

WATER TREATMENT TECHNOLOGY

TECHNICAL REPORT

GUIDELINES FOR DETECTING MICROORGANISMS IN COOLING WATER SYSTEMS



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Plant operators are acutely aware of the damages caused by scale and corrosion in recirculating cooling systems and usually focus their attention on controlling these serious problems. However, there are other water related factors which adversely affect cooling system efficiency, such as the growth of microorganisms and the accumulation of silt and other foulants.

With a few relatively simple procedures, plant operators can often uncover these problem conditions at an early stage and can take prompt corrective action.

This report provides some routine procedures for identifying the presence of biological growths. It is based on the years of experience of Watertech field personnel.

These guidelines, however, are no substitutes for a periodic checkup by a thoroughly trained and experienced Watertech specialist. He is skilled in applying a "system approach" to keeping all interrelated plant systems operating reliably.

PROBLEMS CAUSED BY MICROORGANISMS

Slime-forming bacteria, algae, fungi and other microorganisms often grow profusely in cooling water systems.

Bacteria may thrive anywhere in the system, but algae require sunlight and, therefore, are usually found growing in the exposed areas of the cooling tower, top deck, peripheral fill and sump. The presence of one type of organism is often an indication that another may be present.

The presence of algae does not necessarily indicate a problem but, if growth is heavy, distribution holes can become plugged resulting in poor water distribution through the fill. Further, when a mass sloughs off, there is a possibility it will get into the piping and restrict system water flow.

Bacteria can thrive in heat exchangers where they can't be seen and they, too, pose the threat of restricted flow. They also form an insulating layer on heat transfer surfaces and cause an increase in the corrosion rate of metal equipment.

Fungus is a lower form of plant life which will often attack cooling tower wood and cause deterioration.

COMPARE CHARTS AND RECORDS

System fouling by algae and bacteria may be indicated by these symptoms:

1. Rising temperatures of process water in the heat exchanger
2. Decrease in Delta T
3. Higher pumping pressures
4. Lower vacuum pressures

It is important to keep in mind that factors other than the presence of microorganisms can also cause these same symptoms. Proper interpretation by someone knowledgeable in cooling system operation is necessary.

The following procedures take only a few minutes and can give a wealth of information concerning these symptoms:

1. Read daily log reports on cooling system operation. Compare average daily operating data and note any abnormal variations.
2. Read the service reports filled out by suppliers of chemicals to determine any significant trends.
3. Question operating personnel about changes in process or treatment programs, equipment changes or changes in personnel who may be unfamiliar with the water treatment program. Also, take into account climatic changes which affect water temperature.

CHECK THE TOWER AREA

The easiest place to gain access to cooling water is at the sump or tower basin. Although it is not representative of the entire system, it can often provide useful information in a relatively short period of time.

1. Feel the wetted supports and basin walls to determine the presence of slime.
2. Visually examine upper distribution area and sump for slimy masses.
3. Take a water sample and note the color and odor of the sample.
4. Make a simple Total Plate Count test. This inexpensive procedure will enable you to make a population count of bacterial colonies. The results should be compared to plate counts from previous tests and system performance to determine whether a problem condition exists. If slimy masses are noted, they should be examined microscopically to determine if they are biological in nature.

OTHER PROCEDURES

1. Climb around the tower and inspect the condition of wood fill and supports. Use ice pick to probe for soft spots. Check the slime, fungi, dirt, leaves and other debris.
2. Keep written records of inspections and tests for future reference.
3. In special cases, an untrained observer may not detect evidence of biological activity when the problem exists. Therefore, it is a good policy to call a Watertech field engineer for an in-depth inspection of the system. Remember, he has inspected many different cooling systems and has specialized knowledge on how to keep them operationally reliable.