Chlorine Shock Treatment For Slime and Algae Control

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Slime, algae and other forms of aquatic life, if allowed to grow and thrive unchecked can greatly reduce the efficiency of watercooling systems. Over the years, control of these growths has been successfully accomplished by chlorination. Under certain circumstances the continuous application of chlorine is necessary, but in most cases intermittent or shock chlorination will provide effective control of aquatic growths with substantial saving in chlorine and energy when compared to continuous treatment.

Saving in Chlorine Usage

Normally shock treatment is carried out at a higher chlorine concentration than would be required with continuous treatment. In actual practice, the chlorine dosage during shock treatment has been generally 20 to 30 percent greater than during effective continuous treatment. The actual treating time, however is often reduced by 90 to 95 percent resulting in a substantial reduction in chlorine usage. A 90 percent reduction in treating time also results in a 90 percent saving in power at the ejector pumps. Since no additional benefits from adding more chlorine than the minimum required to keep the system clean, a definite trend exists today to reduce costs even further by determining the lowest possible free chlorine residual that will achieve a growth free system. It is not too unusual to find only 0.1 ppm free chlorine applied for 10-20 minutes can produce good results.

Free Chlorine Residual

Shock chlorination usually requires the chlorine to be available as a free chlorine residual. Free chlorine is chlorine's most potent form as a bactericide, and since the object of shock chlorination is to produce the maximum effect with the minimum application time, common sense dictates trials with a free chlorine residual. The free residual is formed only after sufficient chlorine has been added to the cooling water to satisfy the chlorine demand from the many chemicals and microorganisms already existing in the water. When this demand has been met, free chlorine will exist. The free chlorine residual will then increase in direct proportion to the additional amount of chlorine applied.

Chlorine Usage

No rule of thumb can be used to determine the quantity of chlorine required to keep the water system clean and growth free. Chlorine effectiveness varies with contact time, water quality, temperature and pH. In addition, sufficient chlorine must be used to control both the lower forms of plant life such as algae and fungi and the accumulations of microorganisms known as slime. Additional chlorine may be required to oxidize chemical contaminants such as hydrocarbons, mercaptans and sulfide or to replace chlorine lost by the aerating effect of cooling towers.

Various types of aquatic life require various concentrations of chlorine to affect complete destruction. Free concentrations of less than 0.1 ppm of chlorine are satisfactory to destroy some types of algae, concentrations of 4-5 ppm may be required to destroy certain mussels and as high as 10-l 2 ppm may be required to prevent growth of other salt or brackish water animals.

Sizing The Chlorinator

To size the chlorinator initially, determine the chlorine demand of the cooling water in the laboratory by noting the amount of chlorine required to reach a free residual and add an additional 5 ppm. Add more than 5 ppm if the water animals noted above are a problem. Convert this weight of chlorine and the cooling water flow rate into pounds per day of chlorine. All chlorinators are sized in terms of pounds per day of chlorine. Be generous when sizing the chlorinator. Although chlorinators are available in various sizes, the cost does not necessarily increase as the capacity increases and there is not economic justification for undersizing the chlorinator.

With the chlorinator installed and operating, to determine the minimum quantity of chlorine required to clean and maintain a growth free water system without resorting to extensive testing, chlorinate daily until a free chlorine residual of 1 .0 ppm is maintained for two hours at the end of the enclosed portion of the system. Monitor the temperatures across the heat exchangers, engine jackets, etc. daily and confirm the results when the equipment is available for visual inspection during maintenance or overhaul.

The period and intensity of chlorination can then gradually be adjusted downward to maintain a growth free system.

The time consuming work of checking the residual during each chlorination period can be eliminated by installing one or more chlorine residual analyzers and recording the results.

Chlorinator Controls

The simplest and least expensive system is the manual operation of a single chlorinator. By starting and stopping the pump, the operator can shock chlorinate a cooling system. If the pump is timer operated and a residual analyzer is used, the system

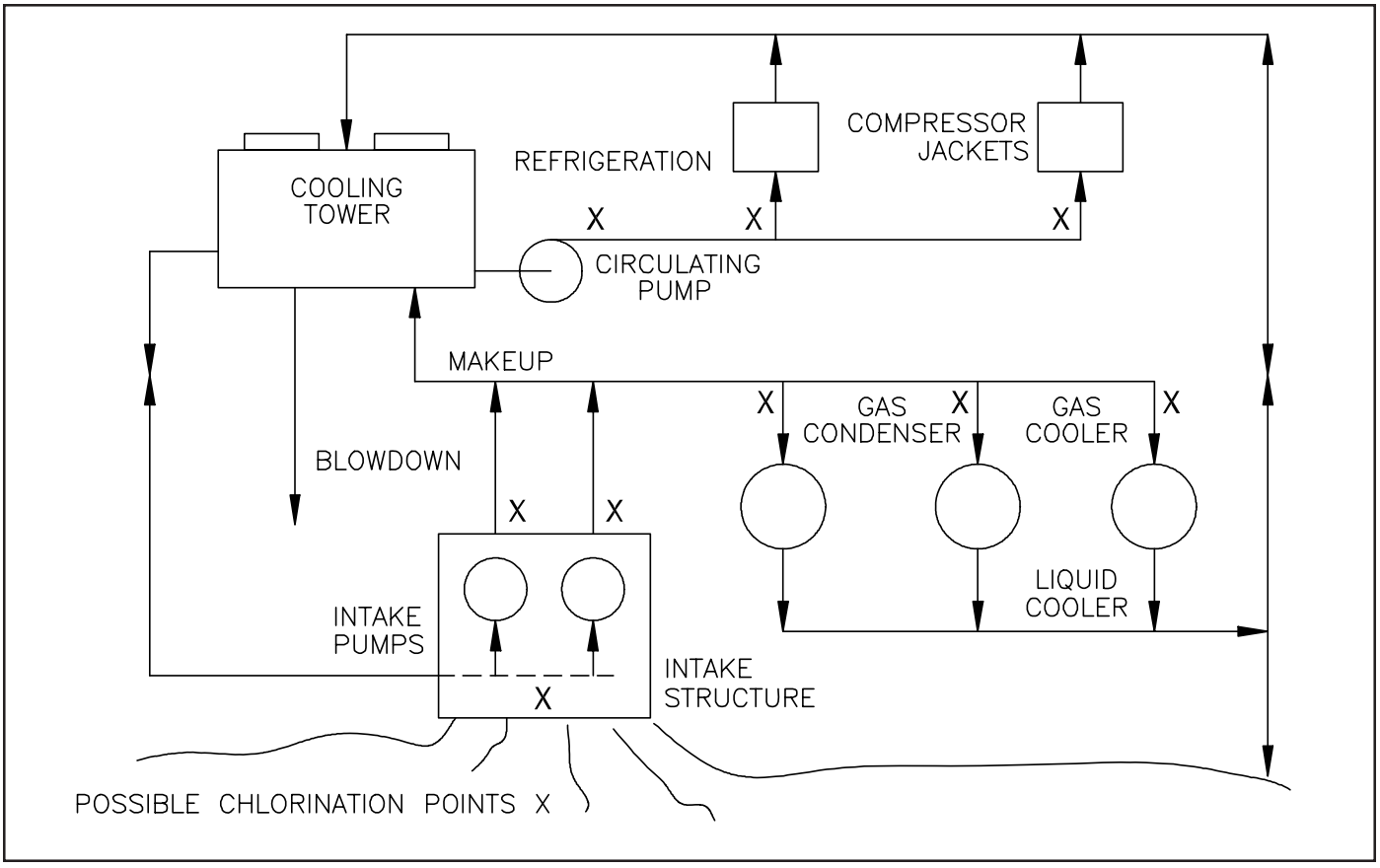

Figure 1 - Complex Cooling System

will operate automatically and operator labor is reduced. If multiple chlorination points are required in a large system such as Figure I, differing chlorination rates may be necessary and various valves will have to be opened and closed. By remotely operating the valves at each injection point and synchronizing the changes of chlorine application rates through timer controls at a centrally located panel, regular shock treatment with no overtreatment is assured while minimizing operator attention.

Obviously, each control system must be custom designed for the specific installation. These custom systems including controls, chlorinators and evaporators can be designed by Capital Controls.

Design improvements may be made without notice.

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