HOC-2467

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8. D&C Files
9. Yellow File
10. Pink File
11. Extra
12. Extra
13. Extra
14. Extra

Richland, Washington
January 22, 1952

Mr. W. J. Davis
Acting Manager,
Design and Development Unit
RICHLAND

This document consists of

4

pages.

PROPOSED WATER PLANT EXPANSION (C-482)

In accordance with your request of last week, we have made a review of the basis for the proposed water plant and pile modifications for the DR and H piles. The engineering review was made by Mr. G. L. Locke and his comments are attached.

As a result of this review, we are submitting the following comments:

- (1) An average power level slightly above that obtainable from the proposed modification may be obtained by the substitution of enlarged pigtails. This latter modification could be accomplished for about 1/3 the capital cost and will permit operation with a header pressure approximately 100 psi lower, thus reducing power consumption. It would appear, therefore, that if one wished to consider average power levels of only 600 megawatts, the use of the enlarged pigtails is preferred.
- (2) The shutdown period required for installation of the ball third system may allow sufficient time for both the installation of

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enlarged pigtails and the water plant modifications. If this is the case, it may be more logical to expand the water plant to a larger capacity rather than 48,000 (a 7,000 gpm increase) as proposed; thus making possible the potential development of even higher powers. As long as it is necessary to modify the 190 pump house, a substantial increase in capacity should be made. The proposed expansion would permit an average power level lower than that which may be obtained by installation of only the enlarged pigtails.

- (3) It is our understanding that the enlarged fittings were not included within the scope because cost, time, and corrosion limitations would not allow power increases. Shutdown schedules were based on the assumption that only one crossheader could be removed at one time. We do not believe this is realistic. Scheduling on the assumption that several adjacent crossheaders may be removed at one time will shorten installation time so that it may be accomplished within the time required for ball 3X system installation. (Understood to be about 30 days.) Cost of the enlarged pigtail installation will be about \$550,000 as compared with over \$1,600,000 for the proposed basis. Furthermore, the statement that corrosion limits will not permit power increases even though enlarged pigtails were added, does not take account of the fact that at reduced header pressures permitted by enlarged pigtails, flow may be increased. (As may be seen from observation of pump characteristic data.)
- (4) In general, we feel that a sound basis has not been demonstrated for the course of action proposed. This should certainly be done before the work proceeds.

W. Nixon
Manager, Reactor Unit
DESIGN AND CONSTRUCTION
MANAGEMENT SECTION

VD Nixon:JRW:ecf

Attachment

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COMMENTS ON PILE MODIFICATION PROPOSAL

Introduction

At the request of the Design and Development Unit, a review has been made of the Documents HW-20425 "Pile Modifications Resulting in Increased Power Levels" dated July 10, 1951, HDC-2354 "Minutes of the Meeting on Pile Modifications" dated October 6, 1951, and the "Design Criteria for Project C-482".

These documents result in a proposal for an increase in the power level of DR and H piles made possible by modifications to the Pile coolant system and front face piping which will allow a flow of 48,000 gpm at an inlet top of riser pressure of 475 psi.

Achievement of this proposal will require the following work:

1. Testing and modification, when necessary, of all front face piping including risers to withstand the increased pressure.
2. Modification or replacement of the 14 secondary pumps at DR and the 16 at H to provide a unit capacity of 3000 gpm at a total head of 625 ft. of water and a maximum discharge pressure of 525 psi.
3. Change of speed of the existing primary pumps at DR and H piles to provide the required flow and pressure.
4. Addition of new pumping equipment at DR to provide an extra 6000 gpm when operated in parallel with the 14 revised pump sets.
5. Replacement of the Panalit gages and orifices to accommodate the increased flow and pressure.

The total cost of the above modifications plus the addition of check valves in the front face cross headers is estimated in HDC-2364 as \$3,250,000 for both piles. The work is to be completed within the thirty-day period allotted for the Ball 3X conversion shutdown.

Comments on the Proposal

A study of the proposal and the material upon which it is based leads to the conclusion that greater gains at less expense can be realized if the pumps and front face piping are left as they are and the outlet pigtails replaced with larger ones. This alternate proposal was discarded in HDC-2354 and HDC-2364 because it was stated that "Gains obtainable by rear face modifications are largely contingent on relaxation of corrosion limitations. At this time, relaxation of corrosion limitations is too indefinite to justify the cost and additional outage

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time required for installation of rear face changes".

This statement must be based on the assumption that no increased flow is possible with the enlarged pigtail. However, as pointed out in HDC-2051, "Increase of Pile Operating Level through Use of Enlarged Pigtails" dated March 2, 1951, the enlarged pigtail allows a greater flow through the pile with the same inlet pressure, relaxes the boiling disease limitation, and consequently allows a greater pile power level.

With the basis for calculation taken from HW-20425 (Same graphite temperature and corrosion limitation; same boiling disease limitation source, Fig. 10; same number of effective power tubes; same orifice efficiency; etc.) it is found that with the enlarged rear pigtails, the existing 14 pumps at DR and H will be adequate to supply 44,100 gpm at 375 psi top of inlet riser pressure and result in an allowable average power level during the year of 603 MW as compared to 590 MW* in the present approved proposal. The cost of making the alterations including new outlet crossheaders is estimated by Reactor Unit Construction Engineers to be about \$550,000 per pile as compared to a total of 3,250,000 or \$1,625,000 for the approved proposal. A previous estimate of 60 days necessary to change the rear pigtails was based on the requirement that only one crossheader at a time could be worked on. Actual experience on DR, however, shows that after the pile has been down 72 hours there is no time limit on the shutdown of any two adjacent cross headers. This means that it would certainly be safe to work on eight non-adjacent cross headers at a time which would decrease the necessary down time to less than 30 days.

Recommendations

Based on the results of the preliminary calculations, it is recommended that the material procurement and the design for the existing pile modification program be delayed for approximately three weeks. During this time it is recommended that the various possibilities for pile modification be re-evaluated. In the re-evaluation the probable future power level limits should be considered as well as the present ones. In both cases all limits should be considered including outlet water temperature, graphite temperature, slug surface temperature, specific power, and boiling disease.

- * In obtaining this power at DR it was assumed that the DR filter plant has a capacity of 48,000 gpm. This assumption is based on an anticipated filter plant improvement described on p. 5 of EDC-2364.

G. L. Locke
G. L. Locke,
Reactor Unit

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