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IRRADIATION PROCESSING DEPARTMENT MONTHLY REPORT

JANUARY 1964

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HANFORD ATOMIC PRODUCTS OPERATION

GENERAL ELECTRIC

RICHLAND, WASHINGTON

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IRRADIATION PROCESSING DEPARTMENT
MONTHLY REPORT
JANUARY, 1964

HANFORD
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IPD Personnel
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DS Lewis 8-27-92
J. Tang 8-28-92
PM Eick 8-31-92
RICHLAND, WASHINGTON

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SUMMARY

MANUFACTURING

Reactor input plutonium production for January was 478.1 KMWDs: 250.0 at the six smaller reactors and 228.1 at the two K Reactors. Production at KW Reactor was an all-time monthly record for a Hanford reactor; its own previous record, established in June, 1963, was exceeded by 4.7%. The DR Reactor established a new monthly production record for that reactor, exceeding its December, 1961 record by 4.5%. Tritium input production was 3101 equivalent MWDs.

Power levels at the smaller reactors (excluding C) were restricted in compliance with a recent AEC directive limiting levels to previously attained maximums. Power levels at the C Reactor and at the K Reactors were restricted by the AEC administrative limits of 2310 MW and 4400 MW, respectively.

Over-all time operated efficiency was 72.9% (73.7% forecast): 69.1% at the smaller reactors and 84.1 at the K Reactors. Uninterrupted operation at KW Reactor resulted in a 100% time operated efficiency for the month. Extended outages were experienced at the F, H and KE Reactors.

Seven failed I&E fuel elements were removed from the reactors: five of natural uranium and two of enriched uranium. One of the natural metal elements was of overbore size at C Reactor. The four other natural metal failures were at B (1) and DR (3). The two enriched metal failures were at C and F Reactors. Five of the ruptures were stuck in the process tubes. There were three process tube leaks, one internal and two at the rear Van Stone flanges.

PRODUCTION FUELS

A total of 648 tons of natural and enriched uranium fuel elements was produced during January, 103% of forecast.

Canning line operation began the month at the rate of eight lines per day for two days, increased to nine lines the next 15 days, and finished the last five days at the rate of ten lines per day. Vacation relief personnel were used to operate the ninth line and seven operators on a temporary transfer from N-Reactor Fuels Section operated the tenth line.

Canning line efficiency was 97.4% for January.

Bare core inventory at month's end was 1,144 tons, a 1.8 months' supply.

Finished fuel inventory was 1,383 tons, a 2.2 months' supply, including 75 tons of dingot fuel elements.

The manufacturing yields of regular and self-supported fuels remained at high levels during the month. All were significantly above forecast. Record high yields were established on the self-supported models, as well as on the eight-inch regular models.

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Work in process at month's end was somewhat less than December and within the normal expected range. About five thousand self-supported fuel elements were backlogged ahead of the ultrasonic welders.

The heat exchanger for the cold degreaser spray of the cap and can machine developed a leak in the coils and allowed water to enter the degreaser. To continue operation, the heat exchanger was bypassed and water removed from the degreaser. The machine was operated in this manner until the standby cap and can machine could be placed in service. Repairs to the malfunctioning machine were in process at month's end. This incident resulted in a 2% increase in reject rates at the bond test for the material processed during the period.

Preparation and testing of two canning lines for production of four-inch fuel elements revealed the most serious equipment problem centered around the duplex loaders and the quench machines. Reshimming of the quench baskets was adequate to handle the four-inch elements. The preheat baskets in the canning furnaces had to be enlarged and equipped with vibrators to facilitate removal of the sleeve-can assemblies. Canning temperatures had to be raised in order to remove the sleeve-can assemblies from the baskets. Yields on the four-inch material have been poorer than regular material due to AlSi slops, attributed to new sleeves, and thin walls, resulting from higher canning temperatures.

Approximately twenty thousand of these smaller fuel elements were produced. Careful pre-planning and operator training resulted in a minimum of lost productive time, and performance on this model is considered creditable.

The overhaul of automatic welders progressed in January with two completed. Some difficulty in attaining satisfactory performance after overhaul has been experienced.

Production through the ultrasonic self-support welders was exceptional during the month, both in volume and yield. An average of 1,710 pieces was welded per shift using two welders. A record of 1,225 pieces was welded on the 2B welder on one shift.

Fuel performance in the fifth H Reactor E-N load exposed to 900 MWD/T was essentially as predicted. Two nonbumped enriched fuel failures occurred in this loading. One was a side hot spot failure and the other was caused by groove corrosion.

Recent canning cycle tests on small reactor (O3N) contour-base cans indicate the over-all time cycle can be reduced from 45 seconds to 41.5 seconds. Further tests are being run on step-base components.

An order for depleted uranium has been revised from 17 to 20 tons of small reactor (O3D) cores to 13 tons of small reactor (O3D) cores and 15 tons of K Reactor (KLD) cores. Approximately one hundred of the O3D cores will be delivered early in February for canning studies, and the remainder of this model by March. The KLD cores will be delivered by the end of March.

Prepared aluminum components and thorium-oxide have been provided to the Hanford Laboratory to assemble about six hundred and sixty low density (65% of theoretical) thoria elements to date. This effort has demonstrated that unsized thoria produced by a modified "Sol-Gel" process can be compacted to at least 65% of the theoretical density under low frequency vibration, and that closure welding will not be a major process problem.

RESEARCH AND ENGINEERING

The first one-ton charge of thorium oxide target elements (6.6 g/cc density) was charged in the F Reactor fringe; the goal exposure is 78 operating days. A second charge of the same density is being canned and will be used to replace the first one about April 1. Fabrication of high density elements (nominally 8.5 g/cc) has also been started for scheduled charging in a reactor central zone about March 1.

On December 31, 1963, the final group of four thorium oxide target elements was discharged from a D Reactor Poison Column Control Facility tube. A total of 16 thorium oxide elements at varying densities of from 6.2 to 8.39 g/cc was irradiated in that tube for periods of from five to fifteen days. All of these target elements were charged and discharged during reactor operation.

The irradiation of the fifth E-N loading in H Reactor was completed and all fissionable material was displacement discharged with the sixth E-N core. During this outage there was a test involving deactivation of the steam-powered secondary coolant supply system and trip-out of the electrically-powered pumps. It provided reactor coolant flow calibration with (1) high tanks, with (2) high tanks and export system flow, and (3) export system alone; data from the test are being analyzed.

An upward trend in effluent radionuclide concentrations continued during December, 1963, at all reactors except H, KE and KW. There were no significant changes in treatment of coolant during the month except at D where the pH of the near-side coolant was reduced from 6.6 to 6.3 on December 30, 1963.

FACILITIES ENGINEERING

The prototype magnesium magazines for K self-supported fuel elements ordered from the Dow Metals Company have been extruded and are undergoing heat treatment. Delivery is to begin in February, but the shipping rate has been reduced from 50 to 40 per week.

The two prototype self-supported fuel element charging machines have been used routinely during three recent charge-discharge operations at the K Reactors. Continued use has eliminated most minor mechanical weaknesses and very few breakdowns were experienced. Responsibility for maintenance and operation of these machines has been transferred to the Manufacturing Section.

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High strength polycrystalline graphite has been selected as the best material for sleeving vertical rod channels at the C and K Reactors. A purchase requisition was issued for prototype sleeves sufficient for three VSR channels at C Reactor. Channel enlargement tools are under continued development to prepare these channels for installation of liner sleeves. Work has continued to permit faster cutting rates and establish the procedures to minimize damage to process tubes during the channel enlargement operation.

The fabricator of the prototype HCR and the supplier of the boron carbide aluminum poison elements for the prototypic flexible HCR tips are having material and fabrication difficulty. This will result in a delay of one month in delivery. Design of the drive system for laboratory testing of the flexible HCR has been completed and approved; fabrication of the components has been initiated.

The engineering study of the feasibility of conversion of a small reactor for power recovery is proceeding. Capital and operating cost estimates are being prepared and economic evaluations are in progress. Preliminary work is under way on the four alternate study concepts which are planned for completion this fiscal year.

A specification for intermediate range neutron monitoring has been drafted. Preparation of a companion specification to delineate component quality and workmanship has been initiated. Testing of the F Reactor intermediate range neutron monitor prototype shield plug installation reveals less neutron leakage from the shield plug than from the surrounding reactor shielding. Data from the prototype installation indicate that the instrumentation equipment is operating satisfactorily; no unusual incidents have occurred.

The third first stage impeller fractured in one of the 275 HP loop pumps on Project CGI-839 (Modification of Fuel Element Test Facilities - 1706-KER). This has been repaired, using the new heavier impeller which the vendor had intended to use in this testing program. This may delay the testing program several weeks.

RESPONSIBILITY

There was no significant change in responsibilities.

FORCE SUMMARY

	<u>Exempt</u>	<u>Non-Exempt</u>	<u>Total</u>
General	8	2	10
Research and Engineering	90	56	146
Manufacturing	393	1332*	1725
Production Fuels	99	405	504
Facilities Engineering	86	33	119
Financial	18	12	30
TOTAL	694	1840	2534

*Includes 4 N Reactor replacement trainees.

SAFETY, SECURITY AND RADIATION EXPERIENCE

There were 101 medical treatment injuries, three security violations, no disabling injuries and no radiation incidents exceeding operational control limits.

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 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.

<u>Inventor</u>	<u>Date</u>	<u>Report of Invention (Title)</u>
L. W. Lang	12/10/63	HW-79915 - Reactor Designs for Producing and Using Clean U-233
"	12/10/63	HW-79916 - Production of Clean U-233
"	12/10/63	HW-79917 - Fuel Cycle that Permits Re-processing Clean U-233 but Minimizes Radiation from Contaminating U-232
"	1/28/64	HW-80729 - Increasing Amounts of Pu Isotope
"	1/28/64	HW-80753 - Nuclear Reactors as a Gamma Radiation Facility

O C Schroeder

O. C. Schroeder
Acting General Manager

OC Schroeder:DLD:bm

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MANUFACTURING

PRODUCTION & GENERAL

Reactor Production

Reactor input plutonium production for January was 478.1 KMWDs: 250.0 at the six smaller reactors and 228.1 at the two K Reactors. Production at KW Reactor was an all-time monthly record for a Hanford reactor; the previous record, established at KW in June, 1963, was exceeded by 4.7%. The DR Reactor exceeded its previous production record (December, 1961) by 4.5%. Tritium input production in the H Reactor E-N load was 1774 equivalent MWDs; incidental production in fringe poison at other reactors yielded an additional 1327 equivalent MWDs.

Power levels at the smaller reactors (excluding C) were restricted in compliance with a recent AEC directive limiting levels to previously attained maximums. Power levels at C Reactor and at the K Reactors were restricted by the AEC administrative limits of 2310 MW and 4400 MW, respectively.

Over-all time operated efficiency was 72.9%; 69.1% at the smaller reactors and 84.1% at the K Reactors. The F, H and KE Reactors had scheduled extended outages.

Fuel Exposure

The discharge goal exposure plan for natural uranium was adjusted downward to offset the increased graphite temperatures which favor Pu-240 formation. Exposure reductions of 25 MWD/T at B, C, DR and F Reactors, 50 MWD/T at KE and KW Reactors and 300 MWD/T at D Reactor were made. The large reduction at D reflects a cutback in unclassified plutonium requirements.

The average exposures (MWD/T) of irradiated fuel discharged in January were:

<u>Natural Uranium</u>		<u>Enriched Uranium</u>	
<u>Smaller</u> <u>Reactors</u>	<u>KE & KW</u> <u>Reactors</u>	<u>Smaller</u> <u>Reactors</u>	<u>KE & KW</u> <u>Reactors</u>
683	None Discharged	948	964

Reactor Personnel Certification

Six operating supervisors and three reactor specialists completed certification requirements during January. One Supplemental Crew supervisor completed special reactor studies program (Certification requirements less oral and demonstration test). Classroom sessions for supervisors and specialists were completed January 8.

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REACTOR AND POWER STATISTICS — JANUARY, 1964

REACTOR DATA	B	C	D	DR	F	H	KE	KW	TOTAL
INPUT PRODUCTION — PU — KMWD	47.7	52.4	48.3	51.6	30.6	19.4	91.9	136.2	478.1
" " — TRITIUM — EQUIV. MWD	321	57	217	500	232	1774	0	0	3101
POWER LEVEL — MW (MAX.)	1940	2310	2005	1925	1935	1955	4400	4400	20870
" " — MW (AVG.)	1853	2201	1949	1873	1906	1840	4351	4393	20366
TIME OPER. EFFICIENCY — %	83.1	77.0	79.9	88.9	51.9	34.0	68.1	100.0	72.9
OUTAGES — ALL CAUSES	2	6	2	3	1	3	2	0	19
OUTAGE TIME ALLOCATION — %:									
CHARGE — DISCHARGE	6.4	9.9	9.7	1.1	4.7	13.0	3.2	0	6.0
FAILED FUEL REMOVAL	1.2	1.1	0	4.8	0.8	0	0	0	1.0
WATER LEAKS	2.5	0	2.8	0	0	0	0	0	0.6
TUBE REPLACEMENT	4.5	6.8	0.7	0.1	18.7	10.6	22.3	0	8.0
OTHER MAINTENANCE	1.3	2.8	4.9	5.0	17.3	38.4	1.9	0	8.9
PRODUCTION TESTS	0.2	1.6	1.7	0	1.1	0.9	2.7	0	1.0
PROJECT WORK	0	0	0	0	0	0	0	0	0
OTHER	0.8	0.8	0.3	0.1	5.5	3.1	1.8	0	1.6
TOTAL	16.9	23.0	20.1	11.1	48.1	66.0	31.9	0	27.1
WATER LEAKS — TUBE	0	0	1	0	0	0	0	0	1
" " — VAN STONE	2	0	0	0	0	0	0	0	2
NEW TUBES INSTALLED	2	9	7	2	189	57	0	0	266
FUEL CHARGE — TONS NAT. U.	193.7	183.7	196.7	179.8	188.0	3.1	416.1	403.2	1764.3
" " — TONS ENR. U.	28.9	38.9	26.1	39.6	33.0	198.4	38.3	48.9	452.1
FUEL ELEMENT FAILURES	1	2	0	3	1	0	0	0	7
HELIUM CONSUMED — M CU FT.	145.9	583.5	348.0	283.8	518.7	89.4	287.7	196.2	2453.2
POWER DATA									
RIVER WATER PUMPED — M GALS.	8456.2		7662.7		3044.4	1671.1	9502.5	9655.2	39992.1
WATER EXPORTED — M GALS.	737.5		0		0	0	0	0	737.5
WATER TREATED — M GALS.	3091.1	4625.4	4678.1	2873.8	3014.5	1668.1	9443.6	9655.2	39049.8
WATER TO REACTOR — M GALS.	3486.7	3503.6	3757.2	3351.7	2851.9	1359.4	8211.5	8603.1	35125.1
" " " — GPM (NORM)	87500	98000	88500	87500	88300	88500	205800	208500	
" " " — PH	6.8	7.8	6.2	6.6	6.7	6.6	6.6	6.6	
" " " — DICHROMATE (PPM)	1.49	1.39	1.42	1.42	1.35	1.45	1.37	1.47	
STEAM GENERATED — M LBS.	70455		83539		45123	42660	29424	23034	
LBS. STEAM / LB. OF COAL	9.32		8.96		8.93	9.13			9.09
" " / GAL. OF OIL							123.7	101.2	112.7
ELECTRICITY GENERATED — MWH							1612.8	1652.0	3264.8

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REACTOR OPERATIONS

Reactor & Power Statistics

These are tabulated on page B-2.

B-C Plant

Power level at B Reactor was restricted to its previous high of 1940 MW, in compliance with the administrative limit recently imposed by the AEC. During the early part of the month, on 10-pump operation, the maximum level at C Reactor was restricted by the administrative limit of 2310 MW. With the 9-pump operation started on January 22, power level was restricted by the 95 C bulk outlet water temperature limit.

B Reactor had one scheduled outage (86.1 hours) for charge-discharge, and was down on a second occasion for 39.9 hours to remove a failed fuel element (dingot metal). During the scheduled outage, in addition to charge-discharge, 615 process tubes were gaged for wall thickness, two VSR channels were borescoped, a vertical traverse of process tube 4579 was completed, and the graphite burnout sample in channel 1081 was removed and replaced. During the second outage at B, the reactor was checked for water leaks, two process tubes were replaced because of leaking rear Van Stone flanges, and the flux monitor converter was relocated (DC 806).

Six outages occurred at C Reactor: one initiated by a manual trip because of insufficient reactivity for adequate temperature control (42.9 hours); one caused by the failure of an I&E overbore-size natural fuel element (93.2 hours); three due to unexplained Panellit gage trips (0.2 hours each); and one due to failure of an enriched fuel element (34.6 hours).

Principal work accomplished during these C Reactor outages (other than charge-discharge and failed fuel element removal) was as follows: wall thickness measurements were made on 91 process tubes; 150 front pigtails were straightened; nine process tubes were replaced, five of which required retubing a second time; new snap-rings were installed on the rear nozzles of 16 overbore-size process tubes; 22 dye-checked front nozzles were installed; the C-1 loop was tied into the No. 1 safety circuit (Design Change 719); and annunciators were installed on the low trip of the flux controllers (DC 824).

At the time of start-up of the B Reactor following its January 7 outage, the outboard seal failed on the No. 1 process water pump. Operation the rest of the month was with seven pumps on the line.

During the C Reactor outage which started January 18, process water pump No. 3 was removed from service for a Class A overhaul. Operation thereafter was with nine pumps.

D-DR Plant

Input production at DR Reactor was 51.6 KMWDs which exceeds the previous best month for this reactor by 4.5%. Maximum power levels at D and DR Reactors

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were restricted to previous highs of 2005 MW and 1925 MW, respectively, by the recently imposed AEC administrative limit.

D Reactor had two outages, one for scheduled charge-discharge (80.0 hours) and one to correct a process tube water leak (69.4 hours). The charge-discharge was unusually large (1,039 tubes) because of the goal exposure reduction from 900 MWD/T to 600 MWD/T. Other work accomplished during these outages included: installation of larger venturis (133 tubes), replacement of the discharge work platform control and communication cables, replacement of seven process tubes, installation of one flexible vertical safety rod, helium testing to locate the leaking process tube, process tube wall thickness measurements (86 tubes), and conversion of four poison column control facility tubes to regular process tubes in order to reduce maintenance and enriched fuel requirements.

DR Reactor experienced three outages during the month, all caused by failure of I&E natural uranium fuel elements. The first two outages were of 36.9 hours and 37.0 hours duration, respectively. The third occurred 8.9 hours before, and was continuing at month's end. All three failed elements were stuck, and one required downstream rib removal before it could be discharged. Other work accomplished during the outages included replacement of two process tubes, checking for restrictions in approximately one-third of the Panellit gage sensing lines, installation of one new flexible vertical safety rod, and checking the reactor rear face for helium leaks (with repair of four leaks).

The DR Reactor rear face fog spray system was activated twice during the month by failure of electronic tubes in the instrumentation system.

A program was initiated to enlarge 0.310 and 0.320 inch venturis on process tubes at D Reactor to 0.344 inch nominal throat diameter (DC 801). Primary advantage of this change is an increase of up to one per cent in water flow through the involved tubes.

Improved level indicating and recording instrumentation was installed for the D Reactor high tanks (DC 703). This equipment enhances reactor safety since it provides a more accurate and reliable indication of water level. Pump No. 2 at the 100-D Area River Pump House was modified by adding a third impeller stage. This is the second three-stage pump in a program aimed at greater pump flexibility for maintenance work.

F Plant

Power level at F Reactor was restricted to its previous maximum of 1935 MW, as required by the current AEC administrative limit.

The reactor was down for one extended outage of 14.9 days. This outage was initiated by the failure of an I&E enriched uranium fuel element fifteen hours before an outage for charge-discharge and tube replacement had been scheduled to start. The failed element was stuck and required hydraulic pushing force for removal.

During the charge-discharge, 20 thorium oxide and 40 enriched uranium support charges were loaded into the reactor as authorized by Production Test IP-648-AC, "Evaluation of Thorium Oxide as a Fringe Loading". Other outage work included process tube wall thickness measurements (218 tubes), replacement of 189 process tubes, mass foaming of the rear face gunbarrel bellows, selective foaming of the rear thermal loop header bellows and the omega seals, installation of 276 "front adjust" Panellit gages, replacement of two coupling seals on the main effluent water line, and installation of a steel liner in the inlet distribution box to the retention basin to correct a major leakage problem (Maintenance Job Authorization No. 58).

Production Test IP-635-A, "Testing of Corrosion Inhibitors in Reactor Coolant Backup Systems", was started on January 28. This test requires that 100 ppm sodium dichromate be maintained in the west emergency water high tank and its outlet lines.

Two leaking water tubes were replaced in the air intake cooler of No. 4 process water pump, thereby returning this pump to normal service.

H Plant

On January 20, H Reactor concluded a 21-day scheduled outage which featured a total discharge of all fuel and target material, followed by major modifications to rear face hardware and associated equipment. All process water flow through the reactor was valved off to provide dry rear face conditions for this maintenance work.

Under the program to increase coolant water flow through the reactor, the following major changes were made based on satisfactory results of the test modification made to cross header No. 27 (and its two tube rows) in December, 1963:

Replacement of all 0.310" venturis and fringe zone double orifices to 0.344" venturis (DC 845). Existing venturis were rebored to the larger diameter.

Replacement of solid Li-Al target elements in the first lattice tubes with I&E geometry elements.

Completion of the transition from bumpered to smooth surface fuel elements.

Reaming of rear crossheader Parker fittings (0.469") to the ID (0.543") of the rear connectors (DC 847).

Replacement of existing rear nozzles with modified inlet nozzles excessed from the K Reactor zirconium retubing program.

Installation of nozzle adapters with larger inside diameter and tapered bore to match the ID of the existing rear connectors.

During the subsequent period of operation, the coolant flow capacity was demonstrated at 93,200 gpm, an increase of 8600 gpm over the previous base at H, and a new record high for one of the smaller reactors (other than C).

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Other work accomplished during the extended outage included recharging the reactor with another E-N load, replacement of temperature monitor thermocouples, wells, ducts, leads and stepping switches, modification of 1533 pressure monitor gages, revision of the power calculator instrumentation, and the change-out of two horizontal control rod tips. Under PITA-IP-22 the types of tube charges in the E-N load were reduced from five to two. Longer Li-Al target elements (5" instead of 4.3") were charged, three per tube, replacing the previous arrangement of three in some tubes and four in others.

Following the reactor start-up on January 20, power level was restricted to its previous maximum of 1955 MW by the recently imposed AEC administrative limit. Three short-duration outages were experienced: a flux monitor scram (0.2 hours), a manual scram initiating the poison discharge outage (12.1 hours), and a shut-down to repair a rear ball valve (1.0 hour).

KE-KW Plant

KW Reactor operated continuously and established a new monthly input production record for a Hanford reactor (exceeding its June, 1963, Hanford reactor record by 4.7%). Maximum power levels at both KE and KW Reactors were restricted by the AEC administrative limit of 4400 MW.

KE Reactor had one outage to verify the integrity of a process tube inlet flexible connector (37.0 hours), and was shut down on January 23 for scheduled process tube replacement. At month's end process tube removal and related tube hardware work were on schedule. During the first outage, a total of ten flexible connectors having seven or more broken mesh strands was removed for destructive testing. In addition, preparatory work for the tube replacement outage was accomplished.

Rear face piping decontamination at KE Reactor prior to tube replacement reduced average radiation levels within the tube removal block to 22 mr/hr.

APPLIED REACTOR ENGINEERING

Plant Engineering

Electrical

A prototype of a 24-volt Work Area Crane Control for use at the K Reactors was satisfactorily tested for replacement of the presently discontinued 24-volt Control. The original low voltage system had been by-passed after repeated malfunctions.

Trouble-shooting assistance was given to Research and Engineering in connection with the several 1706-KER loop pump trips. These coolant supply pump trips have caused numerous near-scram conditions of the KE Reactor. The trip causes were determined and remedial actions were suggested.

Design Change 478, VSR Withdrawal Interlock - F Reactor, was issued. This design change limits the normal removal of vertical safety rods (at one time)

to two which are not adjacent or in the same longitudinal row relative to the process tube pattern. This provision eliminates the purely procedural control over VSR withdrawal during reactor start-ups. Minor Design Change F63-13, F Reactor, also was issued. This MDC provides for monitoring power to the horizontal control rod coolant pressure annunciator and the main process conditions annunciator in the Control Room, for sounding an alarm if a loss of power to either is experienced.

Assistance was provided B-C Plant during acceptance tests on the following Design Changes:

- (1) DC-824, C-1 Loop Safety Circuit Tie-in to C Reactor No. 1 Safety Circuit;
- (2) DC-743, C Platform Safety Clearance Devices; and
- (3) DC-761, Field Loss Annunciation (for process pump motors at the B Main Pump House).

Assistance also was given D-DR Plant with the use of vibration analyzing equipment in the re-balancing of deep-well turbine pumps at the D River Pump House.

Mechanical

To assist Special Outage Service in reducing the zirconium tube losses resulting from defective Van Stone flanging during the zirconium tube replacement program at the K Reactors, a number of improvements have been developed and standardized. These include a dial gage for checking zirconium tube trim length, an explosive tool for forming the first stage of the Van Stone, with a spinning tool completing the flange, and on-the-job training of all three shifts for all craftsmen and supervision who will be engaged in this work.

Under the Assistance to Hanford Program, Manufacturing Services has developed a prototype splitter for use in the removal of zirconium tubes. Preliminary splitting tests indicate the tool is satisfactory.

Preliminary results of Development Test DT-IP-655-F have shown that increased hub retraction forces, and a device to positively eject the coiled poison spline, improve the reliability of spline coiler operation.

Full engineering support was given H Plant during the extensive modification of rear face hardware which was completed during the January outage of H Reactor.

Follow-up gas leak checking was given engineering direction after the mass foaming of rear face gunbarrel bellows at F Reactor. The bottom three omega seals had extensive leaks.

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Instrument

At the request of D-DR Plant a system has been designed to provide automatic pressure control for No. 3 and No. 5 condenser water pumps at Building 182. Permitting cold standby of these pumps should result in a steam cost savings of \$16,000 per year.

During the January outage at H Reactor, temperatures throughout the storage basin were taken before, after, and at the mid-point of the block fuel discharge. Measurements were made at 33 points throughout the basin to obtain a good cross section of the water temperatures. The readings averaged 3 or 4 C higher after the discharge than before. These data were taken at the request of the Facilities Engineering Section.

Strap-on RTDs have been received from Minco, Inc., and are being tested for use in Zone Temperature Monitor revisions. Initial test results show the response time of these RTDs to be faster than that of the immersion type previously used.

Design Change No. 866, Power Calculator Recalibration - H Reactor, was issued as necessitated by the process water flow increase resulting from January outage work on rear face piping. Engineering assistance was given H Plant during the installation of new range tubes obtained from K Plant, and the recalibration work.

Minor Design Change E64K-IC-004-A was issued providing for recalibration of the reactor graphite temperature recorder at KE Reactor. The original iron-constantan thermocouples have failed, and instrument recalibration will permit use of the new Geminol thermocouples.

Design Change 867 was issued to cover the reversal of connector pins on the flux monitor instruments at both KE and KW Reactors. Connector reversal will reduce reactor scram potential by eliminating exposed electrical pins which could inadvertently be grounded.

Design Change 849, Removal of Obsolete Gas Control Piping, F Gas Recirculation Building, was issued. This design change provides for the elimination of existing and potential gas leaks, deletion of unneeded controls, and simplification of operating procedures by reducing the multiplicity of gas makeup valving.

Industrial

A handbook on "Decontamination of Reactors and Associated Equipment" is being prepared with contributions from nuclear energy installations throughout the world. Hanford Laboratories is editing this publication. Responsibility for coordination of IPD contributions was assigned to Applied Reactor Engineering. The first drafts were completed and issued to Hanford Laboratories.

As part of a requested study to reduce errors and provide standardization in the use of Sequence Lists for Charge-Discharge at the reactors, a sequence

list request form was developed with Production Computing. Use of these forms will provide flexibility to combine lists as needed for each reactor outage, and to communicate these needs in a more clear-cut manner.

Industrial engineering observations of the KW Reactor outage which started on December 29, were made to determine the controlling time breakdown for outage activities of all types. This was the third in a series of such studies to identify ways in which to reduce outage time.

The "Personnel Traffic to C Work Platform - Part I" study was completed. Analysis of the spline removal task at B and C Reactors showed that a mobile "on platform" personnel radiation shield can be utilized at the six smaller reactors. Use of the mobile shield allows several substantial improvements, including: (1) elimination of 18,000-20,000 man-trips annually on emergency escape ladders; (2) increase in spline removal productivity from 35 splines to 65 splines per eight-hour shift, equaling present performance at the K Reactors, and (3) reduction of radiation exposure incurred by work crews during the manual dumping of coiled splines. Design work for a mobile personnel shield has been initiated, and studies of personnel traffic problems associated with other C platform tasks are continuing.

Engineering Studies and Analyses

Reports HW-80164 and HW-80266 were issued to document studies made in support of the rear face hardware modifications accomplished at H Reactor during its January outage. These studies included matching considerations for the B, D, DR and F Reactors.

The need for mixer-type fuel elements was reviewed. For aluminum process tubes, the benefits still exceed the costs by at least a factor of four. Mixers are not used in smooth zirconium tubes, consistent with the lower fuel rupture rate in those tubes.

HW-80089, "Increased Length Fuel Elements", was issued. This analysis was made to establish the current development status and potential economic benefits associated with selected increases in fuel length. The analysis considered three conditions of fuel size mix, with 10-inch and 12-inch fuel lengths in addition to current sizes. Primary recommendations related to further irradiation testing of 10-inch fuel, and to firming knowledge on the extent to which longer fuels can be used in the reactors.

A summary of Design Changes was issued to RLOO-AEC covering the last half of CY-1963, with detailed information furnished on changes having an impact on nuclear safety. A total of ninety-two Design Changes was approved during the period, with sixteen per cent of these representing modifications with some significance to reactor safety.

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Maintenance Standards

The status of Equipment Maintenance Standards was as follows at month's end:

Issued to date	-	62
Routed for approval signature	-	82
In comment status	-	23
In preparation	-	48

215

Spare Parts

The status of the order for 106 universal flexible vertical safety rods and parts was as follows at month's end:

<u>Type</u>	<u>Number Received</u>	<u>Assigned To</u>
B,D,DR,F,H	19	13 to DR 3 to B 1 to F 2 to Spare Parts
K	8	5 to KE 3 to KW
C	6	6 to C

Plant Personnel Training

Training activities at White Bluffs facilities were as follows: The Transistor Electronics classes for the instrument and electrical shift maintenance personnel continued, with fourteen craftsmen attending three 8-hour classes. One hundred and seventy-one mechanical maintenance supervisors and craftsmen attended eight 4-hour classes on the use and maintenance of Ramset and Powerset powder actuated tools. One supervisor and four mechanical maintenance craftsmen attended one 4-hour class on K Reactor gunbarrel regrooving, zirconium Van Stoning, and gunbarrel bellows foaming. Two mechanical craftsmen attended one 2-hour class on the tool for explosive forming of Van Stone flanges on reactor process tubes.

The following seven sound-slide programs were issued and approved by the using operations:

- Explosive Van Stone Forming - Zirconium - K Reactors
- Explosive Van Stone Forming - Aluminum - All Reactors
- Cleaning Explosive Van Stone Tool
- Tube Charging and Charge Seating - DR Reactor
- Premarking and Preinsertion - DR Reactor
- Preparation of Gas Chromatograph - B, D, DR, F and H Reactors

Sound-Slide Programs have been issued on 71 subjects to date. Eleven sound-slide programs were revised to reflect changes in equipment and procedures.

The Industrial Engineering Film Library catalog supplement was revised to include movies taken since January, 1963, and sound-slide programs issued since August, 1963.

A handwritten signature in black ink, consisting of a large, stylized 'O' or 'Q' shape followed by a horizontal line and some smaller, less distinct markings.

Acting Manager, Manufacturing

RS Bell:TWB:DLD:bm

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PRODUCTION FUELS

ALSI SHOP

Canning line time operating efficiency was 97.4 per cent, 0.4 per cent above forecast.

Manufacturing yields during January remained at high levels, significantly above forecast. Record high yields were attained on the K Reactor self-support models at 90.2 per cent on the eight-inch fuels and 89.6 per cent for the six-inch fuel. The average self-support welding yield increased to the record high of 99 per cent for the month.

Production of lithium-aluminum target elements for a complete E-N load for H Reactor was completed during the month. The new five-inch size was produced for all the core and a large part of the blanket requirements. A total of nearly 6500 elements were produced in January.

Production of projection fuels during January was:

	<u>Natural U</u>	<u>Enriched U</u>
Tons Produced	147	83
Finished Inventory	543	119

Acceptable Fuel Elements (Tons)

<u>NATURAL</u>					<u>ENRICHED</u>					<u>Total</u>
<u>C</u>	<u>K</u>	<u>K5NS</u>	<u>Reg.</u>	<u>Bumper</u>	<u>C</u>	<u>K</u>	<u>K5ES</u>	<u>Reg.</u>	<u>Bumper</u>	
74.4	111.9	145.7	141.6	-	-	-	83.1	91.3	0.8	648.8 ⁽¹⁾

Per Cent of Forecast

207	106	83	80	-	-	-	163	107	-	103
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Manufacturing Yields

January

96	94	90	94	-	-	-	90	93	-
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Forecast

91	91	87	91	-	-	-	87	91	87
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Previous Month

93	-	88	93	-	88	-	89	94	99
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(1) Includes 11.4 tons of upstream

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HW-80581

Operating Conditions, Incidents, and Improvements

All caps on hand for the small reactor six-inch size fuel elements were found to have a plastic film on the spire portion. The usual cleaning process would not remove this film. The possibility of poor bonding and nonwetting made it mandatory that a method be found to clean these spires. A procedure for wiping the spires with steel wool was developed after which, normal etching and cleaning processes satisfactorily removed the film.

A prototype automatic rail sizer for sizing rail heights on eight-inch self-supported fuels was tested and installed for production use during January. The performance of this unit has been excellent with high throughput and a low reject rate. Based upon a preliminary timestudy that has been made, it appears that a crew of three men may be able to handle the daily throughput.

The production of four-inch I&E fuel elements was moved from the 306 Pilot Plant into the 313 manufacturing facilities in January. Approximately 20,000 of these shorter fuel elements were produced. Although several equipment and process problems were encountered, performance on this model was considered creditable.

Autoclave Failures

There were no autoclave failures experienced in regular production during January.

MATERIALS

Fuel Recovery

Fuel Recovery facilities were out of service for two weeks during the month to permit necessary process piping and equipment repairs.

The following amounts of AlSi fuel were processed during January:

	<u>Pieces</u>
Eight-inch Natural	7516
Six-inch Enriched	0
Six-inch Watermix	<u>0</u>
Total	7516

Hanford Test Reactor

Available reactor time was utilized as follows: 247 routine production tests were performed (182 GO NO-GO and 65 drift tests) representing 50 per cent of the available time, with the remainder being utilized for special testing.

Inventories

Bare Core Inventory	1144 tons
Finished Fuel Inventory	1383 tons
Work in Process	287 tons

Scrap

Four shipments of metallic uranium scrap were made during January, including 7 tons of enriched AlSi scrap, 18.1 tons of NRD scrap, 121 barrels of uranium oxide, 14 drums of filter press canvas, 75 empty billet boxes and 432 empty core boxes with lids.

FUELS ENGINEERING

Quality Control

The accumulation rate of upstream fuel elements is indicated by the following breakdown of material accumulated since August 30:

<u>Category</u>	<u>Number</u>	<u>Per Cent of Total Upstream Fuel</u>
Bond Rejects	3,805	33.4
Low-Rail Rejects	3,606	31.7
Marred Surface	3,317	29.2
Facing Rejects	359	3.0
Inclusions	211	1.9
Rail Weld Rejects	63	0.7
Stains	17	0.1
Total	11,378	100.0

Rupture Experience

A total of seven fuel elements failed during the month of January 1964:

<u>Fuel Element Type</u>	<u>Tube and Reactor</u>	<u>Exposure (MWD/T)</u>	<u>Rupture Classification</u>	<u>Failure Date</u>	<u>Canning Date</u>
Natural Non-Bumper	1265-DR	405	Side Hot Spot	1/6/64	4/10/63
Natural Non-Bumper	3663-DR	394	Side Hot Spot	1/10/64	10/22/63
Enriched Non-Bumper	0678-F	969	Unknown-Not Examined	1/14/64	8/2/63
Natural Overbore Self-Support	3366-C	315	End Defect	1/18/64	11/8/63

C-3
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Rupture Experience - continued

<u>Fuel Element Type</u>	<u>Tube and Reactor</u>	<u>Exposure (MWD/T)</u>	<u>Rupture Classification</u>	<u>Failure Date</u>	<u>Canning Date</u>
Natural Non-Bumper	2181-B	362	Side Hot Spot	1/21/64	4/4/63
Enriched Non-Bumper	1888-C	538	Side Hot Spot	1/24/64	11/20/63
Natural Non-Bumper	2263-DR	616	Unknown-Not Examined	1/31/64	10/22/63

Performance of the fifth E-N load was not significantly different from that expected. Two ruptures were incurred in irradiating the E-N core to approximately 900 MWD/T; both were in non-bumper material. One failure was classified side hot spot, the second was caused by groove corrosion. The expected number of ruptures, based on the irradiation conditions achieved, was 1.6 side failures (in non-bumper material) plus 0.5 groove corrosion failures.

Uranium Technology

Three depleted ingots were cast at NLO to determine the degree of control on the additive and carbon concentration that can be expected using all derby charges. The analytical results were:

<u>Ingot Number</u>	<u>Fe</u>	<u>Si</u>	<u>C</u>
30592	148	87	470
30593	115	90	470
30594	133	105	370

Silicon control is satisfactory, but the iron control should be improved. The lower carbon analysis on ingot 30594 is probably due to a shorter holding period in the molten state, and no problem is expected in maintaining a fairly uniform level in production.

The depleted uranium order was revised from 17 - 20 tons of small reactor cores to 13 tons of small reactor cores and 15 tons of K Reactor cores. Approximately 100 'O' size cores will be delivered in early February for canning studies, and the balance of this model will be delivered during the first week of March. Delivery of 'K' size cores is expected by the end of March.

Grain size variation recently observed in small reactor (O3E) enriched fuel cores is apparently caused by non-uniform quenching after beta heat treatment at National Lead of Ohio. A proposed solution is to heat treat the enriched uranium in the same automatic furnace used for natural uranium--the Amsler-Morton. However, the specified air delay time (salt bath to quench) is 20 seconds for enriched uranium and 43 seconds for natural. It is desirable to have one air delay time to avoid excessive downtime for

changeovers. Considering air delay times and transformation temperatures, a revised specification is being prepared to standardize the air delay time at 20 seconds. This will permit NLO to heat treat both natural and enriched uranium in the Amsler-Morton furnace.

In order to minimize tramp impurities (phosphorous and aluminum) originating from the use of the Uranyl Ammonium Phosphate (UAP) process to recover enriched uranium residues, both NLO and MCW have submitted proposals to process enriched residues in existing solvent extraction refineries. NLO has also developed ion exchange techniques to a point where they are ready to submit a proposal. In addition to producing a purer product from the residues, these alternate refining processes reportedly would be cheaper to operate. HAPO has requested consideration be given to replacing the UAP process with one of the alternates.

According to the analyses, there has been no significant improvement in the precision error of the UT-4 closure testers since they were originally installed. There is no apparent improvement in biases either, in spite of task force efforts. However, substantial process yield benefits have resulted from the use of carefully prepared 0.013 to 0.016-inch diameter defect standards on all fuel models. Tester availability problems have also been eliminated through tester and maintenance engineering efforts.

Recognizing that little, if any, further improvement can be made in the operation of the UT-4 closure testers, a decision must be reached relative to the benefits derived and future application of these testers. A comprehensive destructive examination program is being carried out on fuel samples showing varying tester count in order to develop the information on which to base such a decision.

AlSi Process Development

Recent canning cycle tests on small reactor (O3N) contour-base cans indicated the over-all cycle time can be reduced from 45 seconds to 41.5 seconds. Further tests are being made to determine (1) if the step-base can design or process modification will reduce the cycle time to 40 seconds or less, (2) the optimum canning cycle for other fuel models, and (3) the effect of reduced cycle time on the uranium-AlSi bonds.

Initial evaluation of an alternate deoxidizer solution for cleaning aluminum components has been completed without detrimental effects on fuel quality. Qualification of this material is expected with continuing favorable performance.

The fuel elements for the initial production test of ten-inch enriched water-quenched cores have been canned and are awaiting measurements and assembly into charges. There are 162 ten-inch and 94 six-inch control pieces available for reactor charging. Sixteen charges will be irradiated that contain five matched pairs of ten-inch and six-inch control elements centrally positioned in the charges to compare dimensional characteristics of ten and six-inch cores. In addition, four charges will be irradiated that contain eighteen ten-inch elements.

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Cores for canning 100 double-core, ten-inch natural fuel elements have been machined. These double-core elements are being prepared for reactor drop tests to determine if the core-to-core bond is strong enough to withstand discharge into reactor basins. If the unirradiated double-core elements do not break apart during discharging, consideration will then be given to reactor testing double-core fuel elements.

Thorium oxide and prepared aluminum components have been provided to the Hanford Laboratory for the assembly of about 660 low density (65 per cent theoretical density) thoria elements to date for irradiation tests. This work has demonstrated that unsized thoria produced by a modified "sol gel" process can be easily compacted by means of low frequency, low energy vibrations to at least 65 per cent theoretical density, and that the closure of the finished elements will not be a major process problem.

Alternate Process Development

Both the natural and 0.947 o/o U-235 enriched uranium fuel elements clad by the hot die sizing process experienced dimensional changes during irradiation, which differed from the AlSi brazed control fuel elements. The natural uranium production test (PT-IP-546-A) consisted of 20 columns, 17 of which were charged alternately with hot die sized and AlSi brazed pieces in the downstream half of each column and AlSi brazed pieces in the upstream half of each column. The other three columns were thermocouple charges, which included two full-length hot die sized fuel columns and one AlSi brazed fuel control column. Two of the "striped" columns were discharged after exposure to approximately 370 MWD/T. The remaining 18 columns were irradiated to an average exposure of approximately 950 MWD/T. Average diameter dimensional changes and weight loss for the irradiated hot die sized and AlSi braze control pieces were:

	<u>Average Change (Inches)</u>	
	<u>HDS</u>	<u>AlSi</u>
ΔOD_1 (1" from base)	0.012	0.008
ΔOD_2 (midpoint)	0.017	0.009
ΔOD_3 (1" from cap)	0.010	0.008
ΔID (average)	0.010	0.004
Warp	0.002	0.002
Weight Loss	1.98 grams	1.61 grams

Double bend profiles were noted in 56 per cent of both the hot die sized and the AlSi brazed pieces as compared to about six per cent in standard AlSi brazed fuels.

The 0.947 o/o U-235 enriched production test (PT-IP-616-A) consisted of 19 columns of 28 fuel elements each, charged alternately with hot die sized and AlSi brazed pieces. Ten of the columns contained paired hot die sized and AlSi brazed pieces from the same uranium rods in alternate downstream positions. Average discharge exposure of the enriched production test was approximately 900 MWD/T.

Studies to determine the cause and effect of the observed hot die sized fuel dimensional changes are underway. An irradiated fuel element from the high exposure zone was sectioned and polished. No unusual changes in the uranium structure and no bond deterioration were observed. Density determinations of irradiated fuel samples have not been completed.

Core and finished fuel dimensions taken at various steps of the hot die sizing process are being studied. Concurrent with the dimensional tests, both hot die sized and AlSi brazed fuel cores have been subjected to x-ray diffraction tests. Metallographic examination of the uranium crystallographic structure has revealed some indication of hot working and recrystallization in the hot die sized fuels. Metallography and x-ray diffraction studies are continuing in an effort to relate any changes in the fuel cores with irradiated performance.

Testing and evaluation of fuel elements clad with 0.055 and 0.070-inch thick inner and outer 8001 aluminum alloy tubing have been partially completed. Base end caps were held in place by crimping the outer tubes and flaring the inner tubes. After assembly and lubrication, the pieces were processed using the standard hot die sizing techniques. Base end closure quality was somewhat inconsistent, as evident from welding and destructive and nondestructive tests. In order to eliminate this problem, the end cap was redesigned to provide a closer fit and increased thickness. Average external bond strength (29,000 psi) was equal to or exceeded that of pieces produced with can-spire cladding components.

Initial heating rate studies using induction heating rather than resistance heating in end bonding were completed. Heating rates were compared in two measurement areas, (1) the temperature gradients along the lateral surfaces of the fuel elements, and (2) the U-Al interface on the ends of the fuel elements. The longitudinal center of the fuel elements was a minimum of 50 C cooler than the resistance heated fuel after up to four minutes of induction heating. After six or seven minutes of operation, the fuel centers were virtually at the same temperature as in the resistance heated end bonding press. After two minutes of induction heating at 15 KW, the average interface temperature was 425 C; after three minutes it was 560 C. Minor modifications are being made to the electrical circuitry to improve automatic operation of the press. Changes to the hydraulic system are also being made to provide more uniform bonding pressure.

Studies were completed on a pretreatment process flowsheet change, aimed at eliminating the gel formed on uranium core surfaces after the electrolytic etching step. Removal by a vigorous water spray rinse is impractical and unreliable for large-scale plating of cores with the present geometry. Formation of the gel was prevented by going directly from the electrolytic etch to the warm nitric acid deoxidation step without an intervening water rinse. The standard process and the modified process were each used on approximately one-half of an 111-core cladding test. Evaluation of these were as follows:

- 1) No difference in plate continuity or adhesion was observed on plated cores or in nondestructive bond testing clad cores.

- 2) Metallographic studies revealed no difference in the appearance of the nickel-uranium interface, except that the uranium treated by the modified process appeared to be slightly rougher---an attribute which should improve adhesion.
- 3) No difference was observed in the nickel-uranium bond strength as determined by stud pulling tests.

Major components of the new plating machine have been delivered and installation of the equipment has started. A schematic piping diagram and flow-sheet have been issued, and a document discussing basis for the piping and flow requirements is being prepared.

Fabrication of a prototype automatic shear tester for K Reactor natural self-supported fuel was completed during this period and is being tested. Initial tests indicate the unit is satisfactory. It is planned to install the unit on the production line by mid-February 1964.

Fabrication of the mechanical portion of a prototype automatic fuel support rail feeder was completed and installed on the pilot plant ultrasonic welder. Circuit design is currently being tested and the unit is scheduled to be ready for the vibratory equipment, scheduled for delivery by mid-February 1964.

An investigation of DC welding was made to determine the reliability of arc starting and current control, using 100 per cent helium as inert gas shield rather than the current helium-argon mixture specified for the "F" process welding. Pure helium produced somewhat greater weld penetration, but has the disadvantage of introducing arc striking problems and a more difficult control at low current, which is used in crater fill. Reliable arc starting was achieved by removing part of the ripple filter in the power supply and eliminating the external shorting contactor. Fuel closure weld quality under these conditions appeared to be acceptable on the basis of both visual and destructive examination.

PLANT FACILITIES

Status of Active Construction Projects

CAF-961 - Consolidated 303 Area Services Facility - Phase I

The detailed design drawings for the new 3720 Building (laboratory and machine shop) were reviewed by both General Electric and the Atomic Energy Commission with the Architect Engineer in Seattle on January 16, 1964. The completion date for the Architect Engineer's design was extended further by the AEC to February 7, 1964, due to the higher priority for the Low Level Chemistry Building design also being performed by this same Architect Engineer. The revised project proposal requesting construction funds of \$889,000 (total project \$955,000) was forwarded to the AEC on January 23, 1964. This revised proposal recognized the impact of both production curtailment and phase out of the General Electric Company as the prime contractor.

CAF-973 - Steam Distribution Line Modifications - 300 Area

All work by the fixed-price contractor was completed and accepted by the General Electric Company on January 16, 1964. Minor work and tie-ins to the area system are yet to be accomplished by the Labor Service Contractor.

CAF-979 - Pilot Scale Plating Equipment - 300 Area

The basic electroplating equipment was received at HAPO on January 22, 1964, with only minor auxiliary equipment components yet to be received. The contract completion date was extended to match the project completion date. This will enable the vendor's representative to meet the provision of overseeing the installation and of instructing plant personnel in the operation of the equipment. A revised project proposal requesting an extension of the project completion date to April 15, 1964, has been submitted by the AEC for consideration at the next scheduled Review Board meeting.

CAI-994 - Utilities Extension - 300 Area

The bid opening for the fixed-price contract was held January 29, 1964. Bids are being evaluated.

CAI-107 - Boiler Replacement for Additional Steam Generating Capacity - 384 Building - 300 Area

Detailed design progress is 70 per cent complete as compared with a scheduled 95 per cent. The first call for bids for the boiler was unresponsive and was rejected. A request for rebids continued to be unresponsive. A third round of bids was requested and five bids were received on January 24, 1964. These are being evaluated for responsiveness. Timing to assure beneficial use of the new boiler in time for heavy loads anticipated during the 1964-65 winter months is becoming vital.

CAI-120 - Utilization of PRTR Waste Steam in 300 Area Distribution System

The recommendation of the General Electric Company that Vitro Engineering perform the architect-engineer work for this project was not followed by the AEC. The firm of Bouillon, Griffith, Christoferson and Shairer, Consulting Engineers, Seattle, has been selected as the architect-engineer to perform Title I, II, and III services. A representative of the Architect-Engineer visited HAPO on January 29, 1964. Prompt completion of design work is necessary to assure project completion in time to realize earliest fuel savings during the winter months of 1964-65.

Equipment Modification

Two long duration outages to canning lines were caused by broken tilt cylinder shafts in the quench machines. The breaks were due to metal fatigue in a portion of the shafts having a reduced cross sectional area. Engineering evaluation was started to determine if redesign might eliminate or reduce such breaks. In the interim, complete spare cylinder assemblies

are being kept available for immediate use thus reducing the time lost for a cylinder exchange. A third long duration outage was due to a defective solenoid valve in the pressure quench machine.

Problems encountered during the month in the double spindle automatic welders were due mainly to intermittent relay failures. Several minor circuitry modifications were made to improve the welder reliability. All three machines have been modified to permit operation on a fifteen second cycle. This appears to be the minimum that can be attained without major modification to the transfer system.

The first ultrasonic welder table was received from the vendor on January 27, 1964, instead of December 31, 1963, as scheduled. All work preparatory to start of installation has been completed for the first welder.

The problem of excessive amounts of vapor being ejected into the fuel recovery operating area from the neutralizing tank was apparently resolved. Investigation revealed that the liquid was boiling and the acid and caustic were being mixed faster than the cooling jacket could dissipate the generated heat. Adjustment of a thermal switch was successful in controlling the pumping rate to maintain the liquid temperature between 180 to 185 F during the neutralization cycle.

Utilities

Statistics

	<u>January</u>	<u>December</u>
Maximum steam generated (M lbs/hr)	132	146
Total steam generated (M lbs)	70,041	75,062
Total condensate returned (M lbs)	29,205	33,511
Coal consumed (tons)	3,323	3,646
Evaporation rate	10.54%	10.29%
Efficiency - actual	82.0	80.3
Efficiency - optimum	85.6	84.5
Import sanitary water (M gals)	114.1	115.4
Peak water flow (gpm)	5,000	5,200
Peak water consumed in 24 hours (M gals)	4.1	4.4
Compressed air production (M scf)	52,959	54,633

A supplementary appropriation request for the emergency generator was approved raising the total cost to approximately \$190,000. Concrete foundation work for the generator and control unit is in progress. The power unit is scheduled to be shipped February 3 and the control unit about March 1, 1964.

The study of the compressed air system in 300 Area was completed and recommended the addition of an 800 cfm air compressor due to increased demands from Hanford Laboratories. A \$25,300 appropriation request was submitted for procurement and installation of the required equipment.

Work has been started by the Labor Service Contractor on the sewer modifications to ease overloaded conditions.

Plant Services

Major jobs completed during the month included the fabrication and installation of an exhaust system over an electron accelerator in 3745-A Building; replacement of the hoods and the revision of duct work over the extrusion press in the 333 Building; fabrication of parts for the modification of ALSi Shop process equipment for four-inch fuel production; installation of additional fire alarm bells in 325 and 321 Buildings; combining of the fire alarm systems in 306 and 306-A Buildings; installation of the Pyrotronics fire and smoke detector system in the 313 Building R.F. barrier; and modification of pallets for four- and six-inch fuel elements.

Twenty-five instrument craftsmen attended a series of three classes on maintenance procedure presented by Radiation Instrument Development Laboratories. A contract has been negotiated with Lepel High Frequency Laboratories to conduct training sessions for electrical craftsmen during the first week of February. Preliminary testing of instrument and electrical craftsmen has been completed for the instruction classes on semi-conductors. A total of 746 manhours of training was given in January.

Manager, Production Fuels

WN Mobley:WKW:gl

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RESEARCH AND ENGINEERINGPROCESS AND REACTOR DEVELOPMENTREACTOR FUELSThorium Oxide Target Fabrication

The first charge of thorium oxide target elements, for irradiation under Production Test IP-648-AC, has been completed and was charged into the F Reactor during the January 14, 1964, outage. This charge is made up of 620 pieces, approximately one ton, charged into 20 fringe process tubes. The material has a density of 6.6 g/cc.

A second 620-piece charge of 6.6 g/cc material is now being canned and will replace the first charge about April 1.

Fabrication of the first charge of high density thorium oxide target elements (nominally 8.5 g/cc) is just beginning. Trial canning to date indicates that with the "Sol-Gel" oxide on hand the maximum attainable density will be approximately 8.25 g/cc. This charge is scheduled for charging in a reactor central zone about March 1.

Thorium Oxide Irradiation

The final group of four thorium oxide target elements, irradiated under authority of Production Test IP-627-A, was discharged from D Reactor on December 31, 1963. These elements, containing thorium oxide of about 85 per cent theoretical density, were irradiated in a Poison Column Control Facility tube for 15 days. A total of 16 thorium oxide elements were irradiated in this tube, with oxide density varying from 65 to 85 per cent of theoretical density and irradiation time varying from 5 to 15 days. All of these target elements were charged and discharged during reactor operation.

Hot-Die-Sized Fuel

The fuel columns of the enriched uranium hot-die-sized test, PT-IP-616-A, were erroneously reported last month to have exposures at discharge of about 700 MWD/T. The corrected average exposure for the fuel columns of the test is 900 MWD/T.

Induction Heat Treated Uranium

Ten columns of induction heat treated fuel elements were charged into DR Reactor during the December 26, 1963, outage. The induction heat treated fuel elements are paired with normal, salt bath, heat treated elements containing cores from adjacent uranium ingot rod positions. The test, PT-IP-610-A, will permit evaluation of the irradiation behavior characteristics of the induction heat treated cores for direct comparison with elements made by the current heat-treating process. Goal exposure for the elements of this test is scheduled for 600 MWD/T.

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STATUS REPORT OF PRODUCTION TESTS

<u>Test No.</u>	<u>Type Metal</u>	<u>Tubes</u>	<u>Reactor</u>	<u>Goal Exposure</u>	<u>Current Exposure</u>	<u>Remarks</u>
IP-216-A	Normal prod. natural and enriched fuel elements.	80	All	Normal variable goal.		Provides for monitoring the performance of a sample of all normal production material to assist in development of a Quality Index for production fuel. Test is continuous.
IP-272-A	I&E self-supported fuel.	69	C	Variable plus 200.		Provides for testing of CIVN model fuel in C Reactor ribless zirconium tubes.
IP-381-A and IP-431-A	I&E self-supported fuel over-bore size.	62	C	800 MWD/T		Provides preliminary qualitative data regarding irradiation behavior of larger fuel element designs.
IP-607-A	Oil-quenched enriched uranium elements.	15	F	600 MWD/T		Second step in evaluating irradiation effects on dimensional stability of oil-quenched enriched uranium. Elements charged during outage of January 14, 1964.
IP-610-A	Induction heat-treated fuel core.	10	F	600 MWD/T	160 MWD/T	Provide data for evaluating dimensional stability of induction heat-treated fuel cores. Test elements charged on December 26, 1963.

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STATUS OF PRODUCTION TESTS (cont'd.)

<u>Test No.</u>	<u>Type Metal</u>	<u>Tubes</u>	<u>Reactor</u>	<u>Goal Exposure</u>	<u>Current Exposure</u>	<u>Remarks</u>
IP-627-A Supp. A	Thorium oxide target elements.	1	D	15 Operating Days.		One group of four thorium oxide target elements charged on December 16, 1963, to be irradiated for 15 days to evaluate effect of higher density oxide on yields. Elements discharged December 31, 1963, after obtaining desired exposure.
D-3 [REDACTED] IP-648-AC	Thorium oxide target elements.	20	F	78 Operating Days.		First phase of irradiation of thorium in a six-ton demonstra- tion load. Elements charged during January 14, 1964, outage.

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Enriched Oil-Quenched Uranium

Fifteen columns of oil-quenched enriched uranium, 0.947 w/o U-235, fuel elements were charged into F Reactor during the January 14, 1964, outage. This test, PT-IP-607-A, is a second step in the evaluation of the oil-quenching fabrication process. Alternate core blanks from the same ingot rod were quenched in oil as opposed to the normal water-quench procedure. These alternate rod position cores were then formed into pairs for this test, with one pair of elements consisting of an oil-quenched core and the adjacent rod position water-quenched core. This technique will permit evaluation of the dimensional changes of both types of cores and establish a direct comparison of their irradiation behavior characteristics. These elements were charged into process tubes located in the fringe enrichment pattern for irradiation to exposures of 600 MWD/T.

REACTOR ENGINEERING

Examination of Moderator Stacks

A visual inspection was made of the liner blocks in two VSR channels at B Reactor and one at D Reactor. Only a portion of each channel was directly viewed, but each channel was entirely photographed. In all three channels, roughly one-fourth of the liner blocks inspected were observed to be broken to some extent. The predominant location of failure was at the keyway, although some liner blocks were broken in several pieces and had fallen to the bottom of the channel.

The D Reactor channel was examined because of failure of the VSR to completely enter it. The channel was blocked near the bottom by a protruding liner block. The two B Reactor channels, while having somewhat longer VSR insertion times than the average, were generally picked at random. Since all VSR channels were inspected in 1952 during thimble removal and found to be in good condition, liner block fracture must have occurred during the subsequent annealing and contraction period.

Reactor Last-Ditch Cooling

Production Test IP-651-AI, "Trip-Out Test, H Reactor," was conducted at H Area on January 17, 1964. The test involved the trip-out of the electrically-powered process pumps and the flow decay from flywheel coastdown to the point where high-tank stored, backup coolant is introduced into the reactor. The normal steam-powered secondary system pumps were inactivated for the test.

The test provided reactor coolant flow calibration with high tanks, with high tanks and export system flow, and finally a measure of the coolant flow provided by the export system alone. No problems were experienced during the testing program. The test data are being analyzed.

REACTOR PHYSICS

Neptunium-237

The enriched uranium stream to all reactors continues to be 100 per cent recycle. Neptunium yields have been determined for part of the E-metal used in the third H Reactor E-N core. The reported yield is 3.71 grams neptunium per ton fuel at an exposure of 878 MWD/T. The theoretical yield for virgin E-metal at this exposure is 3.16 g/T.

Clean U-233

Calculations were made for the production parameters for the 20-tube thorium oxide (6.6 g/cc) fringe test load. The calculated effective density (accounting for endcaps) is 6.081. The calculated flux is 1.36×10^{13} and the E/Q tube ratio 1.96. Irradiation time to 1 ppm U-232 is approximately 78 days. This time may be modified by data obtained during the test on power level of adjacent E-columns and fluxes obtained from spline traverses. For the purpose of the production test the E/Q tube ratio is assumed to be 2.0.

New Vertical Safety Rod Testing

Testing of sections and subassemblies of the new universal vertical safety rods continued during the month. The subassembly results continue to show about a seven to eight per cent increase in worth over the standard BDF-size rod. Sufficient data have been now obtained to enable a modification of the sampling procedure to just one sample per heat. Damaged sections from the vendor are being requested from untested heats to further reduce disassembling rods for testing.

Earthquake Studies

Work was continued on review and study of IPD facilities that would be critical in the event of an earthquake and upon which vibration studies could be made to evaluate resistance to earthquakes.

The Earthquake Studies group has held two preliminary meetings to discuss general problems and areas of work. Immediate interest is the vibration testing R. T. Jaske is arranging to evaluate seismic resistance. A detailed study of the battery power supply has been started by Applied Reactor Engineering. It is interesting to note that 105-H detected one of two earthquakes shown below. The shocks were not detected at other reactors.

- 12-26-63 5:57 a.m., 105-H galvanometer oscillation. Rated as a foreshock of less than MM1 by University of Washington's Longmire station.
- 12-27-63 6:37 a.m., not detected. Rated as the main shock of intensity MM4 at Longmire. Earthquake epicenter was placed west of Portland, Oregon.

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RADIOLOGICAL ENGINEERING

Radiation Control Experience

The following table summarizes the 1963 radiation exposure experience for critical IPD classifications:

<u>Classification</u>	<u>Total Dose</u>	<u>No. of Employees</u>	<u>Average Dose/Employee</u>	<u>Maximum Dose</u>
Radiation Monitors	212160 mR	79	2686 mR	2910 mR
Processing Operators	592105	250	2368	3048
Pipefitters	282226	108	2618	6005*
Millwrights	214848	89	2414	3144

* Involved accidental exposure.

Radiation Occurrences

Distribution by Reactor and Component

	<u>B</u>	<u>C</u>	<u>D</u>	<u>DR</u>	<u>F</u>	<u>H</u>	<u>KE</u>	<u>KW</u>	<u>Totals</u>
Processing	1(1)	1(1)	1		1(2)	1		1	6
Maintenance				2		1			3
Research & Engineering	—	—	—	—	—	—	—	1	1
IPD Total	1	1	1	2	1	2	0	2	9
Outside IPD	—	—	2(2)	—	—	—	—	—	2
Total	1	1	3	2	1	2	0	2	10

(1) Share responsibility in the same occurrence.

(2) Share responsibility in the same occurrence.

Effluent Activity Data

The table below shows average concentrations of selected radionuclides from reactor effluent samples taken during December 1963. All units are 10⁻¹² curies/ml.

<u>Reactor</u>	<u>P32</u>	<u>As76</u>	<u>Zn65</u>	<u>Np239</u>	<u>Cr51</u>
B	9.8	100	5.8	220	330
C	14.3	160	7.4	240	850
D	10.4	100	9.3	140	600
DR	11.8	130	9.0	160	1080
F	10.9	140	6.5	180	620
H	9.5	50	7.3	70	380
KE	5.5	40	4.1	50	200
KW	5.8	50	4.6	80	200

The three-month trend in effluent radionuclide concentrations continued adversely during December 1963 at all reactors except H, KE, and KW. There were no significant changes in the treatment of coolant during the month except at 100-D where the pH of the near side coolant was reduced from 6.6 to 6.3 on December 20, 1963, under Production Test IP-634.

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PROCESS TECHNOLOGY

PROCESS STANDARDS

HW-46000 H, Process Standards - Reactor

One revised standard was issued during the report period. This was:

Process Standard A-050 - "Panellit System Control"

Minimum operating pressure specifications were provided for the .344 size venturis.

PROCESS CHANGE AUTHORIZATIONS

Eight Process Change Authorizations were issued during the report period: four to permit deviation from Process Standards - Reactor, HW-46000; three to permit deviation from Process Standards - Water Plant, HW-27155 Rev1; and one to permit deviation from Process Equipment Standards, HW-41000. These were:

PCA #3-132 - "Water Shutoff Curves - B, D, F, and H Areas"

This process change provided supplemental water shutoff curves pending completion of the water shutoff study.

PCA #3-133 - "Sensing Line to 190 Turbines - D Reactor"

This process change authorized valving off the "A" riser pressure sensing line and deactivating the export Grove valve to accomplish necessary maintenance provided the "B" riser sensing line was satisfactorily in service and procedures existed to manually control the export Grove valve.

PCA #3-134 - "Emergency Cooling Water Requirements - K Reactors"

The provisions of PCA #3-72 were extended to allow additional time for appropriate standards revisions. PCA #3-72 provided requirements on V-72 valve operation and crosstie line flushing.

PCA #3-135 - "Panellit Gauge Identification - C Reactor"

Authorization was given to use a fuse device to identify Panellit gauge trips provided carefully controlled conditions were employed such that reactor safety would not be compromised.

PCA #4-1 - "Confinement System Fans - B Reactor"

This PCA authorized removing one steam-driven exhaust fan from service provided the other steam-driven fan was on automatic backup and the shutdown fan would be manually started if PBA power were interrupted.

PCA #4-2 - "Sensing Line to 190 Turbines - D Reactor"

Provisions of this PCA were identical to those for PCA #3-133 above.

PCA #4-3 - "Steam-Driven Export Pump Outage, 182 Raw Water Storage Basin Repairs - B Area"

Removal of the steam-driven export pump at B Area from service was authorized provided the three remaining export turbines were on automatic backup and procedures existed for restricting 200-Area and N-Area flow within 15 minutes following a BPA power interruption.

PCA #4-4 - "Confinement System Fans - B Reactor"

Provisions of this PCA were identical to those in PCA #4-1 above.

PROCESS ASSISTANCE

One engineer audited conformance to Process Standards on all Processing Operations' shifts by making 13 inspections at each reactor during the report period.

FUEL FAILURE EXPERIENCE

<u>Failure Date</u>	<u>Tube Number</u>	<u>Lot Number</u>	<u>Type of Material</u>	<u>Tube Power at Failure (kw)</u>	<u>Exposure MWD/T</u>	<u>Type Failure</u>
1/6/64	1265-DR	KZ-696-D	I&E N	1278	405	SH
1/10/64	3663-DR	KZ-728-B	I&E N	1242	394	SH
1/14/64	0678-F	KY-541-B	I&E E (0.94%)	1226	969	UN
1/18/64	3366-C	CP-805-D	I&E NS	1475	315	EM
1/21/64	2181-B	UZ-104-A	I&E N	1302	362	SH
1/24/64	1888-C	KC-279-A	I&E E	1394	538	SH
1/31/64	2263-DR	KZ-758-C	I&E N	1322	616	UN

Legend

I&E N - This is the symbol for internally and externally cooled production reactor fuel elements of natural uranium. The fuel is irradiated in ribbed process tubes.

I&E E - This is the symbol for internally and externally cooled production reactor fuel elements with uranium cores enriched in U-235. The fuel is irradiated in ribbed process tubes. The weight per cent U-235 in the core material is stated.

I&E NS - This is the symbol for internally and externally cooled production reactor fuel elements of natural uranium which have projections welded to the

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fuel element jacket. The fuel is irradiated in ribless process tubes.

First Character

S Side	Failure occurred on the side of the fuel element
U Unknown	Location of failure is not known.
E End	Failure occurred at the end of the fuel element.

Second Character

H Hot-Spot	Failure caused by accelerated high temperature corrosion attack.
N Not examined	Failure has not been examined.
M Defect	Failure caused by a defect in fuel fabrication.

OPERATIONAL PHYSICSPILE PHYSICS PLANT ASSISTANCE

Although operating efficiency was near normal, operating continuity was interrupted more frequently than usual during the report period.

Increased emphasis has been placed on operator training and procedural monitoring of flux distribution control following two reactor manual scrams due to approach to TAI limits.

Special procedures for charging extra poison and using a neutron source were followed without difficulty during the extended H outage for rear fitting modification; attendant conditions for which physicist coverage was provided included the low neutron background with a "green" poisoned loading and the potential reactivity gain due to coolant channel drainage over the entire reactor.

SUMMARY OF OPERATING DATA OF PHYSICS INTEREST
FOR THE MONTH OF JANUARY, 1964

Reactor	B	C	D	DR	F	H	KE	KW
ECT in January (1)	1440	1660	1495	1510	1495	1545	2480	2390
12-Month Average ECT	1495	1660	1510	1520	1505	1520	2480	2490
Equil. Scram Time (2)	15-24	15-20	15-18	17-19	15-20	20-25	20-25*	20-25*
Recording Time								
From:	12-18	12-18	12-18	12-17	12-18	12-19	12-17	12-17
To:	1-23	1-19	1-23	1-23	1-20	1-23	1-24	1-22

*Equilibrium scram recoveries are not attempted at the K reactors.

- (1) Effective Central Tubes: This value is defined as pile power level divided by the average power of the ten most productive tubes in the reactor.
- (2) This is defined as the maximum time in minutes which may elapse between scram and first indication while still permitting a successful scram recovery.

B Reactor - C. E. Hughey

Flattening and startup efficiency were in general lower than average during the report period due to a high residual water content on two startups, process pump maintenance, and unfavorable flux distributions. A reactivity shortage, following a larger-than-scheduled discharge on 1-7-64, resulted in a period of troublesome operation; localized high graphite temperatures plus loss of one process pump for maintenance required operation at a reduced level for approximately one week.

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C Reactor - P. D. Gross

Several unscheduled outages interrupted operating continuity during the month. An attempted hot startup on 1-10-64 was terminated when TAI limits were approached due to inadequate distributional control measures; since similar problems had occurred during other startups in recent months, a temporary ban was placed by the C Processing Operation on hot startup attempts until associated procedural recommendations and training could be accomplished by Operational Physics Operation; resultant procedures call for fulltime coverage of the geometric tube sampling board during all startups by a qualified operator until level-out conditions have been established. C Reactor presently does not have an operable Zone Temperature Monitor System nor the substitute startup "popcorn popper" device.

Coolant loss in number seven horizontal control rod was the cause for a shutdown on 12-23-63.

D Reactor - G. D. Baston

Although a large fringe discharge taken in mid-December caused some minor flux distributional problems early in the run, operating continuity was excellent, and a new monthly production record for the smaller reactors was established. Termination of the nonrepresentative discharge exposure program resulted in a 700-tube discharge on 1-12-64, and an 800-tube discharge is scheduled for early February; an increased spike enrichment inventory will be required to provide adequate operating control.

Installation of an automatic flux distribution control experimental system was completed, and functional testing is planned for an early date.

Preventive and corrective maintenance on the VSR system considerably improved the speed-of-control status.

DR Reactor - S. M. Skidmore

Although several unscheduled outages interrupted continuity, level-operated efficiency (as measured by flattening and startup efficiencies) remained near the average established over the previous 12 months, and a record startup (turnaround) level was achieved following the outage of 1-10-64. Replacement of three rigid vertical safety rods by flexible rods provided a significant improvement in VSR system drop-time.

F Reactor - G. C. Masche

Operating continuity was generally good during the report period; a fuel-failure outage occurred less than one day before a scheduled tube replacement outage. Two significant Production Test loadings are to be irradiated during the next (and subsequent) operating runs: PT IP-674-AC is a preliminary irradiation of a proposed thorium-oxide fringe loading, and PT IP-607-A is a controlled comparison of distortion (and consequent rupture potential) of special oil-quenched enriched fuel elements.

H Reactor - E. L. Conner, Jr.

Following the irradiation of the fifth E-N block loading, changes were made in the rear fittings of the process coolant system to permit an estimated 6-10 per cent flow increase; during the outage, all fissionable material was displacement discharged with the sixth E-N block, which is a full-pile expansion of the 102-tube test loading irradiated during the previous run, and with "green" fuel in enrichment columns supporting the poison blanket. Coolant flow was completely shut off from the freshly charged reactor, under conditions of PITA IP-27-C.

The subsequent startup, complicated by reactivity evaluation and distributional control difficulties, was within the range of expectations and was handled under the previously established procedures. The reactor was shut down due to high specific tube powers associated with an unfavorable HCR configuration which restricted flux distribution control ability during the level-out period subsequent to the startup rise. Initial operating reactivity and control characteristics have indicated good agreement with expectations.

KE Reactor - D. G. Albertson

Although several outages interrupted operating continuity during the report period, a 19-day period of smooth, continuous operation at high flattening efficiency raised the over-all average efficiency to a reasonable level. A minimum outage scheduled for 1-19-64 was extended approximately four hours due to total control requirements associated with removal from service of the six outer ball 3X channels. The reactor was shut down on 1-23-64 for the final phase of zirconium retubing.

KW Reactor - A. W. Medcalf

Partially as a result of several control and safety system mechanical problems, flattening efficiency was lower than average during the report period; startup efficiency was generally favorable, however. Five HCR's have experienced sticking difficulties either during operation or upon insertion at time of shutdown; one VSR is locked out due to failure to meet drop-time requirements; and as mentioned in the December report, the outer six ball 3X channels have been locked out of service until ball channel distortion problems can be alleviated.

PROCESS PHYSICS STUDIES

Reactivity and Safety Control Studies

As specified in PITA-27, Part II, for the H Reactor rear-fitting-modification outage, neutron source and physics monitoring were provided. Natural background in the "green" load with 90 lead-cadmium columns charged was so low that little change was seen in the source-augmented count rate during coolant drainage with the VSR's out.

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Operational Physics personnel manned a number of positions in the N startup physics test crews from mid-December through mid-January. Approximately half-time participation was required by each individual. Completion of the loading and low-level physics testing in the full reactor are scheduled for February; IPD physics personnel will again provide assistance.

Control Efficiency Studies

Both analytical work and check-runs have been completed for modifying the IPD plutonium prediction tables (HW-50300-B REV). Approvals are being obtained and programming mechanics have been initiated to accomplish the intended normalization by the end of January; the revised program is intended to be available for accountability and cost studies for January production. A relative increase of four per cent in Pu^{240} buildup rate is being incorporated for the K's, and an increase of nine per cent for the smaller reactors, taking into account the expected increase due to high- CO_2 operation in the latter case. Prediction values for plutonium production in E-N loadings is being increased to provide the expected four per cent difference between plutonium production in that loading and E-metal irradiated in normal loadings; normal E-metal production rates are being reduced slightly to hold expected plant yield rates constant. This normalization was delayed until preliminary CPD analytical results were obtained on the portion of the 1963 E-N separation completed before the Redox fire; these initial results indicated higher plutonium yield in E-N loadings than are called for by the normalization based on previous data.

Installation of the experimental demonstration system for automatic distribution control (PT IP-578-C, Part II, Phase II), has been completed at the D Reactor by FES and Manufacturing. Preliminary checks of the wiring have indicated that connections between the control panel and the rod drives are correct. The system appears to be tracking properly and indicating the correct rod movements. A problem has been encountered in establishing the optimum dead-band width in the half-rod zone, but it is expected to be resolved by the time D Reactor has achieved equilibrium reactivity conditions satisfactory for running the test.

PT IP-648-AC, Evaluation of Thorium-Oxides as a Fringe Loading, has been prepared for approval in conjunction with Process and Reactor Development Operation. Twenty columns of thorium-oxide of 65 per cent theoretical density have been charged in the F Reactor fringe along with 40 supporting E-metal columns. A second production test for authorizing a central test load is now in preparation. Material for the latter test is scheduled for fabrication by March 1.

Problems with spline brittleness have been determined to be associated primarily with the point of flow introduction in K reactor nozzles. Redesign of the nozzles for K reactor aluminum tubes is already underway.

Startup losses for 1963 averaged 0.23 equilibrium day per startup at the B-D-DR-F-H Reactors and 0.29 equilibrium day at the C and K Reactors, for a plant average of 0.26 equilibrium day. Corresponding losses for 1962 were 0.25, 0.34, and 0.30 equilibrium day respectively.

TESTING

IRRADIATION TESTING

Irradiations - Sample and experiment irradiations were handled as follows:

<u>Reactor</u>	<u>Test Hole</u>	<u>Facility</u>	<u>Request No.</u>	<u>No. of Samples</u>	<u>Material-Purpose</u>
B		Process Channel	HAP0-098	20	Graphite (burnout rate determination)
KW	2B	Hot Graphite	HAP0-177	2	Graphite (irradiation damage study)
KW	4B	Snout	HAP0-177	2	Graphite (irradiation damage study)
KW	2A	Quickie	HAP0-184	22	Washington Designated Program
KE	2D	Quickie	HAP0-184		
KW	4B	Snout	HAP0-236	7	Iron tensile specimens (fast neutron damage study)
KW	2A	Quickie	HAP0-239	1	Titanium (activation analysis)
KW	4C	Snout	HAP0-243	1	Molybdenum (fast neutron damage study)
C	B	Hot Graphite	HAP0-250	1	Ceramics (rod channel liner material study)
KW	2A	Quickie	HAP0-252	4	Arsenic (tracer isotope production)
KE	2D	Quickie	HAP0-252		
D		PCCF	HAP0-283	4	Thorium (U-232 buildup in various grades of commercial thorium)
KW	4B	Snout	HAP0-285	2	Boron-CO, uranium-CO (chemo-nuclear product buildup)
F	E	Quickie	HAP0-271	2	Sodium (tracer isotope production)
KW	4B	Snout	HAP0-263	1	Neutron detector (development study)
KE	2D	Quickie	Reed College	2	Tissue (cancer research activation analysis)
F	E	Quickie	HAP0-219	1	Strontium (tracer isotope production)
		Gamma*	HAP0-171	2	Plastics and rubber (radiation damage study)
		Gamma		1	Gasket material (radiation damage study)

*Gamma irradiation facility is located in Building 105-KE storage basin

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Borescoping Activities - In-reactor channels and tubes were examined with a borescope as follows:

<u>Reactor</u>	<u>Channel or Tube</u>	<u>Motion Picture Record</u>	<u>Purpose*</u>
B	VSR # 21	Yes	1
B	VSR # 36	Yes	1
C	VSR # 35	Yes	1
C	VSR # 37	Yes	1
H	VSR # 25	Yes	1
D	VSR # 37	Yes	1
KW	HCR # 36	No	1
H	Process Channel # 2356	No	2
H	Process Channel # 1466	No	2
H	Process Channel # 1363	No	2

*1 - HCR-VSR channel problem

2 - Maintenance support

Vertical Bowing - Vertical displacement measurements were taken as follows:

<u>Reactor</u>	<u>Process Tube</u>	<u>Displacement Downward</u>
B	4574	0.08" at 19' since 10-63
D	4674	0.06" at 21' since 10-63
C	4674	0.09" at 21' since 9-63
H	4674	0.22" at 22'4" since 3-63
H	4453	0.17" at 19' since 1-63
H	4494	0.07" at 19' since 1-63

Spline Traverses - Front-to-rear flux distribution data were obtained at the following reactors:

<u>Reactor</u>	<u>No. of Tubes</u>
KE	6
DR	9

C-1 Loop Operation (High Temperature Aluminum Corrosion Studies) - Loop shakedown operation was successfully completed and fuel was charged under PT IP-623-D, Operation of the C-1 Loop Facility with Aluminum Clad Plutonium-Aluminum Alloy Fuel Elements. Reference temperature (554 F) was reached on January 26.

H-1 Loop - The H-1 Loop was decontaminated during the January outage at H Reactor. The general background exposure level in the pump cubicle was reduced by a factor of eight.

COMPONENT TESTING

Irradiated IPD Fuel Examination, 105-C Facility - Examinations were completed from 29 tube charges requiring 114.6 fuel examination units. Individual examinations completed were 3146.

<u>No. of Tube Charges</u>	<u>Production Test</u>
1	None - Flow during shutdown had been shut off to this irradiated regular metal charge for approximately five hours
1	IP-216-A, Evaluation of Performance of Normal Production I&E Fuel Elements
1	IP-431-A, Irradiation of Oversize Fuel Elements in the C Reactor Over Bore Process Channel Facility
15	IP-549-A, Half Plant Low Alum Feed Water Treatment at F Reactor
11	IP-616-A, Irradiation of Enriched Hot-Die-Sized Diffusion Bonded Fuel Elements

Only half of the month was devoted to fuel examination, since equipment modifications were being made and a new fuel handling system was being installed. Photographs of three DR, two C, and one H Reactor fuel ruptures were taken.

Irradiated N Fuel Examination, 105-KE Facility - In addition to performing calibration standard measurements, the following examinations were completed:

<u>No. of Elements</u>	<u>Tube and Discharge Date</u>	<u>Examination</u>
16 (Li-Al targets)	KER-2 12-21-63	Weight
11 (N Inners)	KER-4 9-25-62	Length

Irradiated Process Tube Measurement

Wall Thickness Gauge (Eddy-Current Type) WTG

<u>Reactor</u>	<u>No. of Tubes Measured</u>	<u>Report No.</u>	<u>HW Number</u>
DR	186	1	80274
H	415	2	80350
B	612	3	80400
C	45	4	80443
F	218	5	80507
C	46	6	80508
Total	1522		

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Sector Annulus Gauge (eddy-current type) SAG

No tubes were measured in reactor. Ex-reactor calibration tests and 175 corroded tube mockup runs were made.

Ex-Reactor Visual, Weight and Micrometer Measurement

<u>Reactor</u>	<u>No. of Tubes</u>	<u>Tube Sections Examined</u>	<u>Reason Examined</u>
DR	4	35	1 leaking 1 severe blip in WTG trace - external corrosion found 2 two different sized rib reamers had been used - examined for after effects

Critical Reactor Component Examination - Examination of all B- and F-Reactor front-flexible connectors was completed. No connectors with more than four broken wires were found.

Panellit System Programs

Pressure monitor system components failure analyzed	-	15	
2B-X1 switches examined	-	250	
- acceptance rate	-	225	(90%)
- previous month	-		(92%)
Gauges received from vendor and examined	-	575	
- acceptance rate	-	479	(83%)
- previous month	-		(89%)
Gauges received from Central Maintenance and examined	-	1916	
- acceptance rate	-	1583	(83%)
- previous month	-		(86%)

Three hundred sixty-eight gauges were removed from panels for new gauge installation and prepared for shipment to the vendor as exchange gauges.

COOLANT TESTING

KER Loop Operation

KER-1 - Testing of four stainless steel clad crud detectors and four 17-inch NIEL fuel elements as authorized by PT IP-601-D continued. The objective of

this test is to further evaluate the effects of ammonium hydroxide for coolant pH control, particularly the crud forming and decomposition characteristics of ammonium hydroxide at conditions approximating those expected at N Reactor.

KER-2 - Testing to verify operation and sensitivity and to determine the proper settings of the NPR rupture monitor system for the initial start-up of N Reactor as authorized by PT IP-632-D was completed. The loop was discharged on December 28, and subsequent testing was performed to evaluate the use of ammonium hydroxide for coolant pH control at conditions approximating those expected for the N Reactor graphite cooling system.

KER-3 - Testing of thirteen 23-inch NAEI fuel elements as authorized by PT IP-477-A was completed with the discharge of the elements January 24.

KER-4 - Testing of fourteen NAEI fuel elements as authorized by PT IP-477-A was completed with the discharge of the elements January 24.

Single-Pass Tube Operation - 1706-KE

<u>Tube</u>	<u>Production Test</u>	<u>Water Supplied</u>	<u>Corrosion Inhibitors and Chemical Additions</u>	<u>pH</u>
SP-1 (2952)	IP-476-AL	Process	1.8 ppm dichromate	6.6
SP-2 (3050)	IP-604-A	Service	None	6.6
SP-3 (4355)	IP-520-A	Process	1.8 ppm dichromate	6.6
SP-4 (4456)	IP-520-A	Process	1.8 ppm dichromate	6.6
SP-5 (4557)	IP-604-A	Service	None	6.6
SP-6 (4863)	IP-604-A	Service	None	6.6
SP-7 (4963)	IP-449-A	Process	1.8 ppm dichromate	6.6
SP-8 (5063)	IP-449-A	Process	1.8 ppm dichromate	6.6

KE Reactor Outage Time Requirements - No unscheduled outages were charged to production testing. A total of 13.6 outage hours was charged to production tests as listed below:

<u>Production Test</u>	<u>Description</u>	<u>Hours</u>
IP-601-D	Charge-discharge KER-1	3.0
IP-632-D	Tray discharge and charge KER-2 (12-21-63)	3.5
	Charge-discharge KER-2 (12-24-63)	6.0
	Discharge KER-2 (1-17-64)	1.1

Out-of-Reactor Facility Operation

TF-2 - Testing to evaluate crevice corrosion beneath Zircaloy-2 fuel element supports with ammonium hydroxide used for pH control continued. Testing of NPR steam generator tubing to determine the leak rate and corrosion effects of leakage and uniform corrosion testing of NPR silver-plated components and copper continued. Operating conditions are 288 C, 1340 psi and pH 10.1.

TF-3 - Testing to evaluate crevice corrosion beneath Zircaloy-2 fuel element supports with ammonium hydroxide used for pH control was continued. Operating conditions are 314 C, 1985 psi and pH 10.0.

TF-4 - Testing for determining the effects of the presence of oxygen on the corrosion rates of coupled and uncoupled carbon steel when using the Sulfam-6 decontamination process was completed.

Testing was started to obtain cyclic corrosion data on the alkaline permanganate - inhibited sulfamic acid decontamination process. Prefilming operating conditions are 1600 psi, 300 C, and pH 10.0 adjusted with ammonium hydroxide.

TF-7 - Fretting corrosion testing of various materials continued. Thermocyclic testing of facsimiles of NPR steam generator tube ends was completed. Operating conditions are 277 C, 1125 psi and pH 10.0 adjusted with lithium hydroxide.

The test sections contain the following materials:

1. A PRTR fuel element for fretting corrosion studies
2. Two dummy Zircaloy-2 clad elements for uniform corrosion testing of supports
3. Two NIN1 fuel elements for uniform corrosion testing
4. One KSE3 fuel element for uniform corrosion testing
5. Two 23-inch and one 12-inch NAE1 fuel elements for support fatigue and fretting corrosion testing
6. Type 316 stainless steel tubing fittings for caustic cracking testing
7. One Zircaloy-2 specimen for caustic attack testing
8. A section of NPR steam generator tubing for determining the leak rate and the size propagation of a pin-hole leak formed by intergranular corrosion
9. Stainless steel and Inconel coupons to be prefilmed for decontamination testing

TF-8 - The test to determine the effects of a proprietary cleaning solution on N Reactor fuel elements was completed.

TF-20 - Testing to determine the effects of heat transfer on aluminum corrosion in process water and the cause of resistance temperature detector corrosion and the effectiveness of various coatings continued. Operating conditions are 120 C, 9.5 gpm flow and pH 6.0.

Legend

NIE1 - N Reactor, inner tube, enriched, first model
 NAE1 - N Reactor, assembly - tube and tube, enriched, first model
 NIN1 - N Reactor, inner tube, natural, first model
 KSE3 - KER Loops, single tube, enriched, third model

O. L. Greager
 Manager, Research & Engineering

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FACILITIES ENGINEERING

DESIGN ENGINEERING

Vertical Safety Rods - Graphite Distortion

High strength polycrystalline graphite will be used for sleeving vertical rod channels at the C and K Reactors. A purchase requisition was issued for prototype sleeves sufficient for three VSR channels at 105-C Reactor. Only one of the three major manufacturers of reactor-grade graphite indicates ability to provide the required high strength graphite, although all three had previously so indicated.

Development work on VSR channel enlargement tools has continued to permit faster cutting rates and establish the procedures to minimize damage to process tubes during the channel enlargement operation. An over-all graphite removal rate of 6.8 cu.in./min. was achieved during testing on the second channel mock-up. This rate would permit reaming Channel C-41 in eight hours. A second channel reamer, spare pilot assemblies and guides, and 10 sets of spare cutters are being fabricated for the next on-reactor trial.

Horizontal Control Rods

General Astrometals, the supplier of the boron carbide aluminum poison elements for the prototypic flexible HCR tips, has experienced fabrication problems. The use of a paraffin lubricant in the powder mix was authorized and improved the situation somewhat. However, some difficulties are continuing to be experienced. The vendor is replacing the faulty parts of the extrusion die. Approximately 10 lineal feet of the 98 required to complete this order have been processed.

NTH Products, the prototype HCR fabricator, is having trouble obtaining Inconel sheath material for the two prototype HCR tips. The first load of low cobalt Inconel strip for the sheath was rejected because of surface scratches. A one-month delay will result until the material supplier can furnish new Inconel strip.

Design of the drive system for laboratory testing of the flexible HCR has been completed and approved. Fabrication of the components has been initiated.

Zirconium Tube Installation - K Reactors - Design

Impact extruded aluminum nozzles are being provided for the approximately 600 spline tubes on the 105-K Reactors as part of the zirconium retubing program. These new nozzles have a much higher impact strength than the cast nozzles which are now installed. Procurement difficulties between C. L. Gougler Company, the vendor for the nozzles, and Alcoa, who will supply the raw extrusions, have been resolved. C.L. Gougler will broach the inside bore of the nozzles to obtain the required surface finish and

rib configuration. This firm has also been authorized to anodize these nozzles a blue color for identification purposes on the reactor.

Additional tests have been completed on the aluminum Van Stone gaskets used with the zirconium tubes. These tests show that there is no significant reduction in bolting torque resulting from cyclic application of loads on the nozzle.

Reactor Shield Integrity Studies

A report, HW-80007 has been issued discussing future problems that will be encountered with the Ball 3X system at the 105-K Reactors due to continuing subsidence of the graphite moderator. It is estimated that this may present operational problems in approximately four years.

Process Piping System Studies

Alternative methods of inhibiting pipe corrosion are being investigated. Information regarding the corrosion inhibiting effectiveness of sodium silicate was received from Sheppard T. Powell and Associates. This report stated that use of 10 ppm or less of silicate could possibly accelerate corrosion because only a portion of the system might be protected and the remainder of the system take on all the attack of the corrosive medium. It further stated that our systems would require a continuous silicate treatment to maintain a residual concentration of at least 80 ppm or more. The use of deaerated water for inhibition of the stagnant piping system was recommended. It was indicated that vacuum deaeration could reduce the dissolved oxygen level in the 100 gpm circulating flow in the K Reactor crosstie line to about 0.12 ppm. To further reduce the oxygen content, and as a measure of added system protection, a small amount of sodium sulfite could be added to the deaerated water.

Coolant Backup - Six Small Reactors

A feasibility study regarding the use of flywheels on the export system electric pumps in order to eliminate the need for surge suppressors has been issued (HW-80072). The study concluded that this proposal is not feasible because the flywheels would not eliminate the problems of reliability that currently exist in the present coolant backup feature of the export system. Initial studies are under way to determine the changes in the scope of the proposed last-ditch coolant system modifications which will result from the announced shutdown of three of these reactors.

Power Recovery Studies

Work on the first concept under study based on the conversion of one of the five smaller reactors to power production using technology developed for the NPR is near completion. All of the engineering concept drawings and process analysis defining the proposed revisions to the facility have been completed. Cost estimating has started. To date, no information regarding the economic feasibility of this modification is available; how-

ever, it has become apparent that the basic economic assumptions used in calculating the value of power produced will have significant effect upon the economic feasibility of the program. Preliminary work is under way on the four remaining study concepts which are planned for completion this fiscal year.

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EQUIPMENT DEVELOPMENTSelf-supported Fuel Element (SSFE) Charging

The two prototype charging machines have been used routinely during three recent charge-discharge operations at the K Reactors. Continued use has eliminated most minor mechanical weaknesses and very few breakdowns were experienced. Responsibility for maintenance and operation of the prototype machines has been transferred to the Manufacturing Section. Modifications suggested by the Processing Operators to reduce maintenance and to simplify operation are being incorporated into the machines. A photo-electric detector which will discriminate between smooth and self-supported fuel is being developed to permit charging of the central zone spline tubes with the SSFE charging machine.

During the last three outages two magazine insert strips (white) were lost from the second order of prototype magazines. While the gluing procedure used in fabricating the second prototype order was much superior to the original, in-service experience indicates that the current gluing technique is not adequate for the anticipated service.

The prototype magnesium magazines ordered from the Dow Metals Company have been extruded and are now undergoing heat treatment. Delivery is promised at a rate of 40 per week commencing in February. Testing criteria have been developed to establish a basis for magazine evaluation.

Delivery of prototype all-plastic magazines has been delayed due to reject of mold castings at one vendor and delay in mold fabrication at the second vendor. Revised schedules have been requested.

Prototype High Speed Scanner

The high speed scanner prototype system has operated 25,817 hours; no unusual incidents have occurred.

K Reactor Resistance Temperature Detector (RTD) Corrosion

Testing of various stem coatings for RTDs was continued in the KER facility. Due to the limited number of available test stations, statistically significant data cannot be obtained. A production test, PT-652-AF, has been prepared to permit installation of additional test samples on reactor which have undergone screening in off-reactor facilities. Installation of samples will proceed upon approval of the production test.

Intermediate Range Neutron Monitoring

The specification for intermediate range neutron monitoring has been completed in rough draft form. Preparation of a companion specification to delineate component quality and workmanship has been initiated. Testing of the 105-F intermediate range neutron monitor shield plug installation

reveals less neutron leakage from the shield plug than from the surrounding reactor shielding. Testing of various gamma compensating ion chambers is continuing. Data received from the prototype installation indicate that the instrumentation equipment is operating satisfactorily; no unusual incidents have occurred.

Design Test Service

The N-Reactor program utilized 974 hours of engineering effort for design test service.

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PROJECT ENGINEERINGCGI-103, Fuel Element Charging and Handling System, KE and KW Reactors

Title II design is complete. Requisitions for the engineered equipment have been issued. Delivery of the platform hoist cranes is scheduled for February and of the charging machine for March.

CGI-839, Modification of Fuel Element Test Facilities, 1706-KER

Vendor drawings for fabrication of the neutron detection system are still not available. Sufficient information was obtained by telephone to permit Vitro to proceed with design.

Another impeller failure occurred in one of the 1706-KER recirculating pumps December 27, 1963. A new heavier impeller was subsequently received from the vendor. The rotating assembly has been balanced and the pump has been assembled and is available as a spare. Use of this impeller which the vendor had intended using in his test program will delay the program several weeks while he fabricates a new impeller.

CGI-960, "C" and "D" Work Platform Safety Improvements, All Reactors

Design drawings for the K Plant work were completed. This allowed ordering electrical materials. Brakes, first requisitioned last July, are not yet on order, awaiting approval of a negotiated purchase. Bids for the last engineered item, drive shaft sprockets, will be opened on February 7. Rear platform work was started at KE this month during tube replacement outage.

MJA-42, Interior Painting, Process Water Storage Tanks, B, F, H, DR, and C

This paint contract has been suspended at the direction of RLOO-AEC until it is decided what areas are to close down. A stop work order was issued to the paint contractor January 10, 1964. This order is to be in effect until March 1, 1964.

MJA-54, Thermocouple Temperature Monitor Stepping Switch Replacement and Associated System Repairs, C, D, DR, F, and H Reactors

Installation work has been completed at 105-C and H Areas. Job preparation work started January 20 for the third area installation (presently scheduled for 105-D).

AR-P-25041, Portable Closed Circuit Television Systems, All 105 Buildings

A vendor representative was on plant during the entire week of January 19 through January 24, to make necessary repairs to the equipment.

Fifteen of the sixteen systems have been accepted. Certain components of the 16th system have been returned for repair and/or replacement.

100-K Zirconium Retubing Program

Work is progressing on the installation of 575 zirconium and 48 aluminum tubes at 105-KE. This will bring the total to 2,351 zirconium tubes installed in 105-KE.

A total of 5,253 zirconium tubes have been received from the vendor and so far approximately 5,000 tubes have been accepted. A total of 174 tubes have been returned to the vendor for a net receipt of 5,079 tubes.

Project Proposals Submitted to RLOO-AEC

CGI-125, Replacement and Improvement of Fixed Gamma Radiation Monitoring Instrumentation - Existing Hanford Production Reactor Areas.

CPFF Construction Service Contractor-Liaison

Issued three new work orders and supplemented one old job, for a total of \$2,002 to J. A. Jones Construction Company.

Plant Forces Work Review

The Labor Standards Board approved two jobs for assignment to plant forces, estimated to cost \$37,500.

RT Jessen:hrr

Manager
Facilities Engineering

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FINANCIAL

ACCOUNTING

Cost control procedures for Maintenance and Capital Expenditures related to the six small reactors were revised as a result of the announced shutdown of three reactors. Delegations of authority related to performance of work and material purchase have been changed. Examination of all Maintenance Job Authorizations and Capital Equipment expenditures currently authorized is also in progress. The propriety of all other expenditures is being carefully examined and only work essential to maintain reactor safety and continuity of operation is being performed.

A procedure for "Reactor Shutdown Costs" was issued to management outlining methods for accumulating and reporting cost details associated with shutdown activities.

Budget activity was initiated for the preparation of the FY 1966 and Revision of FY 1965 Budgets. Detail budget assumptions have not yet been received; however, preliminary estimates are being based on assumptions used in the Reactor Production Study Case 16.

AUDITING

During the month revisions of eight Department and seven HAPO OPGs were issued.

Twelve revisions of AEC Manual Chapters were reviewed and copies distributed to components as appropriate.

Reynolds
Manager Finance

RW McMichael:RET:slb

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SIGNIFICANT REPORTS ISSUED

<u>Number</u>	<u>Class'n</u>	<u>Author</u>	<u>Date</u>	<u>Title</u>
HW-78813	Unclass.	DF Watson PF Mercier	10-21-63	Development Test IP-615-E - Removal of Circular Plugs From Process Piping for Metallurgical Testing - 105-C and 190 Buildings
HW-79201	Unclass.	DF Watson PF Mercier	12-18-63	Development Test IP-626-AE - Removal of Circular Plugs From Process Piping for Metallurgical Testing - 100-KE and KW Areas
HW-80083	Unclass.	DF Watson PF Mercier	12-18-63	Development Test IP-642-AE - Removal of Circular Plugs From Process Piping for Metallurgical Testing - 100-H Area.
HW-80084	Unclass.	DF Watson PF Mercier	12-18-63	Development Test IP-643-AE - Removal of Circular Plugs and Spool Pieces From Process Piping for Metallurgical Testing - 100-F Area
HW-79497	Unclass.	NF Fifer	11-4-63	105-K Gamma Monitor Systems Pressure Piping Code Variance
HW-80007	Conf.	CC Steele	12-13-63	Ball 3X Bellows for K Reactor
HW-80072	Unclass.	LB Brinkman SS Jones	12-20-63	Feasibility of Flywheels on Export Electric Pumps
HW-80189	Unclass.	DE Cooley	12-30-63	Study Report - Monitoring Processed Fuel Shipments
HW-80210	Secret RD	DH Frieling	12-30-63	Increased Flow From Parker Fitting Reaming - Five Old Reactors - Calculations
HW-80211	Secret RD	DH Frieling	12-30-63	Rear Face Piping Study - 105-KE Calculations
HW-80212	Secret RD	DH Frieling PH Hutton	12-30-63	Technical and Economic Evaluation of By-Product Horizontal Control Rods. All Reactors - Calculations
HW-80213	Secret RD	NF Fifer	12-31-63	FY-1964 - Overbore Review calculations

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HW-80581

Number	Class'n	Author	Date	Title
HW-80219	Secret RD	NF Fifer	12-31-63	FY-1962 Reduction of Unit Cost Study Calculations
HW-80499	Secret	JW Ballowe	12-13-63	Meeting Minutes - Power Recovery Study - Meeting No. 8 December 13, 1963
HW-80501	Secret	JW Ballowe	1-21-64	Meeting Minutes - Power Recovery Study - Meeting No. 9 January 3, 1964
HW-80504	Conf.	JW Ballowe	1-22-64	Meeting Minutes - Power Recovery Study - Meeting No. 10 January 17, 1964
HW-77789	Unclass.	FE Haun, Jr.	12-5-63	Laboratory Test of Panellit Gauges - EDO #17
HW-79807	Unclass.	WEB Lander	12-13-63	Clare Mercury Wetted Relay Reliability Test, Design Test 1090
HW-79530	Unclass.	GF Ehlers	12-18-63	Export Water System Tests, Design Test 1184
HW-80082	Unclass.	RL Woodward	1-6-64	Design Test 1192 - NRD Filter Test
HW-80452	Conf.	CA Munro	1-17-64	Power Recovery Study, Over-boring, Steam Venting, and Process Equipment Removal
HW-80058	Unclass.	EA Wegener	12-17-63	Interim Report - Correction of Process Tube Distortion, 100-B, -D, -F, -DR, and -H Reactors
	Unclass.	GF Howden	1-17-64	K Reactor HCR Channel Renovation Procedure
	Unclass.	DF Arnold R Sherrard	1-24-64	Record Report No. 64-01, High Speed Scanning System, DDR-179, 105-KW, Record of Visit to Astrodata on 1-13-64 and 1-14-64
HW-79973	Unclass.	RT Jaske	12-13-63	A Review of the Downstream Effects of Priest Rapids Dam at 181-B

Number	Class'n	Author	Date	Title
HW-79670	Unclass.	RT Jaske	12-31-63	Feasibility of Large Scale Booster Testing on the Hanford Reservation
HW-79603	Unclass.	DE Sebade PJ Zimmerman	1-28-64	Rotary Spline Inserter
HW-79958	Unclass.	TW Hauff	12-31-63	Cost Improvements in CY-1963, Irradiation Processing Department
HW-80089	Secret	DA Snyder	12-27-63	Increased Length Fuel Elements
HW-80164	Secret	CR Barker JR Young	12-31-63	Rear Face Hardware Replacement, 105-B, D, DR, F, and H
HW-80266	Unclass.	JR Young	1-3-64	Failure Rate, Rear Cross-header Parker Fittings Reamed to 0.543 Inch Diameter, 100-B, D, DR, F, and H
HW-80444	Conf.	WR Perrault	1-20-64	Justification for Discharge Chute Clearing Equipment for 100-K Area
HW-80476	Unclass.	RS Peterson	1-20-64	Spline Coiler Ejection System (DT-IP-655-F)
HW-80601	Unclass.	WV Thompson	1-27-64	H Area Adapter Sigtail Nut Torque Tests
HW-80160	Conf.	TW Hutton	12-23-63	Status of Canning Cycle Optimization Study
HW-80172	Secret Red Label	TJ Stringer JE Minor M Lewis	1-3-64	Report to the Working Committee of the Fuel Element Development Committee from the General Electric Company - Hanford
HW-80604	Secret	WN Mobley	1-31-64	Production Forecast, Production Fuels Section, Irradiation Processing Department, January 1964 through June 1969

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HW-80531

<u>Number</u>	<u>Class'n</u>	<u>Author</u>	<u>Date</u>	<u>Title</u>
HW-80648	Secret	HC Money	1-30-64	Production Assumptions and Schedules, Production Fuels Section, Irradiation Processing Department, January 1964 through June 1969
HW-80387	Secret	RE Dunn	11-26-63	Investigation Report - Exceeding Reactor Operating Limits
--	Conf. Undoc.	RC Clough	1-2-64	Flow Stoppage on Tube 3750 - KE Reactor

TRIPS

<u>Name</u>	<u>Firm & Location</u>	<u>Date</u>	<u>Purpose</u>
DM Diediker	Byron Jackson Pumps	1-24-64	To consult with manufacturer concerning 1706-KER recirculating pump failures.
CE Bonham	Union Machine Works Seattle, Wash.	1/23-24/64	Discuss technical requirements of Charging Machine and Bridge Crane.
DF Arnold R Sherrard	Astrodata, Inc. Anaheim, Calif.	1/12-15/64	Discuss Contract DDR-179; set up cost auditing system; review initial engineering planning.
AW Hervin	Union Machine Co. Seattle, Wash.	1/22-23/64	Witness tests on traveling cranes.
JW Scoggin	Seattle, Wash.	1/26-27/64	To attend Annual Meeting of Washington Boiler and Casualty Inspectors and Manufacturers.
JM Fox, Jr.	University of California, Berkeley, Calif. Dr. Earl R. Parker	1/13-14/64	Discuss brittle fracture of carbon steel.
RT Jessen	Astrodata, Inc. Anaheim, Calif.	1/12-14/64	Discuss Contract DDR-179 and review engineering planning.
PF Mercier	University of Calif. Berkeley, Calif.	1-14-64	Consult on brittle fracture problems.
A McDonald	Westinghouse Elec. Service Shop, Spokane, Wash.	1-7-64	Accompanied WE Spillman of RLOO-AEC; to consult with vendor on repair of the 181-C river pump motor.
LH Rice	National Lead Co. Cincinnati, Ohio & Mallinckrodt Chemical Works St. Louis, Mo.	1/5-10/64	Discuss uranium technology and mutual problems of HAPO and feed sites.
GF Jacky	Renard Mfg. Co. Seattle, Wash.	1/6-7/64	Examination and evaluation of plating racks.
JT Stringer	Savannah River Plant Aiken, So. Carolina	1/13-17/64	Attendance at FEDC Working Committee meeting.

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HW-80581

VISITORS

<u>Name</u>	<u>Firm & Location</u>	<u>Date</u>	<u>Purpose</u>
P. Hendrickson	Central Intelligence Agency Seattle, Washington	12-18-63	Discuss with G.E. Wade concerning IAEA Symposium, Vienna, Austria.
GR Fox	General Electric Co. Advanced Technology Laboratories, Schenectady, N.Y.	1-20-64	Consultation on 275 hp re-circulating pump failures in accordance with ATH-2-64.
FC Schora	A.D. Little Co. Cambridge, Mass.	1/22-23/64	Discuss Contract CA-379 - graphite distortion problems.
WJ Love	GE - Advanced Tech. Laboratories Schenectady, N.Y.	1/6-11/64	Consult on stack venting problems.
G Tenove	Datex Corp. Monrovia, Calif.	1/13-15/64 1/20-21/64	NAA-115 instrumentation checkout and training.
DB West	Atomics International Canoga Park, Calif.	" "	" " "
AM Labowitz	AEC Washington, D.C.	1-13-64	Visit facilities used for Division of Reactor Development testing programs.
RP Conners R Awalt	Beckman Instruments Fullerton, Calif.	1-21-64	To observe installation and difficulties being experienced with Beckman Model J pH meters.
CD Lundeen EC Valentine	Minnesota Mining & Manufacturing Co. Seattle, Washington	1-3-64	Met with JD Ryan to discuss mastic compound for sealing 107-F Basin.
HE Kingston	Dresser Mfg. Div. Vancouver, Wash.	1-7-64	Met with JD Ryan to discuss 107-F effluent line coupling failures.
RC Yule	Oakite Products Spokane, Washington	1-7-64	Discuss cleaning compounds.
RV Tobe	Dow Chemical Co. Kalama, Washington	1-7-64	Discuss chemical boiler cleaning.

Name	Firm & Location	Date	Purpose
DM Guy	ALCOA Seattle, Washington	1-14-64	Discuss AlSi quality.
G Cambell R Stephens	ALCOA Wenatchee, Washington	1-14-64	Discuss AlSi quality.
A Le Duc	Dearborn Chemical Co. Portland, Oregon	1-14-64	Discuss chemical boiler cleaning.
RL Meyer	Betz Laboratories Seattle, Washington	1-14-64	Consultation on water treatment Contract SA-324.
L LeDoux R Stack	Pittsburg Plate Glass Portland, Oregon	1-21-64	Discuss degreasing compounds.
M Ziegler	ALCOA Edgewater, N.J.	1-29-64	Discuss Aluminum components.
R Ladner	ALCOA Lancaster, Pa.	1-29-64	" "
DM Guy	ALCOA Seattle, Washington	1-29-64	" "

END

**DATE
FILMED**

2 / 8 / 93