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**Prepared for the U.S. Department of Energy
under Contract DE-AC06-76RLO 1830**

**Pacific Northwest Laboratory
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FINAL REPORT

HALF PLANT ACTIVATED ALUMINA TEST

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FINAL REPORT

HALF PLANT ACTIVATED ALUMINA TEST

by

R. W. Pitman
G. W. Wells

May 5, 1967

DOUGLAS UNITED NUCLEAR, INC.
RICHLAND, WASHINGTON

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FINAL REPORT

HALF-PLANT ACTIVATED ALUMINA TEST

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INTRODUCTION

A half reactor test⁽¹⁾ was initiated at B Reactor on February 1, 1967, to determine whether the concentration of P³² and As⁷⁶ in the reactor effluent water would be reduced by the addition of activated alumina in the water treatment process. This test was prompted by the reported⁽²⁾ effectiveness of activated alumina in sorption of phosphates when water flow is through a packed bed of this material. Although direct feed of material would not be expected to be as effective, testing of this possible approach appeared warranted. This report summarizes the results of this test.

SUMMARY

Approximately two months of experience (February 1, 1967, through April 8, 1967) was accumulated. Normal treatment methods remained unchanged with the exception that a constant feed of 2 ppm of activated alumina was added to the test side (south half of water plant) in addition to normal coagulant feed.

Samples taken from each effluent riser during reactor operation indicated no improvement in either As⁷⁶ or P³² performance. This comparison is shown below with a complete tabulation of daily values included as Attachment 1.

Radionuclide Concentration, pCi/ml

	<u>P³²</u>		<u>As⁷⁶</u>	
	<u>Normal Side</u>	<u>Test Side</u>	<u>Normal Side</u>	<u>Test Side</u>
Average for test period	5.9	6.6	58.2	72.6

The C water plant supplies about 15 percent of the B Reactor flow demand with the piping arrangement such that the effect of C water would be most pronounced on the test side. This possible effect is of little concern, however, as major improvement in effluent activity performance would need be demonstrated by this approach in view of its significant cost. Activated alumina feed at 2 ppm represents an added chemical cost of about \$2.15 per mm gallons treated.

(1) R. W. Pitman and G. W. Wells, Production Test Authorization -038, Half Plant Activated Alumina Test, DUN-1232, June 24, 1966.

(2) W. C. Yee, "Selective Removal of Mixed Phosphates by Activated Alumina," American Water Works Journal, February, 1966.

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TEST DISCUSSION

The material selected for test was Grade F-3, Granular activated alumina of minus 325 mesh containing 91-93 percent Al_2O_3 by weight. The 25 tons of material procured from Alcoa had a unit price of \$0.13 per pound. Although it had been earlier anticipated that a coarser grind of material could be utilized, initial testing of 100-pound samples of activated alumina of 1/4-inch diameter and 14 to 28 mesh revealed both unsuitable for use due to rapid settling of material. To compensate for the required use of higher unit cost material, sufficient material was procured for a test duration of only six weeks to maintain cost in line with previous cost estimates.

The No. 2 dry alum storage hopper and feeder was utilized for material feed. The dry feeder was established at a constant 2 ppm feed rate with the slurry from this feeder entering the raw water flume at close proximity to the coagulant feed point. On March 16 the activated alumina slurry addition point was relocated to injection directly into the raw water header (about three foot upstream of the coagulation addition point).

All other treatment methods remained unchanged.

No difficulties were experienced with feed of this material and the rate of feed at 2 ppm was maintained throughout the test period. Although not of a significant nature, the filter performance on the test side appeared to be generally improved as a result of decreased filter floc loading.

GWW:al

ATTACHMENT 1

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<u>Date</u>	<u>Radionuclide Concentration, pCi/ml</u>			
	<u>p32</u>	<u>As76</u>	<u>Normal Side</u>	<u>Test Side</u>
2-2-67	9.6	6.4	36.4	59.2
3	7.7	5.3	43.8	72.3
6	6.8	4.7	53.6	92.1
7	6.7	4.2	55.9	63.0
8	6.6	5.8	50.9	60.9
9	6.4	6.5	50.8	78.0
10	6.4	5.8	41.4	53.6
14	5.9	6.8	49.1	60.1
15	4.6	7.0	59.4	76.5
16	5.7	8.3	40.2	58.5
17	4.1	6.9	35.1	50.5
20	4.8	8.3	49.3	72.6
21	5.8	9.7	44.2	55.3
22	6.7	7.7	45.9	71.9
23	6.1	7.4	45.8	57.2
24	6.3	8.7	54.3	72.2
27	5.0	9.0	52.0	68.5
28	5.3	7.3	45.7	58.8
3-1-67	4.7	6.9	84.0	107.0
2	4.5	6.2	69.9	77.0
3	6.5	4.6	97.0	78.0
13	5.8	6.2	42.0	69.0
14	6.1	6.7	63.0	71.0
15	7.7	6.0	81.0	89.8
16	5.6	6.3	68.0	74.0
17	5.2	5.8	57.0	76.0
29	5.2	6.0	49.9	59.1
30	4.7	4.8	64.2	73.6
31	3.8	5.5	68.5	87.5
4-3-67	9.1	5.0	59.1	70.6
4	4.3	5.9	65.2	68.3
5	4.6	6.8	84.8	71.9
6	5.5	8.3	82.5	100.7
7	6.7	9.0	90.4	114.4
Avg.	5.9	6.6	58.2	72.6