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N - REACTOR DEPARTMENT

MONTHLY REPORT

FEBRUARY

1964

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HANFORD ATOMIC PRODUCTS OPERATION

RICHLAND, WASHINGTON

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N-REACTOR DEPARTMENT

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Verified By PM Eck 9-2-92

MONTHLY REPORT -- FEBRUARY, 1964

Compiled by N-Reactor Department

March 9, 1964 - Richland, Washington

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Work performed under Contract No. AT(45-1)-1350 between the Atomic Energy Commission and General Electric Company.

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N REACTOR FUELS

Production

A total of 72 outer billets and no inner billets were extruded during the month, representing 15.4 tons at 43 per cent of forecast. The low input production reflects the combined effect of the billet shortage and the quality problems from outer tube extrusions. By month end, billet shipments were sufficient to meet the scheduled extrusion rates and sufficient improvement obtained in the dimpling problem to permit normal extrusion rates during March.

A considerable imbalance of inner and outer tubes at final assembly resulted in a significant reduction of finished assemblies to storage. Currently, the imbalance consists of a shortage of approximately 250 outer extrusions. It is expected that input production during March will consist entirely of outer extrusions.

Uranium utilization for February was 73.6 and for calendar year to date 74.1. During February, 100 per cent of the first load had been certified acceptable for reactor charging. Three hundred and seventy-four tons, representing 19,524 assemblies, had been shipped to the reactor site by month end.

Shop Activities

The major shop problem during the month was the lost production time resulting from billet shortage and quality problems. During this low production period, nine chemical workers were loaned to Production Fuels, three maintenance craftsmen loaned to Reactor Plant and extensive maintenance work was scheduled and completed.

Engineering

Evaluation of the low casting temperature uranium produced at NLO during November and December indicates that no significant difference in metal quality between this material and standard material exists. This material is acceptable for production provided it meets the specification requirements for chemical composition and surface finish.

All braze improvement work during February was directed toward the identification and correction of process techniques which have resulted in uranium contamination of the braze material. The braze contamination frequency decreased significantly during February.

The chevron end closure welding process has been evaluated and the closure quality compares favorably with regular production material. End cap design for the 1.25 driver element has been established and procurement of parts is under way.

The dimpling problem of outer tubes has been significantly reduced from a reject rate of 50 per cent in January to an average of eight to ten per cent by month end. The primary cause of dimpling has been identified as inadequate lubrication of the inner copper and mandrel combination. Procedures have been established to assure proper lubrication.

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RESEARCH AND ENGINEERING

A study, HW-80945, was completed which presented production data and average per cent Pu-240 for a co-producer fuel element at varying exposures.

A study, HW-80867, was completed which evaluated the various alternate polonium-210 process possibilities in terms of costs, time requirements, and probable success. This study concludes that the most economical method of producing polonium involves the irradiation of bismuth trioxide in a specially designed reactor channel in the N Reactor, with periodic removal of the polonium by transferring it as a vapor to a cold finger. Projected unit costs are less than \$1,000 per gram of polonium at reactor discharge.

A review of the results obtained during the physics startup tests indicates that the values assumed for k_{00} , or the migration area, or both, are somewhat different than the actual values.

The checkout of the new analogue computer facility has been completed and the results of the reactor kinetics associated with cold water injection are being analyzed. The secondary coolant system for the N Reactor is being programmed on this computer.

Thirteen 26" co-producer fuel elements were charged in the KER facility as a pilot test in preparation for the 36 tube co-producer demonstration test scheduled for N Reactor charging during late summer. Current exposure is 200 MWD/T. Goal exposure is 1400 MWD/T to be reached about July 1.

The swelling experienced by N fuel tubes (both inners and outers) receiving exposures ranging from 740 MWD/T to 3070 MWD/T fell within predicted values. The swelling incurred by six inner tubes made from uranium containing 168 ppm phosphorus could not be distinguished from that incurred by control elements which contained less than 35 ppm of phosphorus.

The equipment necessary to induction heat N fuel tubes (inners or outers) to 1800 F is being assembled in the Radiometallurgy facility. The completed system will allow capability for water quenching of the N fuel element under conditions which would exist during emergency raw water operation in order to determine the fuel integrity under such conditions.

N REACTOR PROJECT

Reports have been issued on the performance history and the steam load requirements of the 184-N standby boiler. The desirability of maintaining the design-rated capacity of 575,000 lb/hr. has been re-affirmed.

Studies have been made of the modifications necessary to maintain proper temperature control of the stored water in the emergency raw water storage tank.

Design modifications have been completed for providing two separate injection systems, ammonium hydroxide and lithium hydroxide, for independent pH control of the primary and graphite cooling loops.

Design modifications are being actively pursued in converting a process tube channel into a test hole for monitoring moderator graphite samples. Design activity is also being directed to a subsequent conversion of one rod channel and one ball channel for this use.

With the installation of the RV-2 valves, construction work in the 105-N Building has essentially been completed except for miscellaneous punch list work items.

Contractor testing has essentially been completed on all the Bailey Meter Systems such that operational testing of the secondary system can now be initiated.

All preparatory work required prior to the sixth cell tie-in outage has been essentially completed.

Considerable testing of the primary coolant system has been completed, including the operation of four primary pumps at rated speeds.

Steam generator unit 4A, which is affected by extensive intergranular corrosion throughout the stainless steel tube lengths, is now being readied for installation of new inconel tubing. Installation of the new tubing is scheduled to begin the first part of May, 1964 and to be completed by August 15, 1964.

A decision is pending regarding the need to chemically clean the primary loop. Because of extensive lead time prior to chemical cleaning, considerable emphasis and priority have been assigned to preparation of the procedure for chemical cleaning, establishment of a contract, for consultation, and to order the chemicals.

Recommendations were recently made by our Audit Group which would provide increased reliability of key reactor control circuits. Delineation of these revisions and procurement of required material has been expedited to allow revisions to be completed prior to low power demonstration.

The main bus A supply circuit breaker, 400 ampere rating, has tripped off a number of times in the past for no apparent reason. In following up on this problem, it was discovered that the 200 ampere circuit breaker which supplies the Bailey load was overloaded and local heating was evident. To reduce the load on the 200 ampere circuit, another circuit breaker of 150 ampere rating was placed in parallel.

N REACTOR PLANT

Full reactor fuel loading and zero power cold physics tests began February 9. Full reactor loading was completed February 15 and full reactor zero power cold physics tests were completed on February 21.

Full reactor zero power hot physics tests and primary reactor coolant system tests began February 26 and were in progress at month end.

Extensive standby boiler testing was carried out during February to set the automatic boiler control system and to gather operating data for the vendor. The boiler was shut down from February 5 to February 8 because of three small leaks in tubes where they join the steam drum and one slight leak in the plug used to seal off a

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tube that was out of service. During this outage, modification and inspection of steam drum internals was completed. On February 17 the boiler was shut down at the vendor's request for further steam drum modifications.

Failure of a mercury switch relay in the rod control circuit necessitated a modification of the circuit design to increase operating reliability. A temporary modification to test a replacement relay was in progress at month end to develop a permanent modification.

Cell 4 has been isolated from the primary loop in preparation for heatup testing.

Major portions but not all of the 109 secondary system piping have been filled and water quality control established.

Water was inadvertently admitted to the secondary side of the steam generators in Cells 1, 2, 3, and 5. All units were drained, given a demineralized water washdown, and returned to dry layup condition.

The total NPR testing program is 51.4 per cent complete.

PERSONNEL STATISTICS

Number of employees as of January 31, 1964 638
Number of employees as of February 29, 1964 640

	<u>Exempt</u>	<u>Nonexempt</u>	<u>Total</u>
General	2	2	4
Finance	15	8	23
N Reactor Fuels	59	108	167
Research and Engineering	49	9	58
N Reactor Plant	63	215	278
N Reactor Project	<u>86</u>	<u>24</u>	<u>110</u>
Total	<u>274</u>	<u>366</u>	<u>640</u>

Employment

Additions	1	9	10
Reductions	<u>2</u>	<u>6</u>	<u>8</u>
Net Additions	<u>-1</u>	<u>3</u>	<u>2</u>

SAFETY AND SECURITY

Days without a disabling injury 456
Hours worked without a disabling injury 1,428,260
Medical treatment injuries (February) 23

SUGGESTION PLAN PARTICIPATION

	<u>January</u>	<u>February</u>	<u>CY 1964 to Date</u>
Number of eligible employees	363	368	365
Number of suggestions received	36	32	68
Number of Suggestions acted upon	41	46	87
Number of suggestions adopted	17	18	35
Net annual savings	\$ 106,228	\$ 2,402	\$ 108,630
Amount of awards	\$ 3,260	\$ 425	\$ 3,685
Per cent of awards to savings	3.1	17.7	3.4
Average amount of awards	\$ 191.76	\$ 23.61	\$ 105.29

PATENT SUMMARY - FEBRUARY, 1964

All persons engaged in work that might reasonably be expected to result in inventions, or discoveries, advise that, to the best of their knowledge and belief, no inventions or discoveries were made in the course of their work during February except as noted below. Such persons further advise that, for the period therein covered by this report, notebook records, if any, kept in the course of their work have been examined for possible inventions or discoveries.

HWIR-1695, "A Means for Combining Wrenching and Restraining within a Single Tool," by J. H. Fastabend, dated January 21, 1964.

HWIR-1684, "Gaging Device, A Device to Measure Length of a Sleeve in a Hole from One End Quickly and Accurately," by H. J. Bellarts, dated February 4, 1964.

STAFF

General Manager	R. L. Dickeman
Manager, Employee Relations	C. O. Steinnagel
Manager, Finance	J. Milne
Manager, N Reactor Fuels	L. M. Loeb
Manager, N Reactor Plant	W. M. Mathis
Manager, N Reactor Project	J. S. McMahon
Manager, Research and Engineering	M. C. Leverett

RL Dickeman
General Manager
N-Reactor Department

RL Dickeman:pw

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N-REACTOR FUELS OPERATION
FEBRUARY, 1964

I. PRODUCTION STATISTICS

		<u>Current Month</u>	<u>CYTD</u>	
1. <u>Input (extrusions)</u>				
.947% Enriched Outer		72	104	
.947% Enriched Inner		<u>0</u>	<u>260</u>	
Total Extrusions		72	364	
Total Tons		15.4	59.7	
% of Forecast		43%	73%	
2. <u>Output (Finished Production)</u>				
.947% Enriched Assemblies	24"	720	1548	
	18"	144	684	
	12"	<u>0</u>	<u>144</u>	
Total Assemblies		864	2376	
Total Tons		16.7	43.2	
% of Forecast		70%	88%	
3. <u>Month End Inventory</u>				
<u>Finished Inventory</u>	<u>300 Area</u>	<u>100-N Area</u>	<u>Total</u>	
.947% Enriched Assemblies	24"	612	45	657
	18"	252	109	361
	12"	<u>324</u>	<u>80</u>	<u>404</u>
Total Assemblies		1188	234	1422
Total Tons		19.5	3.4	22.9
<u>Bare Inventory</u>				
.947% Enriched Outer	68	---	---	
Inner	<u>33</u>	---	---	
Total Billets	101	---	---	
Total Tons	19.3	---	---	
Natural Outer	122	---	---	
Inner	<u>105</u>	---	---	
Total Billets	227	---	---	
Total Tons	41.3	---	---	

4. Shipments to Reactor (Total First Load to Date)

.947% Enriched Assemblies 24"	15,600
18"	3,132
12"	<u>792</u>
Total Assemblies	19,524
Total Tons	373.7

5. Uranium Utilization

	<u>Current Month</u>	<u>CYTD</u>
Over-all Total	73.6	74.1

6. Production Comments

The low input production for the month reflects the combined effect of the billet shortage resulting from casting problems at NLO and the quality problems which reduced outer tube extrusions. By month end, billet shipments were sufficiently increased to meet scheduled extrusion rates, and sufficient improvement obtained in the dimpling problem to permit normal extrusion rates during March.

The imbalance between inner and outer tubes at final assembly resulted in a significant reduction of finished assemblies. The output rate was 70 per cent of forecast. It is estimated that 250 outer extrusions will be required to balance the inner tubes now in-process. Outer extrusions will continue through March with normal balance expected by April 1, 1964.

II. SHOP ACTIVITIES

1. Problems and Incidents

The major shop problem during February was the lost production time resulting from billet shortage and outer tube quality problems. To reduce the manpower inefficiencies during this low production period, nine chemical workers were loaned to Production Fuels, IPD, three maintenance craftsmen were loaned to N-Reactor and extensive maintenance work was scheduled and completed.

On February 18, 1964, a fireman locked out the 333 sprinkler system accidentally tripping the building alarm which evacuated the building. About one half hour of production time was lost. It was determined that the fireman was not completely familiar with the 333 Building and steps have been taken with the fire department to assure this situation does not recur.

On February 26, when the 2300 volt transformer was taken out of service, the braze stations were accidentally shut down too. This has been discussed with Engineering, and in the future, critical production equipment will be shut down prior to an electrical outage to protect the equipment.

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The H_2SO_4 tank was pumped dry and inspected. About six inches of sludge was found in the bottom of the tank. The tank was cleaned and modifications are being made to relocate the outlet valves eliminating the need for the operator to stand directly under the tank to operate the valves.

2. Achievements

Material held for uranium contamination in the braze up to 10,000 PPM was accepted for charging in the first load. A fully certified load was provided, meeting all reactor scheduling requirements.

Two of the braze stations were modified to install a bellows between the roughing pump and the header to remove vibration. The third station is in the process of being modified. The north wall of the chem bay, three monorails, and the safety lanes at the doors of the chem bay and other boundary areas throughout the building were painted.

Nylon roller balls were installed on the loading trays for both end welders to prevent R.F. arcing from fuels to trays. Operating procedures were changed prior to support welding which prevent the fuels from cooling to room temperature before support welding. This will increase throughput.

A functional analysis of the N-fuel was presented to Managers of N-Fuels Engineering, Research and Engineering, and Hanford Laboratories Fuel Design and Fuels Fabrication Development groups on February 11. The technical justification for each of the quality appraisal steps in the N-Fuels Quality System was discussed.

A total of three days were required with personnel from Field Surveys to reference the alignment of the extrusion press to bench marks set on the concrete foundation. Readings were taken on the vertical and horizontal alignment of the main ram and its ways, and the plateaus and its ways. Measurements were also made of column lengths and column stretch under 3000 tons of pressure. The container elevation was adjusted to improve alignment but it was not necessary to adjust column length. The measurements obtained in reference to established bench marks will be documented.

III. ENGINEERING ACTIVITIES

1. Materials

Uranium Quality: Evaluation of the low casting temperature material produced at NLO during November and December, 1963, has been completed. The test work failed to show any significant differences in metal quality between this material and "standard" material. Material cast during this period will be considered acceptable for production provided it meets the specification requirements for chemical composition and surface finish.

Uranium Fabrication

Standards for sorting the three general types of cladding variations, i.e., Wanderlust, Striations, and Streaks, by a combination of non-destructive testing and autoradiography are being prepared and will be complete by April 10, 1964. By April 17, the results of the investigation including recommendations for revised accept-reject limits will be documented.

Four 13-inch OD by 6-1/2 inch ID ingots were extruded to NOT billets using a tipped mandrel technique at Bridgeport Brass Company, Ashtabula, Ohio. Although the extrusions were successful, the extrusion pressures were higher than expected and full length warp increased from about .050 inch to .175 inch. Although these are not serious complications, they do indicate that additional work on tooling and lubrication may be necessary.

Metallography on the as-cast and beta heat treated ingots has been completed and the over-all structure of the ingot looks good. Metallography of the billets will be complete by mid-March. If billet sections are comparable to the "standard" NOE billet, an additional sixteen ingots will be cast and extruded at the earliest possible date.

Purchasing specifications, prints and requisitions for materials necessary for co-product fabrication were completed. Purchasing action on several items was delayed pending resolution of funding problems.

2. Process

Extrusion Unbonding: Six samples of NIT extrusions that failed the ID peel test were examined at 2000X. Only one of the samples appeared to be unbonded at this magnification. Two samples of "unbonded" 1.6 per cent enriched KSE-5 tubes and two samples of 1.25 per cent enriched driver tubes were also examined. None of these samples appeared to be unbonded at 2000 X. Four samples have been selected for further study using an HL electron microscope. Samples which have passed the peel test will be used as controls.

Optimize the Braze Closure Process: All braze improvement work during the month was directed toward identification and correction of process techniques which result in uranium contamination of the braze metal. Although braze contamination frequency decreased to a level comparable to last year's average, the cause for this decrease is not fully understood. Developments during the month are as follows.

- a. Based on the observations made to date, under-the-cap metal flow is considered to be the main cause of ID weld contamination in inner tubes.
- b. Sections of cladding from 34 fuels from four different extrusions were cut off during pre-braze etch and autoradiographed to detect uranium on the clad surface. Two

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of these clad sections showed very slight uranium contamination. In addition, 17 samples from two extrusions which had a high incidence of braze contamination were chemical milled, pre-braze etched, and autoradiographed. All cladding samples showed slight OD contamination, but NO ID contamination. The braze contamination on the original brazes made on these pieces was all on the ID weld.

Although residual clad contamination does not appear to be a primary cause, a PWR is being run to check this out. A double chem mill-pre-braze etch sequence has been developed which insures more complete uranium removal and enough material will be run to define the influence of clad contamination on the braze contamination problem.

Outer Support Improvement: Initial strength tests on .050 inch thick supports for the NOE fuel showed that a 50 per cent improvement in strength as measured by permanent deflection under 70 pounds and 400 pound static loads can be expected from the increase in thickness from .040 to .050 inch. Original calculations and test work had indicated a higher strength gain (100%) should be obtained. All the significant variables which could affect strength, i.e., bend radii, crown length, transverse crown radii, and welding process are being rechecked to determine why the observed gain is so much lower than expected and to correct any conditions which are contributing to this apparent loss in strength.

Chevron End Closure Development (Driver Tube): The end closure welding process has been evaluated and the closure quality compares favorably with that achieved on regular production. However, penetration on the inner weld is near the minimum desired and the welding cycle will be revised to provide deeper penetration on the inner weld.

End cap design for the 1.25 driver fuel elements has been established and procurement of parts is under way.

Driver Tube Extrusion Development

Two zircaloy extrusions were made in support of the co-product production test work.

Two tipped mandrel extrusions were made in which a standard NOE billet was extruded to driver tube size. Both extrusions were satisfactory at the extrusion operation. Evaluation of the product is currently under way.

Two sleeved billets were extruded without using the zircaloy sub-assembly technique. The outer copper sleeve ruptured on the front end exposing bare zircaloy and uranium. The copper blistered heavily. Evaluation is not complete.

Two uranium primary extrusions were provided to provide additional stock for non-sleeved billets.

Ten driver tube extrusions were completed on February 28, 1964. All ten extrusions were zircaloy subassemblies, five with 1/4-inch end plates and five with 1/8-inch end plates. Four were solid uranium billets and six were sleeved billets. This material will be used to pilot the driver tube fabrication process.

Outer Tube Inner Clad Dimpling Defects: The dimple defect rate was reduced from a high of about 50 per cent in late January to an average of about 8 to 10 per cent by month end. The primary cause of dimpling has been identified as inadequate lubrication of the inner copper and mandrel combination. To assure proper lubrication, the following procedure will be followed: Close monitoring of the lubrication processes and materials; continued use of the new lubricant and lower billet temperatures to check for significant differences in clad variation; continued work with lubricant vendors to develop testing techniques to assure proper lubricant properties.

Nuclear Safety: The Nuclear Safety Specifications for the 333 Building are being circulated for approval. C. L. Brown has been requested to obtain the basic information required for a nuclear safety review of 1.95 per cent and 3.0 per cent driver fuel elements. A preliminary review of the pilot plant for these enrichments should be made by March 6.

3. Equipment and Maintenance Engineering

A new billet unloading device was installed at the extrusion loading station. This device will reduce the potential for damage to the extrusion billet during the loading operation. The equipment operated satisfactorily and was turned over to Shop Operations. The bids for the new tool preheat furnace were received, reviewed, and returned to the buyer for initiating procurement.

In order to reduce the variables inherent in the braze equipment, several design improvements are being considered. To date, new fuel centering flanges have been fabricated. These flanges will improve the alignment of the fuel piece during brazing. In addition, modifications of the carriage guide rail assembly and indexing device is under way. This modification will improve the alignment of work piece and coil.

Specifications for a new leak detector were prepared and the purchase requisition issued. The design for the test stand was completed in check print form. An appropriation request for capital funds was prepared and approved.

Preliminary testing of both the parting and counterboring operations has been completed. Mechanical milling of end closure recesses can be accomplished using carbide insert tools. A detailed report of this work will be issued early in March.

Work is under way on preparation of appropriation requests and equipment specifications to purchase a cutoff and a counterboring machine for mechanical milling of end recesses in the production operation.

IV. TESTING METHODS OPERATION

Enrichment Tester-ERT-2: The enrichment tester is being used in the 333 Building by Quality Control personnel to measure incoming billets. Operation has been satisfactory and some valuable data should be accumulated on the current uranium supplies as the material is in a so-called "green" condition. Green uranium is recently enriched material in which the daughter products are still building up. It is necessary to know how the presence of the daughter products may affect the enrichment measurements. With accumulation of sufficient data, a good analysis will be possible.

Braze Station Operation: Fabrication of the mechanical apparatus to complete the x-ray fluorescence tester is progressing. Some difficulties have been experienced in adapting the device to test both inner and outer braze areas of both inner and outer fuel elements. This complication will necessitate the use of specially mounted crystal detectors. It is not expected that this development will delay the start of testing--tentatively set for mid-March. The equipment being constructed is well designed and should be foolproof and radiation safe for use by operating personnel.

The availability of the production testers continued at a high level with only routine maintenance problems experienced. All are performing well in spite of numerous product changes and special test set ups. The past four months record is summarized in the following table:

<u>Month</u>	<u>Hours Downtime</u>	<u>Per Cent Availability</u>
November	68.5	94.7
December	66.0	94.1
January	53.0	95.1
February	19.5	98.3

Alpha Surface Contamination Testers: The alpha counters have performed satisfactorily and have tested the backlog of questionable material and considerable amounts of current production. About 50 fuel elements have been set aside as containing uranium contamination in excess of 30,000 parts per million. Mercy runs on the alpha counters showed an improved measurement error, and further established the confidence that can be placed in the counters.

Improvement of Production Testers: Increased knowledge of cladding effects on the outside-in pulse echo bond test for internal cladding bond testing has allowed clad thickness variations to be reduced and signal to background ratios to be increased. Correlation tests are now under way to evaluate test results on a large number of AlSi fuel elements. Fifty-four "V" Fuels, rejected by present 313 lamb wave bond tests are being tested for correlation and evaluation of the new test. Autoradiographic and acid etch strip destructive tests will also be utilized in the correlation. Preliminary results indicate good reproducibility and increased sensitivity.

N-REACTOR FUELS OPERATION
FEBRUARY, 1964

TRIPS

<u>Name</u>	<u>Company</u>	<u>Contact</u>	<u>Date</u>	<u>Purpose</u>
RB Socky	James Electronic Chicago, Ill.	GW Plice	2/3	Discuss ultrasound imaging equipment and development.
	Materials Eval. Editorial Off. Chicago, Ill.	Burt Stern	2/3	Editorial modifi- cations on paper.
	CBL Industries Cleveland, O.	CF Robards	2/3	Discuss ultrasonic test of s/s tubing.
	SNT Philadelphia, Pa.		2/4-5-6	Attend Society of Non- Destructive Testing Meeting
RH Scanlon	Bridgeport Brass Ashtabula, Ohio	JF Puterbaugh	2/11-12	Participate in tipped mandrel extrusion dis- cussions.
	Nat'l. Lead of O. Fernald, Ohio.	J Blaisdell	2/13-14	Discuss physical test programs
TB Correy TD Naylor	Sciaky Bros Chicago, Ill.	WJ Farrell	2/24	Discuss welding techniques.
	Battelle Mem.Inst. Columbus, Ohio	F. Shober RE Monroe	2/25	Discuss welding techniques.
	Nuclear Mat'l. Equip. Corp. Apollo, Pa.	Dr.LL Pepkowitz	2/26	Discuss welding techniques.
	Linde Co. Newark, N. J.	W Helmbrecht	2/27	Discuss welding techniques.
	Int. Inst. Welding New York, New York	EA Fenton	2/28	Discuss welding techniques.
	Union Carbide Dev. New York, New York	Dr. J Eversole Norman Davis	2/28	Discuss welding techniques.
	Air Reduction Co. Plainville, Conn.	R Tuthill	3/2	Discuss welding techniques.
	Electron Beam Techniques Co. Boston, Mass.	Joe Jenkins	3/3	Discuss welding techniques.

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<u>Name</u>	<u>Company</u>	<u>Contact</u>	<u>Date</u>	<u>Purpose</u>
TB Correy	Nuclear Metals Boston, Mass.		3/4	Discuss welding techniques.
TD Naylor	Nat'l. Of O. Fernald, Ohio	PN McCreery	3/3-4	Discuss uranium procurement, etc.

VISITORS

W Piper	Brush Beryllium Cleveland, Ohio	HP Kraemer	2/5	Discuss braze ring pro- duction.
C Hoeline	Bridgeport Brass Riverside, Calif.	HP Kraemer	2/18	Discuss zircaloy cladding.
R Graham	Wah Chang Albany, Ore.	HP Kraemer	2/19	Discuss zircaloy strip & end caps.
C Barron	Rem, Inc. Portland, Ore.	HP Kraemer	2/19	Discuss zircaloy strip & end caps.
AJ Offer AD McEacheron	Canada	RB Socky	2/19	Discuss zirconium hydriding.

ORGANIZATION AND PERSONNELAdditions

	<u>From</u>	<u>To</u>	<u>Date</u>
Z. L. Elliott	HAPO Management	Testing Methods	2/17
B. R. Kent	Hanford Labs	N-Reactor Fuels	2/10
J. C. Jochen	IPD	N-Fuels Engineering	2/10

Deletions

G. J. Baker	Testing Methods	Research & Engineering	2/17
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Moves

C. A. Edwards	Quality Measurement	Process Control	2/24
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The following Chemical Workers moved to IPD, Production Fuels, on temporary loan:

C. V. Maberry	2/17
M. F. Tschauner	

SAFETYInjury Statistics

	<u>Current Month</u>	<u>CYTD</u>
Disabling injuries	0	0
Medical treatment injuries	5	10

The fire alarm in 333 Building was accidentally tripped by a foreman on 2/18/64 while working on the sprinkler system.

The new Nuclear Safety Specifications for 333 Building were prepared and are being circulated for approval.

<u>SECURITY</u>	<u>Current Month</u>	<u>CYTD</u>
Security Violations	2	2

EMPLOYEE RELATIONS

Suggestions	
Number submitted	20
Number adopted	7
Total awards	\$ 305.00
Total savings	\$2,202.00

Grievances
None

INVENTIONS

All persons engaged in work that might reasonably be expected to result in inventions or discoveries advise that to the best of their knowledge and belief, no inventions or discoveries were made in the course of their work during February, 1964, except as noted below. Such persons further advise that for the period therein covered by this report, notebook records, if any, kept in the course of their work have been examined for possible inventions or discoveries.

SIGNIFICANT REPORTS

<u>HW Number</u>	<u>Classification</u>	<u>Author</u>	<u>Date</u>	<u>Title</u>
HW-80646	Confidential	JW Nickolaus	1/30/64	Monthly Activity Report, N-Fuels Engineering, Jan., 1964.
HW-80402RD	Unclassified	CH Shaw	2/1/64	Loewy Hydropress 2750 Ton (Midge) Extrusion Press Operation
Und.	Confidential	WA Hendricksen	2/13/64	Fabrication of the Driver Fuel Elements for the Co-Product Test Assemblies
HW-80807	Confidential	CH Shaw	2/15/64	Braze End Closures Uranium Contamination-Analysis Procedures and Concentration Levels
Und.	Confidential	RG Curran	2/17/64	Summary-Outer Tube Dimple Problem

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<u>HW-Number</u>	<u>Classification</u>	<u>Author</u>	<u>Date</u>	<u>Title</u>
HW-80637	Confidential-U	BD Hopkins	2/6/64	Effect of Chemical Milling Parameters on Milled Surface Variation
HW-80879	Secret	RR Studer	2/17/64	Specifications for Aluminum- Lithium Alloy Rods
HW-80954	Confidential	TD Naylor for LM Loeb	2/20/64	Dimensional Change-1.25% Enriched N-Reactor Billets Revisions to the Specifications for Uranium Metal Billets for N-Reactor Fuel Elements
Und.	Unclassified	DH Walker	2/20/64	Measurement Error Analysis 333 Building Alpha Counters
Und.	Unclassified	DH Walker	2/20/64	Measurement Error Report - NLO Billet Dimension Precision Check
HW-81012	Unclassified	WW Arnold	2/24/64	Strength Test of the Loewy Hydropress Hydraulic Piping
Und.	Confidential	JE Hansen	2/27/64	Feasibility Report -Machining for End Closures
Und.		WR Krehbiel	2/27/64	Summary Report - Audit of Fuel Loading

Manager

N-Reactor Fuels

LM Loeb:bk

RESEARCH AND ENGINEERING

1. ADVANCE TECHNOLOGY

A review of N-Reactor Department's O2 programs was presented to representatives of the Division of Production, Washington AEC, February 27, 1964. Highlighted were the Department's progress to date for FY-1964 and major objectives of the FY-1965 O2 program.

A study, HW-80945, was completed which presented production data and average percent Pu-240 for a co-producer fuel element at varying exposure. In addition, the quantities of plutonium with specified Pu-240 content that could be obtained by segregation from a co-producer fuel element at exposures of 1700 MWD/T and 2100 MWD/T were determined.

A study, HW-80867, was completed which evaluated the various alternate polonium-210 process possibilities in terms of costs, time requirements, and probable success. A major finding of the study was that potentially, the most economical method for producing polonium involves the irradiation of bismuth trioxide in a specially designed reactor channel in the N-Reactor, with periodic removal of the polonium by transferring it as a vapor to a cold finger. Projected unit costs are less than \$1,000 per gram of polonium at reactor discharge.

2. REACTOR PHYSICS

The Flex 3 computer code is being developed to handle studies of the higher plutonium isotopes. Additional work requirements for the development of this code are about one man-month. Computer runs have been made to estimate production runs and product splits for the fuel element design which will be used in the second co-producer production test.

Using basic burnout and reactivity behavior data calculated by Hanford Laboratories, preliminary fuel cycle data were prepared for use in making an economics evaluation of the different Pu fuel designs under study.

A review of the results obtained during the physics startup tests has been in progress during the month. The present knowledge of several of the parameters is discussed below.

The buckling quantity measured at startup has a value of approximately 100 μb . This is 12 μb smaller than the predicted value which was based upon a migration area of 646 cm^2 and a k_∞ of 1.072. Because the buckling is a function of both quantities, the difference in the buckling indicates that either the assumed value of k_∞ , or of migration area, or both, is somewhat different than the actual values.

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The migration area is also a quantity which was measured at startup. The measurements are much less sensitive than the measurements of buckling and may be susceptible to systematic error. The tentative value obtained is approximately 560 cm². A reasonable, but rather arbitrary, assignment of the uncertainty in this value is ± 60 cm². Although the value of 560 cm² appears to be rather low a symmetric uncertainty is assigned because the magnitude of any systematic errors is unknown.

The value of k_{∞} can be inferred from the startup results, but is not a quantity directly measured during startup. The value of k_{∞} consistent with a buckling of 100 μ b and a migration area of 560 cm² is $k_{\infty} = 1.056$. Recent measurements in the PCTR⁽¹⁾ in which zirconium process tube and cladding were substituted for mockup aluminum components indicate that the predicted value of $k_{\infty} = 1.072$ should be corrected downward by approximately 0.008 to account for what is probably resonance absorption in the zirconium lattice components. Thus, on the basis of knowledge presently available, the predicted value of k_{∞} would be reduced to $k_{\infty} = 1.064$. This is within 8 mk of the value of $k_{\infty} = 1.056$, based upon a buckling of 100 μ b and a migration area of 560 cm².

The best values at the present time of k_{∞} and M^2 would appear to be: $k_{\infty} = 1.056$ and $M^2 = 560$ cm². These values are consistent with the measured buckling of 100 μ b obtained from the startup tests.

3. REACTOR ENGINEERING

A 7090 computer program has been prepared for use in checking co-producing fuel designs for compliance with thermal hydraulic burn-out heat flux criteria. This program will facilitate screening the relatively large number of designs that will come from the Flex 3 Program for optimization studies.

The statement on p. C-2 of the December 1963 Record Report (HW-80111 C) regarding calculations on the flow-pressure drop relationship for the Circulating Raw Water System was incomplete. It was pointed out there that it may be necessary to throttle the dump condenser raw water flow to achieve proper pump operation and suppress boiling in the dump condenser tubes. It should have been added that this in no way adversely affects operation or safety of the reactor. Conceivably throttling the valves could at some future time lead to cavitation in them with resultant corrosion. This however can be detected in advance, and practical remedies for it are available if needed.

(1) HW-80731, "Measured Differences in K Between the N-Lattice and the PCTR Mockup," L. C. Davenport, February 10, 1964.

4. PROCESS EVALUATION AND CONTROL

Thirty-five process standards are required for Startup Test N-2. Fifteen standards have been approved; 14 others have been prepared and are routine for comments. The work is estimated to be about 82 percent complete. Twelve Process Change Authorizations were issued during the month.

The reactor was fully loaded with fuel on February 15, 1964. Horizontal rod calibration tests with the fully loaded reactor were completed and the nuclear chambers relocated for the hot physics tests on February 21. Physics testing was then stopped until February 26, at which time the hot physics testing was resumed. At month's end, the combined temperature coefficients of reactivity were measured at temperatures up to 280 F. The combined reactivity coefficient measured to this temperature is negative as predicted and is not significantly different in magnitude than predicted. Testing was suspended at 280 F because of a suspected leak in the primary cooling loop. Further tests to higher temperatures are programmed when the reactor again becomes available for nuclear testing.

The physics testing so far has shown that the control rod effectiveness is slightly less than predicted. The decrease in effectiveness is, however, small enough that the rod system is still entirely adequate to control the reactor under worst case hypothetical accident conditions, since the excess reactivity of the reactor was, as elsewhere stated, somewhat less than predicted.

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5. CONTROLS, INSTRUMENTS, AND SYSTEMS ANALYSIS

The specifications for the closed circuit TV system, which will be used as part of the process tube monitoring equipment, are still being processed in AEC Purchasing. Specifications and purchase requests have also been submitted for recording, instrumentation, drive unit, cabling and optical equipment. Design layout is continuing on the camera front end section, the drive unit, and on the control console. Development efforts are continuing on the hydride probe.

The four-node model of the reactor kinetics, which has been programmed on the analogue computer, has been utilized to study the effects of cold water injection and to provide information on zone temperature monitoring trip levels. The results are now being analyzed.

The checkout of the new analog facility has been completed. The secondary coolant system is being programmed on the computer.

The calibration procedure for the fuel rupture monitor system has been completed and is being issued as a joint effort with Process Design. Calibration and operational tests of the system continue.

A detailed review of the various control systems applied to the heat dissipation system has been initiated with the primary goal of assuring proper operation during and following single-event system failures.

6. CHEMISTRY AND METALLURGY

KER Loop 1 has been operating at pH 10 using ammonia for pH control. During the KE Reactor outage in January, KER-1 was decontaminated to determine the amount of crud formed in the carbon steel system when ammonia is used for pH control. No crud was observed. Irradiation of the stainless steel clad UO₂ fuel elements and the four NIE-1 fuel elements in this loop continued.

During the KE Reactor extended outage a thorium uranium crud monitor element was charged in KER-2 for approximately one month's irradiation. The crud monitor thermocouple train has performed without difficulty. This test will be terminated in March 1964. Irradiation of the four NIE-1 heater elements with unbonded closures and the three co-producer target elements, previously charged into this loop, continued.

Thirteen 26-inch co-producer test elements were charged in KER-4 during the outage early in February. Because of loop operating problems these elements were transferred to KER-3 replacing the "first load" N fuel element assemblies (NAE-1) and the crud monitor charge that had been scheduled for irradiation in KER-3. The co-producer test elements consist of a tubular 1.25% enriched, uranium driver, coextrusion clad with Zr-2 and the target rod nested inside the driver. The target core is Al-0.6% Li (enriched 65%) canned in aluminum and recanned in Zr-2. This

element is nearly identical to the element which will be used in the 36-tube co-producer demonstration test scheduled for charge in N-Reactor in the late summer of this year. The purpose of this loop test is to pilot the large scale test. Goal exposure is 1400 MWD/T to be reached about July 1. The power level of this column of co-producer elements as measured by flow and temperature rise measurements is as predicted by the design program. The current exposure is 200 MWD/T.

The third test of NAE's was discharged from KER-3 on January 23. In the previous report, the tube average exposure was estimated to be 2120 MWD/T; this value was in error and should be 1975 MWD/T.

The exposure and swelling of the elements has been measured and is reported in the following table.

TABLE I
SWELLING AND EXPOSURE, TEST K-3-18, 1975 MWD/T TUBE
AVERAGE EXPOSURE

Position In Charge (No.)	Inner Tubes		Outer Tubes	
	Exposure (MWD/T)	Swelling (V/o)	Exposure (MWD/T)	Swelling (V/o)
1 Upstream	1185	0.28	1490	0.44
2	1395	0.28	1760	0.76
3	1660	0.34	2090	0.82
4	2020	0.59	2545	1.39
5	2225	1.32	2800	2.12
6	2435	1.17	3070	3.64
7	2385	1.26	3005	3.30
8	2000	1.24	2520	2.78
9	1935	0.62	2435	2.00
10	1540	0.39	1940	0.69
11	1305	0.34	1640	0.67
12	1050	0.22	1320	0.55
13 Downstream	740	0.03	935	0.43

The above swelling data contain two firsts for "first load" N fuel (NAE) irradiations, namely:

- (1) The inner elements in the fifth through the eighth positions are the first to show swelling values greater than 1.0 v/o. These values are consistent with the high exposures that were obtained.
- (2) Similarly, the high exposures attained by the outer elements in the sixth through the eighth position resulted in the first swelling values greater than 2.5 v/o.

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The fourth test of NAE's was discharged from KER-4 on January 24. The tube average exposure for this charge was 1585 MWD/T and the exposure and swelling of the elements is shown in the following table.

TABLE II

SWELLING AND EXPOSURE, TEST K-4-15, 1585 MWD/T TUBE
AVERAGE EXPOSURE

<u>Position In</u> <u>Charge</u> <u>(No.)</u>	<u>Inner Tubes</u>		<u>Outer Tubes</u>	
	<u>Exposure</u> <u>(MWD/T)</u>	<u>Swelling</u> <u>(V/o)</u>	<u>Exposure</u> <u>(MWD/T)</u>	<u>Swelling</u> <u>(V/o)</u>
1 Upstream	730	0.00	910	0.41
2	1010	0.18	1270	0.56
3	1200	0.46	1510	0.67
4	1350	0.74	1730	0.65
5	1570	0.45	2050	0.70
6	1790	0.65	2160	1.34
7	1920	0.65	2430	2.31
8	1960	0.83	2530	2.55
9	1830	0.71	2310	1.21
10	1580	0.45	2020	1.08
11	1280	0.55	1525	0.64
12	1070	0.15	1360	0.46
13	920	0.20	1150	0.53
14 Downstream	680	0.06	850	0.38

Six of the inner tubes in this charge were made from uranium metal containing 168 ppm phosphorus and the remainder of the inner tubes were from uranium containing less than 35 ppm phosphorus. The swelling incurred by the phosphorus-containing inner tubes cannot be distinguished from that incurred by the control elements and other inner elements. One therefore concludes from this evidence that phosphorus at this level has not increased the risk of failure from swelling.

Equipment necessary to induction heat either an inner fuel element or an outer fuel element to 1800 F is being assembled in the Radiometallurgy Building. The system includes the capability of water quenching the fuel elements under simulated flow conditions of the emergency raw water system in order to determine fuel element integrity under dump conditions.

SIGNIFICANT REPORTS ISSUED

HW-80945, "The Production of Plutonium with High Pu-240 and a Co-Product in N-Reactor," R. L. Dickeman, February 20, 1964 (Secret).

- HW-80867, "Alternative Production Methods for Polonium 210," R. E. Tomlinson, et al, February 14, 1964 (Confidential-Unclassified).
- HW-80893 Rev 1, "Interim Limits for Primary Pump Operation," R. H. Shoemaker, January 30, 1964 (Unclassified).
- HW-80937, "Fission Product Formation in Fuel Elements," R. J. Shields, February 2, 1964 (Secret).
- HW-78733, "Analysis and Evaluation of the Zone Temperature Monitor System," L. D. Philipp, February 6, 1964 (Unclassified).
- HW-80643, "Estimated Distances for Exclusion Area and Low Population Zone Boundaries, N-Reactor," E. C. Watson, R. E. Trumble and R. L. Junkins, February 3, 1964 (Secret).
- HW-80782, "N-Reactor Hazards Summary Report, Supplement No. 6, Answers to Questions," Edited by R. E. Trumble, February 11, 1964 (Confidential).

PERSONNEL CHANGES

G. J. (Georgia) Baker joined the Reactor Physics Subsection as Secretary effective February 17, 1964.

TRIPS

<u>Name</u>	<u>Destination</u>	<u>Date</u>	<u>Purpose</u>
J. W. Hagan	Nuclear Material and Propulsion Operation, GE Cincinnati, Ohio	2/12-14/64	Interviews
B. S. Kosut	ASTM Meeting, Philadelphia, Pa.	2/3-7/64	
A. E. Guay	Bridgeport Brass Co. Ashtabula, Ohio	2/12/64	Primary extrusion uranium
	National Lead Co. Fernald, Ohio	2/13/64	Feed material technology
D. H. Curtiss	Wolverine Tube Co., Detroit, Michigan; Reactive Metals, Niles, Ohio; Harvey Aluminum, and Bridgeport Brass Co., Los Angeles, California	2/26 through 3/3/64	Status of Zircaloy tubing technology

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VISITORS

<u>Name</u>	<u>Affiliation</u>	<u>Date</u>	<u>Purpose</u>
G. Brooks	AECL	2/6/64	Reactor confinement
W. R. Kanne	APED - San Jose	2/11/64	Physics tests
J. Switack R. B. Croe C. Kostner	Thiokol Corp.	2/13/64	Steam generators
E. F. Miller	Div. of Production AEC, Washington	2/17-18/64	Physics tests and confinement system
W. T. Ayres	Elliott Company	2/18/64	Drive turbine operating procedures
E. E. Lindros	Byron Jackson Pumps, Inc.	2/26/64	Review of pump operation
O. Giles	Borg Warner Corp.	2/26/64	Pump seal design and operation

SECURITY VIOLATIONS

None

INVENTIONS

All Research and Engineering personnel engaged in work that might reasonably be expected to result in inventions or discoveries advise that to the best of their knowledge and belief, no inventions or discoveries were made in the course of their work during February, 1964. Such persons further advise that for the period herein covered by this report, notebook records, if any, kept in the course of their work have been examined for possible inventions or discoveries.

McLeverett

Manager
Research and Engineering

MC Leverett:LCC:vb

N-REACTOR PROJECTPROCESS DESIGN OPERATIONProject CAI-816Standby Boiler

Reports have been issued concerning the performance history and the steam load requirements of the 184-N standby boiler. It has been concluded that the over-all steam needs of the 100-N plant are most effectively met by the design-rated boiler capacity of 575,000 lb/hr. It has also been determined that the total steam demand load could be reduced to about 450,000 lb/hr, but this would cause some reduction in flexibility and economy of plant operation. An engineering evaluation of the boiler is still in progress.

ERWS Storage Tank

Operational testing of the emergency raw water storage tank heating system has revealed that the design temperature criteria cannot be met under all conditions. It was determined through design review that additional steam heating coils and automatic control of steam flow are required to heat the stored emergency water to 120F within two days in any weather and maintain it between 120F and 150F. It was also determined that a baffling arrangement in the storage tank is required so that the incoming cold water from the low-lift river pumps (automatically brought to full speed by a reactor scram signal) will not unnecessarily mix with or displace the tempered water in the tank to the overflow drain. Also, a feasibility study has been made of additional modifications that would be required to eliminate the necessity of relying upon operator action at every scram to reduce the low-lift pump speed and maintain the required water temperature in the tank. Work on this problem is continuing in the direction of defining the specific design changes that are necessary.

High-Speed Recording of Emergency Cooling System Data

Special instrumentation has been installed and all auxiliary work has been completed for high-speed data recording during primary loop dump tests, requiring emergency depressurization of the primary loop and transition from circulating to once-through flow conditions.

Primary Pump Mechanical Seals

In addition to the recently accomplished modification which provided strainers in the primary pump injection seal water lines, an automatic back-pressure control valve and a leakage flow detector and alarm have been incorporated in the mechanical seal drain lines. A flow of seal water below the minimum will indicate that insufficient lubricating water is passing between the mechanical seal faces, and an excessive flow will indicate that the mechanical seal faces are damaged.

Coolant pH Control

Recently a project scope revision was approved to confirm action that had already been taken in changing the chemical injection for pH control of the primary loop from lithium hydroxide to ammonium hydroxide. The reason for the change was to protect against the possibility of hydriding of the zirconium process tubes due to potential deposition of lithium hydroxide. The reason for not making this change also in the graphite cooling loop was to protect against the possibility of ammonia stress cracking of the copper sensing lines in that system. The design has been completed, modifying and augmenting the original injection system to provide two separate systems for independent pH control of the primary and graphite cooling loops.

Process Tube Flow Monitor

The process tube flow monitor was placed in initial service after completion of the transducer calibration and installation of the additional 420-cycle load centers. Operational and maintenance procedures are being checked out before actual placement of the monitor in the reactor safety circuit is required. The 1,004 controllers with their 4,016 amplifiers have accumulated 4,000 operating hours. This represents 4,000,000 controller hours and 16,000,000 amplifier hours. During this time six component failures occurred exclusive of thyatron indicators. Four of the failures may be considered "early-life" failures, having occurred at the factory during the 530-hour test run.

Reactor Nuclear Instrumentation

All twelve high-range ion chambers for the top of the unit and two of the three intermediate-range ion chambers for the top of the unit have been installed. The third intermediate-range chamber is on-site, and the installation is awaiting repair of a defective shielding plug. All twelve of the high-range ion chambers required for installation in horizontal channels beneath the reactor have been received, and installation has started. An interim design modification has been initiated to increase the sensitivity of the subcritical instrumentation for operation during the period between zero fuel exposure and average fuel exposure.

Fuel Rupture Monitor

An instrumentation calibration procedure has been prepared for the fuel rupture monitor system. The delivery of the additional 4-volt DC supply for the gross gamma differential alarm modules is expected by mid-May. Meanwhile, a temporary modification to the 24-volt DC supply has been made to permit testing and calibration to continue as scheduled. Final HAPO shelf life testing of the GM tubes and their installation in the turret assemblies have been completed.

Traveling Wire Flux Mapping System

All vendor drawings received for this system have been reviewed and approved. Shipment of the flexible wire guide tubing is expected by mid-March, and the remainder of the system by early April.

Vibration Measurements of Primary Piping

Vibration readings were taken during cold flow testing of the primary loop. Amplitudes of 8 mils were observed in the 105-N supply headers with water velocities at 30 fps. Good stability was evidenced. In general, the vibratory behavior of the connectors and primary piping was reasonably quiet during all phases of cold flow testing. However, large vibratory movements were observed in the horizontal low-pressure diversion header at the bottom of the 105-N outlet pipe space and also in various small-size secondary piping in 109-N. Additional supports and snubbers are being provided in these cases to minimize vibration. Temporary equipment has been installed for determining pipe movements in 105-N and 109-N during the ensuing hot flow tests.

Strain Gage System

Locations at which the strain gage leads penetrate the Zone I confinement walls have been sealed with thiokol calking compound and silicone rubber foam. This treatment makes it possible to leave the strain gage system intact until after reactor power ascension or until no longer needed for monitoring strains in the primary piping system.

Solenoid Control Valves in Emergency Cooling System

The solenoid control valves that admit high-pressure nitrogen to the operators of the emergency cooling system valves have been found to be not sufficiently leak tight. The resultant loss of bottled nitrogen could be of such a magnitude as to jeopardize the reliability of emergency cooling system actuation. Therefore, a program has been initiated for batch removal of the 88 control valves from the system to permit them to be returned to the vendor for repair without interrupting the current primary loop flow testing. Twenty-eight solenoid control valves have been successfully repaired to date and will be re-installed when received, thereby permitting additional valves to be removed from the system and returned for rebuilding.

Charging Equipment

Charging of the initial load into the reactor was completed February 15, 1964, approximately eight hours ahead of schedule. During the charging operation, repeated failure of a charging machine cross-travel drive bearing was experienced. The cause of failure is suspected to be a local overload condition. A design of a new bearing installation is in progress and test equipment is being prepared to determine the exact loading on each truck.

Horizontal Rods

The feature of equalizing the pressure in the cylinder lines after each rod movement to eliminate time delay when reversing rod direction has been deleted for an indefinite trial period by the removal of the diodes from the electrical circuit, making the equalizing valves inoperative. The diodes were removed to increase the reliability of the electrical circuit. If operating experience indicates the need for the equalizing feature, a modification can be made to incorporate a circuit utilizing relays instead of diodes.

Conversion

A requisition has been issued by the Atomic Energy Commission to Foxboro for quotation on providing the Power Calculator channel for the sixth loop. The associated design drawings and documents are being revised to reflect the new six-loop data.

A requisition for the design, manufacture, and installation of a third hydraulic power package for the C, D, and W elevators has been completed and transmitted to the Commission.

Special StudiesGraphite Monitoring Facilities

Design has been initiated and is proceeding on an accelerated basis to modify one ball channel, one rod channel, and one process tube channel for use as test holes for monitoring samples of reactor moderator graphite. Present scheduling requires that the modifications to the process tube channel be completed by March 15, 1964, and the rod and ball channels by June 1, 1964.

IPD Power Recovery

In support of studies by the Irradiation Processing Department for economical power recovery from the older Hanford reactors, equations have been developed for use in a computer program to evaluate the physical constants of organic coolants. Primary emphasis now is on two cases, an organic-cooled power system and a boiling-water power system. The information to be developed for these two cases will include design parameters and estimated heat transfer and physics performance.

FIELD ENGINEERING OPERATIONConstruction105-N Building

Construction work in the 105-N Building during the month consisted of installation of the RV-2 valves and completion of punch list work on the primary piping, building piping, confinement and the various instrument systems. Work is continuing on installation of ion chambers for the nuclear monitoring system..

109-N Building

Contractor testing of all the Bailey Meter control systems has been completed except for the steam generator level control and the secondary loop pressure control systems.

Approximately 90 per cent of the remote operated valves have been fully tested. This is a total of 1550 valves.

A repair procedure has been prepared for the graphite cooling system heat exchangers. This has been approved by the fabricator and two units have been repaired.

Mechanical punch list work on the primary loop is essentially complete. Cells 1, 2 and 5 are being used in the hot physics flow tests.

All temporary blanks in the steam drums for the primary heat exchangers have been removed in Cells 1, 2, 3 and 5. The condensate system pipe jumpers, which had been installed for chemical cleaning of the secondary loop, have been removed and final connections to the primary loop have been completed.

The instrumentation equipment for the hot water quality laboratory has been delivered and installed in the laboratory rooms. Work is in progress on the installation of piping, tubing and electrical wiring for this equipment. This work is approximately 50 per cent complete.

184-N Building

The 184-N Boiler was shutdown February 5th through February 8, 1964 due to a plug leak in a previously plugged tube. During this outage the vendor noticed improper installation of steam drum modifications made last October. Another outage was made February 17th through February 20th to permit corrective work to the steam drum internals. The boiler has since been operated at loads up to 575,000 lbs/hr. Contractor testing is continuing.

Conversion

The four 16", two 20" and four 6" condensate sectionalizing valves in the 109-N Building were installed this month. The 12" valve station at the west end of the turbine bay area was also moved. The 24" and 26" primary loop spools in the pipe gallery were successfully hydrostatically tested and the contractor has completed all available work in readiness for the sixth cell tie-in to the primary loop.

NPR Testing Program

Considerable testing of the Primary Coolant System has been completed during the month which included operation of four primary pumps to rated speed, process tube continuity tests, charge-discharge control tests and vibration analysis of critical piping components at approximately 110 per cent of design flow rates. Presently under way are loop pressurization and heatup tests including demonstration of controlled cooldown techniques. In addition to continuation of testing on many supporting systems, testing was initiated on the Circulating Raw Water System, the Rupture Monitor System and the Confinement System. System tests essentially completed during the month are: Compressed Air System, Area Miscellaneous Steam Supply and Condensate, and Emergency Raw Water Control, Instrumentation and Flow Test.

Over-all status of testing progress may be summarized as follows:

Total number of tests scheduled	39	<u>This Month</u>	<u>Total</u>
Scoped	--		39
Issued for Comment	1		39
Issued as Approved	1 + 1 partial		35 + 2 partial
Tests Started	3		35
Tests Completed	3		15
Final Approval of Test	5		7
Data and Results			

	<u>Preparation</u>		<u>Performance</u>	
	<u>Scheduled</u>	<u>Actual</u>	<u>Scheduled</u>	<u>Actual</u>
This Month	99.9%	96.7%	63.8%	51.4%
Last Month	98.5%	92.1%	41.0%	39.8%

Steam Generators

The north head of steam generator unit 4A has been cut from the vessel and all of the existing stainless steel tubing is being removed through the opening. The new inconel tubing is on order with deliveries expected to begin in May, 1964. The new tubing will be positioned in the unit, then rolled and welded in the tubesheet. After replacement and rewelding of the vessel head, steam generator unit 4A will be tested and placed in service about October, 1964.

N-PLANT ENGINEERINGV-11 Inlet Valves

A standardized procedure for setting the low flow stops on V-11 inlet valves was completed. During the period on February 5 that stop adjustments were being made, a no-flow condition was noted for process channel 1945. The subsequent investigation showed that the V-11 inlet valve worked properly and after this particular valve was removed, an obstruction was discovered in the section of the connector between the inlet valve and the riser for a distance of approximately 14 inches. Five full shifts were required to remove it.

Horizontal Rod Position Transducers

On February 7, 1964, it was reported that rod position transducers had drifted out of calibration for rods 51 and 89. It was speculated at the time that perhaps the associated rod chains had become disengaged from the position transducer sprockets, thereby resurrecting a problem thought to have been solved. Thereafter, high speed movies were taken of rod chain action for the two particular rods in question, in the vicinity of the transducer sprocket. Along with normal scram conditions, the most severe scram situation to be expected was setup by loosening the chains to 50 percent of normal tension and thereafter scrambling the rods from the 25 percent OUT position. The movies showed that the chain hold-down mechanism performed in a satisfactory manner and no chain skipping occurred on rods 51 and 89 during the investigation. Upon completion of this investigation, it was the conclusion of operations and engineering people that position transducer calibration drift reported earlier was due to reasons other than chain skipping, and as such, not a serious problem.

Primary Loop Chemical Cleaning

A decision is pending regarding the need to chemically clean the primary loop. Because of extensive lead time prior to chemical cleaning, considerable emphasis and priority have been assigned to preparation of the procedure for chemical cleaning, establishment of a contract with Dow Chemical, for consultation, and to order the chemicals.

Instrument and Electrical EngineeringBall Drop

On February 7, 1964, a spurious ball drop occurred on one row involving hoppers 55, 56, etc. During this ball drop, the 125 V DC electrical system was being checked for grounds. It appeared that the episode was caused by shutting power off to the ball 3X control system while the particular row involved was not locked out. An investigation which followed and included ball 3X system checkout showed the system to be capable of functioning normally.

Reactor Control Circuits

Recommendations were recently made by our Audit Group chairmanned by W. J. Dowis, Consulting Engineer, which would provide increased reliability of key

reactor control circuits. The study was precipitated by repeated malfunction of horizontal rod controls although the rod scram function has always been reliable. Delineation of these revisions and procurement of required material has been expedited to allow revisions to be completed prior to low power demonstration. The modifications call for elimination of the horizontal control rod equalizer valve function, elimination of the diodes which connect the existing control circuit to the equalizer function, elimination of diodes which connect the existing control circuit to the flasher light system which indicates rod movement in and out. Revised circuitry which will initiate rod movement indication will utilize mechanical relays instead of diodes. Completion of the design modifications and procurement of material has been scheduled for March 3, 1964.

On February 23, horizontal rod control circuitry malfunctions were noted wherein certain rods moved out of the reactor contrary to control switch position. The cause of this difficulty was traced to a mercury wetted relay contact which had failed to open mechanically on demand. After the relay contact failure was duplicated twice by testing, a decision was made to replace such relays for rod OUT control. This was subsequently achieved in effect by installing mechanical relays with coils in parallel and contacts in series with the mercury wetted relay contacts. An equipment development and testing program was initiated at the same time to determine the most reliable relay available for this application.

Instrument Power Supply for Bailey Meter Equipment

The main bus A supply circuit breaker, 400 ampere rating, has tripped off a number of times in the past for no apparent reason. In following up on this problem, it was discovered that the 200 ampere circuit breaker which supplies the Bailey load was overloaded and local heating was evident. To reduce the load on the 200 ampere circuit, another circuit breaker of 150 ampere rating was placed in parallel. It was also scheduled to provide another 150 ampere circuit breaker in parallel with the 200 ampere supply on bus B, thus providing two reliable sources of power as intended.

Battery System - 109 Building

The battery system for the 109 Building has been troublesome to date primarily because of deficient battery chargers. Recently, a temporary over-load caused the two chargers to burnout, since the overload protective devices, an integral part of the chargers did not function properly. One of the chargers was repaired but the other could not be repaired immediately due to lack of necessary materials. A temporary source of DC power was provided by connecting the spare turbine generator exciter to this system from the 184 Building. A scope study has been initiated to define permanent corrections for the 109 battery systems.

Trouble Shooting

Sensitivity of the 105 Building 125 V DC ground detector system was raised to 5,000 ohms by minor modification and recalibration of the ground detectors.

This higher sensitivity provides a more discriminatory ground detector system and hence increases the reliability of the key DC electrical circuits.

False tripping during pony motor starts of primary coolant pumps was traced to defective current transformers for over-power relays. Correction was made for these controls on pony motors No. 3 and No. 4, and resulting performance has been under observation, prior to making similar changes to the controls for the remaining three drives.

Maintenance Standards

The Maintenance Standard program has continued on schedule. Slippage toward attainment of submitting critical equipment Maintenance Standards to the AEC by April 15, 1964 has occurred in three areas - equipment for confinement, secondary loop, and the boiler and auxiliaries. Priority need for engineering attention to the operational test program has delayed progress in these areas.

Equipment Development

A pre-proposal conference was held in Richland on February 11, 1964 to resolve questions remaining in regard to Design, Development, and Research Contract No. 185. This contract is for the fabrication of a special cutter to be used in the removal of irradiated zircaloy process tubes from the reactor. Three vendors attended the pre-proposal conference; proposals were due in Richland by February 24, 1964.

Fabrication of special reactor tool prototypes designed and developed by Equipment Development Operation of the Irradiation Processing Department has progressed on schedule in support of the single tube removal planned for March, 1964. Tools for this work which have been completed include the process tube mandrel, inlet nozzle tube sleeve carriage, outlet tube sleeve spanner wrench and tube ID/OD chamfering tool. Special items remaining to be completed are the protective liner for the thermal shield blocks and the outlet nozzle carriage device. Each of these tools will be demonstrated on the N-mockup at 189-D before accepted for use on-reactor.

Modifications to the Environmental Test Facility were completed so that the NPR-PCE loop now holds nine diversion (V-12) valves for long term testing. The facility has operated at 1800 psi, 550 F for four days since completion of the changes.

The full tube mockup of the loop is to receive a new tube assembly. The existing tube is scratched and galled quite badly on the ID from movement of fuel columns under non-prototypical conditions. The new tube needed for studies on fuel element and fuel spacer vibration under various flow conditions was received at 189-D on February 21, 1964 and replacement was started.

The high temperature anti-seize compound being evaluated in the loop as a possible replacement for that now used on-reactor continues to perform satisfactorily. The compound presently used was found to partially corrode carbon steel surfaces after long periods of high temperature service. The candidate for substitution has shown no such tendency thus far. A chemical analysis of the compound has revealed nothing detrimental to nuclear service in its composition. The results of the tests for halogens have not been received as yet.

A fail-negative incident with a mercury relay in the horizontal rod control circuitry triggered establishment of a crash test program on standard type relays. Six conventional relays were set up and put through a four hour bench check of continuous on-off energization under simulated load to establish mechanical soundness of each. Four additional relays of this same type and others have been scheduled to be tested under maximum load conditions to failure. Based on comparative results of these tests, more extensive replacement of rod control relays has been planned.

PROGRAM EVALUATIONDesign Status

Title I - 100 per cent complete.

Title II - 100 per cent complete.

Costs

No change during this reporting period.

Schedules

On February 1, 1963, RLOO-AEC issued Revision #5 to the Certified Construction Schedule. This schedule shows a construction completion of March 15, 1964.

The construction status as of March 1, 1964, based on Revision #5 to the AEC construction schedule dated February 1, 1963, is as follows:

	<u>Scheduled</u>	<u>Actual</u>
Temporary Construction	99	99.8
General Area Systems	99	99.9
105-N Reactor Building	99	99.8
109-N Heat Exchanger Building	99	99.6
163N-183N Water Treat. Facilities	100	100
181-N River Water Pump House	100	100
182-N High Lift Pump House	100	100
184-N Standby Power House	100	99.9
153-N Switchgear Building	100	100
 NPR Project (CAI-816)	 99	 99.8

Revision 9 of the integrated sequence schedule was issued on February 18, 1964 to all parties concerned. This schedule displays the major items of remaining construction, contractor testing, operational testing, calibration, and operational and physics startup steps.

Cold physics testing was completed on February 21, 1964. Hot physics and pressurization and heatup tests were initiated on February 26, 1964.

RESPONSIBILITY

There was no change in responsibility since last month's report.

ORGANIZATION AND PERSONNEL

		<u>1-31-64</u>	<u>2-29-64</u>
Exempt		86	86
Nonexempt		<u>25</u>	<u>24</u>
	Total	111	110
Technical Graduates		1	1
<u>Personnel Changes</u>			
<u>Name</u>	<u>From</u>	<u>To</u>	<u>Effective Date</u>
CA Grimm (exempt)	Field Engineering	N-Reactor Plant	2-3-64
DB Morrison (nonexempt)	Drawing, Spec. & Material Control	Irradiation Processing Dept.	2-10-64
JO Workman (nonexempt)	NRD-Research & Engineering	N-Plant Engineering	2-17-64
JA Mitchell (exempt)	NRD-Research & Engineering	Process Design	2-1-64
ML Stratton (nonexempt)	N-Reactor Project	Leave of Absence	2-28-64

SAFETY AND SECURITY

There were no disabling injuries reported during the month; total CYTD - 0.

There were no security violations reported during the month; total CYTD - 1.

INVENTIONS OR DISCOVERIES

All persons engaged in work that might reasonably be expected to result in inventions or discoveries advise that, to the best of their knowledge and belief, no inventions or discoveries were made in the course of their work during the period covered by this report, except as listed below. Such persons further advise that, for the

period therein covered by this report, notebook records, if any, kept in the course of their work have been examined for possible inventions or discoveries.

HWIR-1695, "A Means for Combining Wrenching and Restraining within a Single Tool," by J. H. Fastabend, dated January 21, 1964.

HWIR-1684, "Gaging Device, A Device to Measure Length of a Sleeve in a Hole from One End Quickly and Accurately," by H. J. Bellarts, dated February 4, 1964.

TRIPS

<u>Name</u>	<u>Firm and Location</u>	<u>Date</u>	<u>Purpose</u>
WA Richards	Burns and Roe, Inc. Hempstead, New York	2-5/6	Discuss conversion instrumentation
	Vogue Instrument Co. New York City, New York	2-6-64	Discuss rod transducer problems
	Eanco Company Hatboro, Pennsylvania	2-7-64	Review progress on the traveling wire monitor
EM Kratz	Burns and Roe, Inc. Hempstead, New York	2-4-64	Conversion design
	Foster Wheeler Livingston, New Jersey	2-7-64	Review 184-N boiler experience
JS McMahon	Seattle, Washington	2-11/12	Attend American Management Association conference

VISITORS

<u>Name</u>	<u>Firm and Location</u>	<u>Date</u>	<u>Purpose</u>
KC Hudson	Sigma Instrument, Inc. Braintree, Massachusetts	2-10 thru 2-19-64	Make initial check and calibration of the Sigma portion of the gross gamma monitor
KA Newman F Morris	Turco Products, Inc. Seattle Washington	2-25-64	Discuss decontamination procedures and chemicals for NPR
J Valance	Atomic Energy Commission Washington, D.C.	2-11-64	Discuss sea water desalinatic
RH Gatien	Drake-Cleveland Jacksonville, Mississippi	2-17-64	Discuss 15 KV cable failure

VISITORS (cont'd.)

<u>Name</u>	<u>Firm & Location</u>	<u>Date</u>	<u>Purpose</u>
JE Visnich	Combustion Engineering Chattanooga, Tennessee	2-19/20	Discuss repair of steam generator unit 4A
RC Ulmer	Combustion Engineering Windsor, Connecticut	2-25 thru 2-27	Discuss repair of steam generator unit 4A and to obtain eddy current testing results of experimental tubing
GL Kinkade	KinKade Tool & Machine Co. Portland, Ore.	2-11-64	Discuss DDR-185 (process tube cutter) contract
DL Schubert	International Design Tacoma, Washington	"	" "
WG McCarthy	Pacific Steel Products Seattle, Washington	"	" "

SIGNIFICANT REPORTS ISSUED

<u>Doc. No.</u>	<u>Classification</u>	<u>Author</u>	<u>Date</u>	<u>Title</u>
HW-78258G	Unclassified	HJ Bellarts	1-21-64	Steam Generator Examination Program - Rolled Tube Joint Study
HW-79924	Unclassified	HJ Bellarts	2-3-64	Steam Generator Examination Program - Rolled Tube Joint Study
HW-80509RD	Unclassified	RA Rohrbacher	1-30-64	Instrumentation Calibration Procedure - Fuel Rupture Monitor System
HW-80894	Secret	JD Agar	2-17-64	New K Reactor Aluminum HCR - Temperature Study
HW-80965	Unclassified	CL Goss	2-24-64	ERWS Storage Tank Water Temperature
--	Confidential-Undocumented	GF Bailey	1-30-64	Predicted Control Strengths
--	Confidential-Undocumented	JD Agar	2-12-64	Power Recovery Study - Phase I Graphite Temperature Study

JS McMahon:mbs

 Manager, N-Reactor Project

N REACTOR PLANT OPERATIONN PROCESSING OPERATION

Full reactor fuel loading and zero power cold physics tests began February 9. Full reactor loading was completed on February 15. Full reactor zero power cold physics tests were completed on February 21.

Full reactor zero power hot physics tests and reactor primary coolant system operational tests began February 26 and were in progress at month end.

The reactor process tubes were equipped with strainers to catch rust and debris during primary coolant high flow tests. The strainers used for cold flow flushing were removed and replaced with a modified strainer for hot flow flushing on February 21. These strainers were in service at month end and will be removed at the conclusion of the hot physics tests. Rags blocking the flow to two process tube inlet water connectors were found during process tube flow continuity checks and removed. The sensing lines to one process tube flow measuring element were found reversed and were corrected.

The No. 5 primary loop process pump was shut down for replacement of mechanical seals on February 20. Disassembly of the pump revealed wiping of the journal bearings and scoring of the pump shaft. A replacement pump impeller siezed after installation and a second replacement impeller was installed. The pump was operating satisfactorily at month end. Some residual dirt in the oil appeared to be the cause of the bearing failure. The oil system had been previously flushed and cleaned, but additional flushing was completed before the pump was returned to service. Failure of the oil pumps on the No. 1 primary loop process pump during hot reactor physics testing on February 28 caused the pump to shut down and resulted in a ball 3X system trip. The ball 3X trip on a single primary loop pump failure was a nuclear safety feature during the hot physics test. Ball recovery was completed and testing resumed on February 29. This ball 3X trip delayed testing approximately 20 hours.

The control rod drive chain replacement and rod position indicator installation was successfully tested on February 1. On February 7 the chains on two rods were suspected of skipping one or two teeth on the position indicator drive sprocket. Extensive testing of these rods using high speed movies showed that skipping of the chains was not possible. No further trouble has been experienced with rod chain skipping.

On February 23 during rod withdrawal using No. 1 rod operating gang switch the rods assigned to this switch failed to stop when the switch

was opened. A faulty mercury wetted switch relay in the circuit was the cause of failure. A temporary modification of the circuit was made on February 27 to increase present operating reliability and to test the performance of a more reliable relay for future installation as a permanent design modification.

The standby boiler was tested extensively during the month at various loads up to design levels. These tests were to give the vendor more operating performance data and to set up the automatic boiler control system. The boiler was shut down from February 5 to February 8 because of 3 small leaks in tubes where they join the steam drum and one slight leak in the plug used to seal off a tube that was out of service. During this outage modification and inspection of steam drum internals was completed. On February 17, the boiler was shut down at the vendor's request for further steam drum modifications. During this outage the boiler relief valve seats and plugs were replaced and following boiler startup on February 20 the valve vendor representative set the boiler relief valves. The latest steam drum modifications have altered the operating characteristics of the boiler sufficiently that new tests must be conducted for setting the system for automatic operation.

The steam header vibration in the standby boiler house reported last month has not recurred. On February 5 the controllers on two pressure reducing valves on this header failed. These failures were easily corrected and subsequent extensive operation of the steam supply system has not revealed any further vibration.

Replacement of power supply cables to No. 2 circulating raw water pumps was completed during the month. Cable replacement for No. 3 and No. 4 pumps has been delayed until pump discharge valve operator modifications have been completed by construction.

The secondary (heat dissipation) system was flushed and placed in wet layup in preparation for testing the system and placing it in operation.

109 N OPERATIONS

WPPSS Tie-In Work

Three more service tie-ins were made in preparation for the sixth cell tie-in outage. This completed nineteen of the thirty-four scheduled tie-ins to be made.

Sectionalizing Valves and Relocation Work

The subject work, also in conjunction with sixth cell installation, was completed on the condensate systems in the basement of the 109 Building.

Secondary System

- a) Principal Project Section construction activities on the Secondary System were:
- 1) Removed blanks on 28" steam risers from all steam generators except those in Cell 4.
 - 2) Removed steam generator jumper piping on the condensate influent and water-to-water feed lines to all steam generators except those in Cell 4.
 - 3) Continued contractor testing of secondary system valves.
- b) Subsequent to blank removal (Item a1 above) some water entered the steam generators. This was nearly coincident with the inadvertent flooding of the secondary side of steam generator 5A. All units were drained, given a demineralized water wash down, and returned to dry layup condition. A letter reporting these incidents was sent to the Commission by R. L. Dickeman.

Primary System

- a) It was necessary to adjust pipe supports in preparation for loop heatup testing.
- b) Primary loop isolation of Cell 4 where steam generator repair on Unit 4A will be in progress for the next several months was accomplished in preparation for heatup testing.
- c) The Emergency Seal Water system was tested and placed in operation.

Graphite Coolant System Heat Exchangers

Repair of heat exchangers 3 and 4 is in progress. Units 1 and 2 are serviceable.

N PLANNING AND SCHEDULING

During this reporting period two issues of the integrated sequence schedule were issued, Revision 8 on February 1 and Revision 9 on February 18. All operation and maintenance work is being scheduled on each man, each shift assignment function. In addition to this, we are issuing the following to integrate the required scheduling information with all punch list, testing, startup, and operational organizations: (1) Daily briefing meetings are held with all concerned. (2) A 24-hour work schedule is issued each morning. (3) Weekly manpower forecasts are issued covering the ensuing two weeks. (4) Remaining punch list items are updated. Cold physics testing was completed on February 21. System checkouts for hot physics and pressurization and heatup tests were initiated on February 23.

NPR TESTING PROGRAM

Considerable testing of the primary coolant system has been completed during the month which has included operation of four primary pumps to rated speed, process tube continuity tests, charge-discharge control tests, and vibration analysis of critical piping components at approximately 110 per cent of design flow rates. Presently under way are loop pressurization and heatup tests, including demonstration of controlled cooldown techniques. In addition to continuation of testing on many supporting systems, testing was initiated on the circulating raw water system, the rupture monitor system, and the confinement system. System tests which were essentially completed during the month are: compressed air system, area miscellaneous steam supply and condensate, and emergency raw water control, instrumentation, and flow test.

Over-all status of testing progress may be summarized as follows:

Total number of tests scheduled	39	<u>This Month</u>	<u>Total</u>
Scoped	-		39
Issued for comment	1		39
Issued as approved	1 + 1 partial		35 + 2 partial
Tests started	3		35
Tests completed	3		15
Final approval of test data and results	5		7

	<u>Preparation</u>		<u>Performance</u>	
	<u>Scheduled</u>	<u>Actual</u>	<u>Scheduled</u>	<u>Actual</u>
This month	99.9%	96.7%	63.8%	51.4%
Last month	<u>98.5%</u>	<u>92.1%</u>	<u>41.0%</u>	<u>39.8%</u>
Net change	1.4%	4.6%	22.8%	11.6%

N REACTOR MAINTENANCE

Assembly and disassembly of primary pump units to correct seal failure and bearing problems was a major effort. This involved consultation and discussion with Byron Jackson Company personnel to evaluate and resolve the problems. Analysis of the 15 KV electrical power supply cable failure to the circulating raw water pumps one and two continued and failures of the afterheat removal tank diaphragm and the primary cation regenerative tank lining of the demineralized water system were also studied and the latter item corrected.

More than 50 percent of the Maintenance manhours were expended in support of system tests and calibration. A program was initiated to check out all annunciators in the plant and place this equipment in full operational status. Included in the many instrumentation systems worked on were gamma monitor, flow monitor and flux monitors.

SIGNIFICANT REPORTS ISSUED

None

TRIPS

<u>Name</u>	<u>Location</u>	<u>Date</u>	<u>Purpose</u>
E. W. Wilson	Hempstead, N.Y & Livingston, N.J.	2/3-8	Discuss conversion design and boiler problems.

VISITORS

J. A. Haaga	APED, San Jose	2/18-19	Startup consultation
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INVENTIONS OR DISCOVERIES

All persons engaged in work that might reasonably be expected to result in inventions or discoveries advise that, to the best of their knowledge and belief, no inventions or discoveries were made in the course of their work during the period covered by this report. Such persons further advise that, for the period therein covered by this report, notebook records, if any, kept in the course of their work have been examined for possible inventions or discoveries.

PERSONNEL

<u>Additions</u>	<u>From</u>	<u>To</u>	<u>Date</u>
C. A. Grimm	N Reactor Project	Plant Maintenance	2/3/64
J. R. Hearty	CPD	Plant Maintenance	2/3/64
D. E. Parchen	IPD	Plant Maintenance	2/3/64
P. J. Dauenhauer	IPD	Plant Maintenance	2/10/64
C. O. Crawley	IPD	Plant Processing	2/24/64
G. R. Madison	IPD	Plant Processing	2/24/64
R. A. Weetman	IPD	Plant Processing	2/24/64

Deletions

L. T. Sneddon	Maintenance	Terminated	2/7/64
W. D. Baxter	Maintenance	IPD	2/10/64
J. W. DeWane	Processing	Terminated	2/20/64

Manager - N Reactor Plant

WM Mathis:ds

FINANCIAL OPERATION
FEBRUARY, 1964

The following will summarize activities of the Financial Operation during February, 1964 other than those of a routine or continuing nature:

Production Studies

Work continued on further studies concerned with operation of N Reactor in a co-production mode. In addition, at the request of Richland Operations Office, Atomic Energy Commission, information relating to Phase III operation of N Reactor was supplied.

Unitization of N Reactor

Three Department employees plus an employee of Contract and Accounting Operation continued the unitization of N Reactor. At the end of the month of February it was estimated that the inventory of N Reactor plant and equipment was 98 per cent complete and the unitizing of Kaiser Engineers incurred costs was 35 per cent complete. The present schedule for completion of the unitization project is June 30, 1964.

Cost Improvements

Cost improvements reported during the two-month period ended February 28, 1964 totaled \$63,430 of which \$28,630 were savings reported from the Suggestion Plan.

During March, 1964 a Cost Improvement brochure detailing all aspects of the Department cost improvement program will be issued to all exempt employees of the Department.

Electronic Data Processing Costs

Total electronic data processing costs billed to the Department for the eight-month period ended February 28, 1964 aggregated \$106,625. These costs consist primarily of programming and operating costs associated with the N Uranium Fuels, N Reactor Planning and Scheduling, and N Reactor Information Programs.

Personnel

As of February 28, 1964 the Section consisted of fifteen monthly salaried and eight weekly salaried employees. This is consistent with Section organization during the recent months.

Travel

The only travel performed by Financial Operation personnel during February, 1964 was that associated with recruiting for the Business Training Course at the University of Washington, Seattle University, and Whitman College.

Manager-Finance

J Milne :pw

END

**DATE
FILMED**

2 / 3 / 93