

Controlling/Monitoring Chlorination of Cooling Water

BACKGROUND

Many manufacturing processes require large amounts of water to provide cooling. Most notable of these are electric power generation plants for steam, oil refining, and petro-chemical manufacturing. In any process where water is used as a coolant, it can contain micro-organisms that interfere with the heat exchangers. These micro-organisms tend to attach themselves to the wall of the heat exchanger tubing forming a layer that decreases the heat transfer efficiency. Another common occurrence is the formation of tubercles. These formations create scale on tube walls and liberate gases (CO_2 , H_2S) which corrode the tube wall.

If the cooling water is sea water, there are other organisms present such as hard shelled mollusks that may attach themselves to equipment and can cause plant shutdowns if caught in rotary equipment.

PROCESS

Chlorination has been used to control biological contamination since the 1930's. To maximize the chlorinator's performance and to control excess chlorine being returned to the water source, free residual chlorine and total chlorine analyzers are used. A typical schematic of a cooling water system is shown in Figure 1.

Measuring free or total chlorine in cooling water provides real time feedback signal for the chlorination system.

INSTRUMENTATION

Since raw water can contain either free chlorine or total chlorine, it is important to determine which form of chlorine is present and select the right chlorine monitoring equipment. Rosemount Analytical has a Chlorine Application Questionnaire and a Chlorine Measurement Selection Guide to assist you (request form 23-6424).

Free chlorine can be measured using the Rosemount Analytical Free Chlorine Measurement System Model *FCLi*, a complete system which includes the chlorine sensor, cable, analyzer Model 1056, and flow controller. Additional choices in instrumentation include the analyzer Model 54eA. The Model *FCLi* is available in two options: Model *FCLi*-01 and Model *FCLi*-02 with a pH sensor and flow cell. This second option is for customers who wish to measure pH.

The Model *FCLi* does not require reagents and avoids the expense and inconvenience of sample conditioning. Nor does it require an auxiliary pH sensor for pH correction.

Total chlorine can be determined using the Rosemount Model TCL. This system is a sample conditioning and measuring system for the continuous determination of total chlorine in water. The conditioning system continuously pumps buffered potassium iodide reagent into the sample. Free and combined chlorine (total chlorine) react with potassium iodide to form an equivalent amount of iodine. An amperometric sensor measures the concentration of iodine and sends its signal to the Rosemount Dual Input Analyzer Model 1056. The analyzer displays the concentration of total chlorine. Additional choices in instrumentation include the analyzer Model 54eA, and the two-wire transmitters Model Xmt and Model 5081.

INSTRUMENTATION: FREE CHLORINE MEASUREMENT

Free Chlorine Measuring System Model FCLi

- Complete system includes sensor, connecting cable, analyzer, and flow controller
- Sensor response is practically independent of pH between 6.5 and 10
- No reagents
- No auxillary pH electrode
- Variopool quick-disconnect fittings: makes sensor replacement easy



Total Chlorine Measurement

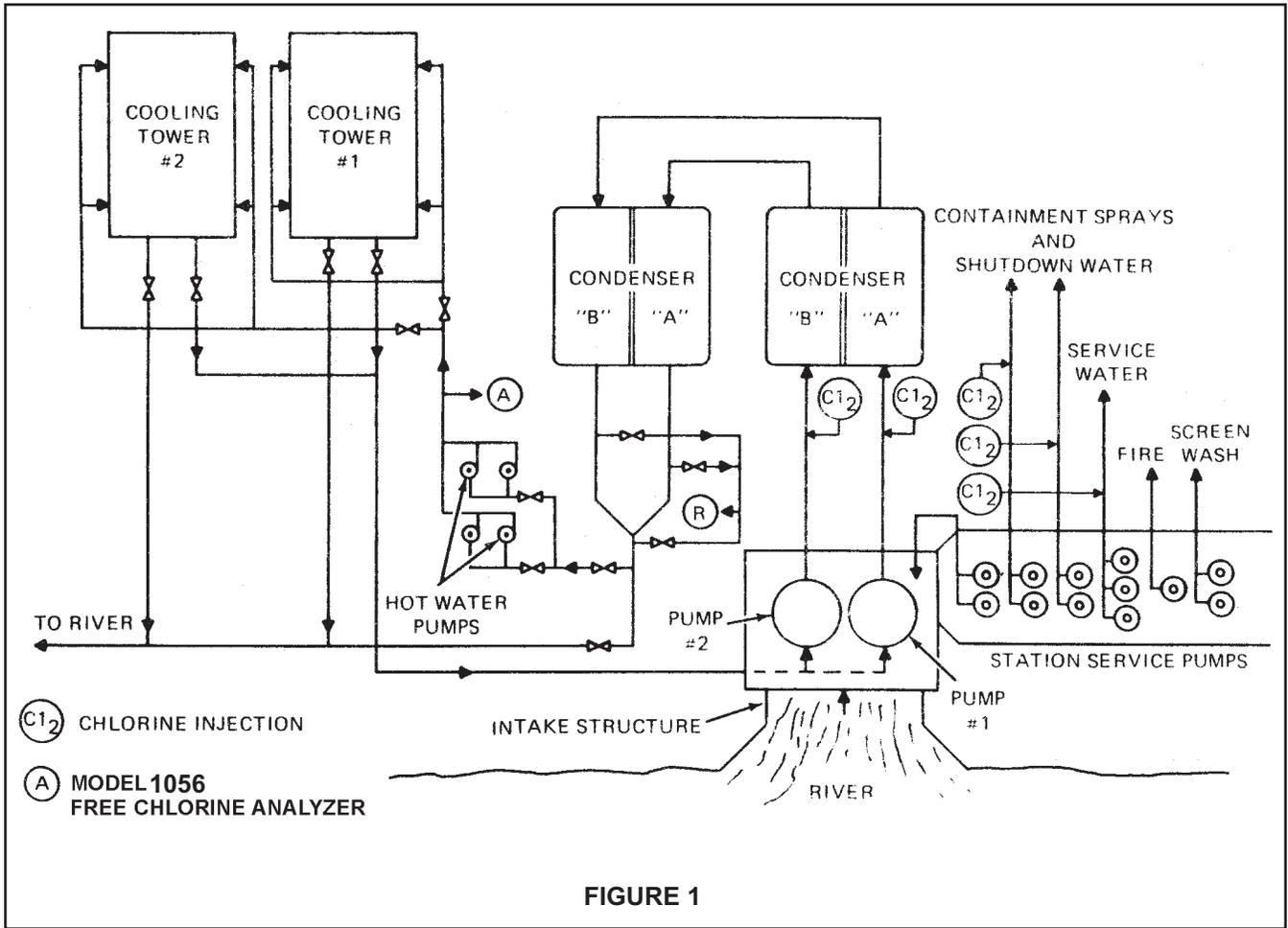
Total Chlorine Measurement Model TCL

- Accurately Measures Total Chlorine: 0 – 2 ppm
- Low Maintenance Design
 - Readily Available Reagent: White Distilled Vinegar
 - Lasts Two Months: Potassium Iodide in Vinegar
 - Low Flow Rate 6 GPD (0.25 GPH or 6mL/Min)
 - Simple Overflow Weir: Correct Flow Rate
 - Corrosion Resistant Construction
- Communication Options: HART, Foundation fieldbus, Alarm/Relays, Alarm/Outputs
- Choice of Four Instruments: 1056, 54eA, Xmt, 5081
- Heavy Duty NEMA 4X(IP65)

Membrane Covered Amperometric Sensor

- No tools required to change membrane
- Maintenance takes only a few minutes a month
- Quick sensor cable disconnect, Variopool connection





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