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HALF-PLANT VALIDITY TEST

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May 20, 1965

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HALF-PLANT VALIDITY TEST

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May 20, 1965

FINAL REPORT - PRODUCTION TEST IP-745
HALF-PLANT VALIDITY TEST

INTRODUCTION

Half-plant production tests have been used for many years to evaluate changes in water treatment processes. Since some conjecture existed regarding the validity of this test concept, it was decided to employ a tracer element. Bromine was chosen as the tracer element due to its absence in raw water, the short half life of its radionuclides, and its compatibility as a potable water treatment chemical.

The parent production test was run for four days, but the scatter in the data indicated equilibrium had not been reached and conclusions could not be made. The test supplement was run for a period of 12 days.

SUMMARY

The test data show that an average cross flow of 7.6% is experienced, as measured in the reactor rear riser, when a reasonably balanced pumping system is maintained.

Operating experiences at D and F Reactors during the early part of 1965 further confirm these facts. Excessive film build-up occurred in both instances on plant halves. A distinct demarkation line was experienced between vertical rows 73 and 74, as measured by front face Panellit pressure increases.

DISCUSSION

Bromine Addition and Water Flow System

This test was run in H Reactor Plant during the periods of February 2-5, 1965, (original) and from April 6-20, 1965 (supplement).

Na Br, grade NF, in an average amount of 0.3 ppm was added to the east (near) bauxite feed machine at 183-H. Grab water samples were obtained daily at 7:30 AM from the near and far reactor rear risers. These samples were forwarded to B-NW 300 Area Laboratories for activated bromine analysis. Calculations were then made of the percentage of cross-mixing.

The water flow systems from 183 raw water inlet to the reactor front face were operated as identical split systems, with the exception that the 183 filtered water loop remained open between 183 and 190. The valving arrangement in this loop does not permit an equal division of flow. Balanced pump units, however, were maintained on this system.

A slight unbalanced flow condition existed in the process water system from 190 to the reactor front face.

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190-H Building (Supplement Test)

<u>TORP - Average</u>		<u>Flow, gpm - Average</u>	
<u>Near</u>	<u>Far</u>	<u>Near</u>	<u>Far</u>
545	542.5	45,200	46,500

This condition can be attributed to slight differences in pumping and piping characteristics, since all cone valves were operated in the fully open position.

Rear Riser Br Analysis ⁽¹⁾

% Cross-Mixing

Original Test

2/2/65	19.7
3	9.2
4	15.3
5	5.8

Supplement Test

4/11/65	9.4
12	8.1
13	Down
14	Down
15	7.1
16	7.0
17	6.7
18	6.4
19	6.9
20	9.2

(1) Progress Report, W. B. Silker, period ending May 15, 1965.

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F Reactor Plant

On January 1, 1965, at 183-F Building, an underwater sulfuric acid feed line developed a leak. This caused a major part of the acid being fed to the west (far) half to be channeled through no. 6 basin. The resulting water coagulation imbalance created a rapid film build-up on the far side of F Reactor.

The attached front face Panellit map indicates those channels in which the pressure increased 15 or more psi above base. A distinct split in film build-up is observed between vertical rows 73 and 74, which is the dividing line of the reactor. The water system upstream of the process water cross tie valve in 105 Valve Pit was operated as an integral plant; however, balanced flows were maintained on each plant half.

D Reactor Plant (2)

Sodium silicate addition was started to the far half of D Reactor on January 15, 1965, as authorized by Production Test No. IP-728. A Panellit monitoring program was established on the test and control side to establish pressure changes from base. A rapid film build-up was experienced on the test half. During the first 60 days, the test side fringe Thoria channels increased a total of 25 psig while the control side remained at zero.

A total increase of 5 psig was similarly observed in the test side core Thoria channels during the first 25 days, while the control side core Thoria channels remained at zero. The film build-up split occurred between vertical rows 73 and 74.

During the period of April 1-7, 1965, the front TORP was unbalanced by 2 psi. This caused the flow split to shift from the customary vertical rows 73 and 74 to vertical rows 72 and 73. 190 Tank inlet and outlet valves were closed during the test.

J. W. Frymier, Senior Engineer
Manufacturing Systems Engineering
Manufacturing Section

JWF:bdt

(2) Personal Correspondence, D. L. Hirschel to J. W. Frymier, May 12, 1965.

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F Reactor Front Face Map

Panellit Pressures Exceeding 15 psi Above Base as Monitored on January 17, 1968 (Data from [redacted])

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