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N - REACTOR DEPARTMENT

MONTHLY REPORT

JUNE

1963

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HANFORD ATOMIC PRODUCTS OPERATION

RICHLAND, WASHINGTON

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By J Tang 9-11-92 MONTHLY REPORT -- JUNE 1963

DG Kriched 9/16/92 Compiled by N-Reactor Department

July 8, 1963 - Richland, Washington

Work performed under Contract No. AT(45-1)-1350 between the Atomic Energy
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GENERAL SUMMARY

N REACTOR FUELS

Manufacturing

A total of 189 billets were extruded during June of which 115 were outers and 74 were inners. Input at the extrusion press was 86 tons, bringing the first load to date to 473 tons, or 73 per cent of requirements. Output through autoclaves was 38 tons, 6 per cent higher than previous month. Although tonnage was higher, piece throughput decreased slightly due to higher rate of outer elements being autoclaved. Throughput to date of 157 tons is 41 per cent of first load requirements. Output to finished storage of 9.8 tons brings first load completed assemblies to 27.9 tons or 7.2 per cent of requirements. An additional 20 tons are ready for storage except for outer shoes. Including this 20 tons in finished assemblies, 13 per cent of the first load requirement has been completed. Output to storage continued to be limited by fuel element support problems. By month end, support attachment and assembly process had been revised and full-scale production will be in effect during July.

Engineering

Comparison of the coextrusion performance of billets made from ingots drilled both before and after heat treatment indicate those drilled before had improved cladding concentricity on the inner surface of the outer tube. A recent increase of about 0.5 ppm in average billet hydrogen analysis is due to a change in sampling location. Five ingots of 1.25 per cent enriched uranium with the standard iron-silicon additions have been ordered to provide fabrication experience in the event additional enrichment is needed for the NPR start-up.

Continued testing of the beveled top cap design in the brazing operation shows this design to be significantly better than the standard production design. Initial tests with a pre-brazed end cap also indicated excellent performance during the operation. Long-term water and steam corrosion tests of brazed closures, without welding, continue to provide good corrosion resistance.

Early in the month, brittle inner supports were found in autoclaved fuel elements. During the sizing-up operation, small transverse cracks developed on the inside surface of the bends of the buggy spring support. The cause of the cracking has been determined to be an undesirable orientation of zirconium hydride platelets precipitated perpendicular to the inner surface during the slow cool down in the autoclave. The problem has been corrected by instituting a hydride solution heat treatment which consists of heating the fuels to 325°C followed by water quench. This restores ductility, and assembly can be accomplished without cracking.

Charging machine tests in the 314 Building have indicated that some outer support damage (flattening) may occur during fuel charging, with the present equipment. Tests also indicate that the 2.9 inch ID magazine is causing the trouble, and conversion to a 2.7 inch ID plastic-lined magazine would eliminate

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damage with high probability. Some shoe scratching and subsequent tube scratching has been also produced during the testing, and some tube scratching will result in reactor during initial charging. However, it has been determined that the present fuel assembly and supports are compatible with a plastic lined 2.7 inch ID magazine.

Testing Methods

The investigations to determine locking clip weld acceptability has been concentrated on X-ray, beta gage and ultrasonic tests. The X-ray fluorescence method and the ultrasonic reflection method have both demonstrated the ability to detect uranium in the weld region. Preliminary work with beta detectors was inconclusive.

RESEARCH & ENGINEERING

A report has been issued to the AEC that details the advantages and limitations of the N Reactor for the production program. Also, a study of exposure versus cost, Pu-240 isotope content versus exposure, and maximum production versus exposure, has been completed.

A summary review to determine the maximum N Reactor power levels which might be expected after start-up indicates that reactor power levels in the range of 115 - 125 per cent of design power level should be obtainable after several years of operating experience. An increase of this magnitude does not require any significant capital expenditures, rather it is based on full use of the design pressure of the primary cooling system; it anticipates some reduction in the design Hot Channel Factor. To reach power levels in the indicated range, it may also be necessary to relax some maximum operating temperature criteria over those currently in use.

Approximate physics calculations have been completed on the production of N Reactor isotopes which are of potential use as power sources, e.g. Co⁶⁰, Po²¹⁰, Pu²³⁸.

Pressure drop tests of N Reactor connectors and process tube (in the NPR-PCE Facility) show that a change in radial orientation of the downstream fuel element spacer (dummy fuel element) causes a significant variation of pressure drop at the outlet nozzle at design flows. Modified designs have been made and testing of these designs will be accomplished in the Thermal Hydraulics Laboratory and/or the 189-D Equipment Laboratory.

A study of the failure of an N Reactor process tube end cap indicates that in an accident comprised of a rear cap failure with subsequent ejection of the fuel load the steam release rate would be well within the combined predicted capacity of the fog spray and filter systems. A similar accident at the front face would release similar or, more probably, smaller quantities of steam.

Prototype multiproduct target elements are being irradiated in KER Loops 1 and 2. The targets are hollow rods of aluminum -1 and 2 per cent lithium that have been clad with aluminum and recanned in Zr-4. Both charges are currently at exposures equivalent to gas-volume-ratios (GVR) of 2.86.

The second group of 14 "first-load" assemblies of N fuel elements to reach goal was discharged at an average exposure of 1815 MWD/T. The swelling incurred by these fuel elements was considerably less than predicted.

The mock-up of the NPR rupture monitor system is now operating successfully in the 100-KE test loops and tests of sensitivity and reliability are underway.

N REACTOR PROJECT

The process tube flow monitor successfully passed its system test and was shipped from Avien on June 24, 1963.

Fuel charging tests have shown that the charging machine, exclusive of magazines, is functionally adequate. Methods for removing the 2.900 inch to 2.700 inch taper in magazines are being studied.

The 108, 151, 153, 182, 183, 184, and 1100 Buildings were accepted for transfer to General Electric operations effective May 21, 1963.

During hydrostatic testing of heat exchangers, leakage in certain heat exchangers occurred. Examination of the heat exchangers showed that stress corrosion cracking has been found in one unit and intergranular corrosion cracking has been found in the other units. The extent of corrosion has not been determined.

Custody transfer was made on the Ball 3X System, Thermal Shield Cooling System, and the Horizontal Rod Supply and Drain System effective June 26, 1963.

N REACTOR PLANT

A long awaited innovation in the delivery of essential materials occurred when two barges of No. 6 fuel oil were unloaded into the 166 oil storage.

The ATP-operational test on the water pretreatment facilities was completed with a few exceptions noted for correction and minor retesting.

The training programs and preparation of operating, maintenance, and detailed test operating procedures continued on an accelerated schedule.

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PERSONNEL STATISTICS

Number of employees as of May 31, 1963 518
 Number of employees as of June 30, 1963 556

	<u>Exempt</u>	<u>Nonexempt</u>	<u>Total</u>
General	3	2	5
Finance	17	7	24
N Reactor Fuels	56	116	172
Research & Engineering	44	10	54
N Reactor Plant	56	131	187
N Reactor Project	<u>91</u>	<u>23</u>	<u>114</u>
TOTAL	<u>267</u>	<u>289</u>	<u>556</u>

Employment

	<u>Exempt</u>	<u>Nonexempt</u>	<u>Total</u>
Additions	13	31	44
Reductions	<u>2</u>	<u>4</u>	<u>6</u>
Net Additions	<u>11</u>	<u>27</u>	<u>38</u>

SAFETY & SECURITY

Days without a disabling injury 212
 Hours worked without a lost disabling injury 550,417
 Medical treatment injuries (June) 8

There was 1 security violation in the Department during June, 1963.

SUGGESTION PLAN PARTICIPATION

	<u>June</u>	<u>Year-to-Date</u>
Number of eligible employees	298	237
Number of suggestions received	35	175
Number of suggestions acted upon	32	112
Number of suggestions adopted	9	48
Net annual savings	\$ 2 636	\$ 14 793
Amount of awards	\$ 365	\$ 2 015
Per cent of awards to savings	13.8	13.6
Average amount of awards	\$ 40.56	\$ 41.98

PATENT SUMMARY - JUNE, 1963

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 May. 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.

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N-REACTOR FUELS OPERATION
JUNE, 1963

MANUFACTURING OPERATION

Production - Coextrusion Shop

Production input during June was deliberately reduced to permit major maintenance overhaul during vacation shutdown. Input production of 189 extrusions was well balanced with 115 outers and 74 inners. Input to date of 473 tons is 73 per cent of first load requirements.

Production output through autoclaves of 3,233 pieces was slightly below previous month, but exceeded the tonnage rate by 6% (38 tons), as a result of a higher rate of outer elements being autoclaved. First load total to date of 157 tons is 41 per cent of requirement.

Output to finished storage of 9.8 tons brings first load completed assemblies to 27.9 tons or 7.2 per cent of requirement. An additional 20 tons are ready for storage except for outer shoes.

Output production continued to be limited by the fuel element support problem. By month end, support attachment and assembly processes had been revised, and full-scale production will be in effect during July.

Production Statistics

	<u>Scheduled Tons</u>	<u>Actual Tons</u>	<u>Percent</u>
Shop Input - Current Month	45	36	80
First Load	645	473	73
Autoclave Output - Current Month	43	38	90
First Load	385	157	41
Output to Finished Storage			
Current Month	45	9.8	21.8
First Load	385	27.9	7.2
		48.1*	12.5*

* Includes 20.2 tons complete except for shoes.

Throughput By Stations

<u>Operation</u>	<u>Inners</u>	<u>Outers</u>	<u>Total</u>	<u>In-Process Inventory</u>
Extrusion	74	115	189	---
Cutup First	1435	1432	2867	13
Cutup Rework	49	72	121	---
Chemical Milling (ends)	2772	2533	5305	292
Braze (ends)	3299	2657	5956	250
Heat Treat	1781	1055	2836	281
Straightening	296	5	301	---
Machining (ends)	3707	1623	5330	162
Vacu-Blast	2236	602	2838	102
Welding (ends)	3888	1268	5156	25
End Test (ends)	3717	1806	5521	---
Clad and Bond Test	2189	939	3128	---
Support Weld	596	2586	3182	9113
Autoclaves	854	2379	3233	1267
Final Inspection	1192	1192	2384	8896
Rework	408	1202	1614	1614
Support Fabrication	17,157	700	17,857	
Locking Clips			12,128	
Oxide Burner - 119 batches burned = 2497.84 lbs.				

Thirty-eight (38) extrusions were made for Engineering.

Shop Yield

	<u>Outer</u>	<u>Inner</u>	<u>Total</u>
Current Month	73%	64%	69%
First Load to Date	47%	59%	51%

Yield for June decreased due to unbonded inners at extrusion. There were 19 extrusions rejected for peel test. Had these been removed from the yield tonnage, the per cent yield would be 85 per cent, which indicates good shop yield after extrusion.

Plant Operation

Production of inner tube supports during June was satisfactory with 1200 pieces being produced daily. Dimensional control is fully satisfactory. The locking clip and outer support dies caused considerable operating problems with both dies requiring modification to meet the dimensional control requirements. Minor quantities of outer supports were fabricated.

Testing of the autoclaves has been initiated to determine the number of cycles a vessel can be operated between lubrications of the main nut and set screws. To date, one vessel has completed eight cycles, opened cold, with no problems. One vessel has completed three cycles, opened hot, 175°F, with no problems. Testing is also under way to determine the effect of

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opening hot (175°F) on nut lubrication. To date, one vessel has completed about ten cycles without problems. A total of three vessels are now being opened hot routinely. This technique reduces the over-all load-unload time for an individual vessel and improves operating efficiency.

Major overhaul of the shop equipment was started the last week of the month and will continue through the first week of July. This overhaul is scheduled during vacation shutdown which will significantly curtail production during this period.

In addition to the major overhaul the following significant maintenance work was performed in the 306 Building:

1. Repair of 65 KW Trent furnace.
2. Removal of induction heating unit.
3. Modification of two Dastrom recorders.
4. Modification of ultrasonic welder.
5. Modification of production model transistorized welder.
6. Installation of new spike welder.

Production through the final etch operation has been limited by temperature control problems. The present cooling coil (PVC) does not transfer heat efficiently enough to maintain the required temperature range. Investigation of the problem is under way.

N-FUELS PRODUCT ENGINEERING

Irradiation Test Fuel Fabrication

Corrosion and Startup Test Fuel

Ten 24-inch NIE-1 fuel elements, complete with shroud tubes, are currently being fabricated in the 306 Pilot Plant for KER Loop corrosion testing and startup tests. Ten fuels are in the Chemical Bay (306) to be pre-autoclave etched, and 11 shroud tubes are at vacu-blast prior to Zircaloy etch and support welding.

Materials Development

Uranium Billet Fabrication

The fabrication of uranium billets is being changed from hollow cast ingots to solid cast and drilled ingots. Production equipment has been ordered at Fernald for this conversion, and

conversion should be accomplished by the end of CY-1963. A pilot lot of 24 ingots, solid cast, drilled and fabricated to billets, was produced in the experimental facilities at Fernald to permit coextrusion evaluation in order to detect any unanticipated difficulties. This test was also designed to evaluate differences from drilling the ingots before and after beta heat treatment. Coextrusion of the outer billets received under this test has been completed and the results are being evaluated. No significant differences have been found, except in cladding thickness variation of the inner cladding. Billets made from ingots that were drilled after beta heat treatment resulted in coextrusions with extreme inner clad thickness variation. The reject rates were as follows:

<u>Ingot Fabrication Route</u>	<u>No. of Fuels Tested</u>	<u>Number of Fuels With Inner Clad Thickness Over 0.008"</u>	<u>Number of Fuels With Inner Clad Thickness Over 0.012"</u>
Solid Cast Drilled Before Beta Heat Treating	64	26	0
Solid Cast Beta Heat Treated Before Drilling	43	12	30
Hollow Cast Control	84	45	3

The obvious conclusion is that beta heat treat must be done after drilling. This processing route is also desirable in order to reduce the risk of cracking from volume changes during transformation.

Hydrogen Impurity in Uranium Billets

An increase of about 0.5 ppm in billet hydrogen analyses occurred simultaneously with a change in sample location and end cropping schedules for NPR primary extrusions. Originally, the hydrogen sample had been removed from between the first (top) and second billet sawed from the primary extrusion. The location was then removed into the rear end crop at the same time the allowable rear end crop was decreased in length about two inches. Billet hydrogen analyses now range from about 1.8 ppm to 2.5 ppm. Because of the critical supply situation for NPR billets, a waiver was authorized to accept billets with analyses up to 2.5 ppm hydrogen until July 15. The purpose of this time interval was to allow National Lead Company to investigate and determine the source of the problem. NLO now reports the apparent increased hydrogen level has

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resulted from sampling the extrusion end defect. The hydrogen is apparently about .5 ppm higher at this point since this metal is very close to the bottom surface of the ingot during beta heat treatment. These data show that the hydrogen levels in the actual billets are about 0.5 ppm lower than the values reported from the rear sample, and these billets will be accepted.

New Uranium Alloy Development

The following special materials have been ordered to support uranium development activities:

1. Two 11 inch ingots of 1.6 per cent enriched uranium with iron-aluminum and iron-silicon as alloying materials. These ingots will be used for fabrication of KSE-5 fuel elements for loop irradiation by Hanford Laboratories. The purpose of this investigation is to investigate swelling phenomena using the so-called British alloy.
2. Two small castings of uranium-2 weight per cent zirconium for fabrication of NPR single tube geometries for irradiation in the ETR.
3. Five ingots of 1.25 per cent enriched uranium standard iron-silicon, (a) to provide fabrication experience in the event additional enrichment is needed for NPR startup, and (b) for fabrication of prototypic multiproduct charges.

Zircaloy-2 Fuel Supports

Inner Support Cracking

Early in the month, brittle inner supports were found on autoclaved fuel elements. The supports would break if the loops were opened, i.e., strained in a direction opposite to the direction of the forming. This type of strain occurs from sizing of the inner supports during assembly of the fuel.

The cause of the cracking has been established as an undesirable orientation of zirconium hydride platelets after autoclaving. This phenomenon has recently been observed by others.¹ At autoclave temperatures the hydrogen is in solid solution. When the support is slowly cooled in the autoclave, platelets precipitate. In the unstrained sections of the support and in those sections strained in

¹ CRGM-1135, "Effect of Strain on the Directional Precipitation of Zr. Hydride in Zircaloy-2," by G. W. Parry and W. Evans, December 1962.

tension, the platelets align longitudinally and do not interfere with support ductility. Where the support was strained in compression during the forming operation, the platelets align radially (perpendicular to the curved inner surface of the bend). These radially-oriented platelets act as notches to initiate cracking when the compression side of the bend is placed in tension during the sizing-up.

The ductility of the supports can be restored by heating them after autoclaving to 325°C and water quenching which returns the hydrogen to solid solution and the rapid cooling prevents agglomeration of large platelets. This process (the whole element is heated) has been accepted. Finished assemblies in storage will be 100 per cent inspected for cracking with the rejects being used for test charging. Although the hydrogen will redissolve and reprecipitate as platelets during the heating and cooling cycles in the reactor, no problems are expected since the support should not be placed in tension during irradiation.

The autoclaved supports range from 50 to 70 ppm hydrogen concentration and the solid solution solubility temperature for this concentration of hydrogen in zirconium is approximately 250 to 300°C. Initial experiments involving heating the brittle supports to 300°C for five to ten minutes and immediately quenching in room temperature water indicated that ductility was improved. A destructive test to determine the ductility of the supports was performed by placing either the sized or as-autoclaved supports in a tensile test machine and noting the force required to fracture the support. Material that consistently cracked during sizing fractured in the 40-70 pound pull test range. Material ductile enough to size without cracking (after anneal and quench) usually pull-tested at 500-700 pounds. Annealing and rapid quenching approximately 50 supports in the brittle condition has yielded supports that were sized without cracking and pull-tested at greater than 500 pounds.

In conjunction with determining the effects of the anneal and quench treatment on the behavior of the supports, work has been in progress to evaluate the effect on the fuel element. The properties under consideration are fuel element warp, cap-to-can bond, clad-to-core bond, corrosion resistance of fuel, metallurgical effect on uranium core, and mechanical properties of the supports. Testing to date has indicated no adverse effects on any of the above with the exception that the evaluation of the uranium metallurgical properties is incomplete.

To evaluate the vibrational effects, fretting and fatigue, on the cracked and less ductile buggy supports, a standard assembly and an assembly with cracked buggy supports were

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charged in the fretting corrosion loop. Vibrations ranging from 50 to 60 cps were applied to the loop during the normal startup, one week run, and cool down periods. The loop operates at simulated N-Reactor conditions with the possible exception of a reduced water flow rate and, of course, the arbitrarily vibrational effects. After one weeks' exposure, the two assemblies were in sound condition with no visible effects of fretting corrosion or increased cracking. Also, deflection tests on the buggy supports indicated normal conditions. The exposure is continuing with a decrease in loop frequency and an increase in amplitude.

Longer range efforts for reducing and controlling support cracking involve altered fabrication methods to remove the compressive strain that causes the unfavorable platelet orientation and changes in strip manufacturing procedures to reduce hydrogen buildup prior to autoclave.

Support Fabrication

The dimensional inspection requirements for the support hardware items manufactured on-site have been reviewed. As a result of this review, several minor changes have been made in the drawings. It is now expected that very little 100 per cent dimensional inspection of support items will be required if the dimensional control of supports fabricated on-site continues at its present satisfactory level.

Fabrication of Ductile Zircaloy-2 for Support Manufacture

Approximately 60 pounds of .3 inch diameter Zircaloy-2 rod have been prepared on-site and shipped to a vendor for Turks-head rolling to 1/4 inch wide inner support strip. In addition, some commercial one-inch diameter Zircaloy-2 extruded rod has been obtained for reduction by swaging and Turks-head rolling at Hanford. The objective of these programs is to determine if satisfactory strip can be made by starting with commercially available extruded bar stock and Turks-heading it under commercial conditions. Supports fabricated from strip that was produced by Turks-head rolling entirely on-site have been extremely ductile and crack-free.

Extrusion Process

Extrusion - Engineering extrusions performed during the reporting month are as follows:

7.5 Inch Tooling

1 Composite - X-91

X-91 - NOE with thin cladding for nondestructive tester standards.

6.0 Inch Tooling

22 Zircaloy Billets - Z-223 Through Z-244

To produce 3/8 inch x 3.75 inch sheet bar for support fabrication.

1 Composite Billet - ZT-29

NIE geometry with copper core for evaluation of inner Zircaloy clad components.

Chemical Processing

Elimination of Pre-Autoclave Etch

A pilot plant work request (E-62) eliminating the final bright etch is being evaluated. The last Zircaloy etch used in this potential process is the pre-weld etch, after which the fuel elements are end welded and support welded. After three days in 400°C steam, all surfaces exhibited lustrous black films. After one week in 360°C, pH 10 with LiOH, water the cladding support surfaces were black, but the end welds turned a brownish-white with some spalling. The second week's exposure to pH 10 water produced spalling white weld beads although the other surfaces were unchanged. Uranium and beryllium analyses are being run on the end welds to determine the cause for the spalling behavior.

End Closure Development

Braze Process - Bevelled Cap

Testing of brazing production fuels using the bevelled top cap design continued during the month. To date, a total of 182 outer fuels have been processed and an equal number of control fuels with standard caps. Defective brazes for both the test and control fuels are detailed as follows:

	<u>Braze Station</u>	<u>Bond Test</u>	<u>Braze Void</u>	<u>Weld</u>	<u>Total Defects</u>	<u># Ends Brazed</u>	<u>Per Cent Defective</u>
Beveled Cap	12	1	2	7	22	364	6.0%
Standard Cap	11	7	13	13	44	348	12.6%

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Materials are now available for brazing at least 200 more fuels (400 ends) during early July using the beveled end cap and based on continued performance at the above level, the beveled end cap will be adopted immediately for production usage.

Pre-Brazed End Closure Cap

Work is in progress in the pilot plant to fabricate and evaluate a combined braze ring-Zircaloy cap as a single piece end closure component. Initially these test components were prepared from braze station rejects by machining away the clad and removing the end cap from the uranium with a parting tool. More recently they have been fabricated by melting a standard braze ring over a beveled end cap in a graphite mold. The casting was then machined to meet dimensional specifications. Pre-brazed components were used in the brazing of outer fuels. Only a few closures have been made using these components, with the following preliminary observations noted:

1. Braze melt and flow time is less than for standard end closure components.
2. Brazing is accomplished without clad crimping or the use of flow wires.

Samples are being prepared for metallographic evaluation of bonding and braze porosity. Also, it is believed that uranium contamination in the end closure weld would be reduced by this process. Welded samples will be tested for comparison with normally processed end closures.

Brazed Closure Corrosion Study

As part of the study on gas pressure bonded closures, control braze closures without welding have been corrosion tested for comparative purposes, and also as long-term corrosion of the brazed closure. These corrosion tests were performed at Battelle Memorial Institute.

Three each inner and outer tube specimens composed of brazed closures, faced and without closure welds, have been exposed to 360°C water and 400°C steam for six months. Results are as follows:²

Water Group

1. There is virtually pure white corrosion product on the exposed braze material with no evidence of spalling.

2 BMI-X-240, "Solid State Diffusion Bonding, Long Term Corrosion Tests, Design, Development Research Control 105."

2. The surfaces of the Zircaloy-2 cladding are a shiny black with no evidence of further corrosion.

Steam Group

1. The surface of the exposed braze material is a medium gray with no evidence of spalling.
2. The surface of the Zircaloy-2 cladding in the zone heat affected by the brazing operation is a light gray and the remainder of the cladding is a medium gray.

It is planned to section the closures to determine the penetration of the corrosion into the braze.

Gas Pressure Bonded Closure

Gas pressure bonding a Zircaloy-2 cap into a recessed fuel element end produces a bonding of the uranium and Zircaloy by means of intermetallic compound.

A number of studies have been made to replace the compound bond between the zirconium alloy closure ring and the uranium core to provide shear resistance in this joint by producing a solid solution bond. Of the few metals that would produce solid solutions with both uranium and zirconium alloys, the most applicable from melting point, neutron cross section and coefficient of expansion is niobium. It was first tried in Lot No. IX at 650°C, 10,000 psi and one hour at temperature. Bonding occurred at points of contact which was approximately ten per cent of the surface indicating that with proper temperature-pressure relationship bonding would occur. In each of the lots in this group, a 0.020 inch thick niobium washer was placed in both ends of two each outer tube and inner tube specimens. After gas pressure bonding, one end each of the outer tube specimen from Lots XIX and XXI was single beta heat treated and both ends of the NIT specimen were double beta heat treated, sectioned and metallographically examined at 600X. Diffusion with uranium, Zircaloy-2 and Zircaloy-3, was complete and uniform with no evidence of residual striations, voids, or fractured bonds being found. The heat treating widened the diffusion zone.

Four lots of samples have been processed at BMI to evaluate cap-clad bonding at the now available higher pressures, and at high alpha and beta (uranium) phase temperatures. These are as follows:

Lot No. XXIII

This lot has Zircaloy-3 closure rings and was processed at 46,000 psi, 650°C and ten minutes at temperature.

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Lot No. XXIV

This lot has Zircaloy-2 closure rings and was processed at 46,000 psi, 750°C and ten minutes at temperature.

Lot No. XXV

This lot has Zircaloy-3 closure rings and was processed at 30,000 psi, 650°C and ten minutes at temperature. Temperature variation from the top to the bottom of the 12-inch column of the specimen was 55.6°C and from the outside of the outer tube to the inside of the inner tube was 25°C.

Lot No. XVI

This lot has Zircaloy-2 closure rings and has been processed at 30,000 psi, 750°C and ten minutes at temperature. Temperature variation from the top to the bottom of the 12-inch column of the specimen was 39°C, and there was no variation in temperature between the outside of the outer tube and the inside of the inner tube.

Support Attachment Process Development

A preliminary study has been made of the following metal joining methods for attaching the Zircaloy-2 supports and locking clips to the NPR fuel tubes:

1. Square current pulse resistance welding.
2. High frequency resistance welding.
3. High-voltage, high energy density electron beam welding.
4. Tungsten inert gas arc spot welding.
5. Laser welding.
6. Resistance welding using a projection attached to the support or locking clip.
7. Resistance welding using many small projections formed on the support or locking clip.
8. Cold welding in high vacuum.
9. Ultrasonic welding.
10. Ultrasonic welding using an intermediate between the strip and cladding.
11. Percussion welding.

12. Resistance welding using metal fibre intermediate.
13. Resistance brazing using a brazing shim.
14. Magna flash welding - similar to percussion welding, but using the welding current to produce the forging action.
15. Diffusion bonding.

The method appearing to have the most promise for producing a completely welded tab on the support and locking clip ends is the square current pulse resistance welding.

The salient feature of the square pulse resistance welder is that no visible melting or heat affected zone is produced. A bond very similar to a diffusion bond is produced. The device produces a very short time, very high current pulse which generates enough heat at the interface to produce a bond. It is being used extensively for attaching thin sections where melting or heat affected zones are not tolerated.

Support System Functional Studies

Charging Machine Test

Thirty charges of fuels were tested during June. Previously it had been shown that columns of fuels could be charged and discharged through a magazine-nozzle process tube assembly without excessive support deformation. It had not been possible, though, to simulate the increased back-pressures which might occasionally be encountered during charge-discharge operations. Through continued testing, it has been possible for Reactor Plant Design and Equipment Development personnel to control and accurately measure the pressures applied on a column of fuels during charging and discharging. The minimum acceptable force which could be used to simulate charging was established by the Reactor Plant Design Group and testing then began with three different reactor nozzles at varied back-pressures. Supports were deformed with charging pressures below the accepted minimum on all three nozzles. The nozzles were removed and a smooth carbon steel transition was substituted; supports still were deformed.

At this point, a process tube was substituted for the charging magazine so that fuels traveled from one process tube to another through a transition. Deformation was acceptably low using this test setup and using a setup with each of the three reactor nozzles.

Having determined that fuels could be charged against acceptable back-pressures through the nozzles and into process tubes, the magazine will be modified.

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Immediate testing is now to be devoted to minimizing process tube damage resulting from damaged surfaces on the support shoes. Some testing has been performed in this area. As yet, test results are not conclusive.

Process Specifications and Waivers

Revisions

Engineering Specification revisions made during the month are as follows:

1. Steel Support Shoes (CX-160, Revision 1)

Specification was revised to allow use of different thickness steel shoes for final sizing of the outer support circle diameter. In addition, simplified sketches with critical dimensions were substituted for detailed purchase drawings.

2. Copper Extrusion Can Components (CX-170, Revision 1)

Specification was revised to allow a greater selection of ASTM copper-silicon alloys and to replace purchase drawings with specified critical dimensions and assembly requirements.

Waivers

Waivers of specifications issued and approved during the month are as follows:

1. CX-13, Short Autoclave Cycle

Waiver was issued for acceptance of NOE elements which were processed at standard autoclaving conditions for 64 hours, 55 minutes vs. 72 hours specified.

2. CX-15, Pressed Braze Rings

Waiver was issued for acceptance of NOE and NIE elements brazed using "pressed chip" braze rings vs. standard cast rings.

3. CX-16, Beveled End Cap

Waiver was issued for acceptance of NOE elements that were brazed using beveled Zircaloy end caps vs. standard flat end caps.

Equipment Development

Support Welding Fixtures

The NOT and NIT support welding fixture bases were modified to accommodate the 20-inch natural fuel tubes. All parts will be fabricated the first week in July and ready to use whenever the natural uranium is processed.

Support Fabrication Dies

The outer support dies have been modified several times during the past month, and tests using various strip material have been run. It appears now that the die setup can manufacture an outer support within specification except for the transverse arch length. The nominal length is running about twelve thousands above that specified on the drawing, resulting in a better fit (less slop) than on other outer support fabrications. The specifications are currently being changed.

333 Building Fume Control

The 333 Building exhaust stack will be increased in height approximately 60 feet. The structural steel and scaffolding are being fabricated and the plastic for the stack will be received July 1 with total completion scheduled for July 8.

The packing media is on-site and is scheduled for installation in the scrubbers the first week in July.

The chemical milltank No. 32 was modified in order that mechanical mixers could be installed. It is expected that using mechanical mixers will definitely help the fume situation during solution mixing and agitation.

Fume tests are complete, although results have not been received from the Health Operation.

Hot Air Dryer Exhaust-Component Chemical Bay

The two dryers in the component chemical bay heat directly into the work area which makes working conditions undesirable. An exhaust system has been scoped to remove the heat from the dryers to the exterior of the building. Estimates are now being made to determine the most economical means.

TESTING METHODS OPERATION

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N-Fuels Testing

Component Testing

Ultrasonic Tests on Billets

Comparison of inner clad variation on 75 NOE extrusions with grain size measurements on the alpha extruded billets has shown a much better correlation than was previously indicated. Further checking of an additional 75 billets under much closer audit is expected to provide more reliable data. In conjunction with Quality Control and Product Engineering, tests are being made on several ingots for grain size and impurity effects on extrusions. The study should result in test specifications which will result in more uniform extruded fuel.

Grain Size Test on Billets

Product Engineering, Quality Control, and Testing Methods are combining efforts to determine the effect of impurities and grain size on cladding variation of extrusions. Tests with UT-8 on several ingots correlate with grain size and thus with impurities. These studies should result in definitive specifications and a nondestructive UT-8 test resulting in more uniform extrusions.

Process Control

Braze Station Operation

Braze station controllers were checked for power input and found to vary considerably. One controller was hypersensitive and found to need repair. Use of a power input meter was demonstrated to give an accurate check of the operation and is recommended along with an improved setup procedure to increase the braze uniformity.

Support and Clip Welding

The investigations to determine locking clip weld acceptability have been concentrated on X-ray, beta gage and ultrasonic tests. Preliminary work with beta detectors were inconclusive, but better matched detectors have been ordered to study this method further. The X-ray fluorescence method to determine the presence of uranium in the clip weld nugget has shown the ability to detect uranium and to determine how much Zircaloy is over the nugget. Work is under way on the problem of testing the clips inside the outer tubes which requires development of special reflecting

techniques. The ultrasonic reflection method from the outer surface to the weld interface and back through the uranium has been demonstrated to detect the weld region. Samples are being obtained of welds which have been over-heated to determine the detectability of a disturbed interface which would indicate some uranium had diffused into the locking clip.

Product Certification

Routine Tester Operation

The problem of clad thickness tester tending to thicker wall readings has been resolved as due to probe wear. It was corrected and two radius gages have been fabricated for checking this condition.

Modifications for Improvement of Production Testers

A transducer design change in the cap to core test was made in new units obtained from the vendor. These are currently being evaluated. A new manipulator has been designed, fabricated and is being evaluated to provide a better means of adjusting the external bond transducer. These modifications are expected to decrease the variables problem between testers.

The combined UE2-b, UT-9 tester consoles are nearing completion and four clad thickness testers have been delivered. The tanks for the units have been received from the vendor three weeks late, and will be readied as soon as practicable.

Alpha Surface Dcontamination Testers

Control chart data accumulation has been continued, but only about 12 fuel elements were tested in June. Variation in contamination ran from 30 to 130 micrograms which is a considerable spread. A cost estimate is being prepared on a semi-automatic unit.

Bore Camera

The excess bore camera has been set up in Testing Methods^o laboratory and photos of internal tube wall, bare uranium core inner surfaces and N-fuel have been taken to evaluate the condition of the camera. Pictures have been encouraging and better film and lights will be obtained which are expected to improve results.

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AlSi Fuel Testing

Product Certification

Hot Die Sized Fuel Element Tester - UE-3

Construction of the test tank was completed and console and tank are operating together. The tester is scheduled for installation in 306 Building July 2. Approximately 250 elements were tested in June and several were found to have unbonded ends. Also, several eccentric spires and three with galling on the inner bore were discovered. Standards work is under way and several designs are in the machine shop for fabrication.

Routine Tester Operation

The selection of UT-2 uranium grain size standards in three sizes has been completed. Tests on the laboratory prototype have shown that finer grain size can be accepted with little effect on rejection of partially transformed cores if the difference reading is fully utilized. Recommendations will be made for use of a difference standard. Thus, reducing the gain of the UT-2 testers, fine grain enriched cores will be accepted. The present reject rate on these cores at times exceeded 25 per cent.

Improvement of Production Testers

Comparison of the pulse echo transducer probes with Lamb wave probes indicated considerable variation in response between pulse echo transducer probes. OD both natural void standards and artificial standards, the pulse echo probes did not give as consistent results as the Lamb wave types. Work has been concentrated on determining the reasons for these discrepancies.

Results are not complete as yet, but the focal points and directivity as well as sensitivity have been found to vary considerably for the pulse echo transducers. A new, more precise design and fabrication process for the probes is needed before a definitive evaluation of the method can be performed. Data on transducers is being accumulated so that definitive specifications can be written.

N-REACTOR FUELS OPERATION
JUNE 1963

VISITORS

<u>Name</u>	<u>Company</u>	<u>Contact</u>	<u>Date</u>	<u>Purpose</u>
CT Ryan JG Clark	National Lead Co. of Ohio	TD Naylor	6/26/63	Discuss uranium inspection and testing.
JL Klein A Kaufman	Nuclear Metals Concord, Mass.	LM Loeb	6/25/63	Discuss N-RD R&D program.
RA Graham	Wah Chang, Albany, Oregon	DW Darsow	6/5/63	Zr-2 end caps.
VH Fleming RM Bristor	U.S. AEC Washington, D.C.	DW Darsow	6/10/63	Tour of 333 facility.
GA Moudry	Harvey Aluminum Torrance, Calif.	DW Darsow	6/19/63	ZR-2 cladding.
RC Anevari	Anaconda-American Seattle, Washington	DW Darsow	6/28/63	Cu-Si Tube.

TRIPS

HD Bell EL House	Autoclave Engineers Erie, Pennsylvania	JF Allison	6/4 to 6/6/63	Attend autoclave training session.
DW Darsow WR Kirk	Rem, Inc., Portland, Oregon	CA Brown	6/4 to 6/6/63 and 6/14/63	Zr-2 end caps and support tooling.
	Wah Chang, Albany, Oregon	RW Yih RA Graham	6/12 to 6/13/63	Zr-2 components.
	Production Parts Mfg. Milwaukie, Oregon	WJ Freeman	6/14/63	Cu-Si end plates.
RB Socky	U.S. Navy Washington, D.C.	Cmdr. Keays	6/24/63	Consultations on potential development.
	ASTM Society Meeting Atlantic City, N.J.		6/25/63	HAP0 representative for NDT.
	Frankfort Arsenal Philadelphia, Pa.	E Roffman	6/28/63	Consultations on bore camera problems.

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TRIPS (Continued)

<u>Name</u>	<u>Company</u>	<u>Contact</u>	<u>Date</u>	<u>Purpose</u>
WR Krehbiel	American Society for Quality Control Seattle, Washington	RP Delay	6/8/63	Gave speech to ASQC.
DL Cornell	American Society for Quality Control Seattle, Washington		6/8/63	Attended society meeting.

ORGANIZATION AND PERSONNEL

	<u>5/31/63</u>	<u>6/30/63</u>
Exempt	57	57
Non-Exempt	<u>113</u>	<u>117</u>
	<u>170</u>	<u>174</u>
Tech Grads Assigned to N-Reactor Fuels	<u>3</u>	<u>5</u>

Transfers

<u>Name</u>	<u>From</u>	<u>To</u>	<u>Effective Date</u>
SE Alder (Non-Exempt)	IPD	Quality Control	6/3/63
EW Enos (Non-Exempt)	IPD	Quality Control	6/10/63
BO Meng (Tech Grad)	New Hire	Quality Control	6/13/63
DA Wolgamott (Non-Exempt)	IPD	Quality Control	6/24/63
MW True (Non-Exempt)	Quality Control	IPD	6/24/63
WK Alexander (Exempt)	N-Fuels Product Engineering	IPD - Research & Engineering	6/17/63
TF Archbold (Summer Professor)	New Hire	N-Fuels Product Engineering	6/17/63

ORGANIZATION AND PERSONNEL (Continued)

<u>Name</u>	<u>From</u>	<u>To</u>	<u>Effective Date</u>
Belva M. Pleake (Non-Exempt)	Rehire	N-Fuels Product Engineering	6/17/63
LH Patterson (Non-Exempt)	New Hire	Testing Methods	6/24/63
DR Wild (MTP)	Manufacturing	Computer Division Phoenix, Arizona	6/27/63
WW Arnold (Tech Grad)	New Hire	Manufacturing	6/1/63
JR Hansell (MTP)	New Hire	Manufacturing	6/17/63

INVENTIONS

All 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 June, 1963. 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-77948	Unclassified	DH Walker RA Wildman	6/18/63	Amendment to Fourier Analysis of NPR Fuel Program Definition
HW-77825	Unclassified	JP Keenan	6/6/63	Locking Clip Gap and Spacing Requirements
HW-77919	Unclassified	WG Hudson	6/24/63	Horizontal Chemical Milling of N-Fuels
HW-78030	Unclassified	WG Hudson	6/25/63	The Use of Masking Plugs in Vertical Chemical Milling
None	Unclassified	WG Hudson	6/24/63	Progress Report - PWR-54 Beveled Top End Closure Cap
None	Conf.-Undoc.	JW Nickolaus	6/5/63	Target Schedule, 6/63.
None	Conf.-Undoc.	DR Wild	6/19/63	Finished and In-Process Fuels Storage

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SECURITY VIOLATIONS

There were no security violations in the N-Reactor Fuels Operation during June. Total CYTD - 7.

Manager, N-Reactor Fuels

LM Loeb:mf

RESEARCH AND ENGINEERING1. ADVANCED TECHNOLOGY

At the request of the AEC, a report was prepared and issued that details the advantages and limitations of the N-Reactor for the production program. The special features of N-Reactor that are attributable to the general physics, performance characteristics and production capabilities were discussed.

The study of exposure versus cost, Pu-240 isotope content versus exposure, and maximum production versus exposure has been completed.

Work continued on the study of AEC Projected Needs and Technology advancements over the next half decade. Significant progress was made in the establishment of basic working assumptions. These assumptions will delineate the scope of study into some manageable size. Considerable attention has been devoted to defining the needs of the AEC with respect to the radioisotope market and N-Reactor's production capabilities of these power source radionuclides.

2. REACTOR ENGINEERING

Review of data from the recently completed pressure drop tests of N-Reactor connectors and process tube (in the NPR-PCE Facility) showed that a change in radial orientation of the downstream fuel element spacer (dummy fuel element) caused a significant variation of pressure drop at the outlet nozzle at design flows. The spacers loaded in the facility during the tests were from a pilot order recently received for on-site evaluation. A recommendation was made to modify the spacer design to eliminate the pressure drop variability by adding an additional row of holes between each existing row of holes. Hydraulic testing of the modified design will be accomplished in the Thermal Hydraulics Laboratory and/or the 189-D Equipment Laboratory. Thermal Hydraulics has modified a sufficient number of spacers to make up a downstream charge for use in the electrically-heated test section.

Requirements and detailed procedures for operational testing of the process tube flow monitor system have been submitted to the Testing Unit for inclusion in the primary cooling system operational tests. Arrangements are being made for tests of critical flow monitor components in the 189-D Equipment Laboratory to obtain response data and to evaluate general performance characteristics of the flow monitor when supplied with hydraulic inputs from one or more venturis. Laboratory testing will precede the operational tests and will provide both reference data for those tests and information which would be difficult or impractical to obtain from the actual system.

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A study of the consequences of the failure of an N-Reactor process tube end cap is near completion. Computations indicate that in an accident comprising of a rear cap failure with subsequent ejection of the fuel load the steam release rate would at no time exceed 88 lb/sec of saturated steam at atmospheric pressure. This is well within the combined predicted capacity of the fog spray and filter systems. It can be reasonably argued that a similar accident at the front face would release similar or, more probably, smaller quantities of steam.

It has become apparent that the thermal-barrier doors may obstruct the opening of the affected process tube end thereby keeping the fuel column within the process tube. The doors are well situated, geometrically, to obstruct the fuel, the strength of the door panels is in question and is presently being investigated. It is advantageous to keep the fuel in the process tube, since it will then be safe from mechanical damage and most likely will be sufficiently cooled.

A summary review was made to determine the maximum N-Reactor power levels which might be expected over a period of several years after startup. A tabular summary of those technical or process items limiting N-Reactor power levels was prepared to point out specific bottleneck areas. This review indicated that reactor power levels in the range of 115 - 125 per cent of design power level should be obtainable after several years of operating experience. An increase of this magnitude over the design power level does not require any significant capital expenditures, rather it is based primarily on making full use of the design pressure of the primary cooling system, and anticipates some reduction in the design Hot Channel Factor. It may, however, be necessary to relax some maximum operating temperature criteria over those currently in use to reach power levels in the indicated range.

3. REACTOR PHYSICS

A study is in progress of the nuclear physical aspects of single tube fuel elements in N-Reactor. A wide range of dimensions and fuel element weights is being evaluated.

Approximate calculations have been completed on the production of several isotopes in N-Reactor which are of use as power sources. The isotopes considered were Co-60 which is obtained from irradiation of Co-59, Po-210 which is produced from irradiation of Bi-209, and Pu-238 which can be obtained from the irradiation of Np-237. The production of Po-210 is very slow as a result of the very low absorption cross section of Bi-209, and large quantities of target material would be required.

Kinetics studies are underway in support of the physics startup testing program. The initial effort is being devoted to general studies to define any problem areas which may exist. Further studies will be conducted in more detail wherever necessary.

Work on debugging the FAP version of FLEX is continuing and some progress is being made. The current operating deck of FLEX 2 is operating in a satisfactory manner.

4. CONTROLS, INSTRUMENTS AND SYSTEMS ANALYSIS

A mock-up of the NPR rupture monitor system has been installed at the recycling test loops of the 100-KE reactor and is in operation. System tests of reliability and sensitivity are being made. The tests will also be a guide for making final adjustments of the NPR rupture monitor instrumentation before the system is placed into operation.

Additional calculations and examinations were made of the 25 rupture monitor sample chambers, with the assistance of personnel from the Chemistry and Metallurgy Sub-section. A detailed test procedure has been written for additional tests of these chambers, including the effects of corrosion from decontamination cycling upon the strength of the chambers.

An Engineering Memorandum has been written covering the development considerations in the design of a process tube monitoring system. This memorandum is being distributed to interested personnel within the N-Reactor Department and the Hanford Laboratories for comment. This memorandum and the comments thereon will serve as the bases for the preparation of the detailed scope document on the program.

A program has been started in the investigation of the application of noise analysis techniques to the solution of N-Reactor system problems. The areas of interest are the determination of physics constants and reactor transfer functions from low power tests, and the noise and possible vibration resonances of the primary and secondary loop piping.

A technical basis specifying trip levels for the Nuclear Instrumentation Systems is about 75 per cent complete. Intermediate power range transient calculations are now under study.

The pressurizer analog computer program has been debugged and regular production runs have started recently.

5. CHEMISTRY AND METALLURGY

The second group of 14 assemblies of N fuel elements to reach goal was discharged on May 13, 1963. The average exposure was 1815 MWD/T. The swelling incurred by these fuel elements has been measured and found to be less than one would predict for the exposure and fuel element temperature. The inner tubes showed swelling up to 0.98 per cent; the outer tubes showed swelling in the range 0.31 to 2.56 per cent.

After an outage for tube replacement in the KE Reactor, the loop irradiation program was resumed on June 9. As of July 1, 1963, a third charge of assemblies reached 565 MWD/T and a fourth charge reached 240 MWD/T.

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Prototype target elements are being irradiated in KER Loops 1 and 2. The targets are hollow rods of aluminum -1 and 2 per cent lithium that have been clad with aluminum and recanned in Zr-4. Both charges are currently at exposures equivalent to gas-volume-ratios (GVR) of 2.86.

SIGNIFICANT REPORTS ISSUED

- HW-77740, "Alternate Uses of Higher Enrichment Fuel in N-Reactor," dated May 27, 1963, by R. J. Shields, (SECRET).
- HW-77806, "Physics Input Data for Economic Studies; Tube-in-Tube Fuel Elements," dated June 4, 1963 by P. F. Nichols (SECRET).
- HW-77866, "Nuclear Aspects of Heavy Isotope Production in N-Reactor," dated June 11, 1963, by P. F. Nichols (SECRET).
- HW-78101, "Hanford N-Reactor Advantages," by Staff of N-Reactor Department, dated June 27, 1963, (SECRET).

TRIPS

<u>Name</u>	<u>Firm & Location</u>	<u>Date</u>	<u>Purpose</u>
R. E. Trumble	Burns & Roe, Inc. New York City	June 3	Technical discussions N-Reactor equipment.
J.W. Vanderbeek	New York City	June 10 - 13	Attend Health Physics Society Meeting
J.W. Vanderbeek	Indian Point, New York	June 14	Discuss radiation protection matters
D.H. Curtiss	Wolverine Tube Co.	June 13 - 14	Review status of K- Reactor process tubes
D.H. Curtiss	Pittsburgh, Penn.	June 17 - 20	Carbon Conference
E.D. Sayre	Los Angeles, Calif.	June 17 - 20	AIAA Summer Meeting
M.C. Leverett	Salt Lake City, Utah	June 16 - 21	ANS Meeting and ASA N-6 Committee Mtg.
J.W. Riches	Mallinckrodt Chemical Works Weldon Springs, Missouri	June 25 - 26	Special meeting of Working Committee of FEDC
B.S. Kosut	Atlantic City, New Jersey	June 25 - 28	Attend ASTM Meeting

VISITORS

<u>Name</u>	<u>Firm & Location</u>	<u>Date</u>	<u>Purpose</u>
W.R. Conley	Cornell, Howland, Hayes & Merryfield Corvallis, Oregon	June 10	Discuss water treat- ment, control and monitoring.
R.M. Mains	Advanced Technology Lab., G.E. Schenectady, New York	June 5	Piping and structural analysis - N-Reactor.
G.A. Maudry	Harvey Aluminum Co. Torrence, Calif.	June 18	Discuss zirconium- niobium for pressure tube application.
D.H. Marquis	Engineering Services G.E., Schenectady	June 24 - 28	General consultation.
W.A. Althaus J.C.R. Clark Conrad Ryan	National Lead Co. Cincinnati, Ohio	June 24 - 25	Uranium feed-site technology
A.R. Kaufmann J.L. Klein	Nuclear Metals, Inc. Boston, Mass.	June 27 - 28	Consultation on fuel development program.
Clarke Williams	Brookhaven Nat'l Lab. Patchogue, New York	June 28	General orientation

PERSONNEL

Additions

<u>Name</u>	<u>From</u>	<u>To</u>	<u>Date</u>
K.L. Berrett	New Hire	Process Evaluation and Control	6-17-63
B.A. Brandt	NRD, N-Reactor Plant	" "	6-10-63
K.O. Creek	Ordinance Dept., Pittsfield, Mass.	Controls, Instruments & Systems Analysis	5-27-63
D.L. Condotta	NRD, N-Reactor Plant	Reactor Engineering	6-17-63
(Temporary Summer Employees)			
R.A. Baker	Washington State Univ. Pullman, Washington	Controls, Instruments & Systems Analysis	6-10-63
T.H. Nyman	Univ. of Washington Seattle, Wash.	Process Evaluation and Control	6-17-63
F.D. Robbins	Univ. of Washington Seattle, Wash.	" "	6-17-63

6-5
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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 June, 1963. 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.

M. C. Leverett

Manager
Research and Engineering

MC Leverett:LCC:mk

N-REACTOR PROJECTPROCESS DESIGN OPERATIONProcess Research and Development

An analysis of the emergency once-through cooling system has indicated that adequate flow will result if four or more of the eight emergency supply valves (V-3) are opened and, similarly, if four or more of the eight emergency dump valves (V-4) are also opened. A review of the detailed design of the gas supply lines to the valve operators has revealed the possibility that a certain type of failure in the gas supply lines could result in a number of the V-3 or V-4 valves being inoperable. Minor design changes are being studied to provide the necessary redundancy of independent gas supply sources to insure adequate response of the V-3 and V-4 valves under credible conditions of supply line failure.

The following trip settings have been studied for N-Reactor Phase I start-up operation to meet the objectives of satisfactory fuel element cooling both before and during the transition from normal recirculating flow to once-through emergency coolant flow and to satisfy confinement system needs in the event of a primary loop rupture:

Low pressure monitor	375 psig
Low flow	15% mass flow rate
Low pump speed	720-830 rpm
High pressure monitor	1720 psig
High temperature	600F

A digital computer study has been completed for determination of Zone I pressure variations in response to large breaks in the primary piping system. The results agreed with previous hand calculations and served also to verify the approach that has been taken in establishing confinement system design parameters. The computer program should also prove useful in future confinement evaluations.

A computer study has been programmed to calculate N-Reactor operating parameters such as reactor coolant flow, inlet and outlet coolant temperatures, hot channel temperatures, system pressure drops, and secondary steam pressures and flows. The program is being used in studies for conversion and future operating potentials of N-Reactor.

Conversion

The flow coastdown characteristics of the primary pumps following a scram have been calculated for Phase II operating conditions, both five and six loop operations. For both cases, the calculations were based on the assumption that all pumps would decay to about 25 per cent of the normal speed at steady state. An additional case assumed the possibility of only five pumps decaying in six loop operation.

Beckman Instrument Company has been authorized by the Atomic Energy Commission to proceed with the design and procurement of the water quality monitoring equipment and instrumentation associated with the sixth cell.

Project CAI-816

Process Tube Flow Monitor Controllers

In order to expedite delivery of the process tube flow monitor controllers, and on the basis of initially favorable test results, the 720-hour test at Avien was shortened to 520 hours and was satisfactorily completed on June 10, 1963. The equipment was shipped from Avien two weeks later and is expected at N-Reactor on July 1, 1963.

Gamma Energy Monitor - Rupture Detection System

All current circuit problems associated with the Gamma Energy Monitor spectrometers have been resolved with the supplier. Necessary equipment and circuit modifications, and testing to confirm correctness of the changes have been initiated. Final delivery is expected by mid-August, 1963.

Gross Gamma Monitor - Rupture Detection System

Reasons for vendor difficulties and delays in fabrication and testing of the GM tubes were investigated, and a test procedure was developed which should result in acceptable GM tubes and, additionally, expedite completion of the order with Lionel Electronics Laboratory. Most of the testing problems were related to an undesirable capacitance effect due to use of an incorrect test fixture.

Charging Machine

Fuel charging tests have continued at an accelerated rate. Based on these tests, it was concluded that:

1. The charging machine, exclusive of magazines, is functionally adequate.
2. Approximately 700 pounds of force is necessary to charge a column of fuel into an empty process tube or to discharge a column of fuel with a second column under conditions prototypical of the initial load.
3. Fuel element supports can be deformed when a horizontal charging force slightly in excess of that required to perform a normal charge is converted to an upward force component by step-ups in the line of flow (such as a 2.900-inch to a 2.700-inch taper in the magazine).

Modifications to the magazines to remove the 2.900-inch to 2.700-inch taper are being studied.

Facilities for In-Place Maintenance of Fuel Segregation Equipment

Scope study and criteria documents for facilities to permit in-place maintenance of segregation area equipment were prepared and approved. The basic facilities consist of a closure at the segregation area end of the conveyor tunnel and a floatable work platform. The closure will permit draining of the segregation area during reactor operation. In order that the Zone I confinement water seal in the discharge chute area will have essentially the same pressure relief characteristics, the discharge chutes must be drained to the (-) 7'-6" level when the tunnel closure is being used.

Review of Supports for Primary Piping

DDR Contract No. 175 was placed with Electric Boat Division of General Dynamics on June 5, 1963, for four analyses of Cell No. 5 piping located in the 109-N Building. The results of the dead load and thermal analyses should be available the first part of July, 1963.

Irradiated Metal Handling

Tests on the wearing characteristics of the discharge conveyor stainless steel components have been completed with very good results. Only one item indicated any additional galling and that was between a 304 s/s return idler and the nonheat-treated 440 s/s shaft. All of these shafts have been cleaned and heat-treated. All the discharge conveyor components are scheduled for shipment.

American Machine and Foundry personnel have been scheduled to inspect the modifications to the discharge conveyor before the parts are shipped. A Design Letter was issued to cover several corrective steps that are to be made before this system is placed in operation.

Maintenance Tooling

Fabrication of a third conceptual design nozzle/connector plug was initiated.

A holding device for use with the clamp-on RTD's during cap and lead tightening was designed.

Design was completed on a special reamer intended to accomplish cleanup of the pill-blend step in a process tube, should this be determined necessary to reduce fuel foot damage during charging. The reamer would be used to provide a shallower blend region in the tube. Final finish in this area would be accomplished with a honing tool currently available.

Drawings of an internal cutter for the inlet tube sleeve tips were completed.

A full-length process tube was procured for use in tooling development. Such a tube is needed for development and testing of longitudinal tube cutter concepts, tube sectioning cutters, and tube removal equipment.

FIELD ENGINEERING OPERATIONConstruction105-N and 109-N Buildings

Construction testing of the Zone II exhaust fans has been completed.

Construction testing initiated and completed on Zone III and IV evaporative coolers and continues on Zone III and IV exhaust fans.

Installation of the fog spray system has been completed and hydrostatic testing has been initiated.

Installation of the electrical Zone I seals on the Zone I shielding doors is in progress and seals on twelve of the eighteen doors have been completed.

As of June 16, 1963, the installation of the electrical cable for the 105-N and 109-N Buildings was approximately 78 per cent complete and approximately 55 per cent of the conductor terminations for the two buildings completed.

Construction testing of the Ball Control System and Horizontal Rod Drive Control and Indicating Systems are in progress.

Continuity checking, purging and flow testing work has been completed on the Flow Monitor System tubing and preparations are being made for hydrostatic testing. The cables and their terminations for the Flow Monitor System from the transducers to Room 6 terminal cabinets and from the terminal cabinets to the data logger have been completed.

The installation of tubing for the right side Rupture Monitor System has been completed. Continuity checking and purging of this tubing has been completed and preparations are being made for flow testing. Installation of tubing for the left side Rupture Monitor System continues. Terminations of coaxial cable between turrets and count rate circuit panels is under way on both right and left sides.

Construction testing (purging, continuity checking, and hydrostatic) has been completed on the tubing for the Graphite Flow Monitor and Rod Cooling Flow Monitor Systems.

The control tubing installation for the butterfly valves has been completed.

117-N Building

The painting in this building has been completed and roof insulation is in progress.

1310-N Facility

Fabrication of the waste storage tank by Chicago Bridge and Iron continues. Progress and the quality of workmanship appears to be good.

Installation of the 10" and 24" lines from the pump house to the tank and to the valve box, including coating, spark testing, hydrostatic and backfilling has been completed.

Installation of the 4" export line and the 6" water supply line to the pump house has been initiated.

181-N Building

Electrical work associated with the pressure transmitter panel has been completed.

The #4 motor for the circulating water pump was received, reinstalled and a six hour heat run test completed.

163-N and 183-N Buildings

Testing work by the subcontractor on the 163-N demineralizer equipment has continued throughout the past month. On June 19, 1963, the subcontractor successfully ran a train test of units in the demineralizer plant. The test shows a through-put gallonage of over 600 gallons per minute over an eight hour period.

Modifications of the balance of the demineralizer units, in accordance with the successful train units, is in progress by the subcontractor.

An extension to the height of the walls of the 183-N filter cells has been completed and three cells are now operable at design flow rates.

Final acceptance of the 183-N Building by General Electric Operations was made effective May 31, 1963.

182-N Building

The run-in tests of the diesel engine driven pumps were initiated and are in progress.

Final acceptance of the 182-N Building by General Electric Operations was made effective May 31, 1963.

184-N Building

The boiler has continued in operation throughout the past month. Work has continued on completion of punch list items and a survey completed for final acceptance of the building.

Final acceptance of the 184-N Building by General Electric Operations was made effective May 31, 1963.

1900-N Building

The fire lines are now complete, tested, backfilled and in use.

Miscellaneous

Final acceptance was also made of the 108, 151, 153 and 1100-N Buildings by General Electric Operations effective May 31, 1963.

Primary Piping

Field erection of primary piping is approximately 95 per cent complete. Chemical cleaning of the secondary piping has been postponed due to delays in getting the necessary valves operable. A new cleaning schedule has not been firmed up as of this date.

During the hydrostatic testing of Cells 3, 4 and 5 it was discovered that heat exchangers in Cells 3 and 4 leaked. An examination of the heat exchangers shows that stress corrosion cracking has been found in one unit and intergranular corrosion cracking has been found in the other units. An extensive testing program has been initiated. At this time the extent or cause of corrosion has not been determined.

File Erection

Hydrostatic testing of the hydraulic system in the right side rod room has been completed and 16 units have been tested in the left side rod room.

Twenty-two horizontal rod tips and seal sections have been installed in the right side, 13 of which have been hydrostatic tested and made operable. No scratches have been observed so far.

Nine hundred sixty-six diversion valves have been installed on the outlet stag and diversion headers and connector to diversion valve installation is approximately 70 per cent complete.

The temporary gas unloading line from the 151 Building spur to the storage tanks is complete, tested and accepted.

Tier 6 of the barrier wall has been poured and the shielding door and step-plug frame has been installed ready for the form work for Tier 7.

Custody transfer was made on the Ball 3-X System, the Thermal Shield Cooling System and the Horizontal Rod Cooling Supply and Drain, effective June 26, 1963. The punch list is complete for the electrical instrumentation system for the horizontal rods.

NPR Testing Program

All but two of the scheduled operational tests have now been scoped. Of the 42 tests presently scheduled, 23 procedures have now been issued for comments and of these nine have been approved.

Testing was initiated during the report period on the 100-N Compressed Air Systems and is approximately 10 per cent complete. Testing of the Fuel and Diesel Oil Distribution System is also in progress. Tests on three other systems have been completed.

Over-all testing progress during the report period may be summarized as follows:

	<u>Preparation</u>		<u>Performance</u>	
	<u>Scheduled</u>	<u>Actual</u>	<u>Scheduled</u>	<u>Actual</u>
This Month	55.5%	43.9%	17.0%	2.1%
Last Month	41.0%	38.5%	15.5%	2.0%

CONVERSION

A meeting was held in Portland on June 28, with representatives of the Bonneville Power Administration, Atomic Energy Commission, R. W. Beck and Associates, and Burns and Roe to review a third electrical power source for the reactor plant. The proposal by BPA was to provide on a scheduled basis a 115 KV supply from an isolated hydroelectric generator at Ice Harbor by an isolated transmission line to the HAPO area. A section of new line would be required to a substation near 151-N. BPA estimated the cost would be about \$633,000. Based upon an estimated improvement of one half of a percent in steam availability, the BPA and R. W. Beck representatives were of the opinion that the proposal was feasible.

The design criteria for conversion to Phase II have been completed and approved by the Design Council.

PROGRAM EVALUATIONDesign Status

Title I - 100 per cent complete.

Title II - 100 per cent complete.

Costs

No change has been made in the Official Budget Estimate during this reporting period. The current estimate for Project CAI-816 remains at \$188,320,000. The Kaiser Engineers May 26, 1963 Cost Estimate displays an estimate \$4,445,000 higher than the Official Estimate. This indicates no change since the April 28, 1963 report.

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 July 1, 1963, based on Revision # 5 to the AEC construction schedule, dated February 1, 1963, is as follows:

	<u>Scheduled</u>	<u>Actual</u>
Temporary Construction	91	91.8
General Area Systems	93	93.1
105-N Reactor Building	91	94.5
109-N Heat Exchanger Building	88	92.4
163N-183N Water Treat. Facilities	100	99.4
181-N River Water Pump House	100	100.0
182-N High Lift Pump House	100	100.0
184-N Standby Power House	100	99.9
153-N Switchgear Building	100	100.0
NPR Project (CAI-816)	90	93.3

RESPONSIBILITY

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

ORGANIZATION AND PERSONNEL

	<u>5-31-63</u>	<u>6-30-63</u>
<u>Exempt</u>		
Permanent	93	93
Tech. Grad.	1	0
<u>Nonexempt</u>	<u>23</u>	<u>23</u>
<u>Total Personnel</u>	117	116

Personnel Changes

<u>Name</u>	<u>From</u>	<u>To</u>	<u>Effective Date</u>
DL Condotta (exempt)	Process Design	Research & Eng'g.	6-17-63
RA Wilson (exempt)	CE&UO	Drafting	6-10-63
HJ Bellarts (exempt)	CE&UO	Process Design	6-15-63
RJ Browning (exempt)	Field Engineering	N-Reactor Plant	6-1-63
J Armstrong (nonexempt)	New Hire	Drawing, Specification & Material Control	6-3-63
V Hoff (nonexempt)	Field Engineering	Terminated	6-14-63
LL Grant (nonexempt)	CPD	Field Engineering	6-10-63
BA Brandt (nonexempt)	N-Reactor Project (General)	Research & Eng'g.	6-10-63
PD Gross (Tech.Grad.)	Process Des.	Research & Eng'g.	6-1-63

SAFETY AND SECURITY

There were no disabling injuries or security violations reported during June.

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.

TRIPS

<u>Name</u>	<u>Firm and Location</u>	<u>Date</u>	<u>Purpose</u>
McCullough, JD	Avien, Inc. Woodside, New York (Continuation of trip which began 5-13-63)	5-29 to 6-15-63	To assist in resolving engineering production and testing problems delaying completion of the Flow Monitor System.
	Chatham Electronics Div. of Tung-Sol Elec. Livingston, New Jersey	6-5-63	To discuss thyatron indicator problems.
Richards, WA	Burns and Roe Hempstead, New York Avien, Inc. Woodside, New York	6-3-63 and 6-4-63	To discuss conversion instrumentatio To observe flow monitor testing and discuss test facility.
	Lionel Electronics Brooklyn, New York Engelhard Engelwood, New Jersey	6-5-63	To observe tests on GM tubes, con- sultation on testing and production. To review production and discuss engineering problems concerning RTD's
	Bailey Meter Company Wickliffe, Ohio	6-6-63	To review ATP-2420 and to discuss conversion.
Kosmata, HR	APED, San Jose, Calif.	6/10-11/63	To discuss desalination program.
Henke, LG	Combustion Engineering Windsor, Conn.	6-10 to 6-13-63	To witness tests of the 105-N relief valves.
	Consolidated Electro- dynamics Corporation DeVar Kinetics Div. Bridgeport, Conn.	Night of 6-12-63	To witness tear-down of RV-2 valves for the examination of parts to determine reason for unsatisfactory operation.
Stepnewski, DD	ANS Meeting Salt Lake City, Utah	6-17-63 to	To assist in presentation of paper on confinement.
	APED San Jose, Calif.	6-20-63	To discuss contamination problems relative to heat exchanger leaks.
Davis, HS	ANS Meeting Salt Lake City, Utah	6-17 to 6-19-63	To present technical paper and attend executive committee meetings
	ASCE Computer Conf. Boulder, Colorado	6-20 & 6-21-63	To attend structural sessions.
Rohrbacher, RA	ISA Meeting Minneapolis, Minn.	6-19,20, 21-63	To attend Joint Automatic Control Conference.
	Sola Chicago, Illinois	6-24 & 6-25-63	To discuss problems and status of Sola Line Voltage Regulator.
	Lionel Brooklyn, New York	6-26 & 6-27-63	To review and discuss engineering and test problems related to Lionel GM tubes and to expedite completion of order.

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TRIPS (cont'd.)

<u>Name</u>	<u>Firm and Location</u>	<u>Date</u>	<u>Purpose</u>
Rediske, AC	Avien, New York, New York	6-8 thru 6-14	Observe testing, dis- mantling and preparation of equipment for shipment.
Dowis, WJ	Bechtel Corporation San Francisco, Calif.	6-7 thru 6-12	Nuclear heat for desalini- zation.
	G.E.-APED San Jose, California		" " "
Kratz, EM	Burns & Roe Hempstead, N. Y.	6-2 thru 6-5	Meeting on reactor conversion.
	Portland, Oregon	6-27-63	Meeting on BPA power supply to N-Reactor
Love, WJ	ASME Meeting Denver, Colorado	6-9/10	Attend program committee meeting
	ANS Meeting Salt Lake City, Utah	6-19	Attend ANS-7 subcommittee meeting
	Baldwin-Lima-Hamilton Philadelphia, Pa	6-10	Review export water system operational and test criteria with consultants
	C. T. Main Boston, Mass.	6-12	" " "

VISITORS

McCormick, HV	Ingersoll-Rand Co. Portland, Oregon	5-23	Discuss mechanical advance air drill application to special maintenance tools
Knoedler, EL	Sheppard T. Powell & Assoc. Baltimore, Md.	6-4 thru 6-6	Review problems in the Demineralization plant
Harper, OJ	Parker Aircraft Renton, Washington	6-10	Discuss mechanical fitting
Zahn, R	Rush S. Drake Assoc. Seattle, Washington	6-11	Discuss high-temperature strain gage system for hot loop test
Lewis, W	Sheppard T. Powell & Assoc. Baltimore, Md.	6-13/14	Review problems in the Demineralization plant
Paulson, CF	C. Frederick Paulson, Consultant Summit, New Jersey	6-26/27	Discuss VPI and piping systems

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SIGNIFICANT REPORTS ISSUED

<u>HW Number</u>	<u>Classification</u>	<u>Author</u>	<u>Date</u>	<u>Title</u>
HW-76664	Unclassified	Johnson, HG	6-20-63	N-Reactor Conversion Project Design Criterion for Addition to the Primary Loop in the 10 Building
HW-76668RD3	Unclassified	Mollerus, FJ, Jr.	6-4-63	N-Reactor Conversion Criteria Process and Control, Secondary Cooling System
HW-76671RD Rev. 1	Unclassified	Kosmata, HR	6-18-63	N-Reactor Conversion Design Criteria - Sectionalizing of the Secondary Coolant System
HW-77028	Unclassified	Robinson, RK	6-25-63	N-Reactor Pressurizer-High Pressure Injection Pump Simulation Study - Part II, System Response During Small Disturbances
HW-77761	Unclassified	Haugland, GT	5-31-63	Scope Study - Facilities to Permit In-Place Maintenance of 105-N Segregation Area Equipment
HW-77761 Rev. 1 RD	"	"	6-12-63	" " "
HW-77761 Rev. 1	"	"	6-18-63	" " "
HW-77762	Unclassified	Haugland, GT	5-31-63	Design Criteria - Facilities to Permit In-Place Maintenance of 105-N Segregation Area Equipment
HW-77762 Rev. 1 RD	"	"	6-12-63	" " "
HW-77762 Rev. 1	"	"	6-18-63	" " "
HW-77936	Unclassified	Brockmeier, GC	6-17-63	Removal and Reinstallation of N-Reactor Steam Generators
HW-77985	Secret	Agar, JD	6-20-63	Proposed Graphite Coring Patterns for B,D,F,DR, and H Reactors

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SIGNIFICANT REPORTS ISSUED (cont'd.)

<u>HW Number</u>	<u>Classification</u>	<u>Author</u>	<u>Date</u>	<u>Title</u>
HW-78037	Secret	Condotta, DL	6-26-63	Reactor Design Analysis Monthly Report for May, 1963
HW-78038	Confidential	Muraoka, J	6-26-63	NPR Primary Pump Coastdown Study

Manager, N-Reactor Project

JS McMahon:mbs

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N REACTOR PLANT OPERATION

TRANSFER OF FACILITIES

The following systems in the 105 Building were received in provisional custody status:

1. Graphite cooling system
2. Ball 3-X system
3. Thermo-shield cooling system
4. 24 Volt battery supply system
5. 125 Volt auxiliary battery supply system
6. 120/208 regulated voltage instrument power supply
7. Horizontal rod cooling system
8. Horizontal rod system, left side.

OPERATION OF FACILITIES

Tests were completed on the 184 turbine-generator set for acceptance from the vendor on June 28. The parts of the test applicable to the operating test program were recorded at the same time to prevent repetition at a later date. The tests were under the direction of Kaiser Engineers.

Kaiser Engineers completed raising the walls of the influent flumes to the 183 filters on June 27. Early indications are that loss of filter material has been reduced during back-flushing operation. Whether or not the loss is within design criteria will be determined by test data obtained in July.

On June 17 the first load of fuel oil was received by barge and unloaded into the 166 storage. The second load was received on June 29.

TRAINING

Orientation

Group VII orientation class, which began on May 13, was completed on June 26 and a new class, group VIII, started on June 10.

Maintenance

The electricians are continuing their training on the electrical systems together with working out specific maintenance problems and performing maintenance work as required.

Instrument training was all on-the-job in the instrument calibration effort and instrument system maintenance in the facilities recently transferred to N Reactor Plant.

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Certification

Formal presentations of the theory phase of the course was completed on June 14. The group is now engaged in studying various instrumentation systems in the control room, which is the second phase of this training effort.

PROCEDURE PREPARATION

Preparation is being kept on schedule by overtime effort as needed. Completion of the required operating and maintenance procedures, equipment descriptions (Vol. II - HW-69000), maintenance manuals, and the detailed test procedures is on schedule.

CALIBRATION

Calibration of the pile gas system instrumentation was completed on June 28 except for the gas chromatograph which was referred to the vendor for corrections.

Calibration of the graphite cooling system and the secondary cooling system was started on June 27.

The turbine-generator set local control panel No. 5 is 95% complete and panel No. 4 is 50% complete. Calibration work in 181 Building is about 80% complete; 182 Building 60% complete; 183 and 184 95% complete. Completion of this work is awaiting installation of equipment and/or completion of the plant control systems from 105-109.

TESTING

The water pretreatment facilities operational test was completed with few exceptions noted for correction. Attention was given to Title III tests on the turbine-generator and pile gas system to acquire data applicable to the operational tests.

SIGNIFICANT REPORTS ISSUED

None

TRIPS

<u>Name</u>	<u>Firm & Location</u>	<u>Date</u>	<u>Purpose</u>
H. A. Carlberg	BPA - Portland, Ore.	6/27-28	Conversion

VISITORS

None

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PERSONNEL

<u>Additions</u>	<u>From</u>	<u>To</u>	<u>Date</u>
G. W. Kaas (E)	IPD	Plant Processing	6/1/63
F. H. Butcher	IPD	Plant Processing	5/27/63
L. R. Adkins	IPD	Plant Processing	6/10/63
O. W. Boday	IPD	Plant Processing	6/10/63
R. S. Dorsett	IPD	Plant Processing	6/10/63
R. F. Hagensicker	IPD	Plant Processing	6/10/63
L. E. Hammer	IPD	Plant Processing	6/10/63
W. D. Heidelberg	IPD	Plant Processing	6/10/63
R. N. Henderson	IPD	Plant Processing	6/10/63
M. I. Johns	IPD	Plant Processing	6/10/63
O. J. Lair	IPD	Plant Processing	6/10/63
C. E. Miller	IPD	Plant Processing	6/10/63
C. T. Morris	IPD	Plant Processing	6/10/63
G. H. Phillips	IPD	Plant Processing	6/10/63
D. H. Schroder	IPD	Plant Processing	6/10/63
W. E. Thomas	IPD	Plant Processing	6/10/63
T. V. Van Lear	IPD	Plant Processing	6/10/63
E. E. Westenberg	IPD	Plant Processing	6/10/63
J. E. Williams	IPD	Plant Processing	6/10/63
R. W. Winegardner	IPD	Plant Processing	6/10/63
R. J. Browning (E)	N Reactor Project	Maintenance	6/1/63
J. L. Rand (E)	IPD	Maintenance	6/17/63
R. M. Brand	IPD	Maintenance	6/10/63
G. W. Frederick	IPD	Maintenance	6/10/63
M. F. Godwin	IPD	Maintenance	6/10/63
R. J. Kasko	IPD	Maintenance	6/24/63
Nola R. Wright	CPD	Maintenance	6/24/63
J. R. Massey	IPD	Maintenance	6/24/63

Transfers

None

Manager - N Reactor Plant

WM Mathis:GVRs:ds

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FINANCIAL OPERATION
JUNE, 1963

Principal activities of N-Reactor Department Financial Operation, other than those of a routine and repetitive nature, during June, 1963 consisted of the following:

N-Reactor Business Information System

Work on this system, in conjunction with personnel from N-Reactor Plant Section, Electronic Data Processing Operation, and Business Systems Development Operation, continued in accordance with the schedule established for a November 15, 1963 system completion date. There was, however, one serious problem. Indications are that data collection equipment would be available about ninety days after issuance of a purchase order. The feasibility study of the system and equipment had not been approved by RLOO-AEC as of the end of June which created considerable doubt as to whether the equipment would be delivered, installed, checked out, and tested prior to November 15, 1963.

However, systems definition and programming was continuing on schedule. All major problems of inputs and outputs have been resolved.

N-Reactor Data System

During the month a proposal was received from Contract and Accounting Operation for a system to generate N-Reactor operating data by use of the 7090 computer. This proposal is presently under study within certain sections of N-Reactor Department. A presentation of the system will be made by representatives of C&AO to the staff of NRD on July 13, 1963.

The system will be studied from the standpoints of:

1. Necessity for all the data presently anticipated to be generated from the system.
2. Comparison of economics generation by this means versus other possible methods.
3. Timeliness of the issuances of required information.

Production Studies

During June considerable effort was devoted to determination of production study information in response to cases established by the AEC task force. N-Reactor Department information was consistent with that previously issued except for changes in guidelines established by the AEC and use of a different method for distribution of cost of HAP0 Pooled Overhead components. The effect of selling steam to WPPSS was also included in these studies on a more equitable basis.

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Distribution of HAPO Overheads

A letter summarizing the N-Reactor Department position with respect to the distribution of HAPO Overheads was issued during the month. At the end of the month an answer to this letter had not been received. Contract and Accounting Operation continued to plan to distribute these overheads in accordance with the method previously established by them.

Fuels Cost Accounting

Revisions to increase the accuracy and improve the dissemination of cost information for N-Reactor Fuels Section were completed during the month of June, 1963. These revisions will be implemented during the month of July.

Personnel

During June two additions were made to the Financial Operation:

S. A. Fitch, Jr. - Analyst, Financial Procedures
J. J. Wheatley - Summer Professor

Manager-Finance

J Milne:pw

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**DATE
FILMED
01/22/93**