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SUBJECT: Treatments for the ERT Closed Cooling Water and Cooling Tower
Water Systems

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FROM: E. A. McLain

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Treatments for the HRT Closed Cooling Water
and Cooling Tower Water Systems

Summary

Potassium chromate is recommended as the corrosion inhibitor for the HRT closed cooling water system. A combination of sodium chromate and sodium phosphate (Betz dianodic treatment) is recommended for the HRT cooling tower water system corrosion inhibitor. Algae growth in the cooling tower may be controlled by the periodic addition of chlorinated phenols to the cooling tower water.

Treatment of Closed Cooling Water System

Potassium chromate is recommended as the corrosion inhibitor for the HRT closed cooling water system. It is relatively stable under radiation provided the pH of the water is kept between 9 and 10.⁽⁴⁾ If the pH of the water is allowed to drop to 8 or lower, the chromate will decompose under radiation. The pH of the water may be adjusted by the addition of potassium hydroxide, and it is also recommended that there will be a little air (oxygen) in the water in order to help to prevent the decomposition of the chromate. It is believed that the water in this system will be sufficiently aerated for this purpose, but if it is not sufficient provisions should be made for the injection of oxygen into the water. The recommended potassium chromate concentration for this water is 1000 ppm, and the water should be checked periodically for this concentration and the pH. The potassium chromate concentration may drop to 800 ppm without any harmful effects.

It is believed that there should not be any problem with the above treatment in radiation fields. If there is, however, the use of potassium phosphates rather than the chromates is suggested, since they are relatively

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stable under radiation.⁽⁴⁾

Treatment of the Cooling Tower Water System

The Betz dianodic water treatment is recommended for the retardation of corrosion in the HRT cooling tower system.^(1,2,5) This treatment involves the use of both sodium chromate and sodium polyphosphate for the prevention of corrosion. It is now used for treating the cooling tower water at the gaseous diffusion plant.⁽⁶⁾ During this treatment, a chromate (CrO_4) concentration of 20-25 ppm and a phosphate (PO_4) concentration of 20-25 ppm should be maintained and the pH must be kept between 6.0 and 7.0, preferably between 6.0 and 6.5. Corrosion may take place at lower pH values and the calcium in the water will tend to precipitate as calcium phosphate at higher pH values. The calcium concentration in the cooling tower water should be limited to 200 ppm.

A commercial preparation called "Betz Compound 181 - H" is available for this treatment. Large amounts of this material are available in K-25 stores, and it is suggested that it be used for the HRT cooling tower water. This material could be batch fed to the HRT cooling tower and the chromate and phosphate concentrations should be checked and adjusted daily by the addition of this material. It is estimated that about 3 to 5 pounds of this material will be required each 24 hrs. The pH of the water can be adjusted daily by the addition of small amounts of sulfuric acid.

During the initial use of this treatment for the HRT cooling tower water system, much of the corrosion products already present in the system will slough off the pipes and migrate to the cooling tower,⁽¹⁾ however, by having a large rate of blowdown during this period, this should not be a serious problem.⁽⁶⁾

Chlorine is usually used to control algae growth in cooling towers, but because the cooling tower water forms an emergency cooling water supply for the components in the reactor cell, its use is precluded here. The use of chlorinated phenols is therefore recommended for the HRT cooling tower. (1,3,6) Tanzola of the Betz Laboratories recommended the use of "Betz Compound B - 7" for this purpose. (5) This preparation consists of a mixture of the sodium salts of trichlorophenol, pentachlorophenol, and thiocarbamates, and is in the form of 1/2 pound briquettes. These could be suspended in a wire basket in the HRT cooling tower. This recommendation was made on the basis of analysis made by Betz of the 7500 Bldg. potable water and the HRT cooling tower requirements. It is recommended that the concentration of this material in the water after addition be about 60 ppm which is about 1/2 pound to every 1000 gallons of water. The chlorine added to the water would be less than 5 ppm. This is not considered serious since there is no stainless steel in the cooling tower water system. It should be added when a new growth of algae begins to appear, which will probably be about twice a week in the summer and every two or three weeks in the winter.

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