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HW--25012

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100 AREAS WATER TREATMENT SPECIFICATIONS

A review of the data from tests using alum in the treatment of pile process water, and using activated silica as a coagulant aid during period of low water temperature, shows that this method should be substituted for the present method of treating pile process water in all 100 Areas. It is recommended that the water treatment procedures and specifications attached to this memorandum be initiated as standard practice in all 100 Areas as soon as it is possible to make the necessary equipment modifications and installations.

Discussion

The test to evaluate the effectiveness of treating water with alum and activated silica has produced data which show that this method of water treatment gives a superior type water for pile process use and substantially increases filter plant capacities. The following brief review of the data available on filtration rates, slug corrosion rates, film formation, and effluent activity demonstrates the advantages of this process.

Operation of the F Water Plant has shown that filtration rates may be considerably increased when the alum-activated silica process is used. Process water of the proper quality has been obtained on a continuous basis with flow rates of 4.45 gpm/sq. ft. of filter area as compared with maximum filtering rates of about 2.95 gpm/sq. ft. with ferric sulfate treatment. Continuous rates as high as 5.2 gpm/sq. ft. have been maintained with new type filter media. This increase in filtering capacity will furnish more water as required for increased production without further expenditures to increase filter plant capacity; this effect is currently of especial importance in the 100-C and 100-H Areas.

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Tests indicate that slug corrosion rates are less with alum treated water than with ferric sulfate treated water. Data obtained from two tubes exposed for six weeks to alum treated water without dichromate show a corrosion rate for this period of time which is about seventy-five per cent of the corrosion rate observed with ferric sulfate treated water without dichromate during a six month period. Since the corrosion rate of aluminum in ferric sulfate treated water without dichromate decreases with continued exposure, it is anticipated that this same phenomenon will be observed with alum treated water, and that the recommended water treatment method will give substantially lower slug corrosion rates at full exposure than are obtained with the present water treatment method. These forecasts are influenced by additional in-pile data obtained from alum treated water with dichromate and by data obtained in the flow laboratory; these data will be reported in detail in a forthcoming document.

Data from the full pile production test at F Area show that with careful control of the proposed water treatment method, pile process tube film formation rates are negligible. The absence of film in process tubes will effect small increases in production rates from the piles, unless a practice were to be adopted of purging the piles very frequently at full power level. With proper control of the water treatment process, purging can be eliminated, which, in turn, will give a small operational cost saving and will nullify the possibility of cross-header screen plugging which has caused outage time in the past.

It has been found that the rear face activity during shutdown at F Area has been decreased by about ninety per cent with alum treated water as a result of eliminating film and purge particles which are normally trapped in the rear face piping. Data reported by the Radiological Sciences Department and by the Radiation Monitoring Unit of the Reactor Section indicate that the recommended water treatment has no major effect on the radioactivity of the effluent water from the retention basin.

Estimates on treating costs show that the proposed method is no more costly than the present process if dry coagulant is used and may be considerably less costly if liquid alum is used.

Since it is advantageous to institute this new process water treatment in all 100 Areas as soon as possible, the attached specifications are presented to serve until such time as complete specifications may be issued.

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INTERIM 100 AREAS PROCESS WATER SPECIFICATIONS

The 100 Areas process water treatment specifications are as follows:

1. Chlorination

Chlorine, by the same methods as are currently being used, may be added as required for slime and algae control or to increase coagulation efficiency in the 182 Raw Water Reservoirs or in the 183 Head Houses. Chlorine shall be added in amounts so that the residual does not exceed the limits given below.

2. Coagulation

The raw river water will be treated with sufficient commercial grade aluminum sulfate to produce the quality of water specified below. The aluminum sulfate may be either in the dry crystalline form (Chemical No. 103, HW-19156) or a liquid form of similar quality.

Activated silica may be added as a coagulation aid. The activated silica will be prepared by the Baylis process, or minor variation thereof, and neutralization of the sodium silicate (Chemical No. 113, HW-19156) will be accomplished by the addition of sulfuric acid (Chemical No. 20, HW-19156). Firm specifications for the conditions of use of activated silica will be submitted at a later date, based upon results of continued test work at 100-F.

3. Lime Addition

Commercial grade hydrated calcium oxide, or lime, (Chemical No. 108, HW-19156) will be added for pH control. Since the coagulation process should be carried out at a pH below 7.5, the lime will be added after the coagulation and filtration processes have been completed. Sufficient lime will be added to maintain the process water pH within the limits given below.

4. Chemical Additives

No additions of chemicals other than those specified are to be made.

5. Water Quality Limits

The water delivered to the 105 Piles will be maintained within the limits given below.

A. Chlorine and Chloride Maximum Concentrations in ppm.

Total Chlorides	Normal	2.0
	Broad	2.0
Free Chlorine	Normal	0.2
	Broad	0.2

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B. Process Water Maximum Impurity Concentration in ppm.

1. Iron	Normal	0.005
	Broad	0.1
2. Aluminum	Normal	0.05
	Broad	0.2
3. Turbidity	Normal	0.2
	Broad	1.0

C. pH of Water.

pH Range	Normal	7.6 - 7.7
	Broad	7.5 - 7.8

6. Transition Limits

Following the changeover in water treatment process from ferric sulfate to alum, it is expected that iron and other concentrations will run higher than normal until the process water system has been thoroughly flushed. Thus, for a period of 120 days from the date of process change, any pile may operate within the Broad Limits of water quality without approval from the Process Committee. After this period, Process Committee approval is required to operate on an emergency basis outside of the Normal Limits, but within the Broad Limits, for any period greater than twenty-four hours. Planned operation outside of the Normal Limits must be approved by regular production test procedures.

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12/18/92