APPLICATION NOTE

Iron, steel & metal

Monitoring the chlorine content in the cooling circuit of a steel mill

- Preventing legionella contamination in the recooling system of a continuous casting plant
- Measuring free chlorine and pH in order to operate an evaporative cooling system hygienically
- Implementation of VDE 2047 Part 2 (VDI Cooling Tower Code of Practice)

1. Background

A steel producer manufactures high-quality raw steel and preliminary products for the processing industry. In one of its German steel mills the company produces slabs, among other things, to be used in the production of large diameter pipes and vehicle body components.

2. Measurement requirements

In order to cool down the steel slabs in continuous casting, the steel producer uses an evaporative cooling system utilizing filtered service water from the adjacent river. By operating open cooling systems, bacteria such as legnionella can form and spread to the environment. The operator must ensure that the recooling system is operated hygienically. VDE 2047 Part 2 (Open recooler systems - Securing hygienically sound operation of evaporative cooling systems; "VDI Cooling Tower Code of Practice") is decisive for the operator.

The steel producer disinfects the service water several times a day with hypochlorous acid (HClO) by way of timer control. The chlorine content must be monitored to achieve a sufficient depot effect while preventing excessive residual oxidation. The concentration range of free chlorine is 0...3 mg/l.

Previously, the company had used a competitor's chlorine measuring system to regulate the dosing system accordingly. It was fitted with a sensor covered by a diaphragm and required significant maintenance. The electrolytes and diaphragm had to be replaced frequently. The system was also prone to drifting, requiring frequent calibration. At times the system produced incorrect readings, resulting in favourable conditions for the growth of legionella bacteria. Even with a two week service interval it was very difficult to adhere to the limits. For this reason, the steel producer was looking for instrumentation that was more reliable and low-maintenance.

KROHNE

3. KROHNE solution

Following a test phase, the operator decided to use three units of the OPTISYS CL 1100 disinfectant measuring system. The system is complete, ready for immediate operation and in this application it is used to measure free chlorine (Cl_2). It was provided as a pre-wired solution featuring a converter, a diaphragm-free chlorine sensor, valves and a flow cell.

In addition, the customer uses the measuring system with an optional pH sensor for process control. The OPTISYS CL 1100 is connected to the control circuit via a hose connection (6 or 8 mm). Chlorine dosage is regulated via the chlorine concentration in the cooling water. An analogue output (4...20 mA) transmits the measured values to a decentralised control unit of the existing dosage system.

Installed side-by-side chlorine measuring systems

4. Customer benefits

Thanks to the OPTISYS CL 1100, the steel mill can now reliably disinfect the service water. The measuring system provides an extremely quick response time. The risk of a legionella contamination caused by critical conditions of the evaporative cooling plant in terms of hygiene is significantly reduced. Health risks to employees and residents are thus virtually eliminated.

The steel producer also benefits from a cost-saving use of disinfectants. Only as much free chlorine is dosed as is required for operational safety. Iin addition, the limits for the subsequent introduction of effluent into the river can be met.

Furthermore, the new measuring system has significantly reduced maintenance intervals. The OPTISYS 1100 features durable electrodes. Its design, featuring no diaphragm, eliminates the need to replace electrolytes or the diaphragm. In addition, automatic sensor cleaning contributes to long-term measurement stability. No longer is the measuring operation constantly interrupted.

Free chlorine monitoring with the OPTISYS 1100

5. Product used

OPTISYS CL 1100

- Disinfectant measuring system for water and wastewater applications
- For the potentiostatic, amperometric measurement of free chlorine, chlorine dioxide and ozone
- Completely installed with MAC 100 converter (output: 3 x 4...20 mA)
- Pre-installed and tested; for bypass lines
- Cl_2: 0.03...20 mg/l; ClO_2: 0.05...5 mg/l; O_3: 0.05...5 mg/l; max. +50°C / +122°F
- With chlorine sensor, valves, flow-through assemblies, optional pH sensor
- Automatic sensor cleaning

Contact
Would you like further information about these or other applications?
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