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PRODUCTION TEST PT-IP-355-I
K REACTOR BACKUP WATER SUPPLY TEST
by

W. R. Smit & S. S. Jones

August 25, 1960

HANFORD ATOMIC PRODUCTS OPERATION
RICHLAND, WASHINGTON

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OBJECTIVE

The objective of this test is to measure the emergency reactor flow through the high pressure crosstie line (HPCT) after the removal of the flow limiting orifices in the HPCT.

BASIS AND JUSTIFICATION

The flow limiting orifices in the HPCT were removed on July 5, 1960, as per Design Change No. 383. The removal of the flow limiting orifice allowed increased emergency flow and brought the crosstie coolant flow more nearly into conformance with the coolant supply reliability criteria.⁽¹⁾ The purpose of this test is to measure emergency flow under certain conditions so that available flow under all conditions may be more precisely determined.

The flow conditions outlined in this test would occur if a total loss of Bonneville Power Authority power occurred at both reactors and one reactor lost all of its steam generated power. Complete loss of steam generated power would occur if both of the emergency power generating systems were to fail at the stricken reactor.

These emergency flow conditions could also be realized if Process Water piping between the 190 Power House and the 105 Reactor were to rupture.

TEST PREPARATIONS

The following test preparation and instrumentation should be completed before conducting this test:

<u>Function</u>	<u>Instrumentation</u>
Front Riser Pressure	Calibrated Heise gage (install in 105 control room with zero static head correction on gage)
Local Reactor Flow	Check header-to-header Δp gages on headers: 10, 20, 30, and 40
HPCT Flow	Set the HPCT flow orifice instrumentation to read HPCT flow towards the "stricken" reactor.

1. HW-66929, "Performance Criteria for the Hanford Production Reactors", R. E. Trumble, September 1, 1960 (Unclassified)

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PROCEDURE

Both of the K Files will be used for this test. One reactor must be down for more than 20 hours, the other need not be down for more than a few minutes. Since this test is a measure of emergency flow conditions, both reactors must be in the normal status without open tubes or valved crossheaders.

Because of the requirement that both reactors be normal, the ideal time for this test is when one reactor is finishing an outage and the other reactor can be shut down for a scheduled outage. In this case, there would be a minimum of lost time.

1. Both reactors must be down. The reactor which will receive the flow (the "stricken" reactor) must have been down at least 20 hours.
2. The crosstie must be flushed before the test begins.
3. The stricken reactor will have two low-lift pumps supplying the reactor, plus one low-lift pump pressurizing the HPC and three service water pumps supplying the low-pressure crosstie. This will supply the reactor with 40,500 gpm at a bottom-of-riser pressure (BORP) of 54 psi.
4. The Ball 3 ELP switches will be bypassed at the stricken reactor.
5. With full flow from six low-lift and three service pumps at the supplying "aiding" reactor, the V-73 at the stricken reactor will be opened.
6. After the V-73 opens, the flow from the low-lift pumps at the stricken reactor will be stopped and the stricken reactor HPC valve closed and FB-5 valve opened.
7. When the flow stabilizes, the flow through the crosstie and the BORP will be measured at both reactors.
8. Close the FB-5 valve and again measure the crosstie flow and BORP at both reactors.
9. The service water pumps supplying the stricken reactor will be stopped and the crosstie flow and BORP will be measured at both reactors.
10. One low-lift pump at the aiding reactor will be stopped and the crosstie flow and BORP will be measured at both reactors.
11. Two low-lift pumps at the aiding reactor will be stopped and the crosstie flow and BORP will be measured at both reactors.
12. The low-lift pumps supplying the stricken reactor and the crosstie will be started.

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13. The service water pumps will be started and the stricken reactor HPC valve will be opened.
14. The V-73 valve will be closed.
15. The Ball 3X ELP switches will be unby-passed.
16. The entire system will be returned to normal.

HAZARDS SUMMARY AND PROCESS STANDARDS

Process Standard C-110

The Ball 3X ELP at the stricken reactor will be by-passed. Upon indication of loss of water, the Ball 3X ELP will be returned to automatic. The loss of water will be shown by a Heise gage situated three feet off the control room floor which will read uncorrected riser pressure. If the riser pressure at this gage drops to 28 psig, the Ball 3X ELP will be returned to automatic.

Process Standard A-030

The TORP will fall to less than the 30 psig as required by this standard. More than the minimum 5000 gpm required by Process Standards will be available from the crosstie line. In the event of total loss of BPA power, over 17,000 gpm would be available to the stricken reactor and over 60,000 gpm at the aiding reactor.

Process Standard 190-B-090

This standard requires that one unthrottled low-lift pump supply water to the reactor when the reactor is down. The shutdown of this pump will not materially affect the reactor safety since the crosstie line will be open and working before the pump is stopped. Power personnel will be available to start the pump if required by the 105 shift supervisor.

This standard further allows the HP crosstie line to be taken out of service for two hours. The lack of low-lift pump at the stricken reactor will effectively remove the high pressure crosstie line from service as backup to the aiding reactor.

COST

Some special instrumentation will be necessary, such as calibrated Heise gages and a flow measuring manometer. Such costs as are necessary should be charged to 5R31-414.78. Approximately one hour of extra down time will be required for this test.

TIMING

This test should be run within three months of the issue date.

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RESPONSIBILITIES

MANUFACTURING

KE-KW Reactor Operation will be responsible for scheduling the test, installation of instrumentation, operation of all necessary equipment, and reactor safety.

KE-KW Power Operation will be responsible for preparing a detailed test procedure for the 190 portion of this test.

RESEARCH AND ENGINEERING

Process Technology Subsection will be responsible for test preparation, detailed test procedures, coordination of the test, obtaining data, and issuing a final report.

Process and Reactor Development Subsection

Reactor Engineering Unit will be responsible for integrating the results of this test into the emergency safety considerations at the K-Reactors and overall interpretation of last ditch cooling adequacy.

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Process Engineering Unit
Process Technology Subsection
RESEARCH AND ENGINEERING

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