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4: E. P. Wigner
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TO: A. H. COMPTON

FROM: H. L. ANDERSON

REPORT - AUGUST 21 TO SEPTEMBER 8, 1943

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Jackets

Corrosion of the slug jackets is strongly temperature dependent. For this reason the power output of the Hanford pile will probably be limited by the maximum temperature reached by any part of the aluminum jackets. Wigner and Young have pointed out to me that the place of highest jacket temperature will be opposite the center of the rib. This temperature is an increasing function of W^2/δ, where W is the width of the rib and δ is the thickness of the jacket wall. Once corrosion starts decreases and the temperature rises further. It would seem worth while to reduce W^2/δ as much as possible.

The increase of jacket temperature due to the presence of the rib has been calculated here by Kelly Woods. Assuming no heat transfer across the gap at the rib at 250 megawatt output in a flat pile, the highest jacket temperature is 85° (inlet water 5°). With zero rib width, this same maximum jacket temperature would be reached at a power output of 300 megavatts.

Wigner and Young made two suggestions for increasing the jacket thickness:

1. Increase metal diameter 2 mm. and double jacket thickness with no loss in k but increased O.D. by 4 mm.

2. Keep O.D. same, decrease metal diameter 1 mm., and increase jacket wall 50%. Loss in k estimated 0.3%.

The first suggestion yields an increase in power output of about 10% due to increased cooling surface in addition to the increase of about 8% due to lowered W^2/δ. In this connection, note that the thicker jacket may permit a smaller width of rib. Thus it would appear that if the full force of this suggestion had been appreciated earlier it would have been a cheaper way of insuring higher power output than the installation of a refrigeration plant. However, rather extensive changes in a design which is essentially frozen would be called for [illegible] seriously to be

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questioned whether the augmented power output would justify the rather considerable delay which would occur. The increased tube diameter would entail changes in the specifications of the shield holes, the tube rings, the aluminum tubes, and the graphite drilling. Orders for the drill jigs and for machining the tubes for the shield blocks were placed 50% on August 11 and 50% on August 25.

The second suggestion requires no change other than in slug fabrication but raises the question: Do we have sufficient k? At present it would seem quite probable that we do. In any case, there is no reason why these lighter slugs need be on hand during starting-up operations. It would seem wise to provide facilities for their fabrication. If after some operating experience has been gained it still seems advantageous to use them, they could be made readily forthcoming.

Experiments should be encouraged to show what reduction in rib width is allowable. A change in the shape of the rib seems certainly desirable.

With good water it would appear that 250 megavatt operation is entirely feasible with the present jacket design and no resort to bonding. Since the swelling of the slug which follows a failure in the jacket takes place relatively slowly, vigilance attending the inlet pressure should make it possible to detect such a failure before much damage is done.

H L Anderson

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