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- # 13. Yellow Copy

Classification, extended change in

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By Authority of

RLD-66-4
WA Snyder 4-2-91

PM Eck 10-20-92
JH Wells 10-21-92

Received by OSTI

NOV 23 1992

June 26, 1953

COPY 1 OF 1

This document consists of
3 pages. No. 13 of
13 copies. Series A

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PROVISION FOR ACTIVATED SILICA AT 183-B

In some of our discussions regarding water flow requirements for future pile power increases at the 100-B Area it was agreed that Pile Technology would explore the feasibility of slightly modifying the activated silica facility at 100-C to supply both areas. This letter summarizes the results of our survey and schedules tests which will allow recommendations to be confirmed.

Introduction

Probable power level increases at B Pile will require process water flows of sufficient magnitude that the alum-activated silica treatment must be used in the water plants. The anticipated need for activated silica addition at 183-B early in 1954 makes it desirable to determine the most economical method of providing the required facilities. To this end, the possibility of expanding the present silica preparation and addition facilities in 183-C to provide activated silica solution to both 183-B and 183-C has been investigated. The results of this investigation are presented herein, together with a scheduled program to evaluate possible process alterations which can increase the capacity of the present facilities in 183-C.

Discussion

Expected power level increases at 100-C and 100-B may ultimately necessitate an increased raw water flow up to 200,000 gpm combined output. Any expansion of activated silica facilities should provide for this flow. The present 100-C

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activated silica facility has a design capacity of 8 ppm activated silica feed (as SiO₂) with a raw water flow of 100,000 gpm. Operating experience of the four areas using activated silica shows that a facility designed for a maximum of 5 ppm SiO₂ feed would be adequate. With a few changes in the process of preparing activated silica, modification or substitution of present equipment, and addition of some new equipment and piping, it is felt that the present facility at 183-C could attain a capacity of at least 5 ppm SiO₂ for a total raw water flow of 200,000 gpm.

The present process for preparing activated silica in the 183-C equipment consists of partially neutralizing a dilute sodium silicate solution with dilute sulfuric acid and aging the mixture for a specified time. Present specifications call for a silicate solution concentration of 1.3 - 1.6 per cent. The per cent neutralization is 82 - 85, and the aging time is a minimum of one hour. After aging, the solution is diluted to 1.0 per cent or less to prevent gel formation. Under present specifications, the 183-C silica capacity is limited by the required aging time and the volume of the aging tank.

Four possible methods of increasing the capacity of the equipment are listed below.

1. Increase the volume of the present aging tank.
2. Increase the concentration of the silica solution maintaining the same aging time.
3. Decrease the required aging time maintaining the present silica concentration.
4. Develop a more effective sol so that fewer ppm are required to obtain satisfactory coagulation.

The first three alternatives increase the throughput of the system, while the fourth essentially lowers the amount required. In general, as silica concentration increases, required aging time decreases; however, time for gel formation also decreases and could result in serious operating problems. The same general variations occur as per cent neutralization increases.

It appears that the first two methods of increasing capacity are most feasible. The second method, of increasing silica concentration, would result in lowest overall construction changes. In order to reach the desired capacity of 5 ppm silica for 200,000 gpm of raw water, silica concentration would need to be increased to about 1.9 per cent. Experiments by the Process Sub-Section indicate that a 2.0 per cent solution may be feasible if it is prepared with a lower per cent neutralization.

It is believed that a series of confirmatory laboratory tests are needed to establish required aging time and subsequent gel time at various silica concentrations and neutralization percentages. Information concerning the coagulation effectiveness of the various sols must also be obtained. Following these tests a development test should be performed at the 183-C water plant. The probability of reaching the required capacity is high using this method. However, if the proposed method is unsuccessful, it is recommended that additional capacity be obtained by increasing

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the volume of the present aging tank, either by adding a new tank or by converting one of the present storage tanks to an aging tank. By the installation of transfer pumps, a pipeline from 183-C to 183-B, and suitable addition equipment at 183-B, considerable construction and operating savings can be realized compared to the cost of a complete new facility at 183-B.

Alternatives No. 3 and 4 are considerably less certain of success and will not be further pursued at this time.

Schedule

Pile Technology is currently performing laboratory tests to establish the suitability of higher silica concentrations; these tests will be followed by a development test at the 100-C water plant to confirm the laboratory results. It is anticipated that the plant test will be initiated in August, 1953, and that the required information will be available by September 1.

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