DECLASSIFIED

HW--82942

DE93 003427

IRRADIATION PROCESSING DEPARTMENT MONTHLY REPORT

SEPTEMBER 1964

HANFORD ATOMIC PRODUCTS OPERATION

GENERAL ELECTRIC

RICHLAND, WASHINGTON

NOV 13 1992

EB

DECLASSIFIED

MASTER

DECLASSIFIED

This document consists of
22 pages.

IRRADIATION PROCESSING DEPARTMENT
MONTHLY REPORT
SEPTEMBER, 1964

DECLASSIFIED

By Authority of RLC-664/IR-24

Compiled By
 IPD Personnel
 October 9, 1964

DS HECIS 8-27-92

By JL Phillips 9-2-92

19 Krieger 9-3-92 RICHLAND, WASHINGTON

CLASSIFICATION REVIEW FOR
 DECLASSIFICATION LEFT
 UNCHANGED

RLC-664/IR-24
 Date 15 15 73
 U.S. Department of Classification

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

DECLASSIFIED

Route To	P. R. No.	Location	Files Route Date	Signature and Date
<u>J E Travis</u>	<u>RLC-664/IR-24</u>	<u>HEC</u>		

GROUP 1
 Excluded from Automatic Downgrading
 and Declassification.

DECLASSIFIED

HW-82942

DISTRIBUTION

Copy Number

1	W. E. Johnson
2	H. M. Parker
3	APD, F. E. Crever
4-5-6-7-8	RLOO-AEC, J. E. Travis
9-10-11	AEC Production Division, F. P. Baranowski
12	SROO-AEC, R. C. Blair
13	R. L. Dickeman
14	R. S. Bell
15	O. H. Greager
16	R. T. Jessen
17	O. C. Schroeder
18	T. B. Pugh
19	W. N. Mobley
20	R. W. McMichael
21	300 Area Files
22	Records Center

DECLASSIFIED

DECLASSIFIED

HW-82942

TABLE OF CONTENTS

<u>SUMMARY</u>	A-1
<u>MANUFACTURING</u>	
Production and General	B-1
Reactor and Power Statistics	B-3
Reactor Operations	B-4
Applied Reactor Engineering	B-7
<u>PRODUCTION FUELS</u>	
AlSi Shop	C-1
Materials	C-3
Fuels Engineering	C-3
Plant Facilities	C-6
<u>RESEARCH AND ENGINEERING</u>	
Process and Reactor Development	D-1
Process Technology	D-7
Operational Physics	D-12
Testing	D-16
<u>FACILITIES ENGINEERING</u>	
Design Engineering	E-1
Equipment Development	E-4
Reactor Plant Deactivation	E-6
Project Engineering	E-7
<u>FINANCIAL</u>	F-1
<u>REPORTS, TRIPS AND VISITORS</u>	G-1
<u>RESEARCH & DEVELOPMENT ACTIVITIES</u>	
Research & Engineering	H-1
Facilities Engineering	H-2
Production Fuels	H-3

SUMMARY

MANUFACTURING

Reactor input plutonium production for September was 457.9 KMWDs: 258.9 KMWDs at the six smaller reactors and 198.9 at the two K Reactors. Tritium input production for September was 4559 equivalent MWDs.

Over-all time operated efficiency was 81.4% (79.4% forecast): 82.3% at the six smaller reactors and 78.9% at the K Reactors. A high time operated efficiency at KW Reactor, 95.3%, was offset by 8.5 days of outage time at KE for scheduled work. The H Reactor concluded 68.7 days of continuous operation on September 20. This established a new record for a Hanford reactor, exceeding the previous record of 60.6 days also held by H Reactor.

Power levels at all reactors except B were restricted by a bulk outlet water temperature limit of 95 C. The B Reactor power level was restricted largely by trip-after-instability limits on enriched tubes supporting the depleted uranium load and periodically by the graphite temperature limit.

Six failed I&E fuel elements were removed from the reactors: three of natural uranium and three (bumped) of enriched uranium. The three natural metal failures, two at B and one at DR, were side hot-spot failures at 70%, 97% and 102% of goal exposure, respectively. Two of the enriched failures, at H Reactor, were hole defect failures at 83% and 92% of goal exposure. The third enriched failure, at DR Reactor, was at 119% of goal exposure. The failed element was not found and the type failure was classified as "unknown."

One process tube leak, at the rear Van Stone flange, was corrected. Four new process tubes were installed.

PRODUCTION FUELS

A total of 753 tons of natural and enriched fuel elements was produced in September, 104% of forecast.

Canning line operation was at the rate of nine lines per day. One overtime day, September 12, was worked. Canning line efficiency was 98.8% for September.

Bare core inventory at month's end totaled 593 tons, a 0.9 month's supply. Finished fuel inventory was 1028 tons, a 1.3 months' supply.

The manufacturing yields of all fuels remained at high levels during the month. All categories were above forecast.

The backlog of work in process at the end of September was less than that experienced in August. A normal amount of self-support elements was ahead of the rail welders and sizing operation. About 6000 enriched elements were ahead of the elliptical rail welding operation.

DECLASSIFIED

DECLASSIFIED

HW-82942

Two autoclave failures, one incipient and one complete, occurred in September. The complete failure was the result of an arc strike in the base end of the spire tube. The incipient failure resulted from a pinhole in the cap weld.

The necessary thorium target elements for loading the KW Reactor fringe were completed on schedule by month's end. A slight delay in oxide deliveries and agglomerates in a portion of the oxide affected production output.

RESEARCH AND ENGINEERING

A schedule for irradiation of thorium to produce 110 kg of U-233 has been prepared. The thorium will be irradiated in the fringe zones of KW, B, D, C, and KE Reactors with the first loading in KW Reactor in early October, 1964. In addition, the central zone of KW Reactor is scheduled to be used beginning in December, 1964.

A total of 194 columns of depleted uranium fuel elements is under irradiation in accordance with the plan for producing 25 kg of plutonium with an 18% Pu-240 content. One hundred and four of the columns are charged in the central zone of B Reactor and 90 in the central zone of KE Reactor; reactivity and flattening flexibility are currently adequate in both blocks for efficient flux distribution control.

FACILITIES ENGINEERING

Studies for further reducing deactivation costs have been summarized. A report of the findings is being reviewed on a Department-wide basis before issuing. Preparation of deactivation instructions and procedures for DR Reactor is now approximately 50% complete.

Final machining of the high strength graphite sleeves for installation in a second VSR channel at C Reactor was delayed approximately one week due to heat treat furnace difficulties at the vendor's plant. The sleeves are undergoing final inspection at month's end and should be shipped early in October.

Delays are being experienced in the procurement of satisfactory boron carbide poison elements for the prototype K Reactor flexible HCRs. However, the vendor has now produced a small quantity of satisfactory material. Attempts are being made to develop a second source of supply, and alternate methods of producing the poison elements are being discussed with the Advanced Technology Laboratories.

The design of an improved aluminum HCR for the smaller reactors has been completed and a purchase requisition package for the procurement of two prototype test rods was delivered to Purchasing.

Testing of the prototype water jet installation at the KW Reactor discharge chute continued. Despite earlier satisfactory performance of the jets, the desired flow during an outage test was not obtained because of the limited storage basin overflow capacity. Planned basin overflow modifications are

in progress and should permit a satisfactory test of the water jet installation.

Inspection of offsite installations of potential internal pipe coatings and a visit to Hanford of possible coating contractors have determined that a suitable corrosion protection coating and appropriate method of application are not available for use in the KE-KW Reactor cross-tie line at this time. Study of alternative coating materials is continuing and deaeration equipment to minimize the rate of corrosion product buildup in the system has been scoped.

Following the failure of a second rear crossheader expansion joint at B Reactor, installed as part of MJA-53 (Installation of Rear Crossheader Expansion Joints, 105-B and 105-D), vendor representatives visited the plant on September 21 for discussions and inspection. Twelve joints have been shipped to the vendor's laboratory for detailed examination.

The major installation work on Project CGI-960 ("C" and "D" Work Platform Safety Improvements, Five Reactors) was completed at KE Reactor on September 5, except for the compressed air piping to the brakes. This piping work was postponed as a result of the pipefitters strike. Beneficial use of the "C" platform was approximately six days behind schedule, due in part to required troubleshooting of electrical problems.

RESPONSIBILITY

Effective September 1, 1964, the responsibility for IPD Transfer Studies was transferred from the Manufacturing Section to the Financial Section.

FORCE SUMMARY

	<u>Exempt</u>	<u>Non-Exempt</u>	<u>Total</u>
General	8	2	10
Research and Engineering	83	48	131
Manufacturing	347	1259	1606
Production Fuels	90	359	449
Facilities Engineering	86	26	112
Financial	<u>18</u>	<u>23</u>	<u>41</u>
TOTAL	632	1717	2349

Effective September 1, L. W. Lang, Principal Engineer, Manufacturing, transferred to Hanford Laboratories as Technical Consultant in Engineering Development.

Effective September 1, C. A. Priode, Specialist, IPD Transfer Studies, was transferred from the Manufacturing Section to the Financial Section.

DECLASSIFIED

DECLASSIFIED

HW-82942

Effective September 8, H. G. Spencer, Supervisor, Process Analysis, Research & Engineering Section, transferred to Production Sub-Section, Manufacturing Section, to fill a newly established position of Specialist, Reactor Optimization Studies.

Effective September 14, E. R. Astley, Manager, Applied Reactor Engineering, Manufacturing Section, transferred to Hanford Laboratories as Technical Consultant reporting to the Manager, Reactor and Fuels Laboratory. Concurrently, W. W. McIntosh, Manager, Reactor Plant Deactivation, Facilities Engineering Section, became Manager, Applied Reactor Engineering, Manufacturing Section.

Effective September 15, in Facilities Engineering Section, W. W. Windsheimer became Manager, Reactor Plant Deactivation.

Effective September 28, R. H. Wheaton, Manager, Central Maintenance, Manufacturing Section, transferred to General Electric at Roanoke, Virginia. Concurrently, N. H. Skarshaug was made Manager, Central Maintenance.

SAFETY, SECURITY AND RADIATION EXPERIENCE

There were 77 medical treatment injuries, six security violations, no disabling injuries or 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>Name</u>	<u>Date</u>	<u>Title</u>
R. R. Cone	9-1-64	Power Rate Meter
M. L. Peterson		

OC Schroeder
Acting General Manager

OC
OC Schroeder DLD:bm

MANUFACTURING

PRODUCTION & GENERAL

Reactor Production

Reactor input plutonium production for September was 457.9 KMWDs: 258.9 KMWDs at the six smaller reactors and 198.9 KMWDs at the two K Reactors. Tritium input production in the H Reactor E-N load (discharged September 22) was 3405 equivalent MWDs; incidental production in fringe poison at other reactors yielded an additional 1154 MWDs.

Power levels at all reactors except B were restricted by a bulk outlet water temperature limit of 95 C. The B Reactor power level was restricted largely by trip-after-instability limits on enriched tubes supporting the depleted uranium load and periodically by the graphite temperature limit.

Over-all time operated efficiency was 81.4% (79.4% forecast): 82.3% at the six smaller reactors and 78.9% at the K Reactors. A high time operated efficiency at KW Reactor, 95.3%, was offset by 8.5 days of outage time at KE for scheduled work. The H Reactor concluded 68.7 days of continuous operation on September 20. This established a new record for a Hanford reactor, exceeding the previous record of 60.6 days also held by H Reactor.

Fuel Exposure

There were no discharge goal exposure adjustments during September. Early discharge of the E-N core from H Reactor compensated for the overexposure of enriched metal at KE Reactor resulting in an average exposure near that set by the weapons product specification. The average exposure (MWD/T) of irradiated fuel discharged is as follows:

	<u>Smaller Reactors</u>	<u>KE & KW Reactors</u>
Natural Uranium	614	759
Enriched Uranium	622	*945

*The Pu-240 content of the K Reactors enriched uranium is equivalent to an exposure of 1100 MWD/T. However, green metal discharged from the depleted block of KE Reactor reduced the calculated average exposure to 945 MWD/T.

Reactor Personnel Certification

Four operators successfully completed the three written examinations and were upgraded during the month to "Nuclear Reactor Control Operators."

DECLASSIFIED

DECLASSIFIED

HW-82942

Oral examinations were given to eight operators during the month, including one failure and subsequent downgrade. A total of 49 operators is upgraded at this time, and 29 of these have completed all requirements for receiving their certificates.

The fall session of Certification classes began during September with 73 operator certification candidates, six supervisor certification candidates, and 36 operating studies candidates.

Radiation Monitoring

A "Special Test Emergency Radiation Event" procedure was written and is to be performed by all reactors. KW Reactor performed the test during September.

A document "Activity of Regular Irradiated Metal in Buckets" by R. H. Smith was published during September with recommendations concerning the shipment of irradiated metals, which are currently being implemented.

REACTOR AND POWER STATISTICS — SEPTEMBER, 1964

REACTOR DATA	B	C	D	DR	F	H	KE	KW	TOTAL
INPUT PRODUCTION — PU — KMWD	38.9	47.6	45.5	43.2	43.6	40.1	76.9	122.1	457.9
" — TRITIUM — EQUIV MWD	275	68	211	402	198	3405	0	0	4559
POWER LEVEL — MW (MAX.)	1740	2060	1790	1750	1770	1845	4335	4325	19615
" — MW (AVG.)	1636	1985	1743	1696	1681	1756	4102	4070	18869
TIME OPER. EFFICIENCY — %	79.3	80.0	87.1	84.8	86.4	76.1	62.5	95.3	81.4
OUTAGES — ALL CAUSES	2	3	2	4	5	6	3	1	26
OUTAGE TIME ALLOCATION — %:									
CHARGE — DISCHARGE	7.5	8.4	7.3	6.9	5.7	12.8	4.0	4.4	7.2
FAILED FUEL REMOVAL	2.6	-	-	2.0	0.3	5.7	-	-	2.2
WATER LEAKS	0.1	-	-	1.4	-	-	-	-	0.2
TUBE REPLACEMENT	0.8	1.7	1.8	0.8	0.5	2.6	16.2	-	3.1
OTHER MAINTENANCE	1.8	8.5	3.1	3.6	4.9	1.4	4.1	-	3.4
PRODUCTION TESTS	0.1	0.9	0.5	0.4	1.3	-	7.5	-	1.3
PROJECT WORK	0.6	-	-	-	-	-	5.4	-	0.7
OTHER	0.2	0.5	0.2	0.1	0.9	1.4	0.3	0.3	0.5
TOTAL	20.7	20.0	12.9	15.2	13.6	23.9	37.5	4.7	18.6
WATER LEAKS — TUBE	-	-	-	-	-	-	-	-	-
" — VAN STONE	-	-	-	1	-	-	-	-	1
NEW TUBES INSTALLED	1	-	1	2	-	-	-	-	4
FUEL CHARGE — TONS NAT. U.	158.8	181.8	193.1	185.3	197.0	133.7	375.4	421.1	1846.2
" — TONS ENR. U.	63.2	40.7	28.4	34.8	26.7	74.5	82.5	39.9	390.7
FUEL ELEMENT FAILURES	2	-	-	2	-	2	-	-	6
HELIUM CONSUMED — M CU FT	154.0	331.8	183.8	196.4	249.8	178.9	137.9	202.7	1635.3
POWER DATA									
RIVER WATER PUMPED — M GALS.	8725.0		7797.0		3822.4	3917.8	5595.7	9149.3	39007.2
WATER EXPORTED — M GALS.	831.3		0		0	0	0	0	831.3
WATER TREATED — M GALS.	3023.7	4368.2	4589.8	3067.6	3787.5	3914.9	5582.2	9149.3	37983.2
WATER TO REACTOR — M GALS.	3124.2	4021.5	3546.6	3580.9	3585.1	3526.5	4638.1	8276.3	34299.5
" — " — GPM (NORM)	89000	100000	89100	88000	89000	91700	209000	209000	
" — " — PH	6.7	6.7	6.6	6.9	6.9	6.6	7.0	6.7	
" — " — DICHROMATE (PPM)	1.00	1.00	.99	.96	.95	.96	1.01	1.08	
STEAM GENERATED — M LBS.	54830		56377		29760	34968	22506	22662	
LBS. STEAM LB. OF COAL	8.93		8.47		9.07	8.30			8.67
" GAL. OF OIL							92.9	104.0	101.9
ELECTRICITY GENERATED — MWH							1257.2	1579.2	2836.4

RECEIVED

HM-32942

DECLASSIFIED

HW-82942

REACTOR OPERATIONS

Reactor & Power Statistics

These are tabulated on page B-3.

B-C Plant

Power level at B Reactor was restricted by TAI tube temperature limits and was approximately five per cent below normal. Power level at C Reactor was restricted by the 95 C bulk outlet temperature limit except for a reduced limit for four days due to a broken spline.

Two unscheduled outages (76.8 and 72.1 hours) were experienced at B Reactor because of failed natural metal fuel elements. Major work, other than charge-discharge, accomplished during these outages included: wall thickness measurement of 41 process tubes, displacement of four tubes of enrichment (27 inches downstream) to reduce outlet water temperature, decontamination of front and rear reactor faces which became contaminated by the second failed fuel element, and replacement of a crossheader joint.

Two unscheduled outages (2.3 and 48.1 hours) and one scheduled (93.9 hours) outage occurred at C Reactor. The unscheduled outages were caused by a faulty thermocouple and by an unexplained Panellit trip. Major work accomplished (in addition to charge-discharge) during these outages was: measurement of the wall thickness of 100 process tubes, sector annulus gaging of 12 process tubes, high velocity flushing of the high tanks, repair of 10 leaking rear face bellows and the top neoprene seal and installation of 12 reamed front face nozzles.

Design Change 865 which modified the controls for the export water system's steam turbine pump assembly was completed.

A third party inspection was performed on the No. 4 boiler in the Power House by a representative of the Travelers Insurance Company.

D-DR Plant

Power levels at the D and DR Reactors were restricted by bulk outlet water temperature limits of 95 C.

D Reactor had one scheduled outage (97.1 hours) for charge-discharge of 1046 process tubes. Other outage work included replacing one tube (internal and external corrosion), WTG probing of 227 tubes, replacing a gate stem in the rear rear side crossheader valve No. 4, and replacing gaskets on five leaking Ball 3X hopper covers.

Shortly after start-up the reactor was manually shut down (1.1 hours) to replace two leaking rear caps. Additional work accomplished during the month included replacing cables and idle rollers on the transfer area crane and replacing the wooden floor in the front change room with steel.

DR Reactor had four unscheduled outages. The first (71.3 hours) was caused by a failed fuel element and was extended to include a scheduled semi-block charge-discharge outage of 802 tubes. Outage work included removing the rupture with a charge machine, helium leak testing all headers, replacing one tube (sheared Van Stone), WTG probing of 109 tubes, installing nine 0.344" venturis, and repairing ten thermocouples. Shortly after start-up the reactor was scrambled (0.4 hours) because of a Panellit row relay failure. The relay was replaced and operation resumed.

The third outage (36.2 hours) was caused by a failed fuel element. Outage work included discharging the fuel element with a ram seater, charge-discharge of 52 tubes, retubing one air channel, replacing two front ball valves, recirculating six hoppers of 3X balls, installing 19 0.344" venturis, and re-sizing 19 rear Parker fittings. Shortly after start-up the fourth outage (1.3 hours), a low pressure Panellit trip, resulted from a failed rear Parker fitting.

A larger capacity bauxite reaction chamber was installed in the D Filter Plant Building bauxite feeder and was placed in operation September 18. Operation during the remainder of the month was satisfactory.

The solid bus bar (Design Change No. 916) was removed at the D Filter Plant Building on September 8, thereby restoring the electrical supply to two separate buses, each supplied by its own transformer and breaker.

F Plant

Equilibrium power level at F Reactor was restricted by the bulk outlet water temperature limit of 95 C.

Six outages were experienced at F Reactor: one a continuation of a rupture removal outage initiated in August (30.5 hours), one an unexplained Panellit scram (0.4 hours), one a Panellit scram caused by improper rolling of the gage (3.1 hours), one a scheduled charge-discharge (47.3 hours), one a manual scram necessitated by a heat control problem during start-up (3.2 hours), and one to replace two leaking front face caps (13.1 hours).

Principal work accomplished during the first outage was removal of the failed I&E enriched fuel element with a charge machine and the final discharge of the fringe load thorium and supporting enrichment authorized by PT-IP-648-AC. Major work accomplished during the scheduled charge-discharge outage consisted of charge-discharge of 671 metal columns, WTG measurement of 53 process tubes, and repair of helium leaks in the rear Omega and neoprene seals.

H Plant

Power levels of the reactor were restricted by the 95 C bulk outlet water temperature limit. A continuous operating period of 68.73 days was concluded by the failure of an enriched fuel element in an E-N charge on September 20. This operating period represented an all-time continuity of operation record for a Hanford reactor and also concluded a period of 105 days since the last unscheduled outage at H Reactor.

DECLASSIFIED

HW-82942

Two short duration outages following start-up from the September 20 outage were caused by a Panellit scram (1.6 hours) and insufficient splines for control during turnaround (2.3 hours). Following shutdown on September 22 for removal of a second enriched fuel element failure, the E-N block discharge originally scheduled for September 28 was completed (135.0 hours). Probologging of 300 process tubes during the outage indicated no significant changes of normal corrosion rates. Correction of a gamma monitor flow gage required a short duration outage (1.3 hours) upon start-up. The reactor was again shut-down 6.3 hours prior to month's end to add additional spike enrichment for the next operating period.

Liquid alum feed as a coagulant was replaced with bauxite alum on the east half of the filters. The change was made to improve effluent radioactivity and for a cost advantage.

Vertical safety rod No. 25 was placed back in service following an overhaul of the winch. Pressure monitor gages for the poison control column facility tubes were modified by revision of the gage drive plates to prevent disengagement of the drive pin (Design Change No. 937). Modification of the "L" and "N" Model "G" temperature recorders was completed including installation of plug-in range cord circuitry. The modification (Design Change No. 913) was made to improve the monitoring reliability of graphite temperatures.

KE-KW Plant

Maximum power levels at both KE and KW Reactors were restricted by the bulk outlet water temperature limit of 95 C.

KE Reactor resumed operation on September 9 following completion of the previously reported scheduled extended outage initiated in August. In addition, three unscheduled outages occurred. Two outages (29.3 and 35.2 hours) were caused by a sensing line system failure at the associated 1706-KE-KER testing facility. An unexplained Panellit trip caused the other outage of 0.4 hours. Major work accomplished during the unscheduled outages included standards checks and routine equipment maintenance.

On September 29, approximately 34 hours prior to a planned shutdown for charge-discharge of fuel elements and extended outage work, KW Reactor experienced a Panellit scram caused by a broken spline. This was the one interruption to operation during the month, and the reactor remained shut-down at month's end to perform the scheduled extended outage work.

The second KE submersible river pump unit to fail because of stator problems, referred to in the June report, was repaired by the manufacturer and returned to service.

During a routine flush of the high pressure cross-tie system, a discharge check valve for an emergency coolant water backup system diesel was found to be stuck in the closed position. The valve was removed and dismantled in order to free the clapper which was wedged tight against the valve seat. The seating surface was polished and the valve reinstalled. To correct the

condition, plans were made to provide and install stops to limit clapper travel of each discharge check valve of the diesel backup system.

Control circuit revisions to the secondary coolant water backup system (Design Change 772) were completed at KE Plant, thereby fulfilling the planned K Plant changes. The modifications are designed to eliminate reactor scrams caused by separations from BPA due to minor power disturbances.

The pH of the process water was raised from 6.5-6.7 to 6.9-7.1 at both KE and KW Plants. The ethylene glycol heating system was placed in service to provide heat for area buildings.

APPLIED REACTOR ENGINEERING

Plant Engineering

Electrical

A general lighting survey of 100-K Plant buildings was made to determine the adequacy of lighting relative to the safe performance of routine work and normal plant activity. A survey report was issued recommending additional lighting for some specific locations.

The Main Pump House 3500 HP electric motor maintenance program is under way. The first rewind stator has been returned to the Plant. The anticipated increase in performance of these motors, with the Class B coils, calculated by the vendor is 115% to 120% of rated nameplate horsepower without exceeding the present losses. The new coils increase the power factor about one per cent from full load through 25% overload. The efficiency is increased slightly at full load and is increased about one-half per cent at 23% overload. At full load, the heating drops to 94% of the previous value, and, at 25% overload heating is reduced to 91% of the previous value.

The RLOO-AEC has not reached an agreement with Byron Jackson for servicing the 600 HP area submersible pump motors. Applied Reactor Engineering has recommended dismantling and cleaning the 10 motors to assure continued reliability.

Mechanical

Additional gas leak checking and repair work was done on the rear face, on the VSR seals and on the horizontal control rod seals at C Reactor. Air duct sampling showed that considerable leakage was coming from both horizontal and vertical rod seals, and that at least one horizontal seal was contributing to air in-leakage. Most of the rear face bellows leaks found to date have been where the bellows flange has moved away from the reactor centering flange as a result of gunbarrel movement. Repair techniques on these seals consist of reclamping the bellows flange to the centering flange and foaming through the jackbolt hole.

DECLASSIFIED

DECLASSIFIED

HW-82942

Design Change No. 930, "High Tank Heating Control, 187-B, C, D," provides for closer control of the steam supply to the existing heat coils in the high tank risers.

The addendum to Design Change No. 518-C authorizes the replacement of the present C Reactor front face hardware with CG-558 hardware. This will provide reduced front face friction loss, improved lug rings, improved retaining rings and an opportunity to check nozzle integrity.

Design Change 948, authorizing the installation of a design to increase the flow from the C Reactor storage basin by an additional 3100 GPM, and a Request for Appropriation for \$17,571 were routed for approval.

The F Reactor downcomer was visually inspected on September 11. The liner appears to be in excellent condition. The cross-over seal has suffered significant deterioration since the last inspection (six months ago) and early replacement was recommended to the F Maintenance Operation.

The condition of the nozzles and diaphragms in the H Main Pump House pump drive turbines would normally require their replacement; however, these units are required to supply less than 50% of their nameplate rating and since the governor regulation satisfies standards and the loss of efficiency is not critical, replacement of nozzles or diaphragms is not recommended. A note has been added to the inspection report recommending new nozzles and diaphragms for these units if they are to be operated after the planned deactivation date.

Nine-pump operation was started at the C Main Pump House to allow the initiation of the motor rewinding program which is scheduled for completion by July, 1965. At the same time, the levels in storage tanks Nos. 3 and 4 were reduced to 28 feet while the level in tank No. 5 was reduced to 27.5 feet. Storage tank No. 2 continued to stand empty for interior painting. At the start of nine-pump operation, automatic controls were set to maintain C Reactor top-of-riser pressure at 393 pounds. Pump suction pressures ranged from 10.2 to 11.6 pounds per square inch; gage and pump discharge pressure readings were between 440 and 460 pounds per square inch. These pressures exceed minimum recommended values of suction and discharge pressures.

A program is being conducted to destructively test a selected number of front face connectors and thereby estimate connector reliability. Twenty connectors have been removed from both B and KW Reactors and destructively tested. All of the connectors had a burst strength greater than 5000 psi. Connectors are also scheduled for removal from D and KE Reactors and will be tested.

The integrity of reactor cast aluminum inlet nozzles was reviewed. It was concluded that replacement of the cast nozzles with impact extruded nozzles is probably not justified, but that some procedural and/or equipment modifications could be made which would reduce the probability of nozzle failure. The most probable failure mechanisms were seen to result from objects being shoved into the front face while platforms are in motion and heavy objects falling and striking nozzles.

Recent examinations have shown the 190-C storage tank plates to be about 10% thicker than originally thought, which reduced calculated static stresses to about 11,000 psi at full water load. Since brittle fracture becomes very unlikely at stresses of 10,000 psi, or below, the water level was lowered from 30 to 27-1/2 - 28 feet. This reduction places stresses in the 10,000 psi range.

Measurement of 117 KE Reactor aluminum process tubes revealed that (1) the spline tubes have not corroded enough in the first two years to permit measurement in-reactor of the wall thicknesses or determination of the corrosion to date, and (2) the fringe tubes are corroding at an average rate of less than one mil per year. No tubes were observed to be thin enough to need replacement now, and the data indicate that none should be expected to need replacement within the next two years.

Instrument

The development of strap-on RTDs for use in the replacement of presently used immersion type RTDs on the Zone Temperature Monitor and K Reactor Temperature Monitoring Systems is continuing. The problem of excessive self-heating mentioned in last month's report has been corrected. A requisition has been issued to procure 135 additional strap-on RTDs, 91 of which are for installation on the ZTM at C Reactor, 20 for additional laboratory testing, and 24 for installation of 12-point average recorders at each of the K Reactors. An accelerated testing program is currently under way to test the effects of thermal compression of the silicone bodies of the RTDs.

MJA 55, Rev. 1, has been approved and funds are available for complete modification of the ZTM systems at B, C, and D Reactors. Design Change 812 and Addendum 1 have been approved and issued. These Design Changes permit rebuilding of the controllers with magnetic amplifiers and general rebuilding of the control room cabinet. The first 20 magnetic amplifiers have been received, installed in controllers, and briefly tested. Full-scale testing has started but no data are presently available.

Design is in progress for providing radiation measurements in the transfer area and graphite and thermal shield temperature measurements for DR Reactor after deactivation.

A design change to provide instruction and authorization for making the required alterations to the Iodine Monitoring System has been completed. This design change is necessary to eliminate inadvertent fog spray activation and erroneous instrument failure lockout. This design change also permits the use of a wider window and improves system sensitivity and reliability.

Design Change 938, "Tape Drive Revision for Particulate Monitors, Sample Buildings, All Reactors," was issued. This installation will provide a constant and dependable rate of speed for the tape and result in improved calibration of the monitors.

DECLASSIFIED

HW-32942

MJA-47, "Pressure Monitor Modification, B, D, DR, and F," was closed out as of August 30, 1964, with an underrun of \$124,000.

Industrial

A pictorially-illustrated tour guide was prepared and issued to the prospective contractor replacement personnel visiting Hanford. This tour guide described the various reactor plant buildings and their functions as well as general information about points on the tour. Assistance in tour planning and arrangements was also provided.

Exhibits were prepared and arranged at the prospective contractor meeting headquarters to illustrate various Irradiation Processing activities and equipment. Selected film strips and sound-slide programs were shown. Slides were also prepared and shown as part of the presentations by IPD Section Managers.

Selected film strips of C Reactor outage operations were compiled and shown to prospective contractor personnel during their visit to 100-B Area.

A standard method for identifying and "sealing" thoria-loaded process tubes to meet nuclear safety requirements received approval of Research and Engineering and the Processing Operations, and fabrication has been initiated.

Sound-slide programs for reactor confinement system operation at B and C Reactors were approved and issued.

An evaluation of benefits obtainable from premarking of rear face caps prior to set-up for charge-discharge at the K Reactors was conducted. The evaluation was based primarily on films and data taken during several recent K Reactor outages. Recommendations on the use of rear face premarking were issued.

Engineering Studies and Analyses

Boron carbide-aluminum poison segments, or rings, swell when irradiated. Because control rod housings do not deform easily side-to-side, most of this swelling appears as an increase in rod thickness -- an increase of 0.080" to 0.100" for the year-old half rod from #2 hole at B Reactor. An increase of this amount is more than enough to cause rod binding in the step plug bushings and seals. At present, enough circumstantial evidence exists to throw the major responsibility for rod sticking upon swelling rather than graphite distortion, at least at the B, D, and F Plants. To map the spread of swelling throughout the rods in use, thickness measurements will be taken along with hardness measurements on all future rod hardness surveys.

Non-destructive tests for splines have shown that ultrasonic attenuation techniques will locate laminations, even small ones, almost anywhere in a spline. The ultrasonic test is simple and inexpensive and will pick up most mechanical manufacturing lapses. Specifying this test will cut inspection time on splines appreciably.

The feasibility of replacing the Model 154 Panellit gages in Pressure Monitor Systems at KE and KW with the Model 156 gages at DR, F, and H Reactors after shutdown is being evaluated. This exchange could be made on a schedule compatible with the three-year recertification program.

Production Test No. IP-689 at KE Reactor on the Process Tube Temperature Monitor Systems has been further postponed and is tentatively scheduled for the October outage. A draft of a detailed procedure for the test has been prepared for comments.

The first inspection of the carbon steel pipe corrosion test facilities at the B and KE Main Pump Houses was performed September 22. A borescope examination was made to observe formation of corrosion products. These units have been in operation only five months and no attempt was made to measure pitting depth. It was observed that corrosion in the totally stagnant sections was essentially nil. Sections normally stagnant with occasional flushing or purge exhibited a uniform, heavy corrosion scale. Flushing at 10 feet per second does not appear to have disturbed or affected the characteristics of this scale formed by stagnant aerated water corrosion. Corrosion deposits formed where flow has been from 0.2 to 2 feet per second show some localizing with a harder, more tubercled appearance. The B Main Pump House facility has been operating with 7.0 pH water and KE Process Pump House with 6.6 pH water. Corrosion product formation appears quite similar with perhaps 10 to 20 per cent less buildup in the 7.0 pH water. In the test sections where mill scale was left intact, the 7.0 pH water has attacked much less area than the 6.6 pH water. No attempt was made to measure pit depths.

The program for adding sodium silicate to the D-DR fire and sanitary water system has been concluded. Preliminary examination of sample pipe sections from these systems shows little, if any, benefit from silicate addition.

After further investigation and analysis of the K Reactor Coolant Backup cross-tie cleaning-coating proposal, it has been decided to await further developments and experience before considering in-place pipe coating. A scope design has been prepared for deaeration of the cross-tie supply water. It is anticipated that with deaeration, corrosion will be reduced so that cross-tie cleaning will only be required about once every five years. Ultimate application of a protective coating to the interior of the K cross-tie line remains as a long-range possibility. There are many other potential applications in the reactor water systems where a practical coating system might be used for reduced corrosion or improved flow. Three small coated test pieces are being installed in the KE Process Pump House pipe corrosion test facility.

Replacement of the C Reactor process tube front hardware and of the B and D Reactor rear hardware may be justified by the resultant reduction of electricity and reactor maintenance costs. The replacement hardware can be obtained for essentially no out-of-pocket costs from the DR, F, and H Reactors.

The production test on the use of carbon dioxide for pH control for one tube at KE Reactor is being circulated for approval.

DECLASSIFIED

DECLASSIFIED

HW-82942

A carbon dioxide recovery system for the K Reactors consisting of a blower, a venturi scrubber and electrostatic precipitator for removing particulate and oily materials, and a pipe system for introducing the purified gas into the clearwells is being studied. The total cost is estimated to be about \$250,000, and the annual cost savings for the current process water pH is about \$240,000, resulting in a repayment period of about one year. Additional benefits could be the reduction of reactor effluent activity and process tube corrosion rates as a result of using carbon dioxide instead of sulfuric acid. A budget proposal for FY-1966 is being prepared for this item.

Maintenance Standards and Manuals

The status of Equipment Maintenance Standards in September compared with August is as follows:

	<u>August</u>	<u>September</u>
Issued to date	136	143
Being routed for signature	8	27
In comment status	24	20
In preparation	<u>46</u>	<u>31</u>
Total	214	221

In addition to the above, 21 standards are being revised to reflect design change and project completions.

Audits are progressing satisfactorily with a total of 49 witness-type audits completed for this quarter.

Three Equipment Maintenance Standards waivers have been issued during this reporting period.

Inlet crossheader check valve tests were completed at B and DR Reactors and the results were used in revising Equipment Maintenance Standard No. 203 which is now out for signatures.

The C Reactor Horizontal Control Rod Electrical Service Manual check sheets were revised and distributed to C Plant.

Spare Parts

Listings of spare parts and equipment to be cannibalized from the DR, F, and H Plants are being developed. Data processing runs of Plant and Equipment Listings of the irradiation, water, and steam systems have been provided to the several Plants along with requests for their selection for equipment to be cannibalized. Except in special cases, the removal and renovation cost of transferred equipment must be funded as operational expense.

Spare Parts Budget: FY-65 - \$2,500,000; Inventory: July, 1964 - \$2,363,000, August, 1964 - \$2,306,187.

During this report period, 21 Stock Adjustment Requests were processed; 111 line items in the Spare Parts Inventory Account were affected.

8 - new items required
41 - alter max./min., description changes and transfer items
62 - deletions

Inventory Increase - \$1,932.10
Inventory Decrease - \$2,639.55

Approximate Decrease in Inventory Account - \$707.45

A review of the Spare Parts' inventories for the Main Pump House pump systems has been made. Parts for K Process Pump Houses have been checked in the 2101-E bins. New SARs have been prepared to correct descriptions of both the equipment pieces and parts, to transfer parts to correct bins, and to excess obsolete parts and eliminate duplication of parts. Moreover, the new SARs will separate the various equipment pieces of the pump system into their proper classes.

Plant Personnel Training

The training program on the Loenco Gas Chromatograph was completed on September 8. Ninety-four instrument craftsmen received eight hours of training on this system for a total of 752 manhours of training this report period.

Manager, Manufacturing

RS Bell:DLD:bm

DECLASSIFIED

DECLASSIFIED

HW-82942

PRODUCTION FUELS

ALSI SHOP

Production

Canning line operating efficiency was 98.8 per cent, 1.8 per cent above forecast.

Manufacturing yields in September were above forecast in all categories. The eight- and six-inch nonprojection fuel yields at 95.0 and 94.4 per cent were near record highs for those categories. The elliptical rail and self-support welding yields remained high at 99 per cent.

Thoria elements were produced at a very satisfactory rate in September with 5120 elements canned. Lack of thoria oxide shut down the operation one day and lowered production on seven other days due to difficulty in compacting oxide containing high agglomerates.

Production of projection fuels during September was:

	<u>Natural U</u>	<u>Enriched U</u>
Tons Produced	257	45
Finished Inventory	358	66

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>C</u>	<u>K</u>	<u>K5ES</u>	<u>Reg.</u>	<u>Bumper</u>	
77.1	59.8	256.7	243.8	16.0	10.5	44.5	43.9	0.5	752.8 ⁽¹⁾

Per Cent of Forecast

119	120	128	75	100	-	114	142	-	104
-----	-----	-----	----	-----	---	-----	-----	---	-----

Manufacturing Yields

September

93	96	91	95	95	93	91	95	-
----	----	----	----	----	----	----	----	---

Forecast

92	92	89	92	92	92	89	92	89
----	----	----	----	----	----	----	----	----

Previous Month

95	94	94	96	96	-	93	94	93
----	----	----	----	----	---	----	----	----

(1) Includes 9.1 tons of upstream fuels.

Operating Conditions, Incidents, and Improvements

Conversion from contour base cans to step-base cans was completed on the K5N model this month without unusual problems.

A new installation of thermocouple leads from the canning furnaces to the thermal analysis room was completed. Early indications are that canning furnace operating temperatures can be more accurately determined. Improved control of nonseal and penetration rejects should result.

The number 1 etch machine was available for use after a three month outage for maintenance overhaul and installation of major safety equipment. The safety equipment included stainless steel catwalk around the top of the machine to provide safe access for personnel when it is necessary to climb on the machine to correct certain process difficulties. Other safety measures were: installation of chains and hooks to hold the carriage in a positive up position, placement of stainless steel splashguards on all flanges and valves on lines which contain hazardous chemicals.

The last material from reprocess storage available for weld reclamation was reworked and put into the production stream by September 10, 1964. All reclamation is now being accomplished on a current basis, and yields for reclaimed material are approaching the initial goal of 95 per cent.

A prototype automatic rail height gaging system for K Reactor self-supported fuel was tested and installed in the ALSi Shop final inspection line. This system is designed to take fuel elements directly from the autoclave test by conveyor and feed them automatically into the (1) automatic rail sizer, (2) warp gage, (3) maximum diameter gage, (4) automatic minimum rail height gage, and then (5) automatically sort the pieces into the acceptable, upstream charging and reject categories for pallet loading. A similar system is being fabricated for enriched self-supported fuel.

The production of thoria target elements continued during the month with several process and material problems partially solved or better control attained. It was necessary to continue blending lots of high and low tap densities. In some cases it was necessary to lower the compaction density to 7.4 grams/cc in order to prevent marring of the aluminum can through prolonged vibration. Material with large agglomerates was broken up by a ten minute agitation using a device normally used for the mixing of paint. After two months' operation, only 100 pounds of agglomerates are on hand which are labeled as unusable.

Autoclave Failures

There were two autoclave failures in September. Identification of the failures is as follows:

UNCLASSIFIED

DECLASSIFIED

HW-82942

<u>Lot #</u>	<u>Model</u>	<u>Type</u>	<u>Date</u>	<u>Cause</u>
KC-299-A	C3E	Complete	9-16-64	Arc strike in base end of spire tube
KV-233-SX	K5N	Incipient	9-9-64	Slight pinhole connected to nonwet area in bond

MATERIALS

Fuel Recovery

The following amounts of AlSi fuel were recovered:

	<u>Pieces</u>
Eight-inch Natural	6,528
Six-inch Enriched	<u>3,540</u>
Total	10,068

Hanford Test Reactor

Available reactor time was utilized as follows: 181 routine production tests were performed (131 GO NO-GO tested and 50 drift tests) representing approximately 70 per cent of the available time, with the remainder being utilized for special testing. Representatives of potential contractors were given a tour of the building on September 22, 1964.

Scrap

Five shipments of metallic uranium scrap were made during the month. Shipments totaled 6.6 tons of AlSi enriched scrap, 9.3 tons of NRD scrap, 1 ton of HL enriched scrap, 6.4 tons of C-6 normal sludge, and 23 tons of C-6 enriched sludge. Eight hundred twenty-six (826) empty core boxes with lids and 201 NRD empty billet boxes were also shipped in September.

FUELS ENGINEERING

The amount of upstream fuel shipped to the reactors since initiation of the program totals 34,085 fuel elements.

Self-supported fuel element yields are lower than last month as a result of further ultrasonic welder problems. Yield losses in natural self-supported fuel also resulted from copper inclusions in as-received aluminum components.

Rupture Experience

A total of six fuel element failures occurred in the reactors during September.

<u>Fuel Element Type</u>	<u>Tube and Reactor</u>	<u>Exposure % of Goal</u>	<u>Rupture Classification</u>	<u>Failure Date</u>	<u>Canning Date</u>
Normal Nonbumper	3880-B	97	Side Hot Spot	9/2/64	4/2/64
Normal Nonbumper	2362-DR	102	Side Hot Spot	9/10/64	5/13/64
Normal Nonbumper	3566-B	70	Side Hot Spot	9/18/64	4/30/64
Enriched Bumper	3261-H	92	Hole-Defect	9/20/64	6/10/64
Enriched Bumper	2378-H	83	Hole-Defect	9/22/64	6/10/64
Enriched Bumper	0868-DR	119	Unknown-Examined but not found	9/26/64	5/20/64

The hot spot failure mechanism continues to be the predominant cause of nonbumper fuel ruptures. Two recent failures in enriched bumper fuel (which failed 8/31/64 @ 51 per cent of goal, and 9/20/64 @ 92 per cent of goal) were possibly caused by defective closures. Both of these failures have been classified as manufacturing defects on the basis of visual examination. There is a distinct possibility, however, particularly in the case of the latter failure, that groove-corrosion may have been the cause of rupture. A more detailed examination of both failures has been scheduled in the Radiometallurgy Laboratory.

AlSi Process Development

Duplicate samples of uranium have been analyzed for magnesium content by NLO, Hanford Laboratories, IPD, and the New Brunswick Laboratories. The results are shown below:

<u>Sample</u>	<u>NLO</u>	<u>IPD</u>	<u>HLO</u>	<u>NBL</u>
1	0.5 ppm	~ 5.0 ppm	~ 5.0 ppm	1.7 ppm
2	2.0 "	~ .5 "	2.0 "	1.7 "
3	4.0 "	~ .2 "	2.0 "	1.2 "
4	2.0 "	~ .2 "	1.0 "	1.8 "

Based on the above results, it does not appear feasible to control the magnesium content of uranium to one ppm maximum as requested by the Chemical Processing Department to facilitate isotope recovery.

Starting in September, National Lead is using a new type of magnesium (Cut Crown) in 20 per cent of their uranium reductions from the green

DECLASSIFIED

DECLASSIFIED

HW-82942

salt. Plans are to increase the usage rate to 100 per cent by year end. Test runs by National Lead on this magnesium indicate the aluminum content of uranium will increase from an average of 10 ppm (25 ppm in enriched) to approximately 40 ppm, and the nitrogen content will increase from an average of 20 ppm to approximately 40 ppm. Cores machined from 100 ingots processed with the new magnesium are being identified and shipped to HAP0 for evaluation.

An analysis of the post-irradiation data from production test IP-654-A shows comparable dimensional behavior of the ten-inch enriched fuel elements and the six-inch enriched control pieces irradiated up to about 1300 MWD/T exposure under this test. Warp (about five mils average) did not differ significantly between the test and control pieces. Only minor differences were noted in diameter change. The inside diameter of the six-inch fuel elements decreased about one mil with a corresponding increase in the ten-inch pieces. Based on these results, no real risk is foreseen in evaluating pilot scale quantities of ten-inch enriched cores fabricated under the same conditions. The core blanks were water-quenched after heat treatment and were not straightened prior to machining.

Alternate Product Development

U-233 Program: Canning of the initial 12 tons of thorium oxide authorized for irradiation has been completed. The canning of the subsequent 102 ton order was started September 23. Five lots of target elements, which exceeded the specified limits for can wall thickness variation slightly, were released for reactor charging under a material waiver. Because of difficulty in controlling the amount of can wall deformation incurred during magneforming the oxide retaining rings in the upper end of the cans, the specifications are being revised to conform with process capability.

A fifty pound sample of arc fused thorium oxide was evaluated for particle size distribution and compactibility. A major fraction of the oxide contained larger particles than the present Sol-Gel material. A comparison of particle size distribution is shown below:

Tyler Sieve Series No.	Mesh Opening (Inches)	Cumulative Per Cent Not Passing Through Sieves	
		Arc Fused Oxide	Sol-Gel Oxide
4	0.1850	4	0
8	0.0930	23	1
20	0.0328	53	13
35	0.0164	55	25
65	0.0082	56	41
100	0.0058	61	47
200	0.0029	77	57

Target element core densities of 8.0 to 8.1 grams per cubic centimeter were achieved through vibration compaction of the arc fused thorium-oxide.

Tests made on the arc fused oxide by the Hanford Laboratory indicated the dissolution rate is slower than that of the Sol-Gel thorium-oxide. The effects of the larger particle size and higher temperatures of arc fusion on dissolution rate are unknown. In addition, the interacting effect, if any, of irradiation on the dissolution characteristics of the oxide has not been determined.

Equipment Development and Testing

Process equipment development was continued in support of increased production (300 to 350 pieces per shift) on the laboratory thorium-oxide canning line and the installation of a new pilot production line. Major development activities on the laboratory line were in the area of oxide compaction and target element end closure welding. Evaluation of five compaction station concepts led to the selection of a suitable vibrator, which is mounted on a complex system of die springs to produce a frequency of 3300 cpm at an amplitude of 125 mils utilizing 80 psig air pressure. Design of prototype equipment for the pilot line is 90 per cent complete. All major pieces of process equipment on order have been received. Shop fabricated items are scheduled for completion in October.

Three concepts of thorium-oxide crushing are under evaluation: (1) jaw crushing, (2) fixed hammer crushing, and (3) knife blade crushing. The jaw crushing concept appears to yield more uniform results, producing a maximum of ten mesh size material with less than 25 per cent passing the 200 mesh sieve.

Debugging of the automatic arch self-support rail on the ultrasonic welder in the Pilot Plant is 98 per cent complete for a continuous operation. Welding of the arch rail has been achieved satisfactorily using a single power supply. A study is underway to evaluate the cost and feasibility of utilizing spare equipment to increase AlSi Shop welding capacity with this type of support rail.

PLANT FACILITIES

Status of Active Construction Projects

The general strike of construction pipefitters ended September 28, 1964, and progress accelerated on project work which had been shut down or slowed down.

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

The pipefitter's strike did not seriously affect this project and foundation work, exclusive of piping, continued. The AEC has authorized the installation of tile on the floors and extension of office partitions to the ceiling. These were in the original work scope but had been removed when it appeared that authorized funds might be short.

DECLASSIFIED

618

DECLASSIFIED

HW-82942

CAF-979 - Pilot Scale Plating Equipment - 300 Area

The completion of exceptions was delayed by the pipefitter's strike on August 21, 1964, with other crafts forced to stop work September 11, 1964. Some temporary measures, not involving pipefitter work, were taken to permit the continuation of the check-out of equipment.

CAI-994 - Utilities Extension - 300 Area

Upon activation of the new water main which extends under the parking lot to the south side, a leak developed under the south entrance road. The line was shut off until the pipefitters returned to work on September 28, 1964, when the leak was quickly located and repaired by the contractor.

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

It was determined that the new package boiler, which arrived at HAPO on August 31, 1964, could be unloaded from the flat car and placed outside the 384 Building by the rigger craft. This was accomplished on September 17, 1964, in readiness for the pipefitters to bring it into the building. The pipefitters returned to the job September 28. The five-week strike has delayed the beneficial use date for the new boiler, increasing the potential for a heat shortage in the 300 Area this winter. Installation of the underground oil storage tanks is 80 per cent complete.

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

Construction progress is considerably behind schedule because of the pipefitter's strike -- 1 per cent complete as compared with a scheduled 18 per cent.

CAI-150 - Relocation of 300 Area Administration Building and Related Work

Design work for both the badge house and the parking lot for the north entrance to the 303 Area has been completed by Vitro Engineering Company. Design required for the moving of the 3703 Building is in progress. The Construction Service Contractor will perform the construction. No official design or construction schedules have been reported.

Equipment Modification

Most of the downtime during this month involved microswitch and photocell adjustments. The reduction in yield losses was primarily brought about by the reduction in arc start rejects. Several modifications were made in the wiring on these machines to eliminate the troublesome microswitches. At the request of the Maintenance Engineer, Quality Control approved a slight change in the helium-argon shielding gas ratio which

resulted in a marked decrease in the problems associated with arc starting.

The 1.3 per cent loss in availability of the lathes in September was due to mechanical failure of equipment components. During the month the use of the cap end pre-set contour tools was extremely high due to the fact that the tools were ground with an improper relief, causing the excessive heat build-up and more rapid deterioration of the cutting edge. Technical Shops were informed and were requested to exercise more care in following specifications.

Utilities

Overhaul of the No. 6 boiler is complete and no further major work on any of the existing boilers is planned until after the winter heating season is over.

Work required to correct vendor deficiencies on the diesel generator for the emergency electrical system was completed and the vendor submitted a check to cover their liability.

Statistics

	<u>September</u>	<u>August</u>
Maximum steam generated (M lbs/hr)	65	49
Total steam generated (M lbs)	30,525	24,220
Total condensate returned (M lbs)	5,728	1,374
Coal consumed (tons)	1,488	1,234
Evaporation rate	10.25	9.82
Efficiency - Actual	73.0	76.5
Efficiency - Optimum	81.0	80.7
Import water (M gals)	113.8	115.9
Peak water flow (gpm)	5,200	5,300
Peak water consumed in 24 hrs (M gals)	4.2	4.1
Compressed air produced (M scf)	64,613	67,529

Plant Services

Major jobs completed during the month included the overhaul of No. 6 boiler and the boilers in the 700, 1100, and White Bluffs areas; fabrication and installation of replacement lid for the beta heat treat furnace in the 333 Building; emergency repair of the exhaust system for the chemical bay in 333; fabrication and installation of a new radiochemistry type hood and filter box system in 305-B; fabrication of miscellaneous parts and equipment for the thorium canning facility; installation of fire detectors in the gas bottle storage room of the 314 Building; removal and reinstallation of supervisory alarm panel for the fire detection system in 314; extensive modification of the fire alarm system in the 313 Building; modifications to the offices in 333 Building; and ladder inspection in PRTR.

UNCLASSIFIED

DECLASSIFIED

HW-82942

The two Manual Writers were transferred to Hanford Laboratories September 28, 1964, and the Instructor, Craft Training, will be transferred on October 1, 1964.

Manager - Production Fuels

WN Mobley:WKW:gl

DECLASSIFIED

HR-82942

RESEARCH AND ENGINEERING

PROCESS AND REACTOR DEVELOPMENT

REACTOR FUELS

Thoria Irradiations

A schedule for irradiation of thoria for the production of 110 kg of U-233 has been prepared. The schedule calls for irradiation of thoria in the fringe zones of KW, D, B, C, and KE Reactors, with the KW irradiation beginning in early October 1964. In addition, use of the central zone of KW Reactor is scheduled with this portion of the irradiation beginning in December 1964.

Depleted Uranium

B Reactor - A total of 104 columns of depleted (0.22 w/o U-235) uranium fuel elements are now under irradiation in central zone process tubes of the B Reactor. These columns are a portion of the over-all irradiation plan to produce 25 kg of plutonium with an 18 per cent Pu-240 content. The depleted elements have accumulated an exposure of approximately 160 MWD/T, with their goal exposure being 1400 MWD/T. Discharge of the fuel columns at goal exposure is expected during May 1965.

KE Reactor - Ninety columns of depleted uranium (0.22 w/o U-235) elements are currently under irradiation in central zone process tubes of the KE Reactor. The depleted fuel columns have accumulated an exposure of approximately 60 MWD/T, with goal exposure for these columns being 1600 MWD/T. Discharge of this test at goal exposure is expected by June 1965. This irradiation combined with the irradiation in B Reactor involves a total of 22 tons of depleted uranium elements.

Longer Fuel Cores

The 20 fuel columns of a test containing ten-inch enriched uranium elements which were discharged in August 1964 have been measured and examined. Analysis of the examination data shows no operationally significant differences in the ten-inch elements and the standard six-inch pieces.

REACTOR ENGINEERING

Process Water Tanks - 190-C

Samples taken from the 190-C process water tanks indicate that the as-built plate material is thicker than specified, thus indicating a lower stress in the tank material than previously believed.

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 production natural and enriched fuel elements.	88	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 CVN 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-648-AC	Thorium oxide target elements.	20	F	120 operating days	115 operating days	First phase of irradiation of thorium in a six-ton demonstration load. Eighteen columns discharged and recharged during April 16, 1964, outage. At the time of discharge, the elements had an accumulated exposure equivalent to 62 operating days. Final columns discharged during August.

STATUS REPORT 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-665-A	Hot-die-size diffusion-bonded elements.	11	C	800 MWD/T	840 MWD/T	Provides for determining the effect of different end-bonding processes on dimensional behavior of the diffusion-bonded fuel. Elements charged during the April 27, 1964, outage. Test discharged during August 31, 1964, outage.
IP-684-A	Hot-die-size diffusion-bonded elements.	23	C	800 MWD/T	480 MWD/T	Evaluation of effects of process parameters on dimensional behavior of hot-die-sized elements. Test columns charged during July 11, 1964, outage.
IP-708	Hot-die-size diffusion-bonded elements.	18	C	800 MWD/T	200 MWD/T	Evaluation of the effects of uranium heat treatment parameters on behavior of hot-die-sized elements. Elements charged during September 3, 1964, outage.

D-3

HM-82942

DECLASSIFIED

HM-82942

Preliminary tensile tests indicate that the tank material is not the specified ASTM A-283, Grade D, and is probably Grade B. Carbon tests, tensile tests, and Charpy V-notch tests are being performed on samples from the C tanks and test results will be available by the first week in October.

Reactor Hydraulics

The hydraulic characteristics of thorium target columns were determined in the flow laboratory in support of the current ThO_2 irradiation program. The results confirmed preliminary estimates of thorium column coolant flow rates and Panellit pressures. K Reactor operating conditions with both fringe and core E-Q loadings have been calculated in support of the current ThO_2 irradiation program. The results indicate that use of the new arch-type self-supports on the KVE fuel elements will give a better flow balance to the reactor core than the present self-support design.

REACTOR PHYSICS

Pu-238 Optimization

Optimum blend calculations using a new function for the cost saved (or not saved) by by-passing the cascades have been repeated for C. W. Showalter and the results forwarded to him.

E-Q Hazards Summary Report

The report for the small reactors is in the process of being issued, and the K document is in preparation.

E-D Loadings

The test in B Reactor is running with a ratio of three E-columns per D-column. The predicted ratio for existing conditions is 2.7 to 1. The test in K Reactor is now running according to calculations. The recommended initial E-D ratio was 3.86 to 1. A ratio of 4.2 to 1 was used in order to be sure there was no reactivity shortage. Following startup, it appears that the correct ratio should have been in the range of 3.7 to 1.

E-Metal - Target Material Requirements

The requirements of E-metal to support various target material, to give a reactivity equivalent to that of natural uranium, had been measured in the HTR. A report describing the testing and correlation with thermal blackness is being prepared.

Cored Lithium-Aluminum Testing

The results of experimentally comparing the absorptions of cored LiAl cylinders with different diameter aluminum cores were analyzed. The variation appears to be directly related to the epithermal blackness. Results are reported in HW-84102, "Reactivity Measurements of Cored Lithium-Aluminum Cylinders," W. A. Blyckert, September 15, 1964.

RADIOLOGICAL ENGINEERING

Radiation Control Experience

The following table summarizes the radiation exposure experience for critical IPD classifications through 35 weeks of the 1964 badge year:

<u>Classification</u>	<u>Total Dose</u>	<u>No. of Employees</u>	<u>Average Dose/Employee</u>	<u>Extrapolated Year End Average</u>	<u>No. of Employees over 3 R Extrapolated Exposure</u>
Radiation Monitors	143216 mR	73	1962 mR	2915 mR	36
Processing Operator	441262	232	1902	2826	97
Pipefitters	176549	97	1820	2704	44
Millwrights	137584	77	1787	2655	36

Radiation Occurrences

	<u>Distribution by Reactor and Component</u>								<u>Totals</u>
	<u>B</u>	<u>C</u>	<u>D</u>	<u>DR</u>	<u>F</u>	<u>H</u>	<u>KE</u>	<u>KW</u>	
Processing		1			2				3
Maintenance		<u>1</u>	<u>2</u>				<u>1</u>		<u>4</u>
Totals	0	2	2	0	2	0	1	0	7
Year to Date									106

Vertical columns do not necessarily add up to the indicated totals because, in some cases, a radiation occurrence is chargeable to more than one component.

DECLASSIFIED

DECLASSIFIED

HW-82942

Effluent Activity Data

The table below shows the average concentrations of five radionuclides from reactor effluent samples taken in August 1964. All units are 10^{-12} curies/ml.

<u>Reactor</u>	<u>As-76</u>	<u>P-32</u>	<u>Zn-65</u>	<u>Cr-51</u>	<u>Np-239</u>
B	86	1.2	3	240	120
C	110	4.6	7	600	150
D	72	4.2	3	370	110
DR	51	3.0	7	400	110
F	43	2.8	7	240	80
H	90	7.9	23	360	120
KE	29	3.7	3	120	50
KW	29	2.6	4	140	50

There were no significant changes in the treatment of reactor coolant during the month of August 1964.

Radiation and Heat Generation

A production test permitting discharge of one column of irradiated natural uranium fuel elements during reactor operation is now routing for approvals. The test, to be conducted in the KE Reactor, will allow radiation and heat transfer measurements on the fuel elements immediately after the elements have been discharged from the operating reactor.

PROCESS TECHNOLOGYPROCESS STANDARDSHW-46000 B, Process Standards - Reactor

Five revised standards were issued during the report period. These were:

Process Standard A-010 - "Process Piping"

A tabulation of front-face component failures along with required courses of action comprised the major change in the standard.

Process Standard A-050 - "Panellit System Control"

This revision added the following requirements: 1) shutdown over a ten-minute period if the temperature sensor is faulty on a tube with a plugged Panellit sensing line; 2) definition of a plugged sensing line; 3) maximum pressure a Panellit gauge may be rolled from the calibrated base pressure; 4) a simplified method for gauge response testing; 5) ground detector operation; and 6) Component Testing Operation approval of all gauges for reactor Panellit board use.

Process Standard D-040 - "Earthquake Seismoscope Operation"

The standard was revised to include specifications for a two-out-of-three trip matrix rather than the former two-out-of-two matrix.

Process Standard C-120 - "Splines"

New requirements were added dealing with faulty splines. The irradiation period for total-control splines was increased.

Process Standard F-010 - "Process Material"

The standard was revised to include new items of "standard" equipment, update fuel element model identification, and list acceptable process tube dummy elements for overbore tubes.

HW-46000 F, Process Standards - Reactor

One revised standard, A-050, "Panellit System Control," was issued for HW-46000 F. The standard was essentially identical to A-050 described for HW-46000 B above.

HW-46000 H, Process Standards - Reactor

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

Process Standard D-070 - "Reactor Confinement"

Major changes in this standard were:

DECLASSIFIED

DECLASSIFIED

HW-82942

1. Specification of conditions under which part of the system could be bypassed for testing and maintenance.
2. New specifications on Confinement Zone Air Pressure.
3. Requirement of an emergency source of water for the fog spray system.
4. Specification of functional tests.

HW-46000 K, Process Standards - Reactor

Nine standards were issued for the K Reactors. These were:

Process Standard A-010 - "Process Piping"

The standard was revised to make its contents similar to those for other plants, and is essentially the same as other A-010 standards previously described.

Process Standards A-030 - "Pressure - Flow During Reactor Shutdown"

A-040 - "Process Water Pressure Trip Settings"

A-080 - "Emergency Water Supply"

These standards revisions were issued in August, 1964, for KW Reactor and reported at that time. The revisions were issued this report period for KE Reactor and are identical to those reported in August, 1964.

Process Standards A-050 and C-120

The revision to these standards is the same as reported for HW-46000 B.

Process Standard C-090 - "Number of Inoperable Rods and Ball 3X Hoppers During Reactor Operation"

Reference to the "outer ball 3X" system was deleted since the six outer hoppers have been removed from service. More flexibility in use of splines for substitution of a ball 3X channel out of service was provided.

Process Standard C-050 - "Process Tube Temperature Monitoring"

The power level where the first temperature map was required was raised. New methods for alternate monitoring of tubes with faulty temperature sensors were added.

Process Standard C-100 - "Inoperable Rods - Ball 3X Hoppers and Rod Testing During Outages"

Primary revisions to this standard were deletion of the reference to cadmium splines, deletion of the reference to the outer ball 3X system, and deletion of references to flux monitor bucking system and proportional counter.

DECLASSIFIED

HW-82942

HW-27155 Rev. 1, Process Standards - Water Plant

Five standards were revised for HW-27155 Rev. 1. These were:

Process Standards 165-D-010 - "Emergency Steam Generating Requirements,
165-K"
190-B-090 - "Emergency Water Requirements - K Water Plants"
190-B-100 - "Emergency Electrical Requirements, K Water
Plants"

The standards revisions were issued in August, 1964, for KW Reactor and reported at that time. The revisions were issued this report period for KE Reactor and are identical to those reported in August, 1964.

Process Standard 184-D-010 - "Emergency Steam Generating Requirements, 184-B,
D, F, and H"

The revision specified a minimum base load for emergency cooling system coal fired boilers.

Process Standard 190-B-070 - "Emergency Water Requirements, B, C, DR, F, and
H Water Plants"

A specification was added to permit removing automatic export backup for relatively short periods of time.

PROCESS CHANGE AUTHORIZATIONS

Six Process Change Authorizations were issued during the report period to permit temporary deviation from Process Standards. These were:

PCA #4-75 - "Water Shutoff Times - B-C Reactors"

Use of the standard's water shutoff time curves was authorized for zirconium and overbore tubes except for the determination of infinite water shutoff time.

PCA #4-76 - "Horizontal Rod Backup Coolant"

The process change authorized removal of the horizontal rod backup coolant for a period of 10 minutes to permit preventive maintenance.

PCA #4-77 - "Roto-Check Valve - Emergency Raw Water Turbine Pumps - B Reactor"

The process change authorized additional time, to September 30, 1964, for installation of a roto-check valve on the turbine-driven raw water pump.

PCA #4-78 - "Flux Monitoring During Outages"

Authorization was given to remove the subcritical flux monitors from service for a short period provided alternate requirements of the PCA were met.

DECLASSIFIED

HW-82942

PCA #4-79 - "Graphite Temperature Limits - B Reactor"

Authorization was given to operate 25 C above the normal graphite temperature limit for seven days provided alternate conditions specified in the process change were met.

PCA #4-80 - "Cavitation of Front-Face Connectors - F Reactor"

Process Standard A-010 prohibits reuse of connectors which have been subjected to cavitation. On September 10, 1964, it was necessary to subject 53 tubes to about 1-1/2 minutes of cavitation. The PCA authorized continued use of the connectors provided the sectioning and inspection of one of the connectors revealed no damage.

MEMORANDUM OF PROCESS STANDARDS RELAXATION

One Memorandum of Process Standards Relaxation was issued during the report period. This was:

Memorandum of Process Standards Relaxation #4-2m Sup. A

The memorandum authorized a rescheduling of dates listed in the original memorandum for B Reactor.

PROCESS ASSISTANCE

One engineer audited conformance to Process Standards on all Processing Operations' shifts by making 12 inspections at each reactor.

FUEL FAILURE EXPERIENCE

<u>Failure Date</u>	<u>Tube Number</u>	<u>Lot Number</u>	<u>Type of Material</u>	<u>Tube Power at Failures (kw)</u>	<u>Exposure MWD/T</u>	<u>Type Failure</u>
9/2/64	3880-B	KZ-086-A	I&E N	1148	570	SH
9/10/64	2362-DR	KZ-102-A	I&E N	1166	563	SH
9/18/64	3566 B	KZ-098-A	I&E N	1164	392	SH
9/20/64	3261-H	KY-665-Q	I&E EB (0.94%)	1164	739	HM
9/22/64	2378-H	KY-665-Q	I&E EB (0.94%)	1147	664	HM
9/26/64	0868-DR	CY-037-Q	I&E EB (0.94%)	1234	917	UE

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 EB - This is the symbol for internally and externally cooled production reactor fuel elements which have projections (bumpers) welded to the fuel element jacket. The fuel is irradiated in ribbed process tubes. The uranium

cores are enriched in U-235 and the weight per cent U-235 in the core material is stated.

First Character

S	Side	Failure occurred on the side of the fuel element.
H	Hole	Failure occurred on the internal surface of the fuel element.
U	Unknown	Location of failure is not known.

Second Character

H	Hot-spot	Failure caused by accelerated high temperature corrosion attack.
M	Defect	Failure caused by a defect in fuel fabrication.
E	Examined, not found	Suspected failure pieces were examined but no failure was found. Other evidence, Panellit, gamma monitor, etc., is conclusive proof of failure.

DECLASSIFIED

DECLASSIFIED

HW-82942

OPERATIONAL PHYSICS

PILE PHYSICS PLANT ASSISTANCE

With the exception of B Reactor, all production reactors operated on bulk outlet temperature limits during the report period.

Reactivity and flattening limitations during the early stages of irradiation of the E-D block loading at B Reactor have been largely overcome. A similar loading was charged into the KE Reactor, and adjustments indicated by B Reactor experience have minimized flux distortions.

The E-N core loading was discharged from H Reactor in late September; a standard natural uranium loading replaced the E-N core.

SUMMARY OF OPERATIONAL DATA OF PHYSICS INTEREST
FOR THE MONTH OF SEPTEMBER, 1964

Reactor	B	C	D	DR	F	H	KE	KW
ECT in September (1)	1380	1555	1490	1460	1485	1505	2380	2455
12-Month Average ECT	1480	1615	1500	1530	1500	1520	2475	2420
Equil. Scram Time (2)	15-17	29-31	15-18	18-20	--	--	11-15	30-35
Recording Time:								
From:	8-20	8-20	8-21	8-21	8-20	8-20	8-21	8-20
To:	9-22	9-20	9-22	9-22	9-21	9-22	9-20	9-21

- (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 which may elapse between scram and first indication that permits a successful scram recovery using hot startup procedures. Hot startup procedures are no longer utilized at any reactor, and at least 45 minutes recovery time is necessary using the allowed cold startup procedures.

B Reactor - C. E. Hughey

With over two months operation with the enriched uranium-depleted uranium (E-D) small core, original flux distribution problems have been largely alleviated; the improvement was possible as the E-D block gained in exposure and thus over-all reactivity, allowing for selective local flux flattening by poison spline and HCR manipulations. Flattening efficiency was lower than average during the first part of the report period, but later approached the average value.

A temporary halt in power ascension when bulk outlet temperature reaches 90 C has been incorporated into startup procedures with the E-D load; as equilibrium conditions are approached and normal flux distributions assured, level is raised toward the 95 C bulk limit.

C Reactor - J. R. Heald

Operating continuity was good during the report period, although flattening efficiency was below the yearly average. There were two observed instances of splines breaking, both at about 2.5 feet inside the front cap; in one instance there was an initial 0.5 per cent power decrease followed by a second 0.5 per cent increase 15 hours later, as the spline washed downstream in two stages.

D Reactor - R. L. Miller

Operation over the report period was smooth and stable, especially in view of a high fuel exposure prior to the scheduled outage of September 7. Flattening efficiency ranged about the yearly average; startup efficiency was low due to an enforced short outage taken two hours after first indication for repair of a cap leak.

DR Reactor - S. M. Skidmore

Flattening efficiency has been below average largely as a result of loading change restrictions initiated as part of the phaseout planning for the imminent deactivation of DR; charge-discharge schedules are based on maximizing shutdown exposure at year's end.

F Reactor - G. C. Masche

Several shutdowns interrupted operating continuity, and directly contributed to a decrease in flattening efficiency and increased startup losses. A short outage was taken following an approach to TAI limits, associated in part with a combination of relatively low flattening efficiency and spline insertion difficulties; although physics coverage had been provided for the startup, immediate correction was indicated for the high temperature situation which developed within a few minutes time. Equilibrium operation has been quite smooth.

H Reactor - G. C. Masche

An unscheduled shutdown on 9-20-64 ended a 68-day continuous run. Following a second outage on 9-22-64, the E-N core was discharged and replaced with a normal uranium loading; the fringe N blanket will be temporarily retained.

KE Reactor - G. D. Baston

The reactor was started up on 9-9-64, following a three-week scheduled outage during which over 2000 tubes were charge-discharged, and the planned E-D block loading was charged. Initial observations indicated that the block was slightly over-enriched, and (as per provisions in the authorizing PT) 46 tubes of supporting enrichment were discharged during two subsequent unscheduled outages. Current flattening efficiency is back to normal, and operation is quite smooth; adjustments in the E-D ratio have virtually eliminated the initial flux depression through the block.

DECLASSIFIED

HW-82942

KW Reactor - R. A. Dieterich/G. D. Baston

Operation was nearly continuous during the report period. A pressure monitor trip resulted when a broken spline washed downstream. Several measures of operating efficiency showed improvement over the yearly average, including flattening, startup losses, and prediction errors, and operation was quite smooth and stable.

PROCESS PHYSICS STUDIES

Reactivity Control Studies

A supplement to HW-50300 B REV1, the IPD Conversion Tables, was issued for the incorporation in one place of conversion constants for nonstandard fuel elements as they are introduced and for accepted target elements.

An extensive survey was carried out of the potential effects of forthcoming fringe and core E-Q loadings on apparent conversion efficiency. Earlier calculations and observations had shown that plutonium yield per unit heat generation should be greater in the core than in the fringe either with natural or E-metal; however, because of bulk metal handling and separations considerations, conversion factors have been applied uniformly without regard to column location. Although the E-Q program will cause changes in the ratios of plutonium product in fringe relative to core locations and in small relative to K reactors, the over-all plant effect has been determined to be small. The maximum expected difference in any calendar quarter is 0.1 per cent in Purex recovery and 1.0 per cent in Redox recovery; both effects will be transient in nature and in the direction of closer agreement with predictions.

A survey study is currently under way to determine the incentives for reactivity measurements during the final shutdown of one or more of the three reactors scheduled for deactivation. An attempt is being made to devise tests which would result in increased knowledge of nuclear safety control parameters but which could be carried out safely with existing instrumentation and without the addition of unreviewed safety problems. The tests would consist primarily of critical control configurations and critical slab widths as the reactor is discharged.

Concurrence has been obtained with Manufacturing on equipment and procedures for the special identification and control of discrete target columns; their wide-scale use in such programs as the E-Q and E-D loadings otherwise creates the potential for large reactivity gains in event of gross charging errors.

Reactor Efficiency Studies

The E-H core in H Reactor was discharged in late September and replaced with natural uranium. Results of the analysis of the January core received from CPD indicate the yield to be slightly greater than calculated from the IPD prediction tables, whereas the Pu-240 content was slightly less than would be predicted in the current tables.

The rough draft of PITA-31, Fringe Blanket Irradiation of Thorium Oxide, has been prepared in multilith form for final signature. A schedule for irradiation of the 114 tons of thorium to make 110 kg of U-233 during the next year was issued as HW-83949.

The E to D ratio in the demonstration block in KE Reactor is now slightly below that calculated to be required. After 40 days of operation the reactivity in the B Reactor E-D block is still somewhat less than anticipated. Reactivity and flattening flexibility is currently adequate in both blocks for efficient flux distribution control.

Reactor Fundamentals Training

Reactor operator classes on the physics portion of the Reactor Personnel Certification program were resumed September 14. Instruction is being provided for four classroom sessions per week.

A programmed text on Atomic Structure has been completed and is now available for use in operator training. A second programmed learning text on Chain Reaction Theory is currently in rough draft form.

DECLASSIFIED

TESTINGPLANT ASSISTANCE - IPDCorrosion Testing Facilities

TF-20 - Testing was continued to determine the cause of resistance temperature detector corrosion and the effect of various coatings to prevent corrosion. Operating conditions are 120 C, 9.5 gpm and pH 6.6.

Irradiated Process Tube MeasurementWall Thickness Gauge (eddy-current type) - WTG

<u>Reactor</u>	<u>No. of Tubes Measured</u>	<u>Report No.</u>	<u>HW Number</u>
KE	117	32	83938
C	100	33	83974
B	38	34	84003
D	227	35	84174
F	53	36	84175
DR	108	37	84176

Critical Reactor Component Examination - All front nozzle connectors and tube sleeve flange retaining rings on KE Reactor were examined.

Pressure Monitor System Programs

Gauges repaired, calibrated by Maintenance	-	15	
Gauges meeting calibration criteria	-	12	(80%)
-previous month	-		(88%)
Gauges receiving failure analysis	-	13	
Gauges received from vendor and examined	-		program completed
Gauges received from Central Maintenance and examined	-	480	
-acceptance rate	-	458	(95%)
-previous month	-		(96%)
Interconnecting lead examination	-		program completed

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

<u>Reactor</u>	<u>Tube or Channel</u>	<u>Photo Record</u>	<u>Purpose*</u>
KE	KER-2 (2864)	No	3
KE	KER-4 (3865)	No	3
KE	HCR No.3	No	2
KE	3-D Test Hole	No	4
KE	VSR No. 49	Still photo	5

- * 1. HCR-VSR channel problem
- 2. Maintenance support
- 3. Routine inspection
- 4. Channel blockage

Vertical Bowing Measurements - Vertical displacement measurements were taken as follows:

<u>Reactor</u>	<u>Tube or Channel</u>	<u>Comparison to Previous Data</u>
KE	Z-1	.10" difference
KE	Z-3	.07" difference
KE	Z-5	.09" difference

Spline Traverses - Front-to-rear flux distribution data were taken as follows:

<u>Reactor</u>	<u>No. of Tubes</u>
C	9
D	5
F	6
KW	6

TESTING AND IRRADIATION SERVICES - OTHER DEPARTMENTS, CONTRACTORS

Irradiations - Non-Loop

<u>Reactor</u>	<u>Test Hole</u>	<u>Facility</u>	<u>Request Number</u>	<u>No. of Samples</u>	<u>Material-Purpose</u>
C	Y	Bare Channel	HAPO-177	2	Graphite (irradiation damage study)
KE	3C,	Bare Channel	HAPO-177	8	Graphite (irradiation damage study)
	3A			1	study)
KW	3C	Bare Channel	HAPO-177	12	Graphite (irradiation damage study)
KW	2A	Quickie	Reed College	2	Tissue (cancer research)
KW	1880	Bare Channel	HAPO-098	22	Graphite (irradiation damage study)
DR	2667	PCCF	HAPO-184	1	Washington Designated Program
KE	2D	Quickie	HAPO-184	7	Washington Designated Program
KW	2A	Quickie	HAPO-184	14	Washington Designated Program
KW	4C	Snout	HAPO-243	11	Reactor materials (fast neutron damage study)
C	B	Bare Channel	HAPO-250	1	Ceramics (irradiation damage study)
KW	2A	Quickie	HAPO-249	2	Titanium (flux monitor calibration)
KW	4B	Snout	HAPO-251	1	Cobalt-60 (source material)
DR	2667	PCCF	HAPO-254	1	Water (water chemical studies)

DECLASSIFIED

DECLASSIFIED

HW-82942

Reactor	Hole	Facility	Request Number	No. of Samples	Material-Purpose
KW	2A	Quickie	HAPO-254	2	Ammonium molybdate (water chemistry studies)
KE	2D	Quickie	HAPO-254	1	Arsenic (water chemical studies)
C	E-TH	Bare Channel	HAPO-259	1	Hastelloy (tensile specimens)
KW	2B	Snout	HAPO-309	1	UO ₂ (calculation of high temperature heat transfer coefficients)
KW	2A	Quickie	HAPO-314	2	Bismuth polonium (separation factors)
KW	2A	Quickie	HAPO-318	4	Cobalt foils (shutdown reactor program)
KW	4B	Snout	HAPO-318	1	Cobalt foils shutdown reactor program)
		Gamma*	HAPO-714	1	Molecular sieves (monitor pressure buildup with temperature increase)
		Gamma		1	RTD's (irradiation damage studies)

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

Special capsule irradiations were handled as follows:

Zirconium Creep Capsule Program - HAPO-236 - A capsule containing a Zircaloy-2 creep sample was removed, via the remote, unshielded discharge method, from the General Purpose facility in 3B test hole in KW Reactor.

Boron-Graphite Irradiation Capsule - HAPO-297 - A boron-graphite capsule was charged in 2C test hole, KW Reactor for irradiation damage studies of boron-impregnated graphite.

Irradiations - Loop Facilities

C-1 Loop Operation - C-1 Loop High Temperature, Nickel Clad Pu-Al Program - HAPO-308 - The C-1 Loop was charged with a train consisting of three nickel-plated, aluminum clad plutonium-aluminum alloy fuel elements and five nickel-plated dummies as authorized by PT-IP-623, Supplement B on September 3. The loop is being operated at 2200 psi, 500 F outlet temperature, with makeup water pH of 7.0. The results of this test will be used to evaluate nickel-plate as a means of protecting aluminum fuel cladding from corrosion at high temperature.

KER-1 Loop Operation - The loop was charged August 20 with three NIEL fuel elements, two lithium-aluminum target elements, and front and rear crud probe train assemblies containing four ceramic fueled crud probes as authorized by PT-IP-601. The objectives of these tests are to evaluate the crud forming characteristics of loop coolant containing ammonium hydroxide for pH control by operating at conditions expected to induce high crud concentrations

and to provide lithium-aluminum samples which can be used to determine tritium production and extraction information.

KER-3 Loop Operation - Flux dosimeters positioned by means of carbon steel spacers were charged August 20 as authorized by PT IP-699 to determine the thermal and fast neutron flux levels. This information is needed to predict accurately the heat generation of the fuel rod clusters experiment requested by North American Aviation.

Irradiated N Fuel Examination - 105-KE - Examinations were completed as follows:

<u>Tube</u>	<u>No. of Elements</u>	<u>Kind</u>	<u>Examination</u>
KER-1	8	KSE5	Visual, weasel, weigh and photograph
KER-3	13	Driver (outer)	Visual and profile

Ex-Reactor Pressurized Water Loops

TF-1 - Cyclic decontamination tests were completed on September 14. This test consisted of approximately one week's prefilming operation followed by chemical cleaning with a synthetic ammonium citrate. Operating conditions were 1650 psig, 300 C and pH 10.0 adjusted with ammonium hydroxide.

A new test was started September 21. This test is a corrosion test to determine the effects of high-oxygen-content deionized water on the corrosion of carbon steels, austenitic stainless steels, and ferritic stainless steels. Operating conditions are: temperature 540 F, pressure 1400 psig, and pH 10.0 using ammonium hydroxide ion exchange resin.

TF-3 - Testing to evaluate crevice corrosion beneath Zr-2 fuel element supports, corrosion of stainless steel and carbon steel alloys was completed on September 14. The fretting corrosion studies of Zr-2 continued. A new test was initiated on September 14 to provide long term corrosion data at N Reactor alternate primary coolant water conditions. The operating conditions are: temperature 560 F, pressure 1350 psig, pH 10.0 using lithium hydroxide.

TF-7 - Corrosion and equipment testing continued. Operating conditions are 1125 psig, 277 C and pH 10.0 adjusted with ammonium hydroxide.

The test sections contain the following materials:

1. PRTR fuel element for fretting corrosion
2. Two dummy fuel elements, two NIN1 fuel elements and coupons for ALK-15 crevice corrosion tests
3. Three NPR valves with loosened packing to simulate a steam leak. The valves are periodically removed and examined for ammonia stress cracking corrosion of the bronze components.

DECLASSIFIED

HW-32942

4. Special NPR type inner fuel elements for fretting corrosion
5. One KSE3 fuel element for uniform corrosion testing
6. Two coupon holders for film buildup studies
7. One Zr-2 specimen for caustic attack testing

TF-9 - Testing to evaluate the swelling behavior and corrosion rates of defected Zr-2 jacketed lithium-aluminum test specimens was completed on August 24. Operating conditions were 270 C, 1500 psig, and pH 10.0 adjusted with ammonium hydroxide.

TF-17 - A non-standard water quality test was started August 31. Corrosion probes were installed in the loop for testing to establish the integrity of the probes for use on the N Reactor secondary system and to obtain corrosion data at conditions duplicating N Reactor conditions. Operating conditions are: 85 psig, 140 F, pH 10.0 controlled by morpholine, 10-20 ppb hydrazine.

Legend

NIN1 - N Reactor, inner tube, natural, first model
NIE1 - N Reactor, inner tube, enriched, first model
NAE1 - N Reactor, assembly, tube and tube, enriched, first model
KSE3 - KER loops, single tube, enriched, third model
KSE5 - KER loops, single tube, enriched, fifth model

Manager, Research and Engineering

DECLASSIFIED

HW-82942

FACILITIES ENGINEERING

DESIGN ENGINEERING

Vertical Safety Rods - Graphite Distortion

The development of tooling and equipment for VSR channel enlargement and graphite sleeve installation in the 105-K Reactor is continuing. Multiple pass graphite enlargement tooling is undergoing preliminary testing in the 189-D test facility mockup. Maximum cutting rates of 16 inches per minute on unirradiated nuclear graphite have been observed. Initial testing of the biological shield boring machine has been completed, and equipment and technique alterations undertaken to correct observed cutting problems.

Final machining of the high strength graphite sleeve planned for installation in a second VSR channel (#41) at 105-C Reactor has been started by the vendor. Shipment of these sleeves is expected before mid-October.

An independent evaluation of the two theories which have been proposed regarding the distortion mechanism which is occurring in the 105-K and C Reactor graphite stacks is being performed by the Advanced Technology Laboratories. This evaluation has been undertaken to provide a reconciliation regarding the magnitude of the stack force which will act on the VSR channel liners installed in problem channels. In support of this evaluation, laboratory experiments to verify postulated graphite key failure mechanisms have been undertaken. The final results of this work are expected to be available by the first of the year. The initial test sleeve installed in a VSR channel in 105-C Reactor continues to function satisfactorily after approximately one year's service.

As an alternative to the graphite sleeving of VSR channels, studies have been initiated regarding the possibility of installing cooled metal liners in the VSR channels. Initial attention is being directed toward the use of zirconium alloys for the liner materials. Although no new technology would be required for this application, fabrication of the required configuration will require some developmental work.

Replacement of Horizontal Control Rods

Receipt of the boron-carbide poison elements for the prototype 105-K Reactor flexible HCRs has been further delayed. The vendor's plant was visited in an effort to expedite his work. Some success was achieved in producing a small quantity of satisfactory material. The vendor, General Atomics, indicated plans to procure additional dies and tooling in order to increase rate of production of the material. As a backup to this vendor's effort, agreement has been reached with RLOO-AEC regarding the placement of an order on a trial basis with a second vendor for the production of test quantities of the poison elements. Discussions have also been undertaken with the

Advanced Technology Laboratories regarding the performance of a manufacturing process evaluation study to develop alternative methods for the production of these poison elements. Pending the receipt of these elements the completion of fabrication of the prototype HCRs remains suspended.

The design of an improved aluminum HCR for the smaller reactors has been completed and a purchase requisition package for the procurement of two prototype test rods delivered to Purchasing. A short test section of the proposed rod is being fabricated locally for mechanical testing of this concept.

Deactivation Program

Five design criteria have been approved and issued to the Architect-Engineer as follows:

- Steam Boiler Facilities 100-F and 100-H Areas
- Emergency River Water for HLO Facilities at 100-F
- Fire and Sanitary Water Modifications
- Fire Protection - Deactivated Areas
- Electrical Modifications for Peripheral Facilities at 100-F and 100-H Areas

In addition, design criteria for modifications of 100-F and H electrical distribution systems are in preparation. The Architect-Engineer has initiated design of the steam boiler facilities at F and H.

Report HW-83523, "Estimated Power Requirements for DR, F, and H Areas After Shutdown" has been issued.

Zirconium Tube Installation - K Reactors - Design

Five sample nozzle identification plates were submitted for evaluation of a vendor recommended change in the specified porcelain enameling procedure. Samples were subjected to exposure cycles of partial immersion in boiling water for five days, followed by two hours immersion in decontamination solutions. One sample, which had a defect on the flange, experienced complete enamel loss on over fifty per cent of its surface. A second sample, purposely defected with six pin head size openings through the enamel, exhibited failure areas which impaired the identification. The proposed change in the existing procedure was not approved based on the results of these tests.

Discharge Area Fuel Handling - 100-K

Testing of the prototype water jet installation in the 105-KW discharge chute continues. Two days before a scheduled shutdown the water jet installation was satisfactorily operated to clean up the chutes and pick-up area. During the actual reactor outage the desired flow was not

DECLASSIFIED

DECLASSIFIED

HW-82942

attainable at the water jets and the test was limited by the storage basin overflow capacity. Planned basin overflow modifications are in progress and should permit a satisfactory test of the water jet installation.

100-K Reactor Coolant Backup System

Inspection of off-site installations of potential internal pipe coatings and a visit to Hanford of possible coating contractors, have determined that a suitable corrosion protection coating and appropriate method of application are not available for use in the 105-KEW cross-tie line at this time. A scope has been prepared for deaeration equipment to minimize the rate of corrosion product build-up in this system. Studies of alternative coating materials are continuing.

105-DR Storage Basin Cooling Capacity

Vitro Engineering Company completed a study of the cooling water capacity, drainage, and utilities required to utilize the 105-DR storage basin for irradiated metal storage after deactivation. On the basis of the recommended modifications, this work has been included in the deactivation project.

100-Area Fuse and Relay Study

As a result of the independent engineering audit of the IPD electrical systems, a detailed engineering review of existing electrical distribution system controls and relay coordination has been initiated.

EQUIPMENT DEVELOPMENT

Self-supported Fuel Element (SSFE) Charging

Polyurethane foam-filled plastic magazines are being investigated as an alternate concept to magnesium extrusions for magazine fabrication. If successful, plastic magazines offer a significant cost savings and improved material handling characteristics due to the reduced weight. Sufficient magazines are on order to permit on-reactor evaluation.

Chemical Decontamination Development

Design and testing of a shield which can be installed on the reactor hardware to prevent contamination of the space between the rear nozzle and the rear gunbarrel flange have been completed. The shields are fabricated from 20 gage aluminum and are easily installed without the removal of reactor components. Shields have been fabricated for the K Reactors. A potential \$30,000 or more per year may be saved due to decreased chemical cost and manpower requirements for routine decontamination.

Identifying Seals for International Atomic Energy Agency (IAEA) Inspection

Development and preliminary testing of two possible sealants for tamper-proof seals have been completed. Efforts are continuing to refine the application procedures and the techniques of identification.

The development contemplates a "safing" wire which will penetrate the reactor and be sealed at an accessible location on the exterior of the reactor. The sealant material will be treated with random inclusions for inspection and identification. Polaroid transparencies or x-ray negatives will allow rapid in-the-field verification of seal integrity.

Integral Connector - Resistance Temperature Detector (RTD) Assemblies

Qualification testing of General Electric and Prestolite cable has been completed. General Electric Company cable passed all requirements of the revised specification. Prestolite wire and cable samples from both lots failed to meet minimum requirements for heat aging.

HWS-6404, Revision 4, "Specification for the Design, Manufacture and Testing of One-Piece Machined Body Resistance Temperature Detector," was completed and issued. Preparation of Specification HWS-8278, Revision 1, "Cable to Resistance Temperature Detector Integral Assembly, All 105 Buildings," has been initiated.

DECLASSIFIED

DECLASSIFIED

HW-82942

Panellit and Ball 3X Ground Detectors

Fabrication of the Panellit ground detector is 98 per cent complete. A dead band has been provided in the approach-to-trip units to prevent relay chatter at borderline values of ground fault resistance. Changes have been made in the trouble reporting section to provide a 50 per cent greater sensitivity to forward leakage from the controlled rectifier. Preliminary testing of the circuit indicates a trip point drift of less than 6 per cent over a two week period.

Design Test Service

The N Reactor program utilized 324 hours of engineering effort for design test service.

1-5

REACTOR PLANT DEACTIVATION

Studies were completed and summarized to show the over-all schedule, manpower requirements, and costs of the deactivation program. This report was distributed to IPD Section Managers and other components for review and comment.

In a program aimed at keeping affected areas informed on related planning, the Reactor Plant Deactivation staff met with the D-DR Management staff. The discussion involved a discussion of over-all objectives and an introduction to the detailed procedures which are being prepared.

A listing was prepared of the detailed procedures and instructions planned for DR deactivation. An estimate indicates 50 per cent completion.

DECLASSIFIED

DECLASSIFIED

HW-82942

PROJECT ENGINEERING

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

Installation of safety circuitry was completed, and the project completed with exceptions, August 28. Testing of the neutron detectors supplied by General Nuclear Corporation indicates that in many respects they are minimal in meeting specifications. Changes required to be made on plant for system reliability are troublesome and time-consuming, but are considered preferable to attempting to obtain improved reliability from the vendor.

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

The major installation work at 105-KE was completed, except for the compressed air piping to the brakes which was postponed as a result of the pipefitters' strike on September 5. Beneficial use of "C" platform was approximately six days behind schedule. Trouble shooting of electrical problems required approximately seven days, during which time the work platform was made available for front face operations under controlled conditions.

Authorized funds were increased to \$717,500 on an interim basis to allow scheduled KW Reactor work to proceed and to permit design and procurement for C Reactor.

CGI-966, Safety Circuit Trip Identification Systems, 105-B, C, D, DR, F, and H Buildings

Pre tie-in testing of the 105-D static switching cabinets has been completed. Tie-in is scheduled for October 19.

Final acceptance was obtained for the 105-C installation September 10.

CGI-998, Improvements to the Gamma Monitor Systems - 105-KE and 105-KW Reactors

The 105-KE installation was completed except for installation of flow controllers and rupture confirmation equipment.

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

The new fuel magazine hoists were installed on the "C" work platform in 105-KE Reactor.

The four charge seaters have been received, and a total of 678 magazines have been shipped.

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

Detail design was completed except for details of mounting picoammeters

and terminal connections for wiring to remote recorders, alarms, annunciator, and ionization chamber. Additional vendor design detail required in order to complete Title II design was received September 25.

CGI-142, Coolant Backup Modifications Required by Reactor Deactivation - Three Small Reactors

With the authorization of design funds, the A-E was requested to place high priority on preparation of procurement specifications for pipe and diesel engines.

CGI-143, Linear Power Rate-of-Rise Instrumentation - 105-KE and Three Small Reactors

By revised directive, authorized funds have been limited to C Reactor only (\$100,000).

An estimate has been prepared at the request of R100-AEC for the addition of KE Reactor to the authorized scope of work.

Schematic drawings and parts listing for the power rate meters and ramp generators were completed. Safety circuit design for C Reactor was completed.

MJA-42, Interior Painting, Process Water Storage Tanks, 100-B and C Areas

The painting contractor commenced repair of the No. 2 tank in 100-C Area on September 28, in parallel with the completion of the No. 2 tank in 100-B Area. Repair will consist of two coats of paint on areas to be repaired, and is scheduled to be completed on October 2. The No. 1 tank in 100-B Area, part of which was touched up earlier, continues in use.

A new contract was negotiated by the J. A. Jones Company with H. B. Painters, Inc., September 28, reducing the scope of work from 20 to 8 tanks and reducing the contract cost from \$471,120 to \$246,287.40.

MJA-53, Installation of Rear Crossheader Expansion Joints, 105-B and D

Following the failure of a second expansion joint in 105-B, vendor representatives visited the plant on September 21, and 12 joints have been shipped to the vendor's laboratory for detailed examination. Failure of the bellows of the two expansion joints, which had been formed hydraulically from welded tubing, was in the welds.

MJA-59, RTD Extension Lead Replacement and Relocation 105-KE and KW Process Tube Temperature Monitoring System

Approximately half of the duct work for 105-KW has been installed, and core drilling is about two-thirds complete. Because four out of five otherwise responsive bidders could not meet the outside diameter requirement on extension cable, specification requirements are being reviewed.

DECLASSIFIED

HW-82942

Directives Received

EQT-C12, Mod. #1, dated September 2, 1964

Linear Power Rate-of-Rise Instrumentation, 105-KE and Three Small Reactors

Reduced interim authorization to C Reactor only, \$100,000.

HW-541, Mod. #4, dated September 21, 1964

"C" and "D" Work Platform Safety Improvements, Five Reactors

Increased interim authorization to \$717,500 to include design and procurement for C Reactor.

Information Copies of Directives and Work Authorities Received

AEC-243, dated September 8, 1964

Plant Modifications for Reactor Deactivation

Interim design funds of \$32,000 were authorized to Engineering and Construction Division. In turn, Work Authority AEC-187 (V-1) dated September 15, 1964 was issued to Vitro Engineering Company.

AEC-245, dated September 15, 1964

Coolant Backup Modifications Required by Reactor Deactivation - Three Small Reactors

Interim design funds of \$35,000 were authorized to Engineering and Construction Division. In turn, Work Authority CAI-142 (V-1) in the amount of \$29,500 was issued to Vitro Engineering Company.

CPFF Construction Service Contractor-Liaison

Issued six new work orders and supplemented two old jobs for a total of \$50,200 to J. A. Jones Construction Company.

Plant Forces Work Review

No Plant Forces Work Reviews were approved this period. One work order job has been stopped until a Plant Force Work Review is processed.

Manager, Facilities Engineering

RT Jessen:dgm

DECLASSIFIED

FINANCIAL

HW 84942

ACCOUNTING

Information covering organization, personnel, operating costs and other business aspects was prepared for presentation during the Contractor Replacement Program meetings held September 22 through 25, 1964. Arrangements for the IPD tours by contractor personnel were made and tour guide brochures prepared. In general, coordination of detail planning for IPD with the AEC personnel was performed for the Contractor Replacement meeting.

A semi-annual manually-prepared statistical report on essential material consumption has been programmed for machine application by Production Computing, Irradiation Processing Department. The report provides quantity and cost information for each reactor plant for the current month as well as fiscal year-to-date. The machine-prepared report will reduce the clerical effort previously required for preparation of the information and speed up analysis work related to essential material consumption.

Essential material inventory procedures in 100-H were reviewed and physical inventory witnessed.

Inventory of Irradiation Processing Department precious metals and zirconium was completed September 11, 1964.

The revised uniform account class coding structure for Irradiation Processing Department has been completed and scheduled to become effective for January, 1965, business. Work is progressing on report format changes which is also scheduled for implementation in January, 1965.

AUDITING

Three cases of possible violations of the Employee Product Purchase Plan were disclosed by an inspection of appliances in employees' homes. Investigation showed violations in two cases, resulting in refunds of courtesy discounts totaling \$50 and the revocation of discount privileges of one employee for five years.

Revisions of the following types of Government instructions were reviewed and appropriate action taken:

AEC Manual Chapters	6
RL-AEC Manual Chapters	7
RL-AEC Procurement Instructions	1

[REDACTED]

HW 84942

BUSINESS AND INFORMATION SYSTEMS

The program for "Preventive Maintenance Reporting System" is being adopted in 100-KE and KW and 100-D Areas. Instruction sheets for establishing the master file have been prepared and issued to the K Area personnel.

The Reactor Work Outage Reporting System was presented to the Managers-Processing, 100-KE and KW. Adoption of the program in both areas is underway.

Manager-Finance

RW McMichael:WKH:slb

DECLASSIFIED

[REDACTED]

DECLASSIFIED

HW-82942

SIGNIFICANT REPORTS ISSUED

<u>Number</u>	<u>Class'n</u>	<u>Author</u>	<u>Date</u>	<u>Title</u>
HW-83084	Unclass.	CC Steele	9-3-64	Design Criteria, Fire Protection Deactivated Areas
HW-83717	Unclass.	PH Hutton	8-24-64	Status HCR System - Renovation All Reactors
HW-82187	Unclass.	CC Steele	9-3-64	Design Criteria Emergency River Water for HLO Facilities at 100-F Project CGI-141 Reactor Plant Deactivation
HW-82188	Unclass.	CC Steele	9-3-64	Design Criteria Fire and Sanitary Water Modifications Project CGI-141 Reactor Plant Deactivation
HW-83869	Secret	DE Cooley	8-31-64	Irradiated Fuel Age Determination Study
HW-83199	Unclass.	W Dalos	7-8-64	Design Criteria, Electrical Modification for Peripheral Facilities at 100-F and 100-H Areas, Project CGI-141
HW-84010	Confid.	DE Cooley	9-14-64	Top Thermal Shield Cooling Tube Repair Study, C & K Reactors
HW-84121	Unclass.	FJ Kempf	9-16-64	Completion Report, Development Test IP-494-AE On-Pile Test of Flexible (3-inch diameter) Vertical Rod, 105-C Reactor
HW-83523	Unclass.	W Dalos	8-5-64	Estimated Power Requirements for DR, F, and H Areas After Shutdown
HW-83765	Unclass.	JE Boyd	9-9-64	Engineering Study for Backup Dump Valve Installation 1706-KER Loops, No. 1, 2, 3 & 4
HW-83795	Unclass.	LD Gustafson GE Peck	8-25-64	Trip Report, Investigation of Materials, Application, and Experience for In-Place Coating of Water Piping

Number	Class'n	Author	Date	Title
HW-83999 RD	Secret	FJ Kempf DE Cooley	9-10-64	ATH-IPD-1-65 Evaluation of Graphite Stack Shift Theories
HW-83420	Unclass.	RR Cone	8-4-64	Final Report - Mark II Power Rate Meter
HW-83344 Add 1	Unclass.	R Sherrard	8-28-64	Evaluation Report - RTD to RTD Cable Integral Connection
--	Confid.	EA Wegener RG Geier	9-10-64	Mechanical Defilming Test
HW-84130	Unclass.	JM Goff, Jr	9-17-64	DT-1199 - Results of Qualifica- tion Testing of General Electric RTD Cable
HW-83561	Confid.	EA Wegener	9-18-64	Tool Development - Zirconium Tube Removal
HW-83214	Confid.	FJ Mollerus	7-8-64	Three-Phase Under Power Relays 10,000 HP Wound Rotor Induction Motors, K Plants, FY-1965 Budget Study HW-80798 (3-5-64)
HW-84102	Secret	WA Blyckert	9-15-64	Reactivity Measurements of Cored Lithium-Aluminum Cylinders
HW-82941 C	Secret	WN Mobley	9-4-64	Production Fuels Section Monthly Report - August 1964
HW-83973	Secret	WN Mobley	9-8-64	Thorium Delivery Schedule
HW-83871 RD	Secret	WA Blanton PC McMahon	9-1-64	Polonium 210 Study - Production Fuels Cost Estimates
HW-83559	Confid.	HG Powers FE Panisko	8-5-64	Provisional Process Sepcifi- cations for Thorium Oxide Target Elements
HW-73111	Confid.	GM Schweikhardt	6-1-64	Supplemental Specifications of Laboratory Hot Press Process for CV Size Self- Supported I&E Fuel Elements

DECLASSIFIED

DECLASSIFIED

HW-82942

<u>Number</u>	<u>Class'n</u>	<u>Author</u>	<u>Date</u>	<u>Title</u>
HW-83996	Secret Red Label	M Lewis JE Minor JT Stringer	9-21-64	Report to the Working Committee from the General Electric Company-Hanford
HW-83454 D	Confid.	CA Strand	9-15-64	Fabrication of Hot Die Sized Diffusion Bonded Fuel Elements from Oil & Water-Quenched Cores for Production Test IP-708-A
HW-83673	Secret	Staff of IPD (JR Young, Editor)	9-1-64	Small Reactor Channel Enlargement
HW-83855	Unclass.	WD Hamilton	8-31-64	Evaluation of Strap-on Resistance Temperature Detectors
HW-83855 Add. 1	Unclass.	WD Hamilton	9-17-64	Evaluation of Strap-on Temperature Detectors
HW-84001	Secret	RH Smith	9-14-64	Activity of Regular Irradiated Metal in Buckets
HW-83856	Unclass.	WD Hamilton	8-28-64	Production Test IP-720, Strap-on RTDs On-Reactor Test, 105-B and 105-C
HW-84116	Unclass.	GW Riedeman	9-16-64	Blisters in B-D-P-Type Control Rods, an Interim Report

TRIPS

<u>Name</u>	<u>Firm & Location</u>	<u>Date</u>	<u>Purpose</u>
PH Hutton	Oregon Metallurgical Corporation Albany, Oregon	8-28-64	To discuss alternate methods of fabricating boron carbide-aluminum elements for the flexible HCR.
HW Heacock	General Eng. Lab. Schenectady, N.Y. Gen. Astrometals Corp. Yonkers, N.Y. Sintercast W. Nyack, N.Y.	9/14-17/64	To discuss HCR poison material procurement.
CC Steele	Soule Steel Company Portland, Oregon	9-14-64	To inspect fabrication drawings for reinforcement steel for the Purex filter facility.
R Sherrard DF Arnold	Astrodata, Inc. Anaheim, Calif.	8/14-18/64	Discuss technical requirements of Contract DDR-179.
CH Gydesen WH Clemans	International Design Corp. Tacoma, Washington	8-26-64	Discuss progress and problems associated with Contract DDR-172.
RS Hammond	NASA, Lewis Research Center Cleveland, Ohio	9-16-64	To discuss cryogenic and helium liquefaction processes.
RS Hammond	12th Annual Joint Engineering Management Conference Cleveland, Ohio	9/17-18/64	Attend as delegate.
KG Hawkins	UCLA Los Angeles, Calif.	8/16-28/64	Attend course in Strain Gage.
KG Hawkins	LTV Ling Electronics Division Anaheim, Calif.	8-19-64	Discuss updating of Ling Vibrator.
JM Fox, Jr.	Astrometals Yonkers, N.Y. Sintercast Corp. West Nyack, N.Y.	9-14-64	Discuss manufacture of boron carbide aluminum cermats. Same

DECLASSIFIED

DECLASSIFIED

HW-32942

<u>Name</u>	<u>Firm & Location</u>	<u>Date</u>	<u>Purpose</u>
JM Fox, Jr	General Electric Schenectady, N.Y.	9-15-64	Discuss manufacture of boron carbide aluminum cermats.
RT Jaske	AICHE Meeting Las Vegas, Nevada	9/20-23/64	Attend AICHE 54th National Meeting.
	U.S. Coast & Geodetic Survey San Francisco, Calif.	9-24-64	Review reactor building oscillator response.
LH Rice	National Lead Co. of Ohio Cincinnati, Ohio	9/8-12/64	Discuss UT-2 testing and sampling program and uranium technology.
LH Rice	Mallinckrodt Chem. Works St. Louis, Mo.	9/8-12/64	Discuss thoria production, uranium research and development.
WK Alexander	NTH Company El Cajon, Calif.	9/1-2/64	Observe welding and Zircaloy tubing fabrication technology.
GC Fullmer	Fort Holabird Baltimore, Md.	9-8-64	Discuss safing devices for reactor shutdown inspection system development.
	AEC Div. of Intell. Germantown, Md.	9/8-9/64	Discussions of shutdown inspection development program. Briefings on foreign reactors.
	Savannah River Plant Augusta, Ga.	9/10-11/64	Discuss shutdown development program and diversification items.
PF Mercier	Metallurgical Engineers Portland, Oregon	9/15-16-64	Advise and direct the Charpy V-notch testing.
OH Greager	General Electric Cherry Hill, N.J.	9/15-16/64	Attend meeting called by Engrg. Services for engineering managers.

<u>Name</u>	<u>Firm & Location</u>	<u>Date</u>	<u>Purpose</u>
WD Hamilton	Minco Products, Inc., and Rosemount Engineering Corporation, Minneapolis, Minnesota	9/9-12/64	To discuss strap-on RTDs.
RM Scott	General Electric Co., Crotonville	8/31-9/5/64	Attend a Methods and Work Measurement Seminar sponsored by the Manu- facturing Services of the General Electric Company.

DECLASSIFIED

DECLASSIFIED

HW-82942

VISITORS

<u>Name</u>	<u>Firm & Location</u>	<u>Date</u>	<u>Purpose</u>
BR Pepka	Renton Coil Spring Co. Renton, Wash.	9-9-64	Delivering and demonstrating equipment furnished by the Renton Coil Spring Company.
Dr. K Newman J Morris	Turco Products, Inc. Los Angeles, Calif.	9-10-64	Consultation and discussion of decontaminating and cleaning chemicals.
J Heck	Linde Division Union Carbide Corp. New York, N.Y.	9-11-64	Discuss gas purification systems.
AS Perkins	Linde Division Union Carbide Corp. Los Angeles, Calif.	9-11-64	Same.
DD Pulsifer	Air Reduction Co. Seattle, Wash.	9-16-64	Discuss means of expediting argon analysis now required for each liquid nitrogen delivery.
J Schneider Dave Tuel	Wyandotte Chemical Corp. Wyandotte, Mich.	9-21-64	Consultation and discussion of decontaminating and cleaning chemicals.
R Carlson	Arthur Forsythe Co. Seattle, Wash. (Flexonics Northwest Representative)	9-21-64	Examine "faults" found in expansion joints supplied by Flexonics Division of Calumet and Hecla, Inc.
LE Fessler WA McDorman	Calumet & Hecla, Inc. Bartlett, Illinois (Flexonics Division)	9-21-64	Same.
RK Steele L Albertin	Aerojet-General Corporation Sacramento, Calif.	9-24-64	Discuss acoustic failure warning technology.
TA Golding	Atomics International Canoga Park, Calif.	9/9-12/64	Assist in test of hydraulic mockup experiment for NAA-117.
PN McCreery	National Lead Co. Cincinnati, Ohio	9/1-3/64	Discuss uranium technology.

Name	Firm & Location	Date	Purpose
DC Allen JK Brown	Savannah River Oper. Aiken, South Carolina	9/2-3/64	Discuss thorium program.
F Morris	Turco Products Spokane, Wash.	9-8-64	Discuss chemical processing of 8001 aluminum alloy.
J Schneider	Wyandotte Chemicals Los Nietos, Calif.	9-21-64	Discuss chemical processing of 8001 aluminum alloy.
D Tuel	Wyandotte Chemicals Seattle, Wash.	9-21-64	Discuss chemical processing of 8001 aluminum alloy.
CH Hoehne	Bridgeport Brass Co. Riverside, Calif.	9-29-64	Discuss aluminum component requirements - negotiate order.
J Driver	Bridgeport Brass Co. Portland, Oregon	9-29-64	Discuss aluminum com- ponent requirements - negotiate order.
T Conners	Traverlers Indemnity Co. Portland, Oregon	9-15-64	Third party inspection of 384 Building equipment.
Walt Conley	Cornell, Howland, Hayes and Merryfield Corvallis, Oregon	8/31-9/1/64	To discuss our water treatment and effluent activity problem.
Dr. James A. Young Humphrey Gilbert	AEC Safety Division Washington, D.C.	9-23-64	To discuss Reactor Con- finement Systems.

DECLASSIFIED

DECLASSIFIED

HW-32942

RESEARCH AND DEVELOPMENT ACTIVITIES

RESEARCH AND ENGINEERING

Reactor Fuels

Eleven columns of hot-die-sized elements authorized under PT-665 were discharged from C Reactor during the August 31, 1964, outage at an average exposure of 840 MWD/T. This test compares the irradiation behavior of elements fabricated with two different end bonding processes. Twenty-three columns of hot-die-sized elements of a test comparing the affects of various process parameters on the irradiation behavior of the elements are now being irradiated in the C Reactor. These elements have accumulated an average exposure of about 480 MWD/T with the goal established at 800 MWD/T (PT-684). PT-708, a test of the effects of uranium heat treatment parameters on hot-die-sized element behavior, is being irradiated in the C Reactor. A total of 18 fuel columns are included in the test. Current exposure of these elements is estimated to be 200 MWD/T.

Clean U-233

U-233 yields and U-232 contaminant build-up have been computed as functions of exposure for the various reactors. Typical examples are shown in the following table and have an estimated accuracy of -5 per cent and +15 per cent.

K CORE (supporting E-metal - tube power assumed to be 1900 KW)				
<u>Irradiation Time</u> <u>Days</u>	<u>Exposure</u> <u>MWD/T</u>	<u>gm U-233/</u> <u>ton ThO₂</u>	<u>ppm U-232</u>	<u>% Pa-233</u>
10	136	278	1.2	88.5
40	543	1098	5.0	63.8
70	950	1881	9.4	48.5
K FRINGE (845 KW)				
90	573	608	1.4	40.0
130	827	864	2.3	30.0
170	1081	1121	3.5	24.0
B FRINGE (650 KW)				
90	509	608	1.0	40.0
140	791	929	1.8	28.0
180	1017	1184	2.55	22.0
C FRINGE (750 KW)				
90	593	701	1.2	40.0
120	791	928	1.8	32.0
150	990	1148	2.5	26.0

Computer Codes

Three computer programs using PANACEA have been written to assist in making routine calculations. These are:

1. DURNOUT COST, to compute burnout costs based on analytical formula and latest constants from cascades.
2. XI, to calculate fuel column exposures from pressure and temperature data.
3. ENDCAP CORRECTION, to calculate correction for endcaps for input to MOFDA.

The generalized Monte Carlo code GMCM-9 was successfully used in evaluating a test problem. The code is now being set up for evaluating the neutron contributions due to the (n,2n) reaction and capture gamma ray distributions in uranium - thorium - graphite lattices. Copies of YOGI-N and YOGI-G are being forwarded by the Lawrence Radiation Laboratory.

Pocket Radiation Alarm Devices

Testing and evaluation of the modified Canadian pocket dose alarm device were completed. The results were favorable. Parts to fabricate 50 units of the device were placed on order. Repackaging of the instrument is under way.

Studies have been initiated to improve the audible alarm circuit and to reduce the cost of the pocket dose rate alarm device.

Condensation Nuclei Counter

A condensation nuclei counter is being used for counting particles generated in the exhaust air stream before and after the confinement filters to measure the efficiency of the filters. In a test at D Reactor, the instrument counted about 20,000 particles per cc in exhaust air and 15-35 particles per cc after filtration. The unit was calibrated in conjunction with the DOP test facility by Industrial Hygiene with satisfactory results. The unit will be returned to D Reactor for further testing.

FACILITIES ENGINEERING

Prototype High Speed Scanner

Repair of the high speed scanner prototype shut down on August, 1964, due to the 400-cycle inverter failure continues to be delayed due to the lack of available manpower.

Dose Rate Telemetry

Negotiations with Tracerlab, Incorporated, for one six-channel prototype dose rate telemetry system have been completed at a firm price of \$33,215. Preparation of Contract DDR-191 is under way. Completion of fabrication for the prototype system has been requested for five months after contract authorization.

DECLASSIFIED

HW-32942

PRODUCTION FUELS

ALTERNATE PROCESS DEVELOPMENT

Hot Die Sizing

Production Test IP-665-A, designed to compare the irradiation behavior of induction and resistance end bonded hot die sized fuel elements, was discharged September 1, 1964. No unusual forces were required to discharge the test, as had been the case for previous tests. Post-irradiation measurements have been completed. Preliminary examination of the diameter measurements on about one-third of the fuel elements indicates the diameter growth of the hot die sized pieces at mid-point is significantly greater than the AlSi control pieces. No significant difference is apparent between the dimensional behavior of the induction and resistance end bonded fuel elements; however, there appears to be a larger variance in the induction end bonded pieces. An analysis of the magnitude of these differences is incomplete.

Production Test IF-684-A, charged July 16, 1964, is scheduled to reach goal exposure in November. This test is designed to determine the effect of core dimensions and end bonding pressure on fuel stability. Familiarization with and improvement of induction end bonding techniques led to a reduction of the central fuel temperature, which resulted in less severe end-bonding conditions for this test. End bond pressure was varied from 3-3/4 to 4-1/4 tons/in.²

Production Test IP-708-A, designed to determine the effect of core heat treatment on growth behavior during irradiation, was charged September 2, 1964. This test consists of 18 columns of oil and water quenched matched cores, part of which were stress relieved by alpha annealing, and an AlSi pretreatment. The AlSi pretreatment consisted of canning the cores by the AlSi process and recanning the recovered cores by the hot die sizing process.

Segregation of the second phase particles in 8001 alloy tube cladding has been detected in material procured on a "best effort" basis. Although the nonuniformity of particle distribution in the alloy is not expected to present a cladding corrosion problem under existing reactor conditions, it is felt that higher quality material should be used for future testing. For this reason, 2,500 feet of inner and outer tubing are being ordered. A corresponding number of thicker base wafers is also being ordered.

Limited die sizing tests without fuel element carriers, using a water-cooled ram and integral internal die and support stem, have been made both on standard and integral rib hot die size fuel elements. Further tests are planned following minor modifications and realignment of the sizing press.

A new lower ram adaptor has been designed and fabricated for quick changing integral internal dies from one fuel size to another. Both the upper and lower ram units incorporate a feature for marking both ends of a fuel element as it is being sized. These marks will provide machining depth of cut as well as end identification through subsequent operations.

The initial end-bonding dies for the "O", "K", and C6 overbore fuel models have been designed and fabricated. Induction heating coils for overbore fuel are being designed.

Work has been initiated on revision and updating the provisional hot die sizing process specifications.

Nickel Plating

Activities were largely confined to the testing, debugging, flushing, and other work incidental to start-up of the new automatic nickel plating facility. With minor exceptions, all equipment is functionally satisfactory based on the dry runs carried out thus far. Installation of the auxiliary piping, vessel temperature recording, pH recording, and water conductivity recording equipment is incomplete. The recording systems require both installation of the sensing elements and debugging the recording instruments.

The carrier transfer mechanism was tested over a narrow range of operating limits. Under some conditions following an emergency stop, it was found that the elevators may operate before the carriers are in their normal stationary position. Redesign of the control circuitry is underway to correct this problem. Testing included a single plating rack loaded with cores, and the core-turning mechanism of both the transfer mechanism and the rack was found to function satisfactorily.

The five rectifiers were tested over a range, approximating 20 per cent and 80 to 100 per cent of their rated voltage, and at two per cent, 10 per cent, 50 per cent, and 100 per cent of their rated current. Three rectifiers required extensive repairs to the internal wiring before the tests could be carried out. Although further tests are required under actual operating conditions, the rectifiers appear to be satisfactory except for minor adjustments.

A. W. Quibrose for

Manager, Research and Engineering

DECLASSIFIED

END

**DATE
FILMED**

2 / 1 / 93