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**HIGH FLUX ISOTOPE REACTOR QUARTERLY REPORT
APRIL, MAY, AND JUNE OF 1966**

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SUMMARY

A power level of 75 Mw was achieved on the last day of this quarter. The first HFIR fuel element was burned out by an uninterrupted 18-day run at a power level of 50 Mw following 1320 Mwd of operation at 20 Mw and less. This element produced 2229 Mwd of power.

Two major modifications were made to the reactor facility.

1. Charcoal filters with a minimum 1 1/8-in.-thick layer of charcoal were installed in the SBHE filter pits to replace the original filters which only had 1/2 in. of charcoal. Subsequent tests indicate that the iodine removal efficiency of the new filters is more than adequate to meet the design conditions assumed in the safety analysis.
2. A poison-injection system utilizing cadmium nitrate was installed as an emergency backup for the normal reactor control system.

OPERATIONS

The first HFIR fuel cycle was completed by an uninterrupted 18-day run at a power level of 50 Mw. This element produced 2229 Mwd accumulated power, mostly at power levels of 20 Mw and lower. The reactor power was increased to 75 Mw for the first time on the last day of the quarter. Operating data for the quarter are listed in Table 1.

Table 1. HFIR Basic Operating Data
(April 1 through June 30, 1966)

	This Quarter	Last Quarter	Year to Date
Total energy, Mwd	1580.1	668.8	2248.9
Average power, Mw/operating hr	26.7	17.1	22.9
Time operating, %	65.0	43.5	54.3
Reactor water radioactivity, $\frac{\text{c/min}}{\text{ml}}$ (av)	74,140	37,590	
Pool water radioactivity, $\frac{\text{c/min}}{\text{ml}}$ (av)	52	67	
Reactor water resistivity, ohm-cm (av)	1.20×10^6	1.40×10^6	
Pool water resistivity, ohm-cm (av)	1.88×10^6	1.41×10^6	

Figure 1 is a plot of the symmetric plate positions (at xenon equilibrium) versus accumulated megawatt days on the first production core. This core produced 2229 Mwd at power levels between 12 and 50 Mw.

Fig. 1. Symmetric Plate Position vs Accumulated Megawatt Days -
First Production Core

SHUTDOWNS

A summary of the HFIR shutdowns for the quarter is given in Table 2. Tables 3 and 4 give further details of the scheduled and unscheduled shutdowns, respectively.

Table 2. Summary of HFIR Shutdowns

Reason	Number	Downtime (hr)
Scheduled		
Training	8	2.166
Maintenance	19	204.000
Tests	27	267.318
End of cycle	<u>1</u>	<u>263.917</u>
	55	737.401
Unscheduled		
Operating errors	4	0.583
Instrument failure	<u>2</u>	<u>0.400</u>
	6	0.983
	<u>61</u>	<u>738.384</u>

Table 3. HFIR Scheduled Shutdowns

Date	Duration (hr)	Remarks
4-4-66	2.283	The reactor was shut down to check the calibration of the servo heat-power instrumentation and to make a comparison between the safety system thermohms and the servo system thermal bulbs.
4-4-66	3.333	The reactor was started to burn out some of the xenon after part of the instrumentation and controls work mentioned above was completed. It was then shut down again to complete the instrument calibration.

Table 3. (Continued)

Date	Duration (hr)	Remarks
4-5-66	0.267	The reactor was shut down to compare the response of the servo system and safety system heat-power instrumentation during startup. Channels 1 and 2 responded very satisfactorily, but channel 3 lagged behind as its reset gain went to zero before settling out at the proper value.
4-5-66	1.617	The reactor was shut down to place the ¹⁶ N system in service and to check it for leaks.
4-6-66	0.300	After the heat-power instrumentation had been calibrated with the reactor operating, the reactor was shut down so that the instrumentation response could be observed during startup. The agreement of the computed heat power among the channels was acceptable.
4-7-66	1.050	The reactor was shut down and restarted as part of an operator qualification test.
4-7-66	0.634	The reactor was shut down by a deliberate scram to check out special instrumentation installed for flow coastdown tests.
4-7-66	0.050	The reactor was shut down by a deliberate reverse to check out special instrumentation installed for flow coastdown tests.
4-7-66	0.200	The reactor was shut down and restarted for operator training.
4-7-66	0.133	The reactor was shut down and restarted to demonstrate the automatic startup to Instrumentation and Controls personnel.
4-7-66	0.150	The reactor was shut down and restarted to demonstrate the automatic startup to Instrumentation and Controls personnel.
4-10-66	27.000	The reactor was shut down to allow a minimum of 24-hr decay time before a scheduled series of flow coast-down tests.

Table 3. (Continued)

Date	Duration (hr)	Remarks
4-11-66	0.984	A series of five flow coastdown tests was run to simulate HFIR area power outages. High speed recorders were used to follow the reactor's response to these transients. It was necessary to scram the reactor to get the process equipment back in operation due to the low trip settings required for 20-Mw operation.
4-12-66	0.350	An additional series of three coastdown tests was run. After each test, the reactor power level sagged and shut the reactor down via a setback. It was determined that the servo system was actually requesting this abnormal action. Investigation revealed that the square root extractors in the servo-flow channels were out of calibration.
4-12-66	27.917	The reactor was shut down to remove and calibrate the square root extractors in the servo-flow measuring channels.
4-13-66	0.133	The reactor was shut down to check the instrument responses.
4-14-66	2.884	Six additional shutdowns were made as part of the coastdown tests. Several were repeats to check correction of troubles discovered during the tests.
4-15-66	1.184	The coastdown tests were continued with three additional shutdowns involved. The final shutdown involved an actual area power outage which was initiated by opening the HFIR preferred electrical feeder.
4-18-66	1.716	The reactor was shut down to lower the intensity of the radiation beam coming from channel 2 fission-chamber thimble while the fission chamber was being replaced.
4-18-66	0.367	The reactor was shut down to check an abnormal vibration of the No. 4 control-plate drive noticed in the preceding shutdowns. Checks were made with the control plate withdrawn to various positions, but nothing abnormal was noted. Time-of-flight measurements were also made. Since these indicated normal response, the reactor was restarted.

Table 3. (Continued)

Date	Duration (hr)	Remarks
4-20-66	1.750	The reactor was shut down to continue the investigation of the No. 4 control-plate drive-rod vibration. Vibration was noted between 21-in. withdrawn and 9-in. withdrawn as the rod was being inserted. The source of the vibration was not determined.
4-21-66	0.967	Another shutdown was made to check the vibration problem on the No. 4 control-plate drive rod. The lower seal in the drive-rod-seal housing was lubricated with glycerine. This seems to have solved the problem, since no further vibration has been observed.
4-25-66	0.733	The reactor was shut down to check the clearance of the No. 2 fission chamber in its thimble. It was discovered that the thimble is slightly smaller than the other two.
4-25-66	0.500	The reactor was shut down to set the limit switches and vernistat of fission chamber 2 following its installation.
4-26-66	0.183	The reactor was shut down to demonstrate an automatic startup.
4-27-66	221.783	The reactor was shut down to conduct primary pump flow-coastdown tests. The shutdown was extended to make low-power level flux-monitor runs and to complete maintenance work.
5-9-66	4.833	The reactor was shut down to run iodine removal efficiency tests on the new SBHE charcoal filters.
5-10-66	2.133	The reactor was shut down to reprogram the function generators in wide-range counting channels 2 and 3.
5-11-66	13.317	The reactor was shut down to repair three leaking valves in the hot water injection system. The shutdown was extended to test new SBHE charcoal filters. Startup was delayed because xenon buildup prevented the reactor from going critical.

Table 3. (Continued)

Date	Duration (hr)	Remarks
5-13-66	134.833	The reactor was shut down to reroute the pressurizer pump control circuit wiring. This was necessary to permit installation of the poison injection system control valves on the process panel. The shutdown was extended to allow sufficient gamma heat decay in the core to make reactor noise measurements at zero flow.
5-20-66	6.017	The reactor was shut down to connect both phases of the No. 5 cylinder shim motor to the withdraw inhibit relay matrix.
5-20-66	0.250	The reactor was shut down and restarted for operator training.
5-22-66	0.150	The reactor was shut down and restarted for operator training.
5-23-66	0.850	The reactor was shut down to continue work on the No. 5 cylinder shim motor inhibit phase-detection circuit.
5-24-66	0.183	The reactor was shut down and restarted to demonstrate its performance to a review committee.
5-24-66	3.233	The reactor was shut down to run an iodine removal efficiency test on another compartment of the new SBHE charcoal filters.
5-25-66	3.917	The reactor was shut down to run a methyl iodide removal efficiency test on a compartment of the new SBHE charcoal filters.
5-29-66	0.050	The reactor was shut down for operator training. The No. 4 control plate was purposely dropped. It took 1 min 15 sec for the reactor to "sag" out of "run" (i.e., power level below ~300 kw) from an initial power level of 12 Mw.
5-31-66	0.133	The reactor was scrammed soon after reaching 50 Mw to check the time response of the No. 1 control plate. This was part of the procedure for power escalation to 50 Mw.
6-19-66	263.917	Fuel cycle 1 was completed at 2:35 a.m. when all control plates reached their withdraw limits.

Table 3. (Continued)

Date	Duration (hr)	Remarks
6-30-66	4.967	The reactor was shut down to inspect the target tower latches. Two broken latches were found, and they were removed to prevent pieces from dropping into the core. The remaining two latches were sufficient to hold the tower in place.
6-30-66	0.150	The reactor was scrammed soon after reaching 75 Mw to check the time response of the No. 1 control plate. This was part of the procedure for power escalation to 75 Mw.
	737.401	

Table 4. HFIR Unscheduled Shutdowns

Date	Duration (hr)	Remarks
4-19-66	0.167	A reactor scram occurred when the fourth primary circulating pump was turned off during electrical power-feeder transfer tests. The pump had been turned on to fully load the alternate 13.8 kv feeder. A trip was received from all three heat-power channels.
4-21-66	0.133	The reactor scrammed from high heat power on all three channels while placing the standby primary circulating pump in operation. This operation was undertaken to determine whether such a transfer could be made during reactor operation. Later pump transfers were made without causing reactor scrams.
5-20-66	0.217	While safety channel 1 was out of service for maintenance, a false trip signal was received on channel 3 flux/flow. The false trip signal was apparently caused by electronic noise in the channel 3 flux/flow circuit.

Table 4. (Continued)

Date	Duration (hr)	Remarks
6-30-66	0.283	The reactor scrammed twice because of insufficient cooling capacity during flow coastdown tests. The reactor coasted down from 50 Mw and 75 Mw, as designed, and operated normally at N_L with the simulated emergency power available. When the main pumps were restarted, scrams due to high inlet temperature occurred.
6-30-66	0.183	As the reactor power was being raised from N_L to 50 Mw, a scram occurred from the >20 Mw/sec rate trip. The short period appears to have been generated by an unexpected air motor insert of the shim plates and subsequent full speed withdrawal of the regulating cylinder to maintain the reactor power. The short period appears to have been real, but it was probably a sub-critical transient.
	0.983	

INSTRUMENTATION AND CONTROLS MAINTENANCE AND CHANGES

No major changes were made in the control system this quarter. As reactor operating experience increased, minor deficiencies in some of the subsystems became apparent. Maintenance and changes in these subsystems are described below.

Control System

A phase-monitoring circuit and an inhibit-relay matrix were installed in each phase of the No. 5 cylinder shim motor. In the original design, the inhibit-relay matrix interrupted only one phase of the two-phase motor upon a reactor scram. It was found that if the motor was energized when a scram occurred interrupting a single phase did not stop it.

Since the installation of an inhibit-relay matrix in each phase of the motor, tests proved that a reactor scram truly inhibits the No. 5 cylinder shim motor. The phase monitoring circuits indicate by lights on the control room console the status of each inhibit-relay matrix.

The power-rate-of-rise was supposedly limited by an inhibiting circuit in the servo channels to 5 Mw/sec. It was found that the +5 Mw/sec inhibits actually operated to inhibit the servo motors in the insert direction, rather than in the withdraw direction. The circuit was changed to inhibit the motors in the withdraw direction..

Wide-Range Counting Channels

The fission chamber assembly for channel 2 failed once this quarter. Since this was the fourth consecutive failure of the chamber assembly in this position, a detailed investigation of the thimble was initiated. The defective chamber and several dummy chambers were installed in the thimble to check the clearance. It was determined that binding in the thimble was occurring, causing damage and subsequent failure of the chamber cable. This problem was eliminated by modifying a chamber assembly to decrease the length of the rigid section. The modified chamber is able to pass through the bends in the thimble without binding.

A circuit change was made to disable the +100-sec-period trip comparator in each counting channel after the run mode is attained. The function of this comparator is to assure that the reactor is not on a significant positive period before permission to go into run mode is granted. Once the reactor is in the run mode, the comparator has no useful function but operates frequently due to the statistical variation of the period signal. This circuit change uses contacts of the "run" relays to disable the inputs to the +100-sec-period comparators when in the run mode. This will extend relay life and eliminate the annoying flickering of the comparator pilot lights during power operation.

Safety Channels

A modified square root signal converter was installed in all three safety channels. In the original design, a low end cut-off clamp drove the output to zero when low-level signals (10.0 to 10.4 milliamps on the 10 to 50 milliamp scale) were received. This low end cut-off clamp was thought necessary because of high noise to signal ratio in this range. The modified square root converter allows the low-level signals to be sent on to the heat-power comparators even though the signals are accompanied by excessive noise.

A large number of flux/flow signal spikes and rate trips occurred in channel 3 this quarter. The spurious trips appeared randomly--during some days as many as ten momentary trips were received; during other days no trips were experienced. This problem has been intensively investigated. The channel 3 ionization chamber was temporarily disconnected. Since the random noise signals persisted with the chamber disconnected, the noise source appeared to be in the control room electronics. It was suspected that the drawer wiring might be defective, so the S-3 drawer frame was replaced. The random noise spikes continued. Next, a high-speed recorder was used to monitor the output of the flux amplifier and the +32-v instrument battery voltage. Results were inconclusive. A number of modules were suspected to be the source of the noise, so they were changed. At the end of the quarter, the problem was not solved; and the spurious trips continued to occur.

Servo Channels

The heat-power calculators, the differential temperature multipliers, and the air-to-current converters in all three servo channels were recalibrated. Much closer agreement existed between the servo and safety heat-power instrumentation after the calibrations. The following data were recorded during 20-Mw operation to show a comparison between the two systems.

	<u>Channel 1</u>	<u>Channel 2</u>	<u>Channel 3</u>
Safety heat power	20 Mw	18.5 Mw	18.5 Mw
Servo heat power	22 Mw	19.5 Mw	21.5 Mw

During the power escalation to 50 Mw, special noise detection instrumentation was in operation. A low-frequency oscillation was observed in reactor power. Various tests indicated that this power oscillation was being caused by servo channel 1. Investigation of this channel revealed that it was oscillating because the flow signal being fed to it was oscillating. The flow transmitter was replaced, but the problem persisted. It was finally determined that the natural frequency of the primary system was being imparted to this transmitter via the connecting flow-signal tubing. The servo oscillations were eliminated by the installation of ~5 ft of additional tubing on both the inlet and exit sides of the flow transmitter.

Control-Plate Drives

The power usage of each shim-plate-drive motor was recorded during motor operation. With the plates clutched to the drive assemblies, recordings were made during a full withdraw-and-insert stroke on each plate. The power recorder revealed no abnormal loads on the motors during operation. Also, the power requirements of the motors were practically identical.

PROCESS SYSTEMS

Maintenance and changes in the various process systems are listed in Table 5.

Table 5. Process Systems, Maintenance and Changes

Date	Component	Remarks
Primary System		
4-12-66	Pressurizer pump PU-11	A test of the emergency pressurizer pump relief valve was made. It relieved between 700 and 800 psi.
5-3-66	Primary strainer	An inspection of the primary strainer revealed the tip of the previously damaged ^{16}N temperature probe. Several metal shavings from an unknown source were also present in the strainer.
5-11-66	Hot-water-injection system	Hot-water-injection system automatic valves HCV-100-1A-1, 2A-1, and 3A-1 were removed and replaced with valves in good operating condition. Replacement of these valves was necessary to prevent leakage of hot water to the temperature sensors.
6-20-66	Circulating pumps	The vibration switches on all primary circulating pumps were checked and set to cause pump shutdown-and-alarm annunciation at a vibration level of 4 mils. All pumps were checked for proper operation following completion of the vibration switch settings, and they were found to operate acceptably.
6-23-66	^{16}N thermocouple	The ^{16}N thermocouple tube on quadrant 4 was capped in the subpile room after the thermocouple leads had been cut. This was necessary because the thermocouple tube tip under the reactor core had broken off.
Secondary System		
4-4-66	Cooling tower water supply line	A cracked flange was discovered on the 8-in. make-up water line to the cooling tower. The make-up line had to be drained to repair the flange.

Table 5. (Continued)

Date	Component	Remarks
5-2-66	Primary pump seal and motor-bearing coolant	The secondary coolant lines in the heat-exchanger cells were revised to cool the primary pump seals heat exchangers and motor bearings with water supplied upstream from secondary flow control valve FCV-377. This eliminated the dependence of the cooling flow rate on the operation of FCV-377 and FCV-377A.
5-13-66	Cooling tower	Each of the four cooling tower basin cells was emptied of water and cleaned. All scrap pieces of water diffusers that had fallen into the basin were removed and ~1/2 in. of dirt was washed off the bottom. The cell walls and floor were inspected for cracks, but none were found.
6-20-66	Control valve FCV-377	A new pneumatic controller and computer for the automatic operation of the secondary flow control valve, FCV-377, was installed.
Ventilation Systems		
6-22-66	SBHE registers	Additional registers were installed at the highest elevations of the vertical SBHE ducts in the primary heat exchanger cells. These will permit gaseous exhaust from the cells, even if the bottom registers are covered with water.
Miscellaneous		
5-24-66	Plant demineralizer	A strainer was installed in the exit line from the plant demineralizer unit. Its purpose is to keep resin out of the demineralized water storage tank.
5-24-66	Pool coolant pump	The mechanical shaft seals were replaced on pool coolant pump 9B.
5-24-66	Diesel generator	During the weekly check of diesel generator 2, a fuel leak was found in the line between the fuel filter and the fuel pump. It was necessary to replace a broken pipe elbow in the line.

Table 5. (Continued)

Date	Component	Remarks
5-26-66	Plant demineralizer	Anion and cation resin--5 cu ft of each--were added to the plant demineralizer to replace resin lost during regeneration.
5-26-66	Pool coolant pump	The mechanical shaft seals were replaced on pool coolant pump 9A. During the repair, a piece of 2 x 4-in. board ~1 ft long was found in the suction line. This had evidently been left in the system by construction forces.
6-8-66	Process waste radiation monitors	Investigation of numerous high and very high radiation alarms from the process waste monitors showed that the G-M tube had been intermittently shorting out due to oil from a leak in a nearby pump. The G-M tube was changed, the pump was repaired, and the process waste radiation monitoring system was returned to service.
6-9-66	Cooling tower fan	A burned out circuit breaker was replaced on cooling tower fan 4B-1.
6-13-66	Air compressors	The piston, piston rings, and feather valves were replaced in air compressor C-1B.
6-13-66	Cooling tower fan	A burned out circuit breaker was replaced on cooling tower fan 4A-1.
6-20-66	Pool coolant pump	A defective bearing was replaced in the motor of pool coolant pump 9B.

FUEL

The status of the HFIR fuel, target, and control-plate inventory is indicated in Table 6.

Table 6. HFIR Material Inventory

Item	This Quarter (No.)	Last Quarter (No.)
New fuel elements placed in service	1	1
New fuel elements available for use	10	5
New sets of shim plates placed in service	0	1
New sets of shim plates available for use	2	2
Plutonium target rods ready for use	31	31

A number of criticality tests was run in the reactor this quarter. A summary of the symmetric control-plate positions and core conditions of the more significant tests is presented in Table 7.

Table 7. Symmetric Control-Plate Positions and Core Conditions

Element Identification	Reactivity* in Infinite Water Reflector (%)	Symmetric Critical Position of Plates (in. withdrawn)	Target Status	Beryl- lium (Mwd)	Control Plates	
					Type	Mwd
Standard	-1.15	16.312	Dummy	0	Stan- dard	0
Standard		16.342	Dummy	0	Set No. 1	0
Standard		16.445	²⁴² Pu	0	Stan- dard	0
ORNL Production	-4.77	18.344	Dummy	0	Set No. 1	0
1-0 and 1-I	-2.49	17.605	Dummy	0	Set No. 1	0
1-0 and 1-I		18.440	Dummy	1076	Set No. 1	1076
2-0 and 3-I	-2.02	18.265	Dummy	2230	Set No. 1	2230

* Data taken from tests run in the Critical Facility.

OPERATIONAL NOTES AND SPECIAL TESTS

Poison-Injection System

A poison-injection system utilizing cadmium nitrate has been provided as an emergency backup for the normal reactor control system. It was postulated that conditions might exist which would make it impossible to move any of the shim plates. If these conditions should exist concurrent with a reactivity increase, such as by burnup of xenon on restart of the reactor, an independent shutdown mechanism would be required. The poison-injection system was designed to handle this situation.

The cadmium nitrate storage tank contains about 290 lbs of cadmium in the form of a 44 wt % solution of 800 lbs of $\text{Cd}(\text{NO}_3)_2 \cdot 4 \text{H}_2\text{O}$ dissolved in water to make ~110 gallons of solution. Automatic valves, actuated manually from the control room, control the injection of the poison solution into the system. When desired, the cadmium nitrate can be introduced at a rate of 60 gpm into the reactor primary circulating water by the pressurizer pumps.

Electrical Feeder Transfer Test

A failure of the preferred 13.8 kv feeder was simulated to determine the effects of a transfer to the alternate 13.8 kv feeder under full HFIR load. An undervoltage relay was manually actuated to simulate a power failure. Transfer to the alternate feeder occurred in ~0.2 seconds. High-speed recorders monitored the current and voltage on each feeder during the transfer. The alternate feeder accepted the load without difficulty. It was determined from the high-speed recorder charts that the initial surge on the alternate feeder was much larger than would normally occur because of the method used to simulate the preferred feeder failure.

Filter Pit Modifications and Tests

Charcoal filters with a minimum of 1 1/8-in.-thick layer of charcoal were installed in the SBHE filter pits to replace the original filters which only had 1/2-in. of charcoal. It was hoped that the additional

charcoal would improve the iodine removal efficiency of the installation. Subsequent tests indicated that the iodine-removal efficiency was satisfactory. Results of absolute DOP filter tests and charcoal filter iodine-removal tests run this quarter are listed in Tables 9 and 10.

Table 9. Absolute Filter--DOP Removal Efficiency Results^a

Filter	East Compartment	Center Compartment	West Compartment
SBHE			
First	99.945% ^b	99.990%	99.995%
Second	99.985%	99.975%	99.985%
HOG			
First	99.993%	94.000% ^c	99.980%
Second	99.982%	99.973%	99.988%

^a Minimum acceptable--99.95%.

^b This filter bank is scheduled for replacement because of excessive pressure drop and slightly low efficiency.

^c This filter will be removed for inspection.

Table 10. SBHE Charcoal Filter Iodine Removal Test Results^{*}

	East Compartment	Center Compartment	West Compartment
Elemental Iodine	3,770	3,810	20,300
Methyl Iodide	3,780	3,846	4,200

^{*} Minimum acceptable iodine decontamination factor--100.

Interaction Between Experiment Facilities and Reactor Control Ionization Chambers

An experiment was run to determine the effects on the various instrument channels of filling and draining the horizontal beam-tube-shield plugs. The reactor was maintained symmetrically critical at 10 Mw while the horizontal beam-tube-shield plugs were individually filled and then drained. Readings were made before and after filling on the "chamber add" signal, reset flux, gamma chamber signal, reset gain, and servo velocity on each instrument channel. No changes in instrument readings were observed during this test.

A similar procedure was followed while the slant engineering facility EF-2 was filled and drained. A change of ~11% was observed on the channel 1 "chamber add" signal and reset gain. This channel was affected because of the proximity of its chambers to the EF-2 tube.

DEMINERALIZER SYSTEMS

Operation of the HFIR demineralizers during this quarter is summarized in Table 10.

Table 11. Demineralizer Data: April 1 - June 30, 1966

Column	Run No.	Starting Date	Termination Date	Throughput Gallons	Specific Resistance (ohms-cm)		pH		Gross Activity (counts min ⁻¹ ml ⁻¹)	
					Influent	Effluent	Influent	Effluent	Influent	Effluent
Pool System										
Cation	1	1-24-66		3E,324,720	1.879 x 10 ⁶		5.94		52	
Anion	1	1-24-66		3E,324,720		2.147 x 10 ⁶		5.97		3
Reactor System										
West Cation	1	1-26-66		26,548,040	1.206 x 10 ⁶		5.56		74,140	
West Anion	1	1-26-66		26,159,240		1.970 x 10 ⁶		5.98		244
Plant Demineralizer										
Monobed	89	3-30-66	4-6-66	21,720						
Monobed	90	4-6-66	4-14-66	20,300						
Monobed	91	4-14-66	4-23-66	23,220						
Monobed	92	4-23-66	4-29-66	13,320						
Monobed	93	4-29-66	5-2-66	18,830						
Monobed	94	5-2-66	5-10-66	16,250						
Monobed	95	5-10-66	5-13-66	20,030						
Monobed	96	5-13-66	5-14-66	20,560						
Monobed	97	5-14-66	5-21-66	17,730						
Monobed	98	5-21-66	5-26-66	3,050*						
Monobed	99	5-26-66	6-9-66	25,370						
Monobed	100	6-9-66	6-21-66	21,550						
Monobed	101	6-21-66								

* Run terminated early to inspect unit and add 5 ft³ of anion and 5 ft³ of cation resin.

DISTRIBUTION

- 1-3. DTIE, OR
4. M. J. Skinner
5. Argonne National Laboratory