DECLASSIFIED

HW-78780

This document consists of
59 pages. No. 5 of
22 copies. Series A.

IRRADIATION PROCESSING DEPARTMENT
MONTHLY REPORT
AUGUST, 1963

HW--78780

DE93 003960

Classification Cancelled (Change to
DECLASSIFIED)

By Authority of PR-24

DS Lewis 8/25/92

DD Krichard 10/5/92

PM Eick 10-6-92

Compiled by
IPD Personnel
September 13, 1963

RICHLAND, WASHINGTON

Received by OSTI
NOV 30 1992

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

Route To:	P.R. No.	Location	Files Route Date	Signature and Date
<u>J. E. Lewis RLOC-AEC</u>				

GROUP I

Excluded from automatic downgrading
and declassification.

MASTER

DISTRIBUTION RESTRICTED TO U.S. ONLY

-1-

DECLASSIFIED

DISTRIBUTIONCopy Number

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

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

TABLE OF CONTENTS

<u>SUMMARY</u>	A-1
<u>MANUFACTURING</u>	
Production Operation	B-1
Reactor Operation Statistics	B-2
Reactor Operations	B-3
Applied Reactor Engineering	B-5
<u>PRODUCTION FUELS</u>	
AlSi Shop	C-1
Materials	C-3
Fuels Engineering	C-3
Plant Facilities	C-7
<u>RESEARCH AND ENGINEERING</u>	
Process and Reactor Development	D-1
Process Technology	D-8
Operational Physics	D-12
Testing	D-16
<u>FACILITIES ENGINEERING</u>	
Design Engineering	E-1
Equipment Development	E-3
Project Engineering	E-4
<u>FINANCIAL</u>	F-1
<u>REPORTS, TRIPS AND VISITORS</u>	G-1

DECLASSIFIED

SUMMARYMANUFACTURING

Reactor MWD input production for August was 16.4% above forecast: 14.7% above at the smaller reactors and 21.1% above at the K's.

Over-all time operated efficiency for August was 77.0% (70.3% forecast). The 88.7% efficiency at the smaller reactors was the highest monthly value for these reactors since February, 1959 (89.8%). The K Reactor efficiency (41.8%) was 6% above forecast because of less than anticipated overlap of K zirconium tube outages. High efficiency at the smaller reactors resulted in part from excellent rupture and water leak experience.

No new power level or production records were established during August.

Two ruptured I&E natural metal fuel elements were removed from the reactors. One occurred at KE Reactor; the other was an overbore fuel element being irradiated under a Production Test at C Reactor.

Two internal tube leaks were corrected. A total of 654 new process tubes, including 600 zirconium, was installed.

PRODUCTION FUELS

A total of 575 tons of natural and enriched fuel was produced during August, 104% of the forecast.

Canning line production was reduced from nine to eight lines on August 5. Ten men, made available by this reduction, were assigned to the N Fuels Section, N Reactor Department, for a period of approximately three months to assist in the completion of the initial load for N Reactor.

Canning line efficiency was 98.9% for the month.

Bare core inventory at month's end is 1662 tons, a 3.1 months' supply, including 104 tons of dingot cores.

Finished fuel inventory at month's end is 1516 tons, a 2.7 months' supply, including 183 tons of dingot fuels.

Major improvements were made during August in yield and throughput of K Reactor self-support fuel elements at the ultrasonic rail welders. On several shifts, over 1,000 elements were processed through one welding machine, and average production per welder-shift has been above 700 during the latter part of the month.

The amount of work in process was unusually high at month's end. The resizing of approximately 50,000 K Reactor self-support fuel elements during the first three weeks in August resulted in a large backlog of self-support fuels production ahead of the sizing operation.

In addition to the sizing backlog, there are approximately 15,000 fuel elements ahead of the projection welders and 3,500 small reactor watermix fuels awaiting attachment of watermix spools.

Cleaning and replacing the salt in the feed site uranium heat treating furnace appears to have eliminated earlier problems experienced at HAPO with excessive external braze porosity and bond test rejects in the canning of several natural ingot core lots. In order to prevent a recurrence of this problem, the feed site is initiating procedures to control uranium surface hydrogen and replace the heat treating salt on a routine schedule.

A total of 560 enriched fuel elements was canned by the hot die sizing process, and the pieces are being finished and tested for irradiation under a Production Test.

RESEARCH AND ENGINEERING

Power levels at all reactors were restricted by a bulk outlet water temperature limit. The limit was 93.5 C at F Reactor and 95 C at all other reactors.

There was a substantial discharge of self-supported fuel from Zircaloy tubes at KW Reactor, following the tube replacement outage in the first part of the month. The regular displacement charge-discharge procedure was used with some 50 charges at about 90% of normal goal, and satisfactory results were obtained with this material. Discharge forces for the self-supported fuel columns were comparatively low for all of the charges handled during this outage. About 150 KV columns at 90% of goal were flush-discharged without significant problems, and 26 charges of self-supported enriched fuel also were flush-discharged.

A further series of tests have been carried out with the export water system in order to characterize the transient behavior of the system upon trip-out of the electric export pumps at varying conditions of flow and with different numbers of steam-driven pumps on the line. The test data obtained will be fully analyzed before proceeding to the next testing phase.

Operation of the 1706 KER recirculation loop facility in support of NPR fuel development has continued. Loops KER-1 and KER-2 have been operating with lithium-aluminum target elements and enriched N inner fuel pieces in order to evaluate target element swelling characteristics and tritium migration. The KER-1 test was completed during the month and the loop discharged; the KER-2 irradiation continues. Loops KER-3 and KER-4 are charged with regular N fuel assemblies which have reached 1000 MWD/T and 635 MWD/T, respectively, against a goal of 2100 MWD/T.

DECLASSIFIED

~~SECRET~~
DECLASSIFIED

HW-78780

FACILITIES ENGINEERING

Six hundred channels were bored and zirconium tubes installed at the 105-KW Reactor. An additional 48 aluminum tubes were replaced. Aluminum tubes are being removed from 596 channels at the 105-KE Reactor preparatory to installation of zirconium tubes. The gas seal tubes were successfully removed from 52 front gunbarrel assemblies on tube row No. 32, permitting the installation of short gunbarrel keys in these tubes as a solution to the stuck gunbarrel problem.

The 600 newly installed zirconium tubes at the 105-KW Reactor were charged with self-supported fuel elements using the Union Machine Works prototype machine. No problems were encountered.

Some fuel element support damage resulted during initial attempts to displacement discharge irradiated self-supported fuel columns. The difficulty was resolved by eliminating the flexibility of the charging machine adapter and reducing the clearance between the adapter liner and fuel elements. Fifty-seven columns were successfully displacement discharged, following these changes, with no support damage.

The initial in-reactor installation of a VSR channel liner was completed at 105-C Reactor. Polycrystalline graphite liner blocks were installed in VSR channel No. 28, which was enlarged down to just below tube row No. 17. Slow graphite reamer cutting rates prevented enlargement of the channel to the bottom of the reactor; however, adequate test information will be obtained from the installation at its present length. The new assembly has a drop time of 1.8 seconds, a substantial reduction over previous experience. The channel enlargement reaming required removal of one process tube from service. It may be possible to restore this tube to service at a later date.

Project CGI-976, "Automatic Filter Backwash System, 183-DR Building," was completed and the facility put into operation on August 21.

RESPONSIBILITY

A change in organization structure of the Production Fuels Section, which was effective August 1, 1963, resulted in a consolidation of the maintenance activities and the deletion of the Quality Control Sub-Section from the organization structure. The Quality Control Engineering and Inspection functions have been assumed by Fuels Engineering and ALSI Shop Sub-Sections, respectively.

FORCE SUMMARY

DECLASSIFIED

	<u>Exempt</u>	<u>Non-Exempt</u>	<u>Total</u>
General	7	2	9
Research and Engineering	89	55	144
Manufacturing	398	1398*	1796
Production Fuels	107	410	517
Facilities Engineering	93	38	131
Financial	<u>20</u>	<u>13</u>	<u>33</u>
TOTAL	714	1916	2630

*Includes 10 N Reactor replacement trainees.

SAFETY, SECURITY AND RADIATION EXPERIENCE

There were 115 medical treatment injuries, five security violations, no disabling injuries or radiation exposures exceeding operational control.

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. 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.

General Manager

AB Greninger:DLD:bm

MANUFACTURING

PRODUCTION OPERATION

There were no adjustments in discharge exposure goals initiated during August. Unclassified plutonium discharging which had been heavy in July was very light in August resulting in a significant reduction in average discharge exposure to 83% of the record July value.

AUGUST DISCHARGE EXPOSURE (MWD/T)

<u>Regular Uranium</u>		<u>Enriched Uranium</u>	
<u>Smaller</u>	<u>K's</u>	<u>Smaller</u>	<u>K's</u>
675	673	915	697

Rail and truck shipments of Essential Materials were as follows:

Carload shipments for IPD	-	223
Carload shipments for other Depts.	-	176
Truck shipments for IPD	-	<u>136</u>
		535

DECLASSIFIED

DECLASSIFIED

HW-78780

MONTH	REACTOR OPERATION STATISTICS - PROCESSING									
	B	C	D	DR	F	H	KE	KW	TOTAL	
AUGUST, 1963										
INPUT PU (% OF FORECAST)	108.6	103.7	135.8	112.2	119.6	111.2	170.1	58.0	116.4	
TIME OPER. EFF. (% OVERALL)	85.4	81.8	99.9	86.7	89.9	88.7	64.4	19.3	77.0	
NEW TUBES INSTALLED	5	0	0	0	0	1	0	648	654	
WATER LEAKS - TUBE	0	1	0	0	0	1	0	0	2	
- VAN STONE	0	0	0	0	0	0	0	0	0	
FUEL ELEMENT RUPTURE	0	1	0	0	0	0	1	0	2	
HELIUM CONSUMED - M CU. FT.	314.6	608.0	280.9	160.3	620.9	426.5	178.0	163.1	2752.3	
UTILIZATION OF REACTOR OUTAGE HOURS										
CHARGE - DISCHARGE	45.7	56.0		50.6	36.0		19.7	86.0	294.0	4.9
RUPTURE REMOVAL	1.0						20.9	0.4	22.3	0.4
WATER LEAK				25.4		13.5		36.6	75.5	1.3
TUBE REPLACEMENT	35.7	2.8		6.0	10.3		178.7	397.3	630.8	10.6
MAINTENANCE	23.4	37.9		16.9	24.5	70.5	15.8	59.1	248.1	4.2
STANDARD CHECK		1.0			1.2				2.2	-
PRODUCTION TEST	1.7	37.6			2.3		8.7	3.9	54.2	0.9
PROJECT WORK					1.2				1.2	-
OTHER	1.0	0.3	0.2				21.2	17.3	40.0	0.7
TOTAL	108.5	135.6	0.2	98.9	75.5	84.0	265.0	600.6	1368.3	23.0
REACTOR OPERATION STATISTICS - POWER										
RIVER WATER PUMPED - M GALS.	9021.9		8506.8		4167.6	3739.3	8954.6	3341.3	37731.5	
WATER TREATED - M GALS.	3484.3	4914.2	5024.4	3347.0	4062.9	3568.4	8908.1	3341.3	36650.6	
WATER TO REACTOR - GPM NOR.	90300	100000	87700	87600	88800	82400	206000	206500	949300	
FINISHED WATER - ANALYTICAL DATA										
TURBIDITY PPM AVG.	.006	.006	.005	.003	.005	.003	.005	.005		
PH AVG.	6.7	6.7	6.6	6.6	6.6	6.6	6.6	6.6		
CL ₂ RESIDUAL PPM AVG.	.05	.05	.05	.05	.06	.13	.18	.21		
DICHROMATE PPM AVG.	1.79	1.39	1.90	1.85	1.80	1.90	1.62	1.89		
STEAM GENERATED M LBS.	55078		67180		35770	36321	26349	17508		
EVAPORATION RATE/LB. OF COAL	9.07		8.86		9.24	8.02				
EVAPORATION RATE/GAL. OF OIL							112.9	111.3		
TOTAL KW - HR GENERATED							1477400	1081000	2558400	

B-C REACTOR OPERATION

B Reactor experienced three outages: one for scheduled charge-discharge, one from an unexplained Panellit gauge trip, and one from a low pressure Panellit trip when an outlet thermocouple blew out of the tube nozzle.

Five outages occurred at C Reactor: one for scheduled charge-discharge, one manual trip (0.3 hour) due to loss of cooling water to an HCR, one manual trip (0.3 hour) from indicated loss of cooling water to HCR's (actually a momentary power loss occurred), one from a ruptured overbore fuel element, and one because of a water leak.

At C Reactor, the reaming and installation of sleeves and a universal type flexible rod in vertical safety channel No. 28 resulted in a drop time within standards (1.85 seconds). A B-size vertical safety rod was installed in channel 47. Presently VSR's 41 and 48 do not fulfill the vertical rod drop time criteria and are considered inoperable.

Process tubes were installed in an air channel and four former PCCF channels at B Reactor and all five tubes charged with production fuel elements.

Electrical power surges on August 15, 18, and 28 caused no loss of power equipment. The August 15 and 18 surges were caused by trip-outs between Midway and Grand Coulee and the August 28 surge was apparently caused by lightning.

Three surges occurred in the export system August 4 when the turbine at 100-F Area tripped out because of overspeed. Water pressure dropped from 217 psi to 22 psi and the surge suppressors cycled each time. A 30 psi surge occurred on August 20 from an unknown cause.

At Building 182-B, extensive repairs were completed on the raw water export turbine.

D-DR REACTOR OPERATION

D Reactor operated throughout the month except for a 0.2 hour spline insertion scram on August 5. DR Reactor experienced two outages, a scheduled charge-discharge outage and an outage caused by a grounded Panellit gauge. The grounding resulted when wiring became damp from a leaking gauge.

The DR Reactor rear face fog spray was activated on August 14 when failure of components in the iodine monitoring instrumentation caused a false high iodine signal. Electrical power surges occurred on August 11, 12, 17, and 28 as a result of thunderstorms. No equipment was affected.

The initial DR Reactor charging of certain categories of graded fuel elements (Fuel Utilization Authorization - IP-02-I) was made. A total of 570 elements was charged in upstream (cooler) locations within process tubes.

DECLASSIFIED

HW-78780

Failure of a bearing in No. 17 river water pump motor at 181-D Building resulted in the rotor rubbing on the stator so that offsite repair of the motor was necessary.

The automatic filter control system at 183-DR Building (Project CGI-976) was placed in service on August 21. However, it was necessary to revert to manual control on August 25, pending resolution of difficulties with solenoid valve coils. Facilities for feeding sodium silicate into the 100-D Area fire and sanitary water were placed in operation August 30. Addition of sodium silicate is being investigated as a potential means of alleviating corrosion in system piping. Temperature detection instrumentation (Design Change No. 678) was installed in the DR Reactor rear face crossunder line to provide bulk outlet water temperature readings when the crossunder system is in use.

F REACTOR OPERATION

Production was above average since no unscheduled outages were experienced. One scheduled charge-discharge outage was taken during the month. During this outage 146 tubes were checked by wall thickness gauging. None were corroded enough to require immediate replacement.

The half-plant low alum test (PT IP-549-A) continued and except for a two-day period when eight ppm was required, alum feed on the test half was maintained at seven ppm.

The 184 Building emergency generator operated satisfactorily during a simulated power failure conducted on August 7 to test the operation of the electrical switch gear at the 105 Building.

Maintenance activities in the 105 Building included installing 190 spline caps with the new positive compression seals, one graphite stringer, and 327 detent caps, and replacing the cables on the D work platform. Two relief valves in the 115 Building gas system were adjusted and reinstalled. Water plant activities included overhaul of backwash valves (Nos. 3, 5, and 12) in the 183 Building. An inspection and dye check of the 190 Building No. 3A process pump flywheel showed it was in good condition.

H REACTOR

Causes of reactor outages for the month were a process tube leak, movement of a vertical safety rod from its clutch, a poison spline seal failure, and a heat cycle following recovery from the preceding scram.

Failure of a motor-generator breaker for instrument supply current caused the vertical rod clutch system to go on battery power as designed. Eventual discharge of the batteries was followed by clutch release of a rod, scrambling the reactor. Repairs were made, returning the systems to normal service.

Sixty-seven front face nozzles were replaced with nozzles broached to accommodate bumper fuel elements, thereby completing the front nozzle changeout program.

The Panellit gauge changeout program was initiated with installation of 30 re-worked gauges having Delrin pivot bushings and mid-ranges changed from 215 to 300 psi.

A coal crusher at 184-H was damaged by a piece of scrap iron traced to the vendor's coal. The drum shafts and one bearing required replacement.

The steam export water pump was operated a total of 23.7 days in support of 100-B Area export water pumping requirements.

KE-KW REACTOR OPERATION

KE Reactor experienced two outages during the month. One was caused by a fuel element failure and the other was a scheduled extended outage initiated on August 22 to perform process tube replacement work. The outage continued at month's end.

Following removal of a fuel element failure which occurred on July 30, KW Reactor remained shut down for process tube replacement. A total of 648 process tubes (600 zirconium, 48 aluminum) was installed during this extended outage. In addition, operating continuity was interrupted by two shutdowns which resulted in significant outage time. One shutdown was required to locate and correct process tube hardware water leaks and one was attributed to a ground in an electrical circuit associated with the Vertical Safety Rod system.

Dams were installed around the outlet drains of the three retention basins serving KW Reactor. The 14-inch high dams are designed to provide a heel of water over the basins during periods of non-use.

Replacement of three-layer crossheader screens with single-layer eight-mesh screens (Design Change 710) was completed at both reactors. The modification is designed to reduce the potential for front crossheader screen plugging in addition to lessening flow friction losses with no compromise in safety of reactor operation. Installation of a new helium supply line from the 115 KW storage facilities to KE Reactor (Design Change M63K) was completed.

Decontamination efforts at KE Reactor prior to the tube replacement work reduced average radiation levels within the tube removal block to 21 mr/hour. Similar efforts at KW Reactor reduced average radiation levels of the rear face to a new low average of 23 mr/hour for that reactor.

APPLIED REACTOR ENGINEERING

MAINTENANCE PRACTICES ENGINEERING

Vertical Safety Rod Purchase Order

Material has been produced for fabrication of 30 universal type vertical safety rods. Inspection is under way and the delivery date of October, 1963 for the initial assemblies will be met.

Horizontal Control Rods

The on-plant fabrication of one half-rod was completed and the rod was sent to Spare Parts. Fabrication of a second half-rod is scheduled for completion in September, 1963.

Equipment Maintenance Standards

a. In first draft status	- 30
b. Waiting for Multilith typing	- 18
c. Out for plant comment	- 16
d. Back from plant comment	- 39
e. Being routed for approval signature	- 19
f. Issued to date	- 44

Total 166

Explosive Aluminum Van Stone Flange Forming Tool

The explosive tool for forming Van Stone flanges has been standardized for aluminum tube Van Stoning at the six smaller reactors. A modified tool and powder load have been provided for K Reactors where approximately eighty aluminum spline tubes were Van Stoned satisfactorily.

PLANT EQUIPMENT ENGINEERINGTurbine Failure 182 B

On July 27, 1963, the No. 1 steam turbine pump at 182 B failed. Investigation revealed that one of the axial thrust plates of the steam turbine broke and fell from its normal position on the shaft into the thrust bearing oil sump. As a result, the running assembly lost axial restraint and shifted enough to permit the rotating and stationary vanes to touch and drag.

Examination of the broken thrust plates established that the failure resulted from fatigue and brittle fracture originating from sharp corners at the bottom of radial oil grooves. Two remedial actions were recommended to reduce the recurrence of this type of failure:

1. Smooth and blend out all sharp corners in the thrust ring radial oil grooves to remove stress risers.
2. Provide as much clearance as practical between the thrust ring inside diameter and the shaft to reduce the stress developed in the ring by the temperature difference which exists between the shaft and the thrust ring.

PLANT ENGINEERINGZone Temperature Monitoring System

Upgrading of the zone temperature monitoring system is progressing satisfactorily with (a) approvals received regarding the specification

to procure additional silicone insulated cable; (b) shop testing of 10 connector-less resistant temperature detectors assemblies; and (c) installation of five controllers at 105-DR utilizing magnetic amplifiers instead of meter relays. There have been no failures or problems with the magnetic amplifiers. It has been decided to continue evaluation of the rebuilt meter relays on a full-scale installation at 105-DR and to initiate a program for full-scale pile installation of magnetic amplifiers at either 105-B or 105-D.

Some 30 to 40 rebuilt meter relays were received and, after testing, 25 were found acceptable. These were installed at 105-DR; however, all but eight failed on the first drop-out test after approximately three weeks of service. Investigation revealed that insufficient degreasing was the principal cause of these failures.

Temperature Monitoring During Splining - 105-B and F

Engineering assistance was provided to design a method of measuring pressures and temperatures during splining operations at 105-B and F. Design has been completed and is being routed for approvals.

Confinement System

All of the ordered filters (315) have been received and are being tested at the 200 East Quality Assurance Station. Replacement of defective filters is continuing.

Crossheader Instrumentation

Design has been completed for a solid state system for checking the indicating lamps for burnout, including a provision for partial muting the audible alarm from one crossheader to eliminate the present annoyance that occurs while work is being done.

VSR Trips - 105-H

On August 16, 1963, the H Reactor was scrambled by what was first thought to be an improperly adjusted VSR clutch. Further investigation disclosed that the motor-generator set had failed without providing annunciation, and that the battery bank had dropped to a low enough voltage that it could not hold in the VSR clutches. Design is now in progress to assure annunciation in the event of a MG failure.

Basin Leak Repair - 107-CE

Two leaks were repaired in the 107-CE basin by use of Hypalon sheets rather than conventional welding. A resulting savings in repair cost of approximately \$35,000 was realized. The repair appears to be effective.

Reactor Pedestal 105-KW

An inspection was made of the reactor pedestal at 105-KW. In addition to the usual hair line cracks, a number of cracks running up the walls, across

DECLASSIFIED

HW-78780

the overhead, and down the other wall in the inlet and outlet gas pipe tunnels were found. The cracks did not appear significant since they originated mostly at wall penetrations.

Helium Supply Line 115-KW to 105-KE

A minor design change was issued to cover the work of running an exposed supply line from 115-KW to 105-KE. The new line will be located in existing tunnels and will not be subject to ground corrosion.

The original supply line between 110-KE and KW has been made unusable by ground corrosion.

VSR Latches 105-KE and KW

Prototype latch arms were installed on four latch assemblies at 105-KE and KW. This provides additional holding force without affecting the release time and, to date, the test has demonstrated that the longer arm is more reliable.

Rupture Information Training Manual

A manual has been prepared showing pictures of all fuel element ruptures caused by charging machine damage during 1962-1963. Pertinent information concerning each rupture and the nonproductive cost of removal is displayed below each picture.

Production and Use of Pictorial Instructions

A training program on the use of Polaroid cameras and methods for producing pictorial instructions was scheduled. Fifty-three people from the various IPD Sections attended the first session.

Leak Repair by Foaming 105-C and 105-F

Tooling modification for the mass foaming work at 105-C is in progress. This new equipment is necessary because the foam must penetrate the areas between the bellows flange and the reactor tie strap to replace the function formerly performed by an "O" ring seal. The hardware which presently exists on the rear face at 105-C also presents problems that require additional modifications. At 105-F the top neoprene seal will be removed during the November tube outage. This problem is complicated by the large amount of silicone adhesive which had previously been spread over this seal. Development of equipment to remove this silicone is now in progress.

K Storage Basin Overflow

A proposal which will provide increased service drainage from the K storage basins has been approved. This will permit process tubes to be opened and charge-discharged without the necessity of opening the bottom drains on the storage basins.

Empty Process Tube Probe

A probe has been fabricated for use in determining the empty length of a tube. The tool consists of a cylinder and tape, actuated from the front face, and gives instant reading of the length of tube traversed.

OC Schroeder
Manager, Manufacturing

OC Schroeder:DLD:bm

DECLASSIFIED

DECLASSIFIED

HW-78780

PRODUCTION FUELSALSI SHOPProduction

Canning line operating efficiency was 98.9 per cent, 2.9 per above forecast.

Manufacturing yields for August were above forecast in all categories of fuels. The welding yield was 95 per cent on self-support fuels and 94 per cent on fuel with elliptical rails.

Production of four-inch I&E lithium-aluminum target elements for the third E-N loading of H Reactor was essentially completed during August.

Production of projection fuels during August was:

	<u>Natural U</u>	<u>Enriched U</u>
Tons produced	199	37
Finished Inventory	503	159

August Production

<u>Acceptable Fuel Elements (Tons)</u>										
<u>NATURAL</u>					<u>ENRICHED</u>					
<u>C</u>	<u>K</u>	<u>Reg.</u>	<u>Bumper</u>	<u>K5NS</u>	<u>C</u>	<u>K</u>	<u>Reg.</u>	<u>Bumper</u>	<u>K5ES</u>	<u>Total</u>
2.9	60.1	187.4	27.6	171.5	22.5	30.0	36.3	25.6	11.5	575.4

<u>Per Cent of Forecast</u>										
-	85	103	66	149	113	77	182	53	64	104

Manufacturing YieldsAugust

-	90	93	80	84	82	93	93	88	80
---	----	----	----	----	----	----	----	----	----

Forecast

90	90	90	85	80	90	90	90	85	80
----	----	----	----	----	----	----	----	----	----

Previous Month

94	90	87	82	81	-	-	95	-	72
----	----	----	----	----	---	---	----	---	----

August fuel production includes 6.1 tons of graded fuel elements for charging in upstream low rupture potential positions in the reactors. Graded fuels are now routinely being accumulated and processed for this use.

Operating Conditions, Incidents, and Improvements

A plugged cross channel resulted in the failure of a duplex furnace which had been in service for more than seven years. An AlSi canning furnace was moved into the duplex position and charged with lead and AlSi. A leak developed and lead penetrated the induction coil, resulting in failure of the replacement unit. A second replacement furnace also failed when lead penetrated the lower hearth and caused a short in the induction coil.

These failures are the most serious furnace problems which have been encountered since installation of the Ajax furnaces. New drying and bake-in procedures now in effect for preparing duplex service furnaces are expected to minimize such problems in the future.

The only significant amount of facing lathe downtime was caused by a malfunction of a safety circuit photocell. The photocell became misaligned and was struck and damaged by an ejected fuel element. Preparations were begun to make minor modifications to the lathes. Improvements being planned involve the installation of micro switches which will shut down the lathes if the cut off wheel fails to cut the cap chimney completely from the fuel elements and the installation of an index bar to facilitate the changing of tool holders on the lathes.

Failure to detect a damaged contour tool on a lathe resulted in the processing of about 1250 fuel elements which had a slight ridge on the contour. The elements were subsequently refaced, and essentially all were accepted. The same type of incident occurred later in the month but was quickly detected and corrected.

Operation of rail welders varied significantly during the month. On August 12, one welder was shut down for modification, and the welding crew was moved to the 306 Pilot Plant welder. Very good operational results were experienced on the 306 machine which has been previously modified. The welding crew will return to 313 Building when modification of that welder is completed.

Mercury spills were noted on two occasions during the month. On August 22, 1963, when a portable instrument was sent to the Instrument Shop for calibration, instrument technicians discovered small beads of mercury inside the box cover. Industrial Hygiene checked the 306 Building area with a Mercury Vapor Detector and no detectable amounts were found. Source of the mercury was not determined.

On August 23, 1963, mercury discovered on the floor was traced to a manometer used by NPR Fuels Development Engineering. After a survey by Industrial Hygiene, the floor area was treated and painted.

Autoclave Failures

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

DECLASSIFIED

DECLASSIFIED

HW-78780

MATERIALS

Fuel Recovery

Fuel recovery activities were primarily directed toward the neutralization of spent acid from the N Fuels fabrication facility as a result of partial two shift operation of that component.

The following AlSi fuel elements were processed through the fuel recovery facilities during the month:

Eight-inch Natural	22,784
Six-inch Enriched	6,528
Watermix	<u>1,060</u>
Total	30,372

Hanford Test Reactor

Routine reactor tests increased about 40% over the previous month and numbered 355 (drift tests - 166; go-no-go tests - 189). These tests utilized approximately 80% of the Reactor operating time, with the remaining 20% being used for special testing.

Inventories

Bare Core Inventory	1662 tons
Finished Fuel Inventory	1516 tons
Work in Process	249 tons

Scrap

Five shipments of scrap (including both metallic and C-6 material) were made during August. AlSi scrap included 10.6 tons of natural and 1.9 tons of enriched material. N Reactor Fuels scrap shipments totaled 17.7 tons of enriched scrap. A total of 1265 empty boxes with lids were also shipped during the month.

FUELS ENGINEERING

Quality Control

On August 16, 1963, samples from a shipment of Vendor R aluminum-silicon were received in the laboratory for spectrochemical analysis. Initially, samples from one large bar and one small bar of aluminum-silicon were taken. Both samples were out of specifications on magnesium content, the former analyzing 0.021 per cent Mg and the latter 0.046 per cent. The specification calls for 0.01 per cent maximum. A resample of the small bar size analyzed 0.014 per cent and two resamples of the large bar size analyzed 0.021 per cent and 0.022 per cent. The total shipment consisted of eleven heats. Two samples were then taken from each heat. Seven of the heats analyzed had a magnesium content in excess of 0.014 per cent while four analyzed between 0.011 and 0.014 per cent. For this particular shipment, only the heats that were out of specifications were rejected.

DECLASSIFIED

DECLASSIFIED

Routine laboratory metallographic examination of Vendor M aluminum cans and spires disclosed five shipments of cans and one shipment of spires which did not meet specifications. Two different irregularities were noted which contributed to the rejection of these components. These irregularities were: (1) large particles of NiAl_3 formed in bands rather than in a fine uniform dispersion and (2) large aggregates of NiAl_3 particles formed in a columnar fashion near the surface of the metal.

Rupture Experience

Two fuel elements (one production I&E and one overbore test element) failed in the reactors during August 1963.

<u>Fuel Element Type</u>	<u>Tube and Reactor</u>	<u>Exposure (MWD)/T</u>	<u>Rupture Classification</u>	<u>Failure Date</u>	<u>Canning Date</u>
8" I&E	3977-KE	574	Long Split	8/5/63	4/17/63
8" I&E (Overbore)	3062-C	490	Not Examined Yet	8/24/63	4/9/63

Uranium Technology

The problem of excessive external braze porosity and high bond test rejects has been traced to certain ingots which were heat treated in the Amster-Morton heat treating furnace at NLO between the last week in April and June 7, 1963. This furnace was cleaned and the salt changed prior to June 10, 1963, and the problem disappeared at that time.

In view of the findings to date, National Lead of Ohio is fairly certain that the problem can be eliminated by routinely changing the salt in the Amster-Morton furnace. They are now in the process of revising their procedures to assure that this is done.

Indications to date are that by converting the National Lead heat treating facility from a salt bath-water quench process to an induction heat-oil quench process, an over-all reduction in reactor induced warp of up to 50 per cent could be achieved. Material for further evaluation of the in-pile behavior of induction heated-oil quenched elements has been canned, and will be irradiated in the near future. It is anticipated that sufficient data will be available by January 1964 to make a decision on the advisability of converting to this new process.

National Lead of Ohio has initiated a procedure to detect surface hydrogen pickup during heat treatment. Two core blank samples per week from each heat treating furnace will be analyzed for surface hydrogen by using a 1/16 inch slice from the end of the core blanks. This process control tool should detect a process problem early enough to prevent shipment of inferior uranium.

AlSi Process Development

A test was conducted in the Pilot Plant to determine if spire etch is a cause of weld porosity. The internal and external welds were examined for pinholes, and the results show the spire etch does not cause porosity in the closure welds.

A test is in process to determine the effect of steel brushing before welding on weld quality. The data collected during the first week of the test indicate the brushing has no effect on weld quality.

Four fuel elements were received at the reactors with elliptical rails bent up so that they could have caused damage to the reactor tubes if the elements had been charged. An investigation was conducted, and the conclusion was that the rails were damaged on the autoclave tubes. Special plate gauges will be used in the future in final inspection to check for maximum height on elliptical rails as well as warp.

A knurled tip weld head was evaluated as a replacement for the smooth tip currently used on ultrasonic welders. The advantage of the knurled tip appears to be shorter weld times and better alignment of rails. Good welds were obtained in 0.4 seconds, and the knurls bite into the weld tab preventing misalignment. The weld strength was not improved using the knurled tip.

Ten columns of natural self-supported fuel elements were charged in KW Reactor under a production test to determine the effect of column displacement charging on annular coolant temperature and irradiation behavior as a function of support height. The test consists of two columns each of fuel elements having as-fabricated nominal support heights of 95, 88, 82, 74, and 65 mils, respectively, for exposure to 600 MWD/T goal. Based on earlier attempts to displacement charge self-supported fuel elements, the supports on these fuel elements were most likely damaged severely during charging, and probably represent the extremes with respect to eccentric positioning in the process tubes.

Alternate Process Development

A lot of 560 0.947 per cent U-235 uranium fuel elements was sized for production testing of hot die sized enriched uranium fuel elements. All phases of the hot die sizing process for the six-inch cores functioned smoothly and no serious difficulties were encountered. The sizing process for six-inch cores was essentially the same as that for eight-inch cores. End bond process conditions were varied from that for eight-inch pieces to prevent over-diffusion. Metallographic examination revealed that a longer bond cycle for eight-inch fuel elements was not necessary to achieve a good diffusion bond because of the reduced fuel element mass.

Because of low bond strength experienced with initial sizing of six-inch fuel cores and the apparent effect of component cleaning on bond strength, a test to measure cleaning effect was made. Results indicate that it is necessary to maintain aluminum cleanliness to produce consistently strong bonds.

DECLASSIFIED

Four titanium-tungsten carbide dies, two smooth bore, one four-rib and one eight-rib, for the hot die sizing process were received during the month. The new dies have had only limited testing. Since no ribbed components were available, thick wall 0.085 inch cans were used for sizing ribbed fuel elements. The first full length ribbed self-supported fuel element has been sent to the Metallurgical Laboratory for metallographic examination.

Recent experience indicates that AlSi wafers can be bonded to the ends of nickel plated cores quite easily. Various other data indicate that aluminum-silicon alloys offer very good resistance to corrosion. For these reasons hot die sized fuels components have been ordered in four different aluminum-silicon alloys which are modifications of aluminum alloy 8001.

A total of 560 six-inch 0.947 per cent enriched cores were nickel plated, with highly satisfactory results. Process solutions and temperatures were maintained within specifications during the entire eight-day plating period with the exception of the final nitric acid deoxidizing solution where the nitric acid concentration varied one per cent above and below the specified limits of 7.5-8.0 molar. A total of 44 pieces (approximately eight per cent) were rejected in 560, including approximately four per cent for cracked uranium, two per cent out-of-process, and two per cent for rack malfunctioning --none were rejected for process behavior.

The electrolytic etch step in the plating process produced uniformly etched cores throughout the run, employing solution composition specifications developed from experience during the past four months. The specifications were developed from etching tests, which indicated absence of dissolved uranium produces a non-uniform etch, and from experience during prolonged plating runs, which indicated dilution of the hydrochloric and/or the phosphoric acid to values 10 to 20 per cent below present minimum limits likewise produces a non-uniform etch.

Design of a plating rack module for the automatic plating machine was completed as well as a rack testing station. The station includes a plating tank and associated piping, a hoist, and mechanisms to oscillate the rack vertically, and to change the rack-core contact points during plating. Fabrication of the rack and the plating tank is essentially complete, and testing is scheduled to be initiated during September.

Equipment Design and Development

Production quantities of the two-dimple 1-7/8 inch long bridge support rails were received, evaluated, and placed in the production stream during this period. Sizing and measuring tests have shown that under production the load deflection and stability of this rail is equal to or superior to the old rail. A reduction in alignment rejects is particularly attributed to the ease of holding the shorter rail during the welding operation.

A second delivery of samples of Vendor RR coined "T" section support rails was received during this period, evaluated, and reactor test quantities approved for fabrication to permit further in and out of reactor testing.

Test samples of Vendor ES coined "bar" section were received and load deflection curves established. The coined "bar" section and the coined "T" section have similar curves which produce 8.5 mil deflection at approximately 600 pounds and 36 mil deflection at approximately 1600 pounds.

The coined "bar" thin tab rail fabricated by Vendor RC has been received and initial testing is under way to determine weldability, load deflection properties and dimensional capabilities of the rail. An improved bumper support was designed during this period and a purchase requisition was issued to obtain test quantities. This improved bumper support is designed to eliminate recent fabrication and handling problems encountered with the existing elliptical bumper support.

Detailed design is approximately 20 per cent complete on a self-support automatic feed system. Minor improvements were made during this period on the manual feeding system to permit the operator to maintain a 20 second cycle on the self-support welder.

A production test was conducted using oil lubrication to replace the present soaping step in the support rail welding operation. Results of the test reflect a 6.6 per cent improvement in welding yield for the 13,382 fuel elements processed. Improvements made to the welder, the most important features of these being a friction drum brake, larger chuck springs, and an improved second position rail holding fixture, resulted in an increase in welder throughput from 550 to 670 fuel elements per shift during the test.

The powered roll self-support rail sizer was placed in operation during this period and demonstrated capability of sizing within the current rail height specification. Currently, a second generation roll sizer is under fabrication as a prototype, and will be equipped for automatic operation.

Detailed design is complete on the production model pneumatic vibrator for removing stuck fuel elements from steel sleeves and an order is placed for fabrication.

Design and procurement specifications were completed during this period and a purchase requisition was issued for the fabrication and delivery of prototype aluminum cast autoclave liners. Delivery is scheduled for mid-September.

PLANT FACILITIES

Status of Active Construction Projects

CAF-954 - High Pressure Autoclave Development Facility

The revised project proposal to close out this project is being prepared for submission to RLOO-AEC.

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

Preliminary design analysis relative to the material handling addition was received from the Architect-Engineer on August 8, 1963, reviewed,

DECLASSIFIED

HW-78780

and comments were forwarded to the AEC. The Title I work is considered complete for this portion of the project, and Title II is underway. Title I on the laboratory and machine shop portion is approximately 90 per cent complete.

CAF-973 - Steam Distribution Line Modifications - 300 Area

Construction by the fixed price contractor was started on July 26, 1963. Approximately 40 per cent of the excavation is complete, and some pipe prefabrication has been accomplished. The contract is behind schedule. The project completion date has been extended to February 15, 1964.

CAF-979 - Pilot Scale Plating Equipment - 300 Area

The design and fabricate contract for the nickel plate machine has been approved by the AEC. The contract is being reviewed by GE legal counsel before being awarded to the low bidder.

CAI-994 - Utilities Extension - 300 Area

Design work by the on-site Architect-Engineer is underway and is approximately 65 per cent complete.

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

Advance design funds were released by Washington AEC, and Vitro Engineering was directed to proceed with the design. The design criteria prepared by General Electric have been approved, and the Architect-Engineer has started design.

Utilization of PRTR Waste Steam in the 300 Area Distribution System

A rough draft of the project proposal was forwarded to interested parties for review and comment. Formal submission of the proposal is scheduled by October 1, 1963.

Equipment Modifications

The automatic welding equipment to be installed on the production line was received on August 26. Installation of auxiliary equipment was started early in August.

Vendor fabrication of the autoclave crane has been completed and erection of the structural steel was started during the latter part of the month.

The Appropriation Request covering major modifications to the ultrasonic rail support welders was approved late in the month.

DECLASSIFIED

Utilities

Statistics

	<u>August</u>	<u>July</u>
Maximum steam generated (M lbs/hr)	49	52
Total steam generated (M lbs)	25,763	27,072
Total condensate returned (M lbs)	1,616	2,221
Coal consumed (tons)	1,335	1,332
Evaporation rate	9.56%	10.16%
Efficiency - actual	74.5	79.5
Efficiency - optimum	80.7	82.5
Import sanitary water (M gals)	148.0	128.7
Peak water flow (gpm)	5,400	5,200
Peak water consumed in 24 hours (M gals)	5.3	5.1
Compressed air production (M scf)	41,054	40,616

The overhaul of the No. 4 boiler is complete, and No. 6 is approximately 20 per cent complete.

An Appropriation Request has been prepared for modification of the air compressor cooling water system in the 384 Building to utilize the waste heat to pre-heat feed water for the boilers.

An emergency power service addition was installed for First Aid and Patrol in 3706 Building to utilize 300 Area emergency power instead of the previous unreliable gas engine standby generator.

Plant Services

The major portion of the work load in the fabrication shops has been involved in the fabrication of special parts for the Ultrasonic Welder modification; conveyor parts for the double spindle welder installation; fabrication of special sleeves for the canning line; fabrication and installation of a large fuel element dryer in the 333 Building (NRD); and modifications to the ventilation system in the 327 Building.

The combined work order backlog in the Plant Maintenance groups totals 804 man days.

for
 Manager, Production Fuels

WN Mobley:HFT:sh

DECLASSIFIED

~~SECRET~~ DECLASSIFIED

HW-78780

RESEARCH AND ENGINEERING

PROCESS AND REACTOR DEVELOPMENT

REACTOR FUELS

At the conclusion of the August 1 Zircaloy-2 tube replacement outage at KW Reactor, about 50 self-support fuel columns were satisfactorily displacement discharged. Average exposure for the charges was about 90 per cent of normal goal, 650 MWD/T.

Discharge forces for self-support columns discharged during this outage were quite low. In fact, about 150 KVNS columns at 90 per cent of goal were flush-discharged without any significant problems. Twenty-six enriched self-support columns were also flush-discharged.

Ten columns of self-support elements authorized by Production Test IP-572-A, Supp. A, were charged during the August 1, 1963 outage at KW Reactor. These ten tubes are equipped with thermocouple probes to measure the effect of possible fuel support damage on the irradiation behavior of the self-support elements.

Twenty fuel columns containing hot-die-sized elements were charged into the C Reactor during the July 27, 1963 outage and currently have an average exposure of about 200 MWD/T. Goal exposure for two of the columns is 400 MWD/T; the remaining columns will be irradiated to an average exposure of 800 MWD/T.

REACTOR ENGINEERING

Zirconium Retubing Program - 100-K Reactors

Measurements in the 2C test hole at KW Reactor have shown that the clearance between the top of tube blocks and filler block layer above has increased from the "as built" 120 mils to approximately 200 mils. The additional clearance allows the tube blocks to lift, which partially straightens the angle between blocks during channel drilling so that less graphite is removed than would be expected from mock-up tests, which used the smaller clearance. The amount of graphite removal in-reactor now compares favorably with that expected for the larger amount of clearance. These test hole measurements indicate that the tube blocks are contracting at a greater rate than the filler blocks.

Export System Studies

1. Export Pumping Transient Tests

Six tests of the system were completed, under the authority of Production Test IP-599-AI, Trip-Off of Electric Export Pumps, HW-78181. These tests were conducted according to the schedule shown in Table I. All tests were successfully accomplished, and no undue stresses or unusual conditions were observed during the testing program. The test data are being analyzed and compared with theoretically-developed predictions of the system's transient characteristics.

DECLASSIFIED

HW-78780

STATUS REPORT OF PRODUCTION TESTS

<u>Test No.</u>	<u>Type Metal</u>	<u>Tubes</u>	<u>Reactor</u>	<u>Goal Exposure</u>	<u>Current Exposure</u>	<u>Remarks</u>
IP-216-A	Normal prod. natural & enriched fuel elements	70	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 overbore size	69	C	Variable +200		Provides for testing of CIW geometry fuel in C Reactor ribless zirconium tubes
IP-381-A and IP-431-A	I&E self-supported fuel overbore size	62	C	800 MWD/T		Provides preliminary qualitative data regarding irradiation behavior of larger fuel element designs.
IP-572-A	I&E self-supported fuel	0	KW	800 MWD/T		Evaluation of effect on temperature distribution of eccentric placement of fuel elements in smooth process tubes. Test columns discharged on 7-8-63.
IP-586-AIE	I&E self-supported fuel	0	KW	1100 MWD/T		Evaluation of self-supported fuel element performance and fuel column discharge forces at extended exposures. Test columns discharged on 7-8-63.
IP-546-A	I&E self-supported, Hot Die Sized Fuel	20	C	800 MWD/T	210 MWD/T	Initial irradiation of hot-die-size diffusion bonded fuel elements. Test columns charged on 7-27-63. Test will provide information for evaluation of relative corrosion characteristics of this new fuel.
IP-572-A Supp. A	I&E self-supported fuel	10	KW	800 MWD/T		Evaluation of effect on temperature distribution of eccentric placement of fuel elements in smooth process tubes. Test charged on 8-1-63.

TABLE I (CONTINUED)

Test No.	Date	No. of Pumps Running (At 182-B)	Type*	No. of Pumps Tripped	Initial Export Flow 1000 gpm	Operational Conditions		
						Area	Time of Start-up** Mins.	282 Reservoir Venting Area Venting
7b	8-21	3	E	3	18.0	B	5	282E Cone valve throttled and closed after trip.
						D		282W 4" Orifice in bypass line.
						F		
						H		

* E = Electric powered, S = Steam turbine powered.

** Time after electric pump trip.

DECLASSIFIED

2. Export System Flow Capacity

Studies have been completed at the Albrook Hydraulic Laboratory, Washington State University, in Pullman, Washington, on the export system water flow to the reactors under various pumping and flow diversion conditions. The analysis was made under provisions of CA-387. A final report of this study will be issued by WSU next month.

REACTOR PHYSICS

Production of Plutonium of High Pu-240 Concentration

Calculations have been made to determine irradiation times and amounts of material required to produce 15 kilograms of 25 per cent Pu-240 plutonium. It was determined that irradiation of about 22 kilograms of 6 per cent Pu-240 plutonium for approximately six months would be required. Reaching the desired concentration using 0.2 per cent depleted uranium supported by 0.947 per cent enriched uranium would be feasible by segregating the central depleted fuel elements from the remainder of the fuel column for the 25 per cent Pu-240 material. Irradiation of about 20 tons of depleted uranium for approximately 400 days to an average exposure of 1600 MWD/T would yield 15 kilograms of 25 per cent Pu-240 in the central 30 per cent of the columns; plutonium of about 15 per cent Pu-240 would be produced in the other 14 tons of depleted uranium.

Conversion Ratio Results From Overbore Tests

Preliminary separation results from four batches of fuel irradiated in the C Reactor 40-tube overbore block have been obtained. The results, which are presented in the following table, compared very well with the predicted values with the exception of one batch.

Overbore Conversion Ratios (g Pu/MWD)

<u>Exposure (MWD/T)</u>	<u>Experimental Results</u>	<u>Calculated Results</u>
382	1.0048	1.0030
408	0.9961	0.9964
714	1.0070	0.9273
790	0.9266	0.9122

VSR Material Testing

The first samples of the replacement vertical safety rods were received for reactivity evaluation. These sections were checked in the HTR and, in addition, a chemical analysis for boron content was made. The reactivity measurements confirmed the results of the chemical analysis and that each of the samples met the boron content specification.

Measurement of U-235 Content in Enriched Fuel

A comparison of the analytical results, obtained at Oak Ridge and National Lead, of the U-235 content in the enriched metal (nominal 0.947 per cent) used at Hanford indicates good agreement. Hanford Laboratory results in identical samples have not been completed as yet.

Brandy

The per cent of recycle fuel in the enriched material in the reactors at the end of August and in the fuel discharged during August was very nearly 100 per cent for all reactors.

Quarrying Basalt Rock

The second part of the quarrying operation took place as scheduled on August 1, 1963. Nothing unusual was noted as a result of the large detonation. The only vibration picked up was at 105-KE where Shannon and Wilson of Seattle were conducting measurements. Geophysical Services, in their report, had predicted about 345 micro inches displacement at K Reactor. However, measured values were about one-fourth this amount. The lower magnitude of the interaction can probably be explained in that the blast was not simultaneous, but occurred in a rapid sequence.

A slight movement of the galvanometers was noted at 105-H following the detonation.

RADIOLOGICAL ENGINEERING

Radiation Control Experience

The following table summarizes the radiation exposure experience of critical IPD classifications through the first 28 weeks of the 1963 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 3r Extrapolated Exposure</u>
Radiation Monitors	114934 mr	77	1493 mr	2772 mr	26
Processing Operators	322740	252	1281	2378	41
Pipefitters	171379	126	1360	2525	35
Millwrights	137263	105	1307	2427	41

There were eleven (11) Lapses of Radiation Control. Five Lapses involved personnel skin contamination and personnel clothing. Other ones included 1) employee in grossly contaminated zone without required protective clothing; 2) a contaminated vehicle; 3) spread of contamination outside the radiation zone; 4) storage of contaminated equipment in a clean storage facility; and 5) uncontrolled exposure of personnel to a high dose rate situation.

DECLASSIFIED

DECLASSIFIED

HW-78780

Lapse of Radiation Control

	<u>B</u>	<u>C</u>	<u>D</u>	<u>DR</u>	<u>F</u>	<u>H</u>	<u>KE</u>	<u>KW</u>	<u>IPD Totals</u>
Processing			1		1			2	4
Maintenance							1	1	2
Suppl. Crews									0
Special Outage Services								4	4
Central Maintenance									0
Research & Eng.					1				1
Facilities Eng.									0
Applied Reactor Eng.									0
Reactor Area								1	1
IPD General									0
Assigned Totals	0	0	1	0	2	0	1	8	12

Effluent Activity

The table below shows average concentrations of selected radionuclides from reactor effluent samples taken during July, 1963. All units are 10^{-12} curies/ml.

<u>Reactor</u>	<u>P32</u>	<u>As⁷⁶</u>	<u>Zn⁶⁵</u>	<u>Np²³⁹</u>	<u>Cr⁵¹</u>
B	1.7	73	5	95	260
C	7.2	110	7	125	500
D	4.1	57	8	100	370
DR	3.1	64	9	120	460
F	7.5	47	6	100	380
H	10.2	63	6	94	410
KE	7.0	43	9	86	330
KW	10.5	57	16	110	340

DECLASSIFIED

PROCESS TECHNOLOGYREACTOR POWER LEVEL LIMITATIONS

Power levels at all reactors were restricted by the 95 C bulk outlet temperature limit with the exception of F Reactor which was restricted at the 93.5 C limit.

PROCESS STANDARDSHW-46000 B, Process Standards - Reactor

One standard was revised and issued during the month. This was:

Process Standard F-010 - "Process Material"

KV self-supported dummies are authorized in this revision for C Reactor smooth-bore tubes.

HW-46000 K, Process Standards - Reactor

One standard was revised and issued during the month. This was:

Process Standard A-021 - "Tube Outlet Water Temperature - Top-of-Annulus Boiling Limit"

This revision added "R" values for zirconium and ribbed tubes and specified the maximum TOA boiling limit as 130 C.

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

Two revised standards were issued and three standards were deleted during the month. These were:

Process Standard 183-A-010 - "Water Quality and Sampling Requirements"

This revision incorporated the water treatment process limits and sampling requirements from four former standards into one standard to emphasize the limits and remove extraneous material.

Process Standard 183-A-030 - "Chemical Additives and Location of Addition Points"

The requirements of two former standards were combined for ease of reference and a new filter conditioning material was added.

Process Standard 183-A-030 - "Sodium Dichromate Addition"Process Standard 183-A-050 - "Chlorine Addition"Process Standard 183-A-100 - "Control of Process Water Analyses"

DECLASSIFIED

~~SECRET~~
DECLASSIFIED

HW-78780

The requirements of these standards were incorporated in 183-A-010 - "Water Quality and Sampling Requirements."

PROCESS CHANGE AUTHORIZATIONS

Nine Process Change Authorizations were issued during the report period: four to permit deviation from Process Standards - Reactor, HW-46000; four to permit deviation from Process Standards - Water Plant, HW-27155 Rev. 1; and one to permit deviation from Process Equipment Standards, HW-41000. These were:

PCA #3-69 - "Removal of Steam-Driven Export Pump - B Area"

This PCA permitted maintenance on one export turbine provided at least two steam-driven pumps were placed in service on the export system.

PCA #3-70 - "Speed of Control, C Reactor"

Reactor operation with two adjacent VSR's partially inoperable was authorized provided more conservative power levels during startup and at equilibrium were adhered to.

PCA #3-71 - "Emergency Removal of Steam-Driven Export Pump - B Area"

This process change authorized doing maintenance on one export turbine provided at least two steam-driven pumps were placed in service on the export system.

PCA #3-72 - "Emergency Cooling Water Requirements - K Reactors"

This process change extends the provisions of PCA #3-40 to allow additional time to obtain necessary information for a standards revision. PCA #3-40 contained additional requirements on the V-72 valve and crosstie line flushing.

PCA #3-73 - "Setting the Seismoscope Trip of #1 Safety Circuit for VSR Drop Only - KE Reactor"

Authorization was given to switch the seismoscope trip from the ball 3X to the VSR system during an explosive detonation provided manual tripping would be instituted if the ball system were needed.

PCA #3-74 - "Removal of Steam-Driven Export Pump at D Area"

This process change authorized taking the D Area export turbine out of service for a maximum of two hours to make emergency repairs while the B Area turbine was also out of service, provided both the H and F Area export turbines were placed in operation and provisions were made to restrict 200 Area and N Area flow within 15 minutes following a BPA power interruption.

PCA #3-75 - "Removal of Steam-Driven Export Pump at F Area"

The provisions of this PCA were identical to those in PCA #3-74, except the F Area turbine required emergency repairs and the D Area export turbine was placed in operation.

PCA #3-76 - "Gas Atmosphere Pressure Requirement During Turco Decontamination - KW Reactor"

Deviation from the standard's requirement that a positive gas pressure of at least one inch of water be maintained during decontamination of rear-face fittings was authorized since it was impractical to achieve this condition, and it was concluded no significant decrease in reactor safety or life would result.

PCA #3-77 - "Panellit Column Identification - D Reactor"

A temporary modification to the Panellit system to permit column as well as row identification was authorized.

PROCESS ASSISTANCE

One engineer audited conformance to process standards on all Processing Operations' shifts by making 19 inspections at each reactor during the report period.

RUPTURE EXPERIENCE

<u>Failure Date</u>	<u>Tube Number</u>	<u>Lot Number</u>	<u>Type of Material</u>	<u>Tube Power at Failure</u>	<u>Exposure MWD/T</u>	<u>Type Failure</u>
8/5/63	3977-KE	CF-014-B	I&E N	1558	574	CP
8/25/63	3062-C	CP-540-D	Overbore N	950	490	SU

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.

Overbore N - This is the symbol for internally and externally cooled overbore reactor fuel elements of natural uranium. The fuel is irradiated in ribless zirconium process tubes.

First Character

C Core - Failure is characterized by cleavage or growth of the core.

S Side - Failure occurred on the side of the fuel element.

DECLASSIFIED

Second Character

P Parallel - Failure caused by cleavage of the core in a direction parallel
Split to the axis of the core.

U Unclassified - No other character logically applies to the failure.

OPERATIONAL PHYSICSPILE PHYSICS ASSISTANCE

Equilibrium operation with high flattening efficiency and relatively few outages was characteristic for the production reactors during the report period.

Minor flux cycling occurred at two reactors. At H Reactor, an exceptionally high residual fuel exposure with its accompanying increase in moderator-coefficient magnitude has caused some tendency for axial temperature cycling; at C Reactor removal from use of two rods during operation due to rod-coolant-supply problems at different times, resulted in reduced control flexibility and simultaneously loss of flexibility for averting a front-to-rear graphite temperature-cycling tendency.

Two small but abrupt reactivity gains at C Reactor during the previous operating period have been investigated. One such reactivity increase during startup was apparently associated with half-rod insertion; the other, which involves a reactivity jump accompanying routine diatomaceous earth purges, is still being studied. Neither instance involved a total reactivity increase of more than a fraction of one milli-k.

SUMMARY OF OPERATIONAL DATA OF PHYSICS INTEREST
FOR THE MONTH OF AUGUST, 1963

Reactor	B	C	D	DR	F	H	KE	KW
ECT in August (1)	1470	1660	1525	1550	1545	1500	2480	2470
12-Month Average ECT	1500	1645	1495	1510	1495	1505	2485	2505
Equil. Scram Time (2)	15-20	20-22	14-16	17-19	15-20	20-25	20-25*	25-30*
Recording Time								
From:	7-23	7-20	7-22	7-23	7-22	7-23	7-23	7-20
To:	8-20	8-19	8-20	8-20	8-20	8-20	8-20	8-20

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

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

B Reactor - J. R. Fredsall

Operation was generally smooth. PT IP-503-J, which permits graphite temperatures up to 735C, remained in effect. The consequent high excess reactivity compensated by splines, plus the prior loss of #2 HCR from service, resulted in lower-than-average ECT. Reactor helium reached a low of 39 per cent under the PT; a deliberately rapid increase (from 39 to 70 per cent over a three-day period) just prior to a scheduled shutdown caused no significant operating-control problems.

C Reactor - P. D. Gross

Flattening efficiency remained high, even though a flux cycle developed toward the end of the period, largely due to reduced control flexibility resulting from loss from use of two different half-rods (#10 and #14); rod-coolant hose failures at different times required that these rods be withdrawn and that alternate control elements be inserted. A small power cut was required at one time to reduce graphite temperatures. One startup was limited by special speed-of-control restrictions imposed because of VSR sticking problems, and approach to full level during another startup was voluntarily prolonged due to temporary loss of the power-level recorder.

Investigation of two separate occasions of small abrupt reactivity increases, previously mentioned in the July report, continued during the month. One, which occurred during a startup, was explained as being associated with half-rod insertion (i.e., the operator was unintentionally increasing the pile excess reactivity when inserting a half-rod). The second, a small but also abrupt gain upon routine purging with diatomaceous earth, is still being studied.

A partial-length graphite liner has been installed in VSR channel #28.

D Reactor - G. D. Baston

Except for a 13-minute interruption due to a scram associated with spline insertion, operation was continuous and flattening efficiency high over the entire report period.

The HCR's did not enter the reactor automatically at the time of the above scram; although there is only marginal dependence on HCR's for safety control, the cause of their noninsertion is being investigated.

DR Reactor - S. M. Skidmore

A pressure-monitor trip caused the only outage during the report period; an attempted hot startup was unsuccessful (the first such failure in seven months). Operation before and after the scram has been quite smooth, and flattening efficiency has been above average.

DECLASSIFIED

F Reactor - A. W. Medcalf, C. E. Hughey

A new production record for F Reactor was established in July, due largely to exceptional operating continuity. In addition, flattening efficiency was considerably above the previous-12-month average, and nonequilibrium losses per startup were similarly about 25 per cent under the 12-month average.

H Reactor - E. L. Conner

Some front-to-rear cycling tendency, attributable to the exceptionally high residual exposure (915 MWD/T), was encountered near the end of the report period. The longest continuous operating interval during the report period was ten days. In addition, several instrumentation malfunctions occurred in the following failure systems: Power Calculator, Rate-of-rise meter, #1 Subcritical Monitor channel, and Flexowriter temperature recorder. Nevertheless, flattening efficiency remained equal to the past-12-month average.

Barring operating problems, residual exposure will be over 1100 MWD/T at the time of the scheduled September outage for replacement of the E-N core.

KE Reactor - D. G. Albertson

A good operating month with a respectable flattening efficiency was experienced, despite deliberate fluctuations in reactor power level to allow operation constantly at the bulk-outlet-limit temperature. The power variations were accomplished without introducing significant flux cycling.

The reactor now has 596 zirconium tubes in service; an additional 778 are scheduled for installation during the next outage.

KW Reactor - R. A. Chitwood

KW operated only briefly during the report period; the shutdown, resulting from an enriched-charge rupture, occurred only two days before the scheduled outage date. During the outage, an additional block of zirconium tubes was installed, bringing the total to over 1200 in service. The 51-tube E-N demonstration-test block was discharged as scheduled during the extended outage.

PROCESS PHYSICS STUDIES

Reactivity and Safety Control Studies

An investigation of the dependence of zone-temperature-monitor safety-trip settings upon grid spacing of the sensing elements was completed and documented as HW-78607. Although other grid sizes were also considered, a promising approach appears to be the use of a 3x6 pattern to assure 6x6 absolute coverage consistent with reasonable maintenance and operability

requirements. Trip settings consistent with this geometry and with present TAI limits and rod withdrawal speeds are calculated to be 125C with, and 128.5C without, PCCF channels in operable condition.

Control Efficiency Studies

The 51-tube E-N demonstration test block in the KW zirconium lattice was discharged during the month as scheduled. No unexpected temperature or reactivity effects were observed, and no fuel failures occurred.

A PITA is presently circulating for authorizing a 103-tube central block of modified charges within the next H Reactor E-N core. Each of the tubes in the block will contain three five-inch N pieces, and there will be only two charge types within the experimental block. This refinement is being carried out in an attempt to further simplify charge-discharge conditions for E-N loads.

There has been a recent reduction in demand for grey splines and an increase in demand for half-splines. This change in emphasis is indicative of the incentives for increased flux-distribution-control flexibility during long operating runs at bulk limit conditions as opposed to fine trim-control adjustments for immediate flattening gains.

A study on E-metal usage and its optimization, carried out with Process Technology, was completed during the month and published as HW-78595. Calculated results indicated that present flattening efficiencies yield nearly optimum net return and production, but that there is a relatively wide range over which flattening may be varied without significant differences in production and unit cost; in other words, E-metal can be used to "buy" reductions in corrosion and rupture potential on a nearly equivalent basis.

Reactor Fundamentals Training

Makeup sessions for supervisory personnel enrolled in the Reactor Processing Certification program started on August 19; the physics portion for these classes was given during the four meetings that week. A number of individuals in the Operational Physics Subsection are attending the formal classes for supervisors under the certification program this fall.

Material from the Reactor Operating Physics booklets has been arranged into 16 lesson assignments and supplemented with written questions and study guides for systematic supervisory use for on-shift training. The Reactor Processing Certification Subsection is sponsoring use of this material, designated as the "In-Area Training Program." In-building training in this and other subjects is intended to augment and to lessen the extent of later formal centralized classroom requirements.

DECLASSIFIED

DECLASSIFIED

TESTING

IRRADIATION TESTING

Irradiations - Sample and experiment irradiations were handled as follows:

Reactor	Test Hole	Facility	Request No.	No. of Samples	Material-Purpose
KE	2D	Quickie	HAP0-184	32	Washington Designated Program
KW	2A				
KE	2D	Quickie	HAP0-252	3	Arsenic (tracer isotope production)
KE	2D	Quickie	HAP0-254	1	Phosphorus (tracer isotope production)
DR		PCCF	HAP0-254	3	Effluent water (reduction of radioisotopes in river water study)
F	E	Quickie	HAP0-219	1	Strontium (isotope production)
KE	2D	Quickie	Reed College	2	Tissue (cancer research project)
KW	4C	Snout	HAP0-243	2	Iron (fast neutron damage study)
KW	3865	General Purpose	HAP0-222	3	Uranium (swelling capsule experiment)
KW	3674				
B		Process Channel	HAP0-098	40	Graphite (burnout rate study)
KW		Process Channel	HAP0-098	20	Graphite (burnout rate study)
C	Y	Bare Channel	HAP0-177	6	Graphite (neutron irradiation damage)
KW	0074	General Purpose	ORNL-184	35	Beryllium nitride (carbon 14 production)
KW	4B	Snout	HAP0-249	1	Boron-graphite (heat generation study)
KW	4B	Snout	HAP0-225	2	Uranium-tungsten (high temperature stability study)
F		Process Channel	HAP0-098	20	Graphite (burnout rate study)
		*Gamma	HAP0-171	2	Plastics and rubber (damage study)
		Gamma		4	Seals (damage study)

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

Vertical Bowing - Vertical displacement measurements were taken as follows:

Horizontal control rod channel 2-B	No previous data
Horizontal control rod channel 1-KW	No previous data
Horizontal control rod channel 4-KW	No previous data

Spline Traversing - Front-to-rear flux distribution data were obtained from two reactors as follows:

<u>Reactor</u>	<u>No. of Tubes</u>
C	9
D	7

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

<u>Reactor</u>	<u>Channel or Tube</u>	<u>Movie Record</u>	<u>Purpose</u>
B	HCR 2	No	Maintenance support
B	VSR 20	No	Maintenance support
C	VSR 28	Yes	HCR-VSR channel problem
KW	HCR 1	No	HCR-VSR channel problem
KW	HCR 4	No	HCR-VSR channel problem
KW	Process channel 2050	No	Maintenance support

H-1 Loop Operation - Development Test IP-590-D, Chemonuclear Experiments in the H-1 Loop, Demineralized Water, was extended when it was found that removing the loop demineralizer resulted in an increase in hydrogen peroxide concentration with oxygen addition and time, where it had decreased before. When air was added, in another test, the nitrite and nitrate concentrations increased gradually with operating time. These tests were concluded without determining the maximum attainable concentrations because of water radioactivity buildup and loop operating problems due to excess gas in the system. The loop was shut down and the in-reactor test section was put on single-pass cooling.

COMPONENT TESTING

Irradiated IPD Fuel Element Examination, 105-C Facility - Examinations were completed on 51 tube charges requiring 189.8 fuel examination units. Individual examinations completed were 4344.

<u>No. of Tube Charges</u>	<u>Production Test</u>
15	IP-216-A, Evaluation of Normal I&E Fuel Element Performance
7	IP-442-A, Half-Plant Reduction in Process Water pH, 105-D
14	IP-549-A, Half-Plant Low Alum Feed Water Treatment at F Reactor
15	IP-572-A, Effect of Eccentricity on the Irradiation Behavior of KVNS Fuel Elements.

DECLASSIFIED

~~SECRET~~
DECLASSIFIED

HW-78780

Irradiated NRD Fuel Examination, 105-KE Facility - No normal production test fuel was examined. Drop tests were performed for Chemistry and Metallurgy, NRD, to determine the effect of discharge impacts upon structural integrity of N Reactor fuel. Tests were performed on the following assemblies:

<u>Outer</u>	<u>Inner</u>	<u>Loop</u>	<u>Discharge Date</u>
Assembly 2228-8	1094-4	KER-4	5-13-63
Assembly 2100-2	1057-4	KER-4	9-25-62

The outer tube of each assembly fractured on impact with the concrete floor after a fall through 10 feet of water.

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

<u>Reactor</u>	<u>No. of Tubes Measured</u>	<u>Report No.</u>	<u>HW Number</u>
C	74	48	78504
F	145	49	78627
C	48	50	78668
B	409	51	78739
Total	676		

Sector Annulus Gauge (eddy-current type) - SAG

<u>Reactor</u>	<u>No. of Tubes Measured</u>
C	2
B	12

Visual examination and actual measurements were completed on five process tubes:

<u>Reactor</u>	<u>No. of Tubes Measured</u>	<u>Reason Examined</u>	<u>HW Number</u>
DR	3	1 leak suspect 1 fuel rupture 1 thin wall indicated by WTG	78519
H	2	2 leaking tubes	78735

Critical Reactor Component Examination - Examination of all B and F Reactor front-face flexible connectors was made. The following summary results:

<u>No. of Connectors</u>	<u>Broken Wires/Connector</u>
<u>B Reactor</u>	
201	1
40	2
7	3
2	4
1	7
<u>F Reactor</u>	
28	1
12	2
2	3
1	6

Panellit System Programs

Gauges repaired, calibrated by Maintenance	-	35	
Gauges meeting calibration criteria	-	32	(91%)
-previous month	-		(30%)
In-board gauge reliability examination	-	400	
Gauges meeting examination criteria	-	392	(98%)
-previous month	-		(99%)
-average for past year	-		(96%)
Response time determination	-	400	
Gauges meeting response criteria	-	400	(100%)
-previous month	-		(100%)
-average for past year	-		(99.8%)
In-board Bourdon coil examination	-	3000	
Non-leaking coils	-	2991	(99.7%)
-average rate past two years	-		(99.8%)
Gauges receiving failure analysis	-	50	
2B-X1 switch examination	-	600	
-acceptance rate	-	478	(80%)
-previous month	-		(87%)
Gauges received from vendor and examined	-	60	
-acceptance rate	-	49	(82%)
-previous month	-		(88%)
Bourdon coils examined	-	115	
-acceptance rate	-	114	(99%)
Gauges received from Central Maintenance and examined after pivot-bushing replacement	-	532	
-acceptance rate	-	421	(79%)
-previous month	-		(79%)

DECLASSIFIED

DECLASSIFIED

COOLANT TESTING

KER Loop Operation

KER-1 - Testing of eight 9-inch lithium-aluminum target elements with five 17-inch NIEL fuel elements as authorized by PT IP-584-D was completed. The elements were discharged on August 22.

KER-2 - Testing of eight 9-inch lithium-aluminum target elements with six NIEL fuel elements as authorized by PT IP-584-D was continued. The purpose of the test is to evaluate target element swelling characteristics and lithium and tritium migration at conditions approximating those expected at N Reactor.

KER-3 - Testing of thirteen 23-inch NAEI fuel elements as authorized by PT IP-447-A continued. The objective of the test is to evaluate the irradiation behavior of N Reactor fuel elements at conditions equivalent to or more severe than those expected at N Reactor.

KER-4 - Testing of fourteen NAEI fuel elements as authorized by PT IP-477-A continued.

Legend

NIEL - N Reactor, inner tube, enriched, first model
 NAEI - N Reactor, assembly - tube and tube, enriched, first model
 NINI - N Reactor, inner tube, natural, first model
 KSE3 - KER Loops, single tube, enriched, third model

Single-Pass Tube Operation - 1706-KE

<u>Tube</u>	<u>Production Test</u>	<u>Water Supplied</u>	<u>Corrosion Inhibitors and Chemical Additions</u>	<u>pH</u>
SP-1 (2952)	IP-476-AL	Process	1.8 ppm dichromate	6.6
SP-2 (3050)	IP-555-A	Service	10 ppm silicate	6.6
SP-3 (4355)	IP-520-A	Pilot plant	1.8 ppm dichromate	6.6*
	Supplement A			
SP-4 (4456)	IP-520-A	Pilot plant	1.8 ppm dichromate	6.6*
	Supplement A			
SP-5 (4557)	IP-524-AL	Service	0.2 ppm quachrom glucosate	6.6
SP-6 (4863)	IP-524-AL	Service	0.2 ppm quachrom glucosate	6.6
SP-7 (4963)	IP-449-A	Deionized	0.2 ppm sulfate**	
SP-8 (5063)	IP-449-A	Deionized	0.2 ppm sulfate**	

*Water treatment pilot plant changed from pH 7.0 to pH 6.6 on August 2.

**Started addition of 0.2 ppm sulfate on August 6.

SECRET

DECLASSIFIED

KE Reactor Outage Time Requirements

No unscheduled outages were charged to production testing. A total of 5.0 outage hours was charged to production tests as listed below:

<u>Production Test</u>	<u>Description</u>	<u>Hours</u>
IP-449-A	Charge-discharge single-pass and control tubes	4.0
IP-476-AL		
IP-520-A		
IP-524-AL		
IP-555-A		
IP-584-D	Tray discharge KER-1	1.0

Out-of-Reactor Facility Operation

TF-3 - Testing to evaluate crevice corrosion beneath Zircaloy-2 fuel element supports with ammonium hydroxide used for pH control was continued. Operating conditions are 598 F, 1985 psi and pH 10.0.

TF-4 - Testing to evaluate single-step carbon steel decontamination procedures utilizing ammonium citrate continued. The operating conditions are 300 C, 1650 psi and pH 10.0.

TF-7 - Testing for the primary purpose of further evaluating fretting corrosion of various materials continued. The operating conditions are 530 F, 1125 psi and pH 10.0. The test sections contain the following materials:

1. A PRTR fuel element with an end bracket design employing a full 360° contact area with the process tube for fretting corrosion studies
2. Two dummy Zircaloy-2 clad elements for uniform corrosion testing of supports
3. Two NIN1 fuel elements for uniform corrosion testing
4. One KSE3 fuel element for uniform corrosion testing
5. Two 23-inch NAE1 fuel elements for support fatigue and fretting corrosion testing
6. Three coupon holders containing 304 stainless steel coupons for stress corrosion testing

TF-17 - Testing to evaluate the corrosion of A-212 carbon steel, 304 stainless steel, Admiralty metal and 70-30 cupro-nickel was completed. Operating conditions were 318 F, 72 psi and pH 9.0 adjusted with ammonium hydroxide.

Hydrostatic Cycling of NPR Heat Exchanger Tube Specimens

Six NPR heat exchanger tube specimens were tested for a total of twelve specimens tested so far.

O.A. Greager
 Manager, Research and Engineering

DECLASSIFIED

DECLASSIFIEDFACILITIES ENGINEERINGDESIGN ENGINEERINGVSR - Graphite Distortion

The initial in-reactor installation of a VSR channel liner has been completed at 105-C Reactor. The polycrystalline graphite liner blocks were installed in VSR channel No. 28, which was enlarged down to between tube rows 16 and 17. The unexpectedly slow graphite reamer cutting rates which were experienced prevented enlargement of the channel down to the bottom of the reactor; however, adequate test information will be obtained from the installation at its present length. The enlargement of the thermal shield hole had previously been completed.

Due to an unexpectedly sharp curvature of the VSR channel near the bottom of the enlarged section it was necessary to cut several of the lowest sleeves to a nominal nine inches rather than the 18-inch normal length. The installation of the remaining sleeves, prototype flexible VSR, and cable guide was accomplished without incident. The new assembly had a drop time of 1.8 seconds which was a substantial reduction over previous experience. The channel enlargement reaming required the removal of one process tube from service; however, it may be possible to restore this tube to service at a later date.

Laboratory testing of the pyrolytic graphite sleeve samples deposited on various substrate materials has been completed. These various samples were prepared by High Temperature Materials, Inc. and the Metallurgical Products Department of the General Electric Company. None of the substrate deposited samples had the strength of normal pyrolytic or polycrystalline graphite except for the samples of pyrolytic graphite deposited upon a polycrystalline graphite base. This material had improved strengths over the normal material; however, its properties were inferior to the various ceramics under consideration.

The test installation in the 185-D Test Tower for development testing of new VSR air and gas seals has been completed. The new seals which will be tested will be utilized with the universal flexible VSR's in the 105-KE and KW Reactors. Initial test runs on these seals are underway.

Flexible Horizontal Control Rods

Only one vendor quotation was received for fabrication of the two prototype flexible HCR tips. Since only one bid was received the negotiation of a contract with this vendor is proceeding based upon his quotation. A purchase order has been placed with another vendor for the poison segments required for fabrication of the two prototype rods. Delivery of the two prototype rod tips can be expected February or March 1964.

105-K Reactor Zirconium Tube Program - Design

During the recent zirconium tube installation outage at 105-KW Reactor, the gas seal tubes were successfully removed from 52 front gunbarrel assemblies on tube row 32. Short gunbarrel keys were installed in these tubes as a solution to the stuck gunbarrel graphite distortion problem recently encountered. Due to the success of the trial installation, this procedure has been adopted for utilization in the remainder of the zirconium tube installation work at the K Reactors. This change is being made to provide additional front gunbarrel travel as a corrective measure for the stuck rear gunbarrels in order not to limit zirconium process tube life in the upper part of the reactors.

A final decision has been made that new impact extruded nozzles will be installed on all spline tube assemblies as part of the zirconium retubing program. The previous plan to install these improved nozzle assemblies on the fringe tubes of the K Reactors was not approved by RLOO-AEC.

Rear Crossheader Expansion Joints

Design has been completed for all rear crossheader expansion joint installations. Pending the completion of an evaluation of the 105-H Reactor installation and a review of the ultimate benefits, further installation work on this program has been deferred.

Fixed Radiation Monitoring

The preliminary engineering report in support of project proposal preparation has been completed and approved by the Project Representatives. This study was performed on a basis of accomplishing a minimum, but adequate scope of work for the plant requirements for this system.

RTD Cable Specifications

Two specifications for RTD cable replacement were prepared and forwarded to RLOO-AEC with the purchase requisitions for bid purposes.

Work Platform Gratings

Laboratory tests using four alternate methods of applying a safety grid surface on work platform aluminum gratings were completed. It appears that cleaning the aluminum surface by sand blasting is the best and quickest method.

Process Piping System Studies

Little progress has been made on visual inspection or radiography of line interior during the last month because of lack of long scheduled reactor outages. Initial tests on the removed section No. 25½ front crossheader from 105-DR Reactor revealed considerable lack of penetration and fusion at the saddle weld. There was no evidence of stress corrosion cracking in the main body; however, ultrasonic tests revealed some irregularities in the structure which are being investigated further. The engineering program document for the processing piping inspection program which is a part of this over-all study has been completed and issued.

DECLASSIFIED

DECLASSIFIED

EQUIPMENT DEVELOPMENT

105-K Reactor Zirconium Tube Program - Development

During the outage at KW Reactor, in which 640 channels were bored prior to the installation of zirconium tubes, a basic design deficiency was noted in the boring machines. The slip tube which provides a continuous vacuum connection between the drive shaft and the vacuum line galled and required replacement. Analysis of the problem indicates that the flexibility of the vacuum tube extension causes the drive shaft to bind in the slip tube bearing. The bearing is being redesigned to accept the drive shaft distortion. With the correction of this deficiency, development effort on K Reactor boring equipment will be completed.

Self-supported Fuel Element (SSFE) Charging

During the outage at KW Reactor 280 irradiated and 600 empty tubes were scheduled for charging with self-supported fuel. Charging of the 600 empty tubes was accomplished at a rate of 31 tubes per hour using the Union and HAPCO designed charging machines.

Initial displacement discharging of the irradiated tubes with the Union Machine Works charging machine was not successful due to damage occurring as the fuel element left the charging machine adapter and entered the nozzle. The adapter was modified and displacement discharging was accomplished with no fuel element support damage.

The Mark II prototype charging machine designed and fabricated by Union Machine Works has been completed and was received at HAPCO on August 31, 1963.

Bids have been received from Dow Chemical Company and Pacific Steel Products Company for 400 all magnesium prototype magazines for use with the new charging machines. Bids are being reviewed prior to order placement.

Prototype High Speed Scanner

No problems or unusual conditions were experienced on the prototype high speed scanner system. Approximately 22,746 operating hours have been logged.

K Reactor Resistance Temperature Detector (RTD) Corrosion

Work continued on the investigation of the corrosion problems associated with the RTD assemblies at the K Reactors. Numerous RTD samples were received with the various types of plated and silicone varnish coatings.

Coated, sample RTDs have been installed in test facilities by Coolant Systems Operation and testing is in progress. Investigation of coating RTD stems with glass and stainless steel is being pursued with the McGraw Edison Company. If feasible, samples will be obtained for on-site testing.

Design Test Services

The N-Reactors program utilized 462 hours of engineering effort for design test service.

PROJECT ENGINEERING

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

The Commission authorized an additional \$51,000 for procurement and partial installation of critical equipment. The total authorized funds are \$65,000, which includes the \$14,000 previously authorized for design. Drawings of an all-steel pallet and a yoke for transferring two magazines from pallets to the charging machine have been completed and purchase requisitions issued for procurement of prototypes.

The bid opening date for the purchase of four traveling cranes is scheduled as September 3, 1963. A requisition is being prepared to purchase another charging machine.

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

The revised construction schedule was approved by the Commission on July 30, 1963. Additional information is required from the supplier of the safety circuit system before detailed design can be completed. This information is promised for mid-September. The request from the supplier for additional money for the safety circuit equipment has been reviewed and a letter has been sent to RLOO-AEC outlining the reasons why the claim is not merited.

Bids on the neutron detection system have been rejected. Minor modifications were made to specifications and new bids are required by September 13.

CGI-939, Analog-to-Digital Converter System for Temperature Monitoring, B, C, D, DR, F, and H Reactors

Construction work at the final area (105-C) was completed with exceptions on schedule August 15 and the completion report submitted to RLOO-AEC. All other areas have been completed with no exceptions. Remaining project-responsible work at C Area will be completed and project Acceptance Test Procedure run following the installation and activation of MFA-5+ stepping switches.

CAI-940, Installation of Oil-Burning Facilities in Lead Boiler, 184-E

A review of our design requirements is being made. It is believed that revisions can be made to the scope proposed by the equipment vendor which will allow performance of the work within authorized funds. Extension of time for performance will, however, be required.

DECLASSIFIED

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

Title II Design work is proceeding under the Vitro Engineering Company on-plant and is currently an estimated 90% complete against a scheduled 98%. First priority has been given to the Title II Design work involving the 105-K work platform system. Requisitions and specifications have been completed on all engineered equipment items. Bids have been received on three items. Bids are being placed on two items. The bid on brakes approximated \$80,000 as compared to the estimate of \$70,000.

The Commission has approved Project Representatives Meeting Minutes Nos. 4 and 5. This deletes the truss overload deflection devices from the project scope and also allows retention of existing in-line platform drive synchronization shafts. This alteration will allow savings in excess of \$100,000 if the entire project is constructed.

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

The bids for the static switching assemblies were opened August 8 and there was only one bid; the bid was considered nonresponsive since it failed to supply the backup information for the proposed components as required by the invitation to bid. A new bid package is being sent to fabrication shops for bids on the original required design system and the functional specification and drawings have been included as an alternate. Bid opening date on the new invitation is September 18.

CGI-967, High-Speed Scanning System for Temperature Monitors, KW Reactor

Following receipt of the procurement package and direction from the Commission to negotiate with the required vendor, GE Purchasing has initiated procurement action. They have sent the equipment specification and procurement drawings to Astrodata for evaluation prior to contract negotiations.

CGI-976, Automatic Filter Backwash, 183-DR Building

The system was satisfactorily tested August 19 and acceptance with minor exceptions was achieved August 21. The completion report has been submitted to RLOO-AEC. The difficulty since encountered with failure of solenoids in the control valves is currently under investigation.

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

Detailed design of this project was 70% complete on August 15, 1963. Purchase requisitions have been written for all engineered equipment except for the recorders to be located in the Control Room. Drawings are ready for approval when a final decision is made on the location of the holes to be drilled through the rear shielding wall.

Several items of cost savings were turned in on this particular project. Included are the use of existing sample take-off valves, relaxation of

the Inconel tubing specification, the use of soldered brass connections at the heat exchangers, and similar design innovations. So far these cost savings amount to approximately 10% of the total authorized project funds.

MJA-47, Pressure Monitor Modification and Repair, 105-B, D, DR, and F

Only a token quantity of gages have been received from the vendor since movement of the production facility to Skokie, Illinois. Procurement personnel have been in contact with the vendor in an attempt to stimulate production of gages. This current delay, added to the delay in starting production, has made necessary revision of the completion date to December 31, 1963.

100-K Zirconium Retubing Program

A total of 3,696 zirconium tubes have been received from the Wolverine Tube Company. Of these, 2,800 have been accepted after plant-site inspection, and 77 have been rejected and returned to the vendor.

Quotations were received on new extruded nozzles for the spline tubes. After approval from the Commission, the order was placed with the C. L. Gougler Machine Company.

Project Proposals Submitted to RLOO-AEC

CGI-112, Increased Storage Basin Overflow, 105-KE and KW.

Directives Received

HW-541, Mod. No. 2, "C" and "D" Work Platform Safety Improvements, All Reactors.
(Reduced funds to \$600,000)

HW-552, Mod. No. 1, Fuel Element Charging and Handling Systems, KE and KW Reactors (Increased funds to \$30,000).

HW-552, Mod. No. 2, Fuel Element Charging and Handling Systems, KE and KW Reactors (Increased funds to \$65,000).

CPFF Construction Service Contractor-Liaison

Issued seven new work orders and supplemented three old jobs for a total of \$34,480 to J. A. Jones Construction Company.

Plant Forces Work Review

The Labor Standards Board approved three jobs for assignment to plant forces, estimated to cost \$95,910.

DECLASSIFIED

RT Jessen
Manager, Facilities Engineering

RT Jessen:dgm

DECLASSIFIED

HW-78780

FINANCIAL

ACCOUNTING

As a result of meetings with the Vitro Engineering Company, General Electric Company representatives agreed on the work authorization form and format for work contracted with the Architect Engineer. It was also agreed that a weekly cost report of work in process would be issued by the Architect Engineer.

The AEC requested additional detail on maintenance costs included in the current Reactor Cost Study Document HW-77951. The information, which included base case maintenance cost estimates by reactor through FY 1972, was submitted to the AEC through Contract Accounting as requested.

The AEC requested an estimate of radioactive waste burial costs during FY 1963 and a report on costs incurred at each burial location during the first six months of FY 1964. We have established a procedure to obtain this information and the information for FY 1963 was forwarded to Contract Accounting.

A letter was written to the AEC in reply to their August 6, 1963, letter regarding Planned Maintenance Jobs for FY 1964. Since we did not receive comments from the AEC prior to June 30, 1963, work was initiated on one maintenance job, Relocation of Terminal Board-F Reactor. A contingency maintenance request has been submitted to the AEC for approval to proceed with this work.

Manager-Finance

FW McMichael:RET:slb

SIGNIFICANT REPORTS ISSUED

<u>Number</u>	<u>Class'n</u>	<u>Author</u>	<u>Date</u>	<u>Title</u>
HW-76836	Unclass.	DF Watson	8-1-63	Engineering Review of Critical Process Piping - Program for Inspection
HW-78019	Unclass.	JE Boyd	6-24-63	Project CGI-960 Representatives Meeting No. 4
HW-78134	Unclass.	JE Boyd	7-9-63	Project CGI-960 Representatives Meeting No. 5, "C" and "D" Work Platform Drive Synchronization Shafts
HW-78357	Unclass.	GE Peck	8-15-63	Preliminary Engineering Study, Laundry and Storage Facility Addition - 105-D Building
HW-78596	Conf. Undoc.	HW Heacock	8-9-63	Tritium Production Horizontal Control Rods.
HW-78343	Unclass.	RR Henderson JP Cooke	7-29-63	Operation of C Reactor Process Atmosphere System
HW-78376	Unclass.	HF Jensen	7-22-63	Cleaning Procedure for the NPR Secondary Piping
HW-78578	Unclass.	DF Arnold	8-7-63	Evaluation of Oil Immersed Stepping Switch Performance in 105-D Area, Post CGI-939 and DC-631
HW-77628	Unclass.	RK Smith LJ Nitteberg	5-14-63	NPR High Efficiency Filter Bid Evaluation Humidity Test Report
HW-77925	Unclass.	M Pociluyko	7-25-63	Design Test 1160, N-Reactor Pressure Drop and Plugging Tests
HW-78421	Unclass.	WEB Lander	7-26-63	Final Report for Design Test 1182, 105-K Zirconium Tube Life Determination, Reduction of Support Rail Height on KVN
HW-78480	Unclass.	WEB Lander	8-8-63	Final Test Report for Design Test 1175, Submerged Water Jet for Moving Irradiated Fuel Elements, 105-K

Number	Class'n	Author	Date	Title
HW-76392 Sup B	Unclass.	JL Rusk	8-12-63	Design Test 1140, Sup. B, Nozzle Van Stone Gasket Seat Strength Test, 105-K Zirconium Retubing Program
HW-76392 Sup A	Unclass.	JL Rusk	8-15-63	Design Test 1140, Sup. A, 105-K Van Stone Gasket Evaluation
HW-78600	Unclass.	JL Rusk	8-21-63	Design Test 1144 Final Report, 100-K Van Stone Flange Strength Test, 105-K Zirconium Retubing Program
HW-78524	Unclass.	M Pociluyko	8-21-63	Design Test 1152, Flow Calibration Test NPR Safety Flow Control Leg, Report of Test Data
--	Unclass.	JM Goff, Jr.	7-25-63	Van Stone Flange Strength Test, Hard Temper, B-D-F Type
--	Unclass.	JM Goff, Jr.	7-26-63	Report on Design Test 1183, New Gunbarrel Gas Seal Leak Test, 105-DR and H
--	Unclass.	GF Ehlers	8-14-63	Blast Test Vibration Measurements
HW-78607	Secret	WL Stiede	8-9-63	Zone Temperature Monitoring Grid Study - B, D, DR and F Reactors
HW-78595	Secret	RD Carter, WI Neef	8-15-63	E-Metal Usage and its Optimization
HW-78740	Secret	WI Neef	8-23-63	Cost of Removing Process Tubes from Service
HW-78525	Secret	LE Kusler, LW Lang, HC Rathvon	8-7-63	HAP0 Isotope Program - Po-210 Production
HW-77221	Unclass.	RE Tillier	8-1-63	Clumsy I - A Time and Space Dependent Reactor Kinetics Code by the IBM 7090 Computer
HW-78368	Secret	RE Tillier	7-24-63	Effective Delayed Neutron Fractions and Decay Constants in the Hanford Production Reactors
HW-78356	Secret	RE Tillier	7-25-63	Neutron Lifetimes in the Hanford Lattices

Number	Class'n	Author	Date	Title
HW-78547	Secret	FF Nichols, R Nilson	8-7-63	Comparison of Physics Parameters for N and K Reactors
HW-78553	Secret	AR Maguire	8-6-63	Unusual Incident Report - No. 25 Crossheader Damage
HW-78364	Unclass.	CR Barker WW Porter	7-24-63	Van Stone Flange Gaskets for Reactor Rear Face Process Tubes
HW-78674	Unclass.	GW Biedeman	8-19-63	182-B Pump Turbine Failure
HWS-7360	Unclass.	EW Acker	7-29-63	Procurement Specifications for Programming Recorder - Controller System 189-F
HW-78509	Unclass.	HC Copeland	8-1-63	184-B Boiler Performance Test
HW-78621	Unclass.	HC Copeland	5-10-63	184-H Boiler Performance Test
HW-78276	Unclass.	EJ O'Black	8-15-63	Review of the July 17, 1963 BPA Electrical Disturbance and Effect on IPD Equipment Operation
HW-78602	Unclass.	JG Parsons	8-14-63	Charge Platforms Protective Devices, All Reactor Buildings
HW-78746	Secret-RD	JW Hedges	8-23-63	Interim Pumping Modification Review
HW-78583	Secret	LM Loeb, WN Mobley	9-9-63	Fuel Element Development Committee Annual Report from the General Electric Company - Hanford

DECLASSIFIED

VISITORS

<u>Name</u>	<u>Firm & Location</u>	<u>Date</u>	<u>Purpose</u>
P Thompson	GE-APED San Jose, Cal.	7/17-18/63	To correct trip circuit interactions on a logarithmic picoammeter of their design.
JJ Dietz	McGraw-Edison Co. West Orange, New Jersey	8-7-63	To discuss RTD cable integral connector and RTD corrosion resistant coatings.
V McCormick	Ingersoll-Rand Co. Portland, Ore.	7-23-63	Inquire on delivery date of special right angle drive air motor.
Dr. K Newman F Morris	Turco Products, Wilmington, Cal.	8/22-24/63	Consultation with technical personnel using their product.
WA Kates	WA Kates Co., Deerfield, Ill.	8/15-18/63	To witness tests on Kates regulators (CGI-904).
RL Ohmie	Manning, Maxwell and Moore, Inc. Seattle, Wash.	8-7-63	To reset safety valves on No. 5 boiler at Building 184-D.
AC Pertmer	Combustion Engineering, Inc. Seattle, Wash.	8-28-63	Consultation on installed equipment.
WA Kates	Kates Corporation Deerfield, Ill.	8/12-15/63	To test modified flow regulators.
GA Moudrey	Harvey Aluminum Co. Torrance, Calif.	8-19-63	Nickel segregation, aluminum caps and cans.
DM Guy	ALCOA Seattle, Wash.	8-27-63	General, cap and can problems.
J Horton	Travelers Indemnity Seattle, Wash.	8-15-63	Third Party Inspection of No. 6 boiler - 384 Building.

TRIPS

<u>Name</u>	<u>Firm & Location</u>	<u>Date</u>	<u>Purpose</u>
RS Hammond	Union Machine Works; Pacific Steel Products; Dow Metal Company; Seattle, Wash.	8-7-63	To discuss purchase orders held by these companies
CA Munro	International Design Corp., Tacoma, Wash.	8-5-63	To discuss Contract DDR-172
PB McCarthy	Union Machine Works, Seattle, Wash.	8-22-63	To inspect SSFE charging machine being built by Union Machine Works under Contract DDR-169
JA Dear	General Electric- APED, San Jose, Cal.	8/13-15/63	Employment interview at their request.
FJ Mollerus	IEEE Pacific Annual Meeting, Spokane, Wash.	8/26-29/63	Serve as Moderator, Nucleonics Session. Attend selected technical sessions.
RT Jaske	Bureau of Reclamation Grand Coulee Dam, Grand Coulee, Wash.	8/2-3/63 8/8-9/63 8/15-16/63 8/26-27/63	Conduct measurements of thermal inventory. Review program details with Bureau of Reclamation.
KW Gerdes	Vallecitos, Calif.	8-15-63	Interview
GJ Rogers	Univ. of Calif. Los Angeles, Calif.	8/12-23/63	Attended a course, "Reliability and Statistical Methods in Industry"
JT Stringer	National Lead Co. Fernald, Ohio	8/26-27/63	Feed site liaison activity at NLO
	GE Research Lab. Schenectady, N.Y.	8-28-63	Contact with GERL on programs
	GE Engineering Services New York, N.Y.	8/29-30/63	Discuss quality control programs systems and organizational philosophy
ES Bell	Columbus Tool & Die Company Columbus, Ohio	8/5-13/63	Conduct test runs on the automatic welders for 313 Building
JA Cowan	General Electric Co. Schenectady and Crotonville, N.Y.	8/25-28/63	Attend Measurements and Work Standards Seminar

DECLASSIFIED

END

**DATE
FILMED**

2 / 8 / 93