in the sugar juice produced during the processing of the sugar beet. The silicic acid reacts with the calcium ions in the lime milk and forms calcium silicate deposits.

The silicic acid in the sugar juice comes mainly from the sugar beet itself. This silicic acid can get into the sugar juice during the extraction process in which the juice is obtained from the sugar beet. The exact amount of silica in the diluted sugar juice can vary depending on various factors such as the variety of sugar beet, the growing conditions and the processing method.

Solution and Improvements

The company is taking various measures to tackle the problem of calcium silicate deposits in the sugar factory's production facilities:

- **Improve water quality:** Water quality is often a decisive factor in the formation of calcium silicate deposits. The sugar factory could take measures to improve the water quality, such as installing water treatment plants or using demineralised water for certain process steps.
- **Chemical treatment:** Chemical treatments could be considered to reduce the formation of calcium silicate deposits. This could include the addition of inhibitors or dispersants that prevent the crystallisation of calcium silicate or break down the deposits into smaller particles that are easier to remove.

- **Mechanical removal:** The sugar factory could also implement mechanical methods to remove calcium silicate deposits in its plants. This could include regular cleaning and descaling of the equipment with special cleaning agents or the installation of filtration systems that trap large particles before they can form deposits.
- **Monitoring and maintenance:** Regular monitoring of equipment and planned maintenance are crucial to minimise the build-up of calcium silicate deposits. This could include the implementation of a monitoring system that provides early warning of signs of deposits and a maintenance schedule that includes regular inspections and cleaning. Operators are trained to understand the importance of silica control and to effectively implement the new process optimisation measures.

Conclusion

The case study illustrates the importance of silica control in sugar production and shows how the problems with calcium silicate deposits can be successfully overcome through targeted optimisation of silica treatment.

It is therefore important to monitor the silica concentration in the production process using reliable analytical measurement technology to ensure that efficiency is increased and the sugar produced meets quality standards.

With the help of our HACH solutions for Laboratory and online measurements it is possible to check the Silica values in a very accurate way. These results can be used to regulate e.g. the dosing of chemicals during production.