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IRRADIATION PROCESSING DEPARTMENT

MONTHLY REPORT

SEPTEMBER 1961

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HANFORD ATOMIC PRODUCTS OPERATION

GENERAL ELECTRIC

RICHLAND, WASHINGTON

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MONTHLY REPORT
SEPTEMBER, 1961

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By IL Phillips 8-11-92
DJ Kucher 2-12-92

Compiled by
IPD Personnel

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By J.P.P./AR
Date 5/15/73
U. S. AEC Division of Classification

October 16, 1961

RICHLAND, WASHINGTON

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

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TABLE OF CONTENTS

<u>SUMMARY</u>	A-1
<u>GENERAL</u>	A-3
<u>RESEARCH AND ENGINEERING</u>	
Process and Reactor Development Operation	B-1
Process Technology Operation	B-10
Operational Physics Operation	B-16
Testing Operation	B-22
<u>MANUFACTURING</u>	
Production Operation	C-1
Reactor Operation Statistics	C-3
Applied Reactor Engineering Operation	C-8
B-C Reactor Operation	C-11
D-DR Reactor Operation	C-12
F Reactor Operation	C-13
H Reactor Operation	C-14
KE-KW Reactor Operation	C-15
<u>FACILITIES ENGINEERING</u>	
Reactor Modification Design Operation	D-1
Equipment Development Operation	D-3
Plant Engineering Operation	D-4
Project Engineering Operation	D-6
<u>NPR PROJECT</u>	
Process Design	E-1
Field and Operations Engineering	E-3
Program Evaluation	E-7
<u>FINANCIAL</u>	F-1
<u>RELATIONS PRACTICES</u>	F-1
<u>SIGNIFICANT REPORTS ISSUED</u>	H-1
<u>TRIPS</u>	H-3
<u>VISITORS</u>	H-6

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SUMMARYRESEARCH AND ENGINEERING

The power levels at all reactors are currently limited by bulk outlet temperature restrictions. A reactivity gain of about 2 mk resulted from the major ball removal attempt at DR Reactor which was made simultaneously with the block discharge early in September.

Flow anomalies were observed in three of the C Reactor 20-tube overbore facility. Investigation indicated that the difficulty was caused by misalignment of the unsupported, solid aluminum spacers in the downstream dummy pattern. Replacement with self-supported solid aluminum spacers was made and operation has been satisfactory. During the September 16 outage, 32 columns of standard-sized, self-supported fuel were discharged and recharged at C Reactor without difficulty.

To date, 1320 tubes of bumper fuel have been irradiated and discharged from D Reactor, and 1500 tubes are currently under irradiation. Three failures occurred during the report period but none were related to the bumper support concept.

Of the seven N-size inner tube elements being irradiated in KER-1, five have reached an exposure of 1720 MWD/T and two an exposure of 675 MWD/T. The last two and two of the high exposure elements have capped jacket defects for future testing in the PRTR Rupture Loop. A short term fuel loading in KER-2 to determine if fuel element fouling would occur from small amounts of resin in the loop was completed; visual examination of the elements indicated no unusual film formation. KER-2 was then recharged with five 23-inch N-size inner tubes for a long term irradiation. KER-3 and KER-4 Loops remained shut down for Project CGI-839 revisions. General Atomic requested an increase in test conditions of the DR-1 Loop to raise the cladding temperature to 1700 F. The change was made in increments of 50 F reaching 1700 F at the end of the month.

MANUFACTURINGProduction

Reactor input production (MWD) was 7.5 per cent below forecast; 15.8 per cent below at the six old reactors and 3.6 per cent above at the K's.

Over-all time operated efficiency was 71.3 per cent (80.6 per cent forecast); 66.6 per cent at the six old reactors and 85.3 per cent at the K's. Efficiency was low at the old reactors due largely to tube replacement, water leaks and block discharges at DR and H Reactors.

There was no increase in the combined reactor instantaneous power level nor in the individual reactor record power levels.

Nine ruptures, eight I&E enriched metal and one I&E regular, were removed from the reactors. Three of the enriched ruptures were at F, two at DR, two at H and one at D. The regular metal rupture was at D. Three of the ruptures, one regular metal and two enriched, were caused by charging machine damage.

Engineering

Drafts of two Equipment Maintenance Standards were issued for comments. Inspection gages were provided to Component Testing Operation for use during the scheduled inspection of inlet gunbarrel flange retaining rings at both K Reactors. A Design Change for replacement of inlet nozzles fabricated by impact extrusion was approved and issued.

FACILITIES ENGINEERING

Engineering assistance has been requested from the General Engineering Laboratory regarding the graphite distortion problem. Efforts will be directed initially toward the evaluation of alternate materials for use as sleeves in the vertical safety rod channels. Boroscope and traverse measurements were completed on No. 37 VSR channel at C Reactor. The channel was relatively straight when compared to fringe channels; however, the channel was obstructed by a protruding block below the full in-rod position. A visual examination with a closed circuit television system of nine VSR channels at DR confirmed earlier boroscopic examinations. Statistical methods have estimated a total of 344 broken blocks adjacent to VSR channels.

Three operational fueling cycles were performed at 105-KE Reactor. Some difficulty was experienced on two occasions with check valves not seating. The tubes involved were discharged and left empty; however, the difficulties have since been remedied.

The remote manipulator was utilized successfully at the 105-DR Reactor to remove the cap from a nozzle which contained an irradiated fuel element.

An inspection revealed no serious damage as a result of operating the 1904-H overflow flume with full reactor flow during the effluent line stoppage in July.

Reactor charge platform weighing was completed this month with the weighing of the equipment in 105-B and DR.

NPR PROJECT

Preliminary testing has been completed on sample carbon steel to zirconium process tube joints utilizing a co-extrusion process.

All work in connection with NPR conversion (AEC-179) has been terminated in accordance with a Work Authority issued by the Atomic Energy Commission.

A purchase order contract for Bailey Meter Company to provide 109 instrumentation has been approved in the amount of 1.7 million dollars.

The prototype horizontal control rod drive for 87 production units has been approved for fabrication with the exception of the control valve panels.

Tests have been initiated on the fuel element discharge conveyor.

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Based on a recently developed computer program, the density of the inlet primary shield has been increased from 220 pounds per cubic foot to 245 pounds per cubic foot.

Mockup of the graphite moderator was completed September 22, 1961. All graphite machining is complete except for miscellaneous auxiliary and spare details required for unit final packing.

A total of 1,014 zirconium process tubes has been received. Seven-hundred and eighty-five have been processed and accepted for installation in the reactor. The Vacu-Blast equipment has performed satisfactorily on OD film removal but is still under test for ID film removal.

A strike of ironworkers and boilermakers welders from September 15 to September 26, 1961, essentially stopped all work relative to installation of reactor shielding.

GENERAL

RESPONSIBILITY

Effective September 1, 1961, the Relations Practices Operation was reorganized. The functions retained in the Irradiation Processing Department include:

1. Health, Safety and Fire Prevention reporting to Facilities Engineering Operation.
2. Office Service and Program Administration reporting to Manufacturing Operation.
3. The position Manager, Employee Relations.

W. D. Richmond, Manager - D-DR Reactor Operation, transferred to Hanford Laboratories Operation September 18.

A. R. Maguire, Manager - B-C Reactor Operation, was transferred to Manager - D-DR Reactor Operation September 18.

FORCE SUMMARY

	<u>Exempt</u>	<u>Non-Exempt</u>	<u>Total</u>
General	7	1	8
Research and Engineering	109	51	170
Manufacturing	413	1371	1784
Facilities Engineering	128	43	171
NPR Project	96	36	132
Financial	18	15	33
Relations Practices	3	3	6
TOTAL	774	1530	2304

SAFETY, SECURITY AND RADIATION EXPERIENCE

There were 76 medical treatment injuries, four security violations, and 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 except as listed below. Such persons further advise that, for the period therein covered by this report, notebook records, if any, kept in the course of their work have been examined for possible inventions or discoveries.

<u>Name</u>	<u>Date</u>	<u>Title</u>
G. F. Howden	9-20-61	Vehicle for Remote Manipulators
D. W. Peacock	9-7-61	The Chemical Dissolution of Polystyrene Base, Ion Exchange Resin

General Manager

AB Greninger:OCS:kn

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RESEARCH AND ENGINEERING OPERATION

PROCESS AND REACTOR DEVELOPMENT

REACTOR FUELS

Present Reactor Technology

Overbore Fuel Development

Twenty channels were bored, fitted with overbore size smooth-bore Zr-2 process tubes, and equipped with hardware during the 8-18-61 outage at C Reactor. The tubes were charged with 19 CVINS fuel elements each.

Channel 1459-C was equipped with an overbore size smooth-bore Zr-2 process tube and fitted with hardware during the 9-16-61 outage. The tube was charged with 18 CVINS fuel elements and has a flow rate of 62.2 gpm.

Three of the newly installed tubes were observed to have flow rates about 5 gpm lower than the others. On one of these tubes the Panellit pressure was observed to slowly increase 10 psi in two days; and on August 28, the reactor was shut down to investigate the cause of the low flow.

Of the possible reasons for the lower flow rates, cocking of the solid aluminum dummies used to throttle flow in the short charge tubes appears to be the most probable. These solid dummies are unsupported and a significant reduction in flow area is possible should a solid aluminum be completely misaligned, i.e., one solid aluminum held against the top of the tube while the others rest normally on the bottom. It was determined analytically that such a condition would result in a 4-5 gpm flow decrease when compared to the fully aligned charge flow rate.

The three offending tubes were discharged and recharged, the rear hardware was replaced, and the downstream dummy patterns on all 41 columns were inspected. The dummy patterns in all tubes using solid aluminum spacers have been replaced with self-supported solid aluminum spacers. No abnormal panellit pressures have since been observed.

Self-Supported Fuel Development

Thirty-two columns of self-supported fuel were discharged and recharged into C Reactor during the 9-16-61 outage without difficulty. There was no reported increase in the radiation levels at the pickup chute area above normal background.

Two columns of self-supported fuel elements were charged into smooth-bore Zr-2 process tubes in KW reactor on 8-14-61. These columns reached an average exposure of about 200 MWD/T on 9-20-61.

Bumper Fuel Development

Ten columns of bumper fuel elements charged into KW Reactor on 6-27-61 reached an estimated exposure of 600 MWD/T on 9-20-61. Scheduled goal exposure is 1200 MWD/T.

Twenty-six columns of bumper fuel charged into D Reactor on 8-6-61 as part of the UT-2 Fuel Core Tester evaluation have reached an estimated exposure of 270 MWD/T.

To date, 1320 tubes of bumper material have been irradiated and discharged from D Reactor; 1500 tubes (both natural and enriched) are currently under irradiation. Three failures have occurred in bumper fuel at D Reactor during this report period; however, none of the failure mechanisms were associated with the bumper support concept. Two were internal coolant channel (hole) failures and the other was a mechanical damage failure.

Nickel Plated Fuel

Seventy columns of nickel plated OIIN fuel elements were charged in DR Reactor during the 9-5-61 outage. Twenty of the 70 columns were charged as monitor columns and the remaining 50 were lot-charged. Two plate thicknesses, a nominal .6 mil and a nominal .2 mil, are represented equally in the monitor columns. Special effluent sampling arrangements have been made for monitoring the effluent activity from two tubes charged with .6 mil plate.

Coextruded I&E Fuel

Six columns of coextruded I&E fuel elements charged into KW Reactor on 8-14-61 have reached an estimated exposure of 320 MWD/T.

Advanced Reactor Technology

N Reactor Fuel Development

Three 17 inch NIEL elements and two 17 inch NIEL elements, with capped jacket defects for failure testing in the PRTR rupture loop, have been irradiated in KER-1 to an average exposure of 1720 MWD/T. Two more 17 inch NIEL elements with capped jacket defects added to the charge on 7-19-61, have reached an exposure of 675 MWD/T.

The short term fuel loading in KER-2 consisting of one 17 inch NIEL element, one 23 inch NIEL element, and one 23 inch NINL element were discharged on 9-17-61. The discharge exposures of the NIEL elements were 230 MWD/T and the exposure of the NINL element was 200 MWD/T.

KER-2 was charged on 9-17-61, with five twenty-three inch NIEL elements for a long term irradiation. These elements have an exposure of less than 10 MWD/T.

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STATUS REPORT OF PRODUCTION TESTS

<u>Test No.</u>	<u>Type Metal</u>	<u>Tubes</u>	<u>Reactor</u>	<u>Goal Exposure</u>	<u>Current Exposure</u>	<u>Remarks</u>
IP-183-A	K size bumper fuel. KIVN-B	10	KW	1200 MWD/T	600 MWD/T	Repeat of an earlier inconclusive test to evaluate the reduction of hot-spot frequency associated with bumper fuel elements in a K ribbed process tube. Ten tubes of bumper and ten tubes of non-bumper control elements charged on 6-25-61.
IP-216-A	Normal prod. natural and enriched fuel elements	107	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 use. Test is continuous.
IP-225-A	Solid black Li-Al	7	H	2 yrs	23 mo.	Provides for long term irradiation of solid black Li-Al for conversion ratio, and fuel performance determination.
IP-263-A Supp. A	Nickel plated OIIN fuel	70	DR	Twice normal variable goal		Demonstrate on a pilot scale that satisfactory nickel plate adhesion has been attained and that reducing nominal plate thickness from .6 mil to .2 mil does not affect this parameter. Seventy columns were charged into DR Reactor on 9-5-61.
IP-272-A	CIVN geometry I&E self-supported fuel	69	C	Variable +200		Provides for testing of CIVN geometry fuel in C Reactor ribless zirconium tubes.
IP-310-A	OIIINB three-rail bumper in new tubes	26	D	Variable		Determination of the dimensional stability of uranium fuel cores classified by the fuel core tester (UT-2). Obtains process tube corrosion data for bumper fuel elements with various mixer arrangements.

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<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-381-A & IP-431-A	CVIN geometry I&E overbore- size fuel		C	800 MWD/T		Provide preliminary qualitative data regarding irradiation behavior of larger fuel element designs. PT-431 expands the test facility up to 65 tubes. Twenty tubes installed outage of 8-19-61.
	a) CVINS	40				
	b) CVINB	2				
IP-377-A	Five 17-inch NIEL elements, two with capped jacket defects	1	KE	2000 MWD/T	1720 MWD/T	KER-1 charged 5-28-61, with five NIEL elements.
	Two 17-inch NIEL elements with caped jacket defects				675 MWD/T	Two NIEL elements added to charge 7-19-61.
	One 23-inch NIEL; 1 one 23-inch NINL; one 17-inch NINL element		KE	< 2000 MWD/T	230 MWD/T	Elements charged in KER-2 on 9-1-61 for one operating period and discharged 9-19-61.
	Five 23-inch NIEL elements	1	KE	3000 MWD/T	<10 MWD/T	Elements charged in KER-2 on 9-17-61 for high exposure test.
IP-397-A	Zircaloy clad enriched I&E fuel elements	6	KW	Variable	320 MWD/T	Provide irradiation experience for elements fabricated by NPR manufacturing process. Two tubes initially charged on 5-25-61 were discharged on 8-14-61 at 680 MWD/T.
IP-409-A	KVNS geometry I&E self-supported fuel in K Reactor	2	KW	800 MWD/T	200 MWD/T	Provide qualitative data to confirm the fuel geometry design.

HM-71230

Loops 3 and 4 remain out of service for modification.

Nomenclature: (NIEL - NPR sized inner tubes - enriched uranium)
(NINL - NPR sized inner tubes - natural uranium)

REACTOR ENGINEERING

Present Reactor Technology

Overbore Tube Procurement

A visit was made to Wolverine Tube Company and Chase Brass and Copper Company to review the status of qualification orders to fabricate C overbore Zr-2 process tubes, held by these companies. **Wolverine made extrusions by September 15** and, following conditioning, the extrusions are to be rocked at the Inkster facility. The order should be completed by November, 1961. Under the Chase Brass and Copper order, 100 percent scrap ingots are being melted by Carborundum Metals. The completion date of this order should be December 15, 1961.

Tube Reducing Corporation was visited to review the status of Contract DDR-122 to develop a method of converting C size Zircaloy-2 process tubes for use in the K Reactors. TRC has successfully developed a two-step process that provides acceptable inner and outer surface and dimensions.

Heat Decay Test

On September 5, the first portion of a test to measure the heat decay rate immediately following reactor shutdown was conducted at the DR Reactor under the provisions of Production Test IP-338-AI, "Reactor Heat Decay Test at High Outlet Water Temperatures". The test was conducted at this time to obtain data under conditions of near-maximum process water inlet temperature. The second portion of the test will be conducted later in the year to obtain similar data at elevated outlet water temperatures.

Process Water pH Tests

On June 21, 1961, pH process water supplied to the KW Reactor was reduced from 7.0 to 6.6 under the provisions of Production Test IP-380-A, "Reduction of pH of Process Water". On September 23, a similar reduction in process water pH was initiated at the KE Reactor under the provisions of Supplement A to Production Test IP-380-A.

Advanced Reactor Technology

Thermal Cycling of Zr-2

The thermal cycling tests of Zr-2 have been completed by the General Engineering Laboratory, General Electric Company, under Contract ATH-IP-6-61.

KER Tubes

Two of the rejected NPR process tubes (CT-14 and AT-87) will be installed in the KE Reactor in the Loops 3 and 4 position under Project CGI-839. Each tube contained defects near one end which were eliminated in cutting the tube to a 48-foot length. The remainder of the tubes met all other aspects of the NPR specifications. In addition to the normal NPR inspection, the following additional measurements were made on these tubes:

- a. Kinescope of ID surface (TV).
- b. Two perpendicular ID measurements reported at 1-foot intervals over the length of the tube.
- c. Four Vidagage measurements at the ends of each ID measurement.

Technical Bases For Standards

Thirty-nine Technical Bases for NPR Process Standards have been completed in rough draft form.

NPR Hazards Review

Rough drafts have been completed for three sections of Volume I of the NPR Hazards Review: the Introduction, the Description of the Confinement System, the Discussion of Reactor Operations and Operator Training.

N Reactor Simulator

The computer excessed by the ANP project was not allocated to Hanford.

REACTOR PHYSICSPresent Reactor TechnologyC Overbore Performance

The twenty-tube block installed at 105-C is performing as predicted. The lowest tube power in the block (center) is about 87 percent of the average power in the edge tubes. Eighteen spike E columns have been charged to compensate for the reactivity loss. The maximum power generation in the highest power overbore tube is 100 kw/ft. The maximum power generation averaged over all twenty tubes is 89 kw/ft. The maximum power generation average over the surrounding normal size tubes is 63 kw/ft. The ratio of maximum power generation in the block to maximum power generation in the surrounding columns is thus 1.59. This compares with a 1.60 ratio predicted from three-group calculations and reported in last month's report.

Early-Warning Panellit System

In tests prototype switches (2B-X3-EVV) have run for over 2,000,000 cycles, and experienced no failures. Based on this figure, the switches have

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exhibited very good reliability (of the order of .99). Therefore, further on-reactor testing is acceptable. Production Test IP-415-B, "Panellit Gauge Early Warning Switches", document HW-69862 provides for on reactor testing of early warning switches and for testing "Delrin" bushing with 303 MA uniloy stainless steel and 416 stainless steel pivots.

Spline Poison Assurance

Data are being obtained on the neutron flux available from the test holes of the reactor as a potential neutron source for determining the concentration of boron in splines using transmission measurements. As previously reported, the use of a laboratory neutron source in a moderating material did not give sufficient intensity to accurately determine a difference of 10 percent in boron concentration.

A PCTR-determination of splines in a K lattice is underway. The eventual measurements will answer the following questions:

1. Worth of spline in wet lattice
2. Worth of spline in dry lattice
3. Worth of spline in center hole of I&E slug
4. Worth of spline in lattice cell edge.
5. Worth of spline after 10^5 MWD in reactor.

The principle information being sought is the burnout characteristic.

Critical Mass Considerations

As assistance to the design of criticality-safe, plastic, fuel magazines the possible addition of boron to the plastic has been investigated.

A three-group diffusion code has been used to determine how much boron would have to be added to the plastic to insure that the OIIE slug could not be critical in a flooded lattice. In initial runs, the epithermal fission cross section was adjusted so that the calculated material bucklings were reasonably close to known values for uranium-water lattices. Boron was then added to the water external to the fuel element only. It was found that 5.5×10^{-4} grams of natural boron per cm^3 would poison the lattice sufficiently to prevent criticality, even for optimum spacing.

Reactivity - K Lattice

A discrepancy continued to exist between measured wet-to-dry reactivity differences and calculated values for the K pile I&E fuel elements. Good agreement between measurement and theory exists for the other reactors in this matter - and also for the solid fuel element in K Reactor. An early remeasurement of the K lattice in the PCTR (in conjunction with the spline measurements mentioned earlier) is planned.

Nodal Model

The 9-node, speed-of-control program was used to calculate flux distortions for a reactivity ramp in either the top or center of a reactor. The results can be used to compare the flux distortions caused by the ramp as seen by a Beckman and octant system.

Work on the nodal model has been continued. At present it is planned to reduce the number of active nodes to six (seven slabs) and to incorporate individual reactivity gains, metal coefficients, and water loss functions into each node.

Overbore Physics

Initial experiments in the C exponential stack have been completed. The first test involved a measurement of the VSR local control strength in the dry lattice with present I&E geometry fuel elements. The uncorrected value is 150 μ B. This will be reduced when leakage corrections are made. The VSR local strength presently assumed in total control calculations is 120 μ B which includes a 15 percent safety factor.

Advanced Reactor TechnologyBall 3X Strength

Sufficient ceramic balls have been received to allow early measurement of the poison strength of this material in NPR.

RADIOLOGICAL ENGINEERINGRadiation Control Experience

The following table summarizes the radiation exposure experience of critical IPD classifications for the first 36 weeks of the 1961 badge year:

<u>Classification</u>	<u>Total Dose</u>	<u>No. of Employ- ees</u>	<u>Average Dose/ Employee</u>	<u>Extrapo- lated Year End Average</u>	<u>No. of Em- ployees over 3r Extrapo- lated Exposure</u>
Radiation Monitors	163858 mr	85	1928 mr	2785 mr	21
Processing Operators	428353 mr	252	1700 mr	2455 mr	23
Pipefitters	142146 mr	91	1562 mr	2256 mr	6
Millwrights	109657 mr	74	1482 mr	2140 mr	8

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Lapse of Control

Lapse of Radiation Control
Distribution by Reactor and Component

	<u>B</u>	<u>C</u>	<u>D</u>	<u>DR</u>	<u>F</u>	<u>H</u>	<u>KE</u>	<u>KW</u>	<u>IPD</u> <u>Totals</u>
Processing	0	0	0	1	0	0	0	1	2
Maintenance	2	1	1	0	1	0	1	0	6
Supplemental Crews	0	0	0	2	0	0	0	1	3
Power	0	0	0	0	0	0	0	0	0
Research and Engineering	0	0	0	0	0	0	0	0	0
Facilities Engineering	0	0	0	1	0	0	0	0	1
Central Maintenance	0	0	0	0	0	0	0	0	0
Reactor Areas	0	0	0	0	0	0	0	0	0
Assigned Totals	2	1	1	3	1	0	1	2	11

Vertical columns do not necessarily add up to the indicated totals, because in some cases a Lapse of Control may be chargeable to more than one component.

Effluent Water Data

The table below shows the average concentrations of radioisotopes in reactor effluent water from samples taken during August 1961. Concentrations are in units of (10⁻¹² curies/cc).

<u>Reactor</u>	<u>As⁷⁶</u>	<u>P³²</u>	<u>Zn⁶⁵</u>	<u>Np²³⁹</u>	<u>Cr⁵¹</u>
B	95	2.3	36	80	330
C	125	2.1	30	70	240
D	75	6.1	52	200	490
DR	80	3.6	94	90	360
F	50	4.0	48	80	270
H	90	2.8	9	80	280
KE	50	2.8	40	50	200
KW	40	8.7	6	60	350

A change was made in the alum feed rate at the KW Area because the concentration of P³² was twice that experienced in 1960 and much higher than the concentrations observed at other areas. The water plant control criteria for KW Area was changed on September 1 to producing water with minimum turbidity. This resulted in reducing the alum feed rate from 18 ppm to about 8 ppm. Insufficient time has elapsed to observe the effects of this change.

Hand and Shoe Counter

The hand and shoe counter being field tested at D Reactor has performed very satisfactorily for over a month. The sensitivity is better than that demonstrated by present hand and shoe counters even in the presence of very adverse background conditions. A cooperative effort has started to engineer revisions to the instrument to reduce the cost and increase its practicability to the user.

PROCESS TECHNOLOGY OPERATIONREACTOR POWER LEVEL LIMITATIONS

During this report period the power levels at all reactors were restricted by bulk outlet temperature limits.

PROCESS STANDARDSHW-46000 B, D, and F, Process Standards - Reactor

Three revised standards were issued during the month for each of these manuals. These were:

Process Standard C-130 - "Total Control Criterion"

The revision to this standard specified that rods may not be considered for total control purposes if calculations indicate they have lost any poison strength, or if they have been observed to have lost strength. The reactor physicist shall be responsible for assessment of rod strength.

Process Standard G-010 - "Distortion of Graphite Moderator, Process Tubes, and Reactor Shields"

Vertical bowing measurement frequency of process tubes in top of the reactor was reduced in this revision.

Vertical distortion data gathered over several years show that the reduced frequency of obtaining vertical traverse data provides the necessary data.

Process Standard H-010 - "Storage and Handling of Unirradiated Enriched Slugs"

Two revisions were made to this standard. The first revision authorized use of polyethylene clips attached to bumper slugs to aid in slug orientation during the charge operation. From a criticality standpoint, no change in storage array was necessary as a result of using plastic clips.

The second revision was made to clarify specifications that restrict the number of enriched charges that may be made up in advance of the charging operation.

HW-46000 H, Process Standards - Reactor

Two revised standards were issued during the month. These were:

Process Standard C-130 - "Total Control Criterion"Process Standard H-010 - "Storage and Handling of Unirradiated Enriched Slugs"

Revisions to these standards are identical to those made for the HW-46000 B, D, and F manuals, above.

B-10

DECLASSIFIED

HW-46000 K, Process Standards - Reactor

Four revised standards were issued during the month. These were:

Process Standard A-070 - "Thermal and Biological Shield Cooling Water"

The temperature gradient of the concrete pad at the bottom of the reactor has been controlled by specifying the exit temperature of the bottom thermal shield cooling water and the steel membrane temperature directly below the concrete pad. Difficulties have been experienced in meeting these specifications due to seasonal variations in the bottom shield cooling water temperature. Specifications were revised by placing a limit on the temperature of the bottom thermal shield which is equivalent to the temperature of the top surface of the concrete. The net effect of the change was a relaxation in the temperature gradient requirement but the limit is still below the value where significant damage will occur to the concrete pad.

Other changes to this standard were as follows:

1. Recirculation of inhibited water through the foundation cooling system was authorized.
2. Temperatures of the foundation and bottom shield must be measured hourly, while cooling flow is stopped in one or both foundation loops.
3. Operating specifications upon loss of coolant to individual tubes of the loops are based, in part, on fringe zone tube powers. These fringe zone tube powers were raised on the basis of data from Production Test IP-285-C.

Process Standard C-120 - "Poison Splines"

Splines used for safety control reasons must be of known poisonous strength. Splines will eventually lose poison strength on long irradiation. A specification in this revision requires that splines shall not be used for total control usage after 30 days in the reactor.

Splines irradiated for 72 hours or less may be re-used by new provisions of this standard. Splines irradiated for 72 hours exhibit no change in physical properties and calculations show that the reduction in poison strength is negligible.

Process Standard C-130 - "Total Control Criterion"Process Standard H-010 - "Storage and Handling of Unirradiated Enriched Slugs"

Revisions to these standards are identical to those made for HW-46000 B, D, and F manuals, above.

PROCESS CHANGE AUTHORIZATIONS

Twelve process change authorizations were issued during the month to permit temporary deviation from Process Standards - Reactor, HW-46000. These were:

PCA #1-59 - "Monitoring of Converted KER Process Tubes"

Process Standard A-050 stipulates that coolant pressure for process tubes containing any material in the active zone of the reactor must be monitored in the #1 safety circuit. High and low trip requirements are also specified. KER Loop tubes 3565 and 4268 were recently removed from the recirculation loop and returned to the normal process water system as front-to-rear test channels. Both tubes presently contain solid aluminum charges and are operating in critical flow condition, which does not afford low trip protection in the event of a front connector failure.

Process Standard K-020 permits irradiation of non-fissionable material in zirconium tubes without being monitored in the #1 safety circuit since a coolant failure would not result in a tube meltdown.

A temporary relaxation of Process Standard A-050 was granted to permit operation of zirconium tubes 3565 and 4268 in critical flow provided:

1. Each tube is monitored by a 0-400 psi Panellit gauge (Model 155-100) with a maximum high trip of 32 psi and a minimum low trip of 67 psi.
2. A trip of the Panellit gauge will initiate either a #1 safety circuit trip or a 105 control room annunciator circuit.

PCA #1-60 - "Speed-of-Control Limits - DR Reactor"

Process Standard C-140 does not specify speed-of-control limits for DR Reactor since the reactor has not approached the limit. However, because of the recent ball 3X drop, the current operating conditions at DR Reactor dictate temporary lower speed-of-control limits.

This PCA authorizes until December 1, 1961, use of the speed-of-control limits contained in Basis #C-3 of document HW-55500 RD. Responsibility for interpretation and administration of the limits was assigned to the reactor physicist.

PCA #1-61 - "Speed-of-Control Limits - F Reactor"

Process Standard C-140 specifies power level limits based on weighted graphite temperature and weighted exposure. The limit can also be expressed as a function of tube power rather than power level.

Due to a recent severe tube leak at F Reactor, the pile flattening has decreased below that assumed during calculation of the speed-of-control limit curves. Consequently, a lower pile power level is now equivalent to the same maximum tube power, and the lower value becomes the speed-of-control limit. It is expected that the flattening efficiency will improve rapidly as the reactor dries out; therefore, this PCA expires upon maintaining an ECT (effective central tubes) of 1500 at F Reactor.

This PCA specifies the correction to be made to speed-of-control limits by a means of a curve supplied which must be used whenever the ECT value is below 1500.

DECLASSIFIED

PCA #1-62 - "Removal of Process Water Backup to the KER Loops During a KE Reactor Outage"

Process Standard K-040 specifies coolant backup requirements for the KER loops on recirculation during reactor shutdown.

In order for the KER loops to obtain the increased emergency backup coolant flow required by Project CGI-839, it will be necessary to replace existing supply piping. This will require removal of emergency coolant backup to the KER loops and the 1706-KER single pass tubes, as well as complete coolant removal to the reactor's horizontal control rods and water cooled test holes. This process change authorized removal of the emergency process water backup supply to the KER loops after KE Reactor graphite temperatures were below 100°C, and in accordance with a detailed procedure which provided for an alternate supply of coolant in the event of failure of the normal coolant source.

PCA #1-63 - "High Graphite Temperature, DR Reactor"

Process Standard C-040 authorizes relaxed graphite temperature limits for 72 hours following a cold startup to permit flexibility in controlling reactivity. During a startup in August, excessive graphite temperatures resulted from rapid power level increases following turnaround.

Graphite temperature control is designed to ensure a certain lifetime of the graphite stack. Operation outside of these limits for a short period, on occasion, is desirable for control or production reasons.

Authorization was given to continue operation with graphite temperatures no more than 59°C above the limits specified by the standard. The PCA expired on the same day of issuance, when the reactor was shut down to charge additional enrichment.

PCA #1-64 - "Reactor Control - All Reactors"

Process Standard C-090 limits the number of vertical rods and ball 3X hoppers that are allowed to be out of service or by-passed during operation of a reactor. Based upon total control and speed-of-control calculations, the additional limits specified in the PCA are necessary to ensure adequate reactor control is always available.

The following requirements were specified in the PCA and supplement the specifications contained in the above standard:

1. No two adjacent vertical rods may be inoperable or by-passed during reactor operation.
2. The reactor physicist, Pile Physics Unit, must be notified whenever ball 3X hoppers are removed from service or by-passed.

This PCA will expire on November 27, 1961, or upon revision of the referenced standard, whichever is sooner.

PCA #1-65 - "Gas Flow - KW Reactor"

Process Standard B-010 specifies that the recirculation rate of the reactor atmosphere be maintained over 400 cfm whenever the water condensate collection rate exceeds 24 gallons per day. This specification is intended to ensure rapid removal of the water once it has entered the reactor.

The condensate collection at KW Reactor on August 28, 1961, immediately following startup from a water leak, was so rapid that the second drying tower became saturated before regeneration of the first tower could be completed. Because the K Reactors were constructed with only two drying towers, continued operation of the reactor would require recirculation of the gas atmosphere through a saturated drying tower or removal of both drying towers from the recirculation line. Removal of the second drying tower from the recirculation line would permit immediate regeneration of this drying tower; this would maximize, within design limitations, the drying capacity of the gas system. Because the booster blower was out of service, removal of both drying towers could not be accomplished without losing recirculation of the gas atmosphere to the reactor. It is believed that damage to the reactor moderator and components in this situation could be minimized by permitting continued operation of the reactor in a manner which will permit as rapid removal of moisture from the reactor as possible.

This process change authorized for one day no gas circulation at KW Reactor as necessary to maximize the drying capacity of the gas system, provided a positive pressure is maintained at all points in the reactor.

PCA #1-66 - "Temperature Monitoring During Shutdown - D Reactor"

Process Standards A-030 and C-050 specify frequencies and conditions of process tube temperature monitoring.

During the process tube thermocouple replacement program at D Reactor, all of the shutdown temperature monitoring requirements specified in the standard cannot be met.

To ensure that sufficient process tube temperature monitoring is available during the course of thermocouple replacement, a detailed list of requirements was specified in the PCA.

PROCESS ASSISTANCE

One engineer audited the conformance to process standard by making 19 inspections at each reactor during the report period.

B-11
DECLASSIFIED

RUPTURE EXPERIENCE

<u>Failure Date</u>	<u>Tube Number</u>	<u>Lot Number</u>	<u>Type of Material</u>	<u>Exposure</u>	<u>Type of Failure</u>
9/2/61	2667-H	KH-274-A	I&E EB (0.94%)	843	Hole
9/3/61	1465-D	KZ-067-E	I&E NB	13	Mechanical Damage
9/5/61	2178-F	KY-006-A	I&E E (0.94%)	338	Side Hot-Spot
9/6/61	1581-H	KY-081-D	I&E EB (0.94%)	544	Side-Other
9/15/61	4072-D	KY-024-D	I&E EB (0.94%)	986	Hole
9/15/61	2384-F	KY-062-A	I&E E (0.94%)	434	Side Hot-Spot
9/18/61	2561-DR	KY-096-A	I&E E (0.94%)	93	Side Hot-Spot
9/19/61	2795-F	KH-221-D	I&E E (0.94%)	1098	Side-Other
9/26/61	0766-DR	KY-096-A	I&E E (0.94%)	154	Mechanical Damage

Legend:

I&E EB - This is the symbol for internally and externally cooled production reactor fuel elements which have projections (bumpers) welded to the fuel element jackets. The uranium cores are enriched in U-235 and the weight per cent U-235 in the core material is stated.

I&E NB - This is the symbol for internally and externally cooled production reactor fuel elements of natural uranium which have projections (bumpers) welded to the fuel element jacket.

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

Hole - Failure on the internal surface of an I&E piece probably caused by water penetration through a weld or other unknown mechanism.

Mechanical Damage - Failure probably caused by mechanical damage to the fuel element prior to irradiation.

Side Hot-Spot - Failure probably caused by accelerated corrosion of the external can wall in a localized region of high temperature.

Side-Other - Failure probably caused by corrosion or water penetration of the external can wall or other unknown mechanism.

OPERATIONAL PHYSICS OPERATIONPILE PHYSICS ASSISTANCE

Sufficient additional enrichment has been charged to compensate residual effects of the July Ball 3X drop at the DR Reactor to permit continuing operation on bulk temperature limits. A relatively small amount of the reactivity loss was apparently regained following a major ball removal effort.

A major equilibrium rod configuration change at KE Reactor, replacement of upstream "outboard" rods with upstream "inboard" rods, was accomplished with only minor control technique changes necessary to permit efficient operation. Preliminary data indicates that the anticipated neutron flux flattening and upstream shifting were essentially realized.

"Nonpoisonous" splines were successfully used for obtaining flux distribution data. Reactivity effects of their insertion and withdrawal were negligible; outlet tube temperature increased about four per cent and the temperature rise between the ribs about 10 per cent. Based on these favorable results, "nonpoisonous" splines have been ordered for routine reactor flux traverse use.

SUMMARY OF OPERATING DATA OF PHYSICS INTEREST
FOR THE MONTH OF SEPTEMBER, 1961

Reactor	B	C	D	DR	F	H	KE	KW
ECT in August (1)	1520	1660	1480	1400	1420	1490	2500	2545
12-Month Average ECT	1510	1700	1495	1540	1455	1560	2540	2550
Equil. Scram Time (2)	14-16	30-35	13-17	18-22	14-20	35-45	20-25*	20-25*
No. of Scrams and Recoveries (3)	1/1	0/0	1/1	2/2	0/0	1/1	0/0	1/1
No. of Non-Scram Outages (4)	0/0	2/1	1/1	0/0	0/0	2/2	0/0	0/0
	3/0	2/0	4/0	4/0	4/0	4/0	3/0	2/0
Recording Period -								
From:	8-22	8-22	8-22	8-23	8-25	8-24	8-24	8-21
To:	9-21	9-20	9-21	9-22	9-22	9-21	9-21	9-21

*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 of the ten most productive tubes in the reactor.
- (2) This is defined as the maximum time available in minutes between scram and first indication of startup.
- (3) The first pair of numbers shows the number of brief outages from which secondary cold startups would be made and the number of successful startups. The second pair shows the number of brief outages from which hot startups would be made and the number of successful recoveries.

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- (4) The first number shows the number of ordinary outages (including those initiated by scrams followed by unsuccessful recovery attempts), and the second shows the number of additional outages to discharge temporary poison.

B Reactor - J. H. Ferguson

Operating efficiency was good with flattening and startup efficiency continuing at a high level. Operating continuity was interrupted by two full term outages, both for water leaks.

C Reactor - D. E. Newbrough

No significant operating problems have resulted from the recently charged block of 22 tubes of overbored material. Up to 20 per cent axial flux peaking relative to a full length pile cosine distribution has been measured adjacent to the block; at least a portion of this local peaking is the result of the shorter overbored charges. The calculated amount of enrichment to provide sufficient operating reactivity has proven to be adequate.

Number 10 HCR was replaced with a half-rod bringing to four the total number of cadmium rods which have been replaced in the last few months. The six remaining cadmium HCR's are either little used or will not approach burnout of the cadmium for several months.

The pile loading is being moved downstream 24 inches; the initial change was made with the 700 tubes discharged during an outage at the middle of the report period. The justification for this change is based on obtaining improved flux distribution (moving away from the upstream flux depressed area which is presumably caused by 3X balls in the lattice), possible reduction in enrichment requirements, and reduced front face radiation levels. This change has been planned for several months and has recently been made possible by (1) the necessary replacement of certain downstream cadmium control rods (which must be used for long rod control with the displaced charge location), and (2) spline traversing which permits frequent front-to-rear flux distribution determination.

One hot startup was successfully achieved following a scram from equilibrium conditions.

D Reactor - D. W. Constable

Five full length outages occurred during the month, associated primarily with ruptures and water leaks. Flattening efficiency has been somewhat lower than normal due to the outage frequency and operation on bulk limits. The nonequilibrium losses have been good, averaging less than 0.15 equilibrium operating day per startup.

DR Reactor - J. F. Jaklevick, Jr.,/L. L. Grumme

The reactivity gain from the major ball removal attempt in early September has been evaluated to be about 2 mk (compared to a total loss of about 15 mk);

with the block discharge occurring during the same outage, the possible inaccuracy in the determination was probably equal to about 50 per cent of the measured change.

The enrichment inventory increased to the extent that the flattening efficiency is now approaching the level preceding July's ball drop.

The reactivity loss resulting from September's block discharge was compensated by the addition of 50 enrichment columns. The full relaxation in graphite temperature limits permitted initially following a block discharge was not necessary because of the additional reactivity apparently gained from the concurrent ball removal effort.

Three outages occurred in addition to the extended outage for the block discharge and removal of 3X balls, two for fuel ruptures and one due to a gas loop trip.

F Reactor - R. B. Heiple

Nearly all the excess enrichment charged to compensate for the water in the lattice following July's water leak (see the August report) has been removed. Startup losses continued to average about 0.15 equivalent equilibrium day for the four startups during the report period.

To improve flattening efficiency for the low inlet water temperature operation this winter, the top and bottom portions of the enrichment "ring" are being advanced from the seventh to the sixth lattice unit from the edge of the reactor. This action should improve the flattening efficiency by about two per cent. Other nine-rod reactors have their top and bottom enrichment in this position.

H Reactor - S. L. Stewart

The operating continuity was interrupted by five full term outages and three shorter outages. The average flattening efficiency was limited by the relatively short equilibrium operating periods. During one startup, failure of the Flexowriter required conservative operation which resulted in an additional nonequilibrium loss of about 0.3 equivalent day. The average nonequilibrium loss for the other startups was less than 0.2 equivalent day.

Malfunction of the PCCF facility caused one shutdown.

The operation following charging of nearly half the second cycle of the E-N striped core loading proceeded normally with no problems.

KE Reactor - A. R. Kosmata/J.W. Hagan

The reactor operated with an "inboard" control rod configuration in the "upstream" rod banks after the August 30 outage - in other words the upstream rods used were in the bank near the longitudinal center rather than

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those farthest to the front. Initial operation indicates that control stability is only slightly more sensitive than with the "outboard" pattern, and except for utilizing the spline system to a greater extent for fine control adjustment the control techniques remained essentially unchanged. The initial two startups with this new configuration exhibited higher average nonequilibrium losses, namely 0.43 equivalent day per startup, as a result of a more deliberate approach to full power and avoidance of distributional flux cycling; however, with the experience gained during the initial startups and a modification in spline control techniques to compensate cycling tendencies, the normal nonequilibrium loss of 0.2 equivalent days was attained during the last startup of the report period.

Examination of the limited front-to-rear flux distribution data obtained from nonpoisonous spline traverses agreed with predicted calculated longitudinal flux distribution changes of a moderately less peaked flux distribution shifted upstream slightly; the calculated average rupture potential based on the present empirical rupture relationships appeared to be reduced by about the factor of three as previously predicted. A more complete longitudinal flux analysis utilizing spline traverses will be made as nonpoisonous splines become available for extensive traversing.

KW Reactor - R. A. Chitwood

The Number Three HCR apparently sustained an internal rupture while being used as a long control rod during equilibrium conditions. The rupture, which would have permitted rod cooling water to enter the section of the rod containing the powdered boron carbide, was indicated by a marked rise in the building exhaust gas activity and an increase in the rod effluent water temperature. A 40 per cent "half" rod was installed to replace the failed 60 per cent "half" rod formerly in the number three position.

The water leak occurring in the front portion of tube 4889 was accompanied initially by a slight increase in pile reactivity. The postulated mechanism was that the escaping water was vaporized, lowering the conductivity of the local gas; this would have the effect of raising local graphite temperature and consequently the pile reactivity. The residual water in the lattice following the startup following the leak forced about half the pile to operate with a reduced flux level for the first few hours until the water had been removed; a slightly higher nonequilibrium loss for the startup of 0.45 equivalent days resulted.

PROCESS PHYSICS STUDIES

Safety Control Studies

The conservative assumption that all of the residual balls left in the DR Reactor from the July Ball 3X drop detract from the effective strength of the safety control system has required the use of a considerable amount of supplementary control to meet total control requirements during outages. Two approaches are being followed to relieve this situation. Matching experiments between splines and E-columns were carried out in the Hanford Test Pile during the month. These measurements showed that the value

previously assumed for spline compensating effectiveness was conservative by approximately 30 per cent. The second approach currently being pursued is a rod drop transient comparison of the DR and older reactor systems to be conducted with equivalent detector geometry in each case. Although this type of measurement does not give good absolute evaluations in large reactors, it should show whether or not the DR system with larger VSR's is at least as effective in the ball-shadowed case as is the old reactor system in the normal loading.

Oscillations in flux distribution at the KE Reactor on September 2 and 3 afforded an excellent opportunity for obtaining data for establishing the geometrical detection requirements and limitations of an octant monitor system. These data will be compared with tube temperature maps taken during the same period of time.

Pile Reactivity Studies

A feasibility test for the method of determining stack purity at NPR was carried out at the NPR mockup in the 300 Area. Although quantitative results are still being analyzed, the qualitative results look encouraging. It is quite possible that the tubes will not be installed in the NPR reactor prior to the construction of the top shield, thus requiring that this test be carried out in blank channels. Channel irregularities will have to be considered in the design and accuracy of positioning components.

Steps were also taken during the month for financial arrangements for the procuring, testing and servicing of startup instrumentation. Such services will be provided by instrument development components from Equipment Development Operation in IPD and Physics and Instrumentation Research Operation in HLO.

Control Efficiency Studies

A series of reactivity tests have been completed to determine acceptable parameters for "weaker" poison splines for use in equilibrium trimming. The primary limitations are seal leakage if the spline is too narrow, strength limitations if the spline is too thin, and burnout limitations if the boron content is too low. Results indicate that a spline with 50 per cent of the reactivity strength of normal splines can be satisfactorily obtained, however.

Approximately 40 per cent of the second core of the H Reactor E-N loading was charged during the outage of September 10-15. The remainder of the second core will be charged during the week of September 25.

Manufacturer review of specifications for an automatic control prototype test has not been completed. Instrument Development personnel have corrected initial manufacturer misunderstandings of the specified circuits.

A production test has been written and is currently circulating for signatures to install the instrumentation which continuously records rod motion during equilibrium at one of the K reactors. This test, which is being sponsored for HLO, is intended to determine the dynamic response characteristics of a K reactor.

Shielding Studies

A letter of recommendations has been secured from the shield design engineer in Reactor Process Design regarding bottom thermal and biological shield temperature limitations at the K reactors. This letter confirms verbal recommendations regarding acceptable temperature gradients with respect to thermal stresses.

A thermocouple was installed against the concrete ceiling of the KW Reactor Ball 3X room and connected to a recorder. Continuous recordings of this temperature during a shutdown and operating period in August will be compared to similar data to be taken in February for "cold water" conditions.

Comparative gamma leakage readings before and after installation of the overbore tube in C-3265 showed a substantial reduction following the overbore installation. However, these results must be assigned in considerable part, at least, to the shortened charges in the overbore tubes.

Assistance was given during the month on shielding problems connected with a shield plug design at D Reactor, repair of the H Reactor near side viewer, and estimated effects of increased graphite temperature limits on fringe poison or gas atmosphere requirements.

Reactor Fundamentals Training

The program of supplementary training in reactor fundamentals for Pile Operators was resumed during the month. Approximately 50 operators will be attending the four classes each of which meets on one Friday per month for four months. A refresher series for Reactor Specialists was also started during the month. Guest speakers were available for each class; the subject of Supplementary Control and Nonequilibrium Losses was discussed for the Pile Operators, and a presentation on Radiation Shielding was made for the Reactor Specialists.

Assistance was also given during the month to use of the teaching machine which is being demonstrated for a week at each reactor plant. A short questionnaire consisting of six questions was prepared to obtain some idea of operator response to this type of learning device.

TESTING OPERATIONIRRADIATION TESTING OPERATIONDR-1 Loop

The DR-1 Loop was operated continuously during the past month with the exception of 95 hours during reactor outages. PT IP-376-D, Supplement B authorized the increase of test reference conditions to 1700 F cladding temperature, as requested by General Atomic. The temperature increase was made in 50 F increments, reaching 1700 F at the end of the month. Total time at reference conditions now totals 3127 hours, with 2841 hours at 1500 F, 70 hours at 1550 F, 126 hours at 1600 F, and 90 hours at 1650 F. The test element temperature was cycled three times from reference conditions to ambient temperature for a total of 23 cycles.

C-1 Loop

The C-1 Loop recirculation pump, returned to the vendor for repair, was returned to HAP0 and scheduled for loop installation during the next C-Reactor outage.

Borescoping Activities

Process Tubes 3265 and 3373, D Reactor - These tubes contained stuck green metal charges after the channels had been retubed. Several long gouges were observed in tube 3373. No noticeable damage was found in tube 3265.

Process Tube Channels 1958, 2084, 3558, 3779, 4269, and 4280, B Reactor - These channels were inspected prior to retubing to determine the condition of the channels to help resolve the tube replacement problems.

The normal split blocks and block separations were observed in all channels, but nothing unusual was observed. A detailed report of this examination has been issued.

Process Tube 2561, DR Reactor - This tube was examined to obtain information that might explain the cause of a fuel element rupture seven days after retubing and charging. There was a slight galling in the top of the tube from 18 to 24 feet in from the inlet nozzle. The top of the tube was also discolored from 30 to 31 feet in from the inlet nozzle.

Vertical Safety Rod Channel 37, C Reactor - This channel was examined to determine why the VSR could not be inserted all the way. The channel was obstructed by a graphite block which had moved into the channel 3-1/4 inches at 41'4" down from the top of the bumper block. Three balls, and a considerable amount of graphite dust, were observed on the top of this block. All of the channel above this point was in very good condition.

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Sample Irradiations

The following irradiation samples were handled:

Reactor	Test Hole	Facility	Request No.	No. of Samples	Material-Purpose
KE	2D	Quickie	HAPO-184	10	Washington designated program
KE	2D	Quickie	HAPO-172	2	Effluent water (activation analysis study)
KW	2D	Magazine	ORNL-172	1	Cesium (isotope production)
KW	2D	Magazine	ORNL-198	1	Antimony (isotope production)
KW	2D	Magazine	ORNL-200	1	Tungsten (isotope production)
KW	2D	Magazine	ORNL-204	1	Mercury (isotope production)
C		Process Channel	HAPO-098	24	Graphite (burnout rate study)
KE	2D	Quickie	U of W-104	1	Yttrium (isotope production)
C	Y	Hot Graphite	HAPO-177	11	Graphite (damage studies)
DR		PCCF	HAPO-218	3	Natural uranium (fission product release study)
F	E	Quickie	HAPO-262	2	Aluminum-nickel, silver (radioactive buildup of H-1 loop sample)
KW	3A	General Purpose	HAPO-236	2	Zirconium (creep capsules)
KW	4B	Snout	HAPO-243	6	Reactor structural materials (fission damage studies)
F	E	Quickie	HAPO-250	4	Ceramics (radioactive buildup and decay of VSR, HCR rod-liner materials)
KE	2D	Quickie	HAPO-252	1	Arsenic (tracer isotope production)
KE	2D	Quickie	HAPO-254	4	Phosphorus (tracer isotope production)
KW	2D	Magazine	HAPO-259	8	Ni, and Ni-base alloys (radiation damage study to sub-size tensile specimens)
KW	4C	Snout	HAPO-259	2	Ni, and Ni-base alloys (radiation damage to cup test and KAPL-type tensile specimens)
KW	4C	Snout	HAPO-251	1	Cobalt (radiation source for Biology Operations' gamma facility)
		Gamma*	HAPO-171	15	Plastics and rubber (damage studies)

*Gamma Irradiation Facility is located in Building 105-KE storage basin

Vertical Bowing Measurements

A summary of the results of vertical bowing measurements follows. All distances were measured from the process tube inlet flange or reactor face.

Date	Tube	Distance	Results
8-31-61	Y2-KE	42 feet	Down .23" at 11' since 12-19-60 Down .81" at 24'4" since 12-19-60
8-31-61	Z1-KE	41 feet	Down .01" at 17' since 8-8-60 Down .07" at 23' since 8-8-60
8-31-61	Z3-KE	14 feet	Down .56" at 14' since 7-16-60 Unable to traverse beyond 14 feet
9-1-61	4675-DR	32 feet	No change at 9 feet since 1-17-61 Down .23" at 22'4" since 1-17-61
9-1-61	4356-DR	36 feet	No previous data
9-1-61	4389-DR	36 feet	No previous data

COOLANT TESTING OPERATION

KER Loop Operation

KER-1 - Operation of the loop with three 17-inch NIEL and four 17-inch NIEL defected elements as authorized by PT IP-377-A, and PT IP-377-A, Supplement A and the fretting corrosion testing of a Zircaloy-2 wire-wound rod in a 9-inch Zircaloy-2 coupon holder continued. Loop operating conditions were 230 C, 1600 psi, and pH 10.

During the outage of August 30, a recirculating pump was replaced with a spare. During the outage of September 17, the upper outlet crossheader and connector were replaced because of tubing connection leaks.

A reactor scram occurred on September 24 because of failure in the process neutron monitoring instrumentation. Investigation of the cause of failure is in progress.

KER-2 - During the outage of August 8, a special loading consisting of one 23-inch NINL, one 23-inch NIEL, and one 17-inch NINL fuel element was charged as authorized by PT IP-377-A to determine if fuel element fouling would occur from small amounts of resin in the loop. The elements were discharged during the September 17 outage. Visual inspection of the elements indicated no unusual film formation. The loop was then recharged with five 23-inch NIEL elements authorized by PT IP-377-A and testing continued. Loop operating conditions for the last charge are 240 C, 1600 psi, and pH 10.

KER-3 and KER-4 - The loops remained shut down for Project CGI-839 revisions.

1706-KE Single-Pass Tube Operation - All eight tubes were supplied normal process water from 105-KE.

During the outages of September 3 and September 24, the second and third decontaminations of SP-7 (4963) and SP-8 (5063) were performed as authorized by PT IP-197-A, and the tubes were recharged with normal fuel loadings. Trace amounts of ammonium phosphate were added to SP-7 process water from September 10 to September 24. After the September 24 decontamination, ammonium citrate became the trace additive in SP-7.

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HW-71230

KE Reactor Outage Time Requirements - One unscheduled outage was charged to production testing. A total of 23.8 hours was charged to production tests as listed below:

<u>Production Test</u>	<u>Description</u>	<u>Hours</u>
PT IP-361-A	Charge-discharge SP-1	0.4
PT IP-377-A	Borescope and charge KER-2	3.1
PT IP-197-A, Supplement D	Decontaminate, charge, and discharge SP-7 and SP-8	1.8
PT IP-377-A	Charge-discharge KER-2, replace rear crossheader and connector on KER-1	3.9
PT IP-377-A	Instrument failure - KER-1	12.8
PT IP-361-A	Charge-discharge SP-2	0.5
PT IP-197-A, Supplement D	Decontaminate, charge and discharge SP-7 and SP-8	1.3

Out-Of-Reactor Facility Operation

TF-1 (CEP-1) - Testing of crevice attack on 410 and 420 stainless steel coupons in high purity water was completed. An eight-week cyclic decontamination test began on August 30. Three of the eight decontamination runs were completed. Materials undergoing testing are carbon steel, stainless steel, Zircaloy-2, Stellite 6 and 12, Haynes Alloy No. 41, and six stress crevice samples of AMS 5616, Zircaloy-2 mechanically-bonded carbon steel, stainless steel, and Zircaloy-2.

TF-2 (CEP-2) - Testing of the effect of contact area on the fretting corrosion between two Zircaloy-2 surfaces at 200 C was completed.

TF-3 (CEP-3) - Loop conditioning and shakedown testing was performed. Operating conditions were 690 F and 3100 psi using demineralized, deoxygenated water.

TF-4 (CEP-4) - The eighth cyclic decontamination test was concluded on September 9, completing the test series during which corrosion testing was performed on 304 stainless steel; A-212 carbon steel; carbon steel welded to stainless steel; Stellite 6 and 12, Haynes Alloy 41; AMS 5616, barstock and cast; Zircaloy-2; 420 stainless steel; and mechanically-bonded carbon steel, stainless steel, and Zircaloy-2 prestressed coupons.

TF-5 (ELMO-5) - Corrosion testing of Zircaloy-2, carbon steels 1031, 1051, and A-212 and sensitized and non-sensitized 304 stainless steel coupons continued. Corrosion testing of Hastelloy C was completed. Stressed samples of stainless steel and Zircaloy-2 for corrosion and crevice testing began on September 21.

TF-6 (ELMO-6) - Corrosion testing of aluminum X-8001, sensitized stainless steel, and Zircaloy-2 at pH 4.5 using a slurry of molybdenum trioxide as a corrosion inhibitor was completed on September 19.

TF-7 (ELMO-7) - The following test work was continued:

1. Fretting corrosion testing of a PRTR fuel element
2. Corrosion testing of suit-case-handle supports on two Zircaloy-2 clad fuel elements
3. Corrosion testing of one KSE3 element
4. Stress cracking of 316 stainless steel by the deposition of lithium hydroxide on the surface of the stressed material

Testing of the nozzle-to-tube joint of a prototype CGI-839 nozzle assembly for use on KER-3 and KER-4 began on September 22.

TF-8 (ELMO-8) - Corrosion testing of 304 stainless steel, Admiralty metal, 70-30 copper-nickel, and A-212 carbon steel in pH 9 water containing ammonium hydroxide for pH control and hydrazine continued.

TF-9 (ELMO-4) - No fuel elements were available for testing.

TF-10 (ELMO-10) - Decontamination testing was resumed on September 21. Eight scanning studies tests were completed.

TF-11 (REP) - One gross fission product contamination-decontamination test was completed on stainless steel, carbon steel, and Zircaloy-2 test coupons.

TF-13 (Dowtherm) - Testing of the effect of raw water film buildup on the heat exchanger tubes and corrosion testing of carbon steel and 304 stainless steel coupons continued. Corrosion testing of aluminum coupons was completed. Corrosion testing of 70-30 copper-nickel coupons was started.

COMPONENT TESTING OPERATION

Irradiated Fuel Element Examination - Examinations were completed on the fuel elements from the following 54 tubes at the 105-C Metal Examination Facility.

PT No.	Tube No.	PT No.	Tube No.	PT No.	Tube No.	PT No.	Tube No.
216-A	1464-B	216-A	2378-F	216-A	3684-KE	272-A	3873-C
	1485-B		1972-KE		1586-KW	381-A	1453-C
	2456-B		1977-KE		1797-KW		1494-C
	2764-B		1987-KE		3365-KW		3163-C
	2768-B		2060-KE		4163-KW		3164-C
	3464-B		2372-KE		4952-KW		3165-C
	3365-C		2377-KE		4989-KW		4472-C
	1277-F		2456-KE	272-A	3679-C		4478-C
	1364-F		2463-KE		3681-C	397-A	2647-KW
	1385-F		2465-KE		3683-C		2947-KW
	2072-F		2661-KE		3684-C	Reg.Metal 8 Tubes	
	2261-F		3177-KE		3685-C		

Process Tube Corrosion Monitoring Program - In-reactor measurements of 1067 process tubes were completed. Listed below are the number of tubes measured for each reactor and the document numbers of the reports issued:

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Reactor	No. of Tubes Probologged	Report No.	HW Number
F	77	71	70869
KW	5	72	70870
D	32	73	70903
KE	26	74	70947
DR	373	75	71027
H	109	76	71033
D	10	77	71071
B	129	78	71072
F	146	79	71147
D	41	80	71116
C	100	81	71148
KE	19	82	71149

Visual examination, wall-thickness and rib-height measurements were completed on ten process tubes as follows:

Reactor	No. of Tubes	HW No. of Unclassified Report
H	3	70907
D	3	70904
B	4	Not reported

Nine of the ten tubes examined this month were removed from the reactor as leakers. In tubes 1675-B, 3575-B, 3580-B and 2663-D the leaks were caused by internal corrosion occurring between 9 and 11 feet from the tube outlet flange. Leaks in tubes 0880-H and 2081-H were found to be transverse cracks. In tube 3781-H, two pinhole leaks were detected in a slightly bulged area caused by a ruptured fuel element. The remaining two tubes 3983-D and 3985-D were removed as leakers, however, the leaks were not found. Both tubes were probologged prior to removal and the trace from tube 3983-D did not indicate a leak. The trace from tube 3985 indicated there was a leak located between 9 and 10 1/2 feet from the tube outlet flange, but this section of tubing was not recovered during the pick up operation.

Critical Reactor Component Examination - All of the truarc snap rings on the inlet tube flanges of both KE and KW Reactors were examined.

Panellit System Programs

Gages repaired, calibrated by maintenance	-	150	
Gages meeting calibration criteria	-	141	(94%)
-previous month	-		(64%)
In-board gage reliability examination	-	635	
Gages meeting examination criteria	-	612	(96%)
-previous month	-		(97%)
-average for past year	-		(91%)
Response time determination	-	635	
Meeting response criteria	-	627	(98.7%)
-last two months	-		(99.2%)

In-board Bourdon coil leak examination	- 10 694	
Non-leaking coils	- 10 689	(99.5%)
-average rate for past two years	-	(99.6%)

During the month, 83 gages received failure analysis.

The first gages of the Panellit exchange gage program were received.
Examination results are delineated below:

	<u>Model 154-100-C</u>	<u>Model 154-100-K</u>
Examined	207	46
Rejected	53	0
Rejection rate	26%	0

Manager, Research and Engineering

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MANUFACTURING

PRODUCTION OPERATION

PRODUCTION PLANNING & SCHEDULING

Discharge Concentrations

There were several changes in the discharge goal exposure plan prompted by a revised set of Plutonium Conversion Tables, HW-50300 B, which lowered the predicted Pu-240 yield. To maintain the predicted Pu-240 content at 6%, increases of 25 MWD/ton were initiated for regular uranium at B, C, DR, F, KE and KW Reactors and for enriched uranium at C, KE and KW Reactors.

Over-all exposure of uranium discharged was the highest it has been in two years. Pu-240 remained in control despite the high exposure due to the large quantity of enriched uranium discharged which is low in Pu-240.

Discharge Exposure Comparison (MWD/T)

	<u>Regular Solid</u>		<u>Regular I&E</u>		<u>Enriched I&E</u>		<u>Over-all Exposure</u>
	<u>6 Old</u>	<u>2 K's</u>	<u>6 Old</u>	<u>2 K's</u>	<u>6 Old</u>	<u>2 K's</u>	
July	808	739	642	682	841	753	682
August	773	748	706	707	851	760	735
September	776	770	730	707	817	739	740

ESSENTIAL MATERIALS

Rail and truck shipments received in September were as follows:

Carload shipments for IPD	-	206
Carload shipments for other Depts.	-	135
Truck shipments for IPD	-	<u>306</u>
Total		647

MISCELLANEOUS ACTIVITIES

Arrangements were made for the September 11-15 visit of W. H. Coleman to Hanford. Mr. Coleman, a General Electric Field Representative for the Manufacturing Training Program, spent September 14 and 15 in this department discussing primarily trainee progress and work assignments.

The one 1961-62 class in IPD's "Fundamental of Manufacturing" course held its first session on September 11. As before, only one-third of the 33 sessions in this course are scheduled during working hours.

Liaison was maintained with Research & Engineering in connection with the resumption in mid-September of supplementary classroom training for Reactor Specialists and Pile Operators. Research & Engineering handles the scheduling and instruction of these courses in reactor processing fundamentals for Manufacturing personnel.

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MONTH		REACTOR OPERATION STATISTICS — PROCESSING																					
September, 1961		B	C	D	DR	F	H	SIX OLD	KE	KW	K'S	TOTAL											
INPUT FU (% OF FORECAST)		87.8	105.5	75.3	76.6	91.2	63.0	84.2	100.8	106.3	103.6	92.5											
TIME OPER EFF. (% OVERALL)		68.4	85.4	61.7	65.0	67.7	51.5	66.6	82.8	87.9	85.3	71.3											
NEW TUBES INSTALLED		87	0	43	47	31	86	294	1	1	2	296											
WATER LEAKS — TUBE		2	0	7	0	2	10	21	0	0	0	21											
- VAN STONE		1	-	-	-	-	1	2	0	0	0	2											
SLUG RUPTURES		0	0	2	2	3	2	9	0	0	0	9											
HELIUM CONSUMED — M CU. FT.		310.5	582.8	442.1	208.9	641.3	100.3		226.7	333.9		2846.5											
CAUSES OF REACTOR OUTAGES		NUMBER OF REACTOR OUTAGES AND HOURS																					
		NO.	HRS.	NO.	HRS.	NO.	HRS.	NO.	HRS.	NO.	HRS.	NO.	HRS.	NO.	HRS.	NO.	HRS.	NO.	HRS.	NO.	HRS.		
S	OPERATIONAL CAUSES						1	0.6				1	0.6	1	37.0			1	37.0	2	37.		
	FAULTY INST. OR CIR.									1	0.2	1	0.2					-		1	0.		
	FAULTY PROC. EQUIP.									1	33.2	1	33.2					-		1	33.		
	UNEXPLAINED			1	0.2					2	0.3	3	0.5	**2	69.2			2	69.2	5	69.		
	Oscillating Gage						1	0.3				1	0.3							1	0.		
	151 Bldg.				2	39.9						2	39.9							2	39.		
CHARGE — DISCHARGE				1	105.4			1	135.0			1	114.4	3	354.8	*	18.1	1	85.8	1	103.9	4	458.
RUPTURE					2	121.4	2	116.6	3	123.9	2	61.3	9	423.2							9	423.	
WATER LEAK		2	226.1			3	109.8			2	106.7	2	139.0	9	581.6						9	581.	
TUBE REPLACEMENT																							
MAINTENANCE		1	1.6			1	4.9			1	2.6	1	1.1	4	10.2			1	1.4	1	1.4	5	11.
TOTAL		3	227.7	2	105.6	8	276.0	5	252.5	6	233.2	10	349.5	34	1444.5	3	124.3	2	87.2	5	211.5	39	1656.
UTILIZATION OF REACTOR OUTAGE HOURS																						TOTAL HOURS	% TIME
CHARGE — DISCHARGE		33.7	40.0	29.7	67.7	36.3	92.2	299.6	31.3	44.7	76.0	375.6	6										
RUPTURE REMOVAL		-	-	45.1	10.2	37.2	12.7	105.2	-	-	-	105.2	1										
WATER LEAK		34.5	-	75.0	4.6	32.5	82.3	228.9	-	-	-	228.9	1										
TUBE REPLACEMENT		141.9	7.8	60.4	97.5	41.0	126.2	474.8	12.4	21.3	33.7	508.5	8										
MAINTENANCE		15.9	13.9	50.1	44.6	84.8	32.8	242.1	28.2	16.9	45.1	287.2	5										
STANDARD CHECK		0.5	7.8	4.8	12.0	1.4	-	26.5	4.5	1.0	5.5	32.0	0										
PRODUCTION TEST		1.2	29.7	1.5	15.0		-	47.4	30.5	3.3	33.8	81.2	1										
PROJECT WORK		-	6.2	-	-		3.0	9.2			-	9.2	0										
OTHER		-	0.2	9.4	0.9		0.3	10.8	17.4	-	17.4	28.2	0										
TOTAL		227.7	105.6	276.0	252.5	233.2	349.5	1444.5	124.3	87.2	211.5	1656.0	28										

*Continued an outage which started during August.

**Includes 37.9 hours for an unexplained trip caused by KER Loop 1 instrumentation.

MONTH DATA THRU 9/25/61 ONLY.		REACTOR OPERATIONS STATISTICS — POWER								SHEET 1
		100-B	100-C	100-D	100-DR	100-F	100-H	100-KE	100-KW	TOTAL
RIVER WATER (BLDG.181)										
TO RESERVOIR (BLDG.182)	GPM AVG.	16419		2007		2171	2373	-	-	22970
TO FILTER PLANT (BLDG.183)	GPM AVG.	68236		83948		77364	61800	170058	175661	637067
TO FILTER PLANT (C&DR)	GPM AVG.	106744		49656						156400
TO R & E (KER) & FEO	GPM AVG.			203				298		501
TOTAL	GPM AVG.	191399		135814		79535	64173	170356	175661	816938
TOTAL	M GAL.	6890.4		4889.3		2863.2	2310.2	6132.8	6323.8	29409.8
RESERVOIR WATER (BLDG.182)										
TO POWER HOUSE (BLDG.184)	GPM AVG.	34		62		291	51			438
TO COND.SYSTEM(BLDG.190)	GPM AVG.			942		1804	2322			5068
TO COND.SYSTEM (190DR & 183F)	GPM AVG.			800		76				876
TO EXPORT SYSTEM Incl. NPR	GPM AVG.	16385								16385
TOTAL	M GAL.	591.1		64.9		78.1	85.4			819.6
FILTER WATER (BLDG. 183)										
TO POWER HOUSE (BLDG.184)	GPM AVG.	158		162		80	146			546
TO PROCESS (BLDG. 190)	GPM AVG.	73476	87344	68000	62676	71532	53700	166684	172457	755869
TO 108	GPM AVG.	2500	4500	88		1100	1290			9478
TO 108DR	GPM AVG.			88						88
TO FILTER PLANT (BLDG. 183DR) & B.	GPM AVG.		10055	13732						(23787)
TO F & S SYSTEM	GPM AVG.	132		345		363	139	8	50	1037
TO R & E (KER) FEO	GPM AVG.			153				189		342
BACKWASH	GPM AVG.	2025	4845	1380	712	4289	6525	3177	3154	26107
TOTAL	M GAL.	2818.5	3842.8	3022.1	2281.9	2785.1	2224.8	6122.1	6323.8	29421.1
PROCESS WATER (BLDG. 190)										
TO REACTOR	GPM AVG.	73076	86944	67600	62276	71152	53200	150500	159200	723948
TO REACTOR	GPM NOR.	88600	99300	88000	88700	89100	84600	184000	185100	907400
POWER HOUSE (K AREA)	GPM AVG.							23	15	38
108 (KE - KW)	GPM AVG.							15761	12842	28603
TO R & E (KER)	GPM AVG.									
BUILDING USAGE	GPM AVG.	400	400	400	400	380	500	400	400	3280
TOTAL	M GAL.	2645.1	3144.3	2448.0	2256.3	2575.1	1933.2	6000.6	6208.5	27211.1
RIVER DATA										
ELEVATION (MSL, FT.)	(MAX.)	388.5		382.2		368.0	372.8		381.3	
	(MIN.)	384.5		377.5		364.0	369.8		378.5	
	(AVG.)	386.1		378.8		365.5	371.0		380.3	
TEMPERATURE	AVG. °F	64.2		68.0		70.0	67.8		65.8	

DECLASSIFIED

HM-71230

MONTH DATA THRU 9/25/61 ONLY.		REACTOR OPERATIONS STATISTICS — POWER								SHEET 2
		100-B	100-C	100-D	100-DR	100-F	100-H	100-KE	100-KW	TOTAL
<u>WATER TREATMENT DATA</u>										
AT BLDG. 182	MM GALS	2456.4	3842.8	3022.1	1787.6	2785.1	2224.8	6122.1	6323.8	28564.8
BLDG. 183	MM GALS									
<u>CHEMICAL CONSUMPTION</u>										
CHLORINE (BLDG. 182)	LBS.	19600	13786	20840	10900	15759	15528	85825	75000	257238
(BLDG. 183)	LBS	.9	.4	.8	.7	.7	.8	1.7	1.4	1.1
	AVG PPM									
Alumina		88500	135133	-	-	86204	86520			396357
ALUM	LBS	23218	100959	462852	278744	79573	43295	1241275	854125	3084041
	AVG PPM	*18.4	*20.0	18.4	18.7	*18.3	*21.0	24.1	16.2	19.6
SEPARAN	LBS	450	650	600	75	650	390	2082	666	5563
	AVG PPM	.022	.020	.023	.005	.028	.021	.040	.012	.023
SULPHURIC ACID	LBS	283192	446227	177650	60350	293512	206921	233000	887600	2588452
(AS 100%)	AVG PPM	13.8	13.9	7.1	4.1	12.7	11.2	4.5	16.8	10.9
DICHROMATE	LBS	23097	37806	34665	31950	21900	16107	49862	85690	301077
<u>PURGE MATERIAL CONSUMPTION</u>										
SOLIDS	LBS	-	13200						833	14033

*Alumina and Alum Combined for PPM in Alum Column.

DECLASSIFIED

HW-71230

DECLASSIFIED

HM-71230

MONTH DATA THRU 9/25/61 ONLY.		REACTOR OPERATIONS STATISTICS — POWER							SHEET 3
ANALYTICAL DATA		100-B	100-C	100-D	100-DR	100-F	100-H	100-KE	100-KW
<u>RAW WATER</u>									
PH	PH AVG	8.3	8.1	8.4	8.4	8.3	8.2	7.1	7.2
TURBIDITY	PPM AVG	5	4	5	5	4	2	6	8
<u>FINISHED WATER</u>									
PH	PH AVG	7.0	6.9	7.0	7.0	6.9	7.0	6.9	6.6
TURBIDITY	PPM AVG	.005	.006	.004	.005	.003	.003	.006	.003
Cl ₂ RESIDUAL	PPM AVG	.05	.05	.05	.05	.06	.18	.20	.17
DICHROMATE	PPM AVG	1.05	1.45	1.80	1.80	1.02	1.01	1.10	1.79
STEAM DATA		100-B	100-D	100-F	100-H	B-D-F-H TOTAL	KE	KW	KE-KW TOTAL
GENERATED (MAX)	LBS/HR	92000	160000	60000	65000	377000	41000	53000	94000
(NOR)	LBS/HR	81000	81000	40000	56273	258273	-	-	-
(AVG)	LBS/HR	82200	82368	39208	52613	256389	31100	33400	64500
TOTAL	M LBS	49378	49421	29171	31568	159538	18711	20018	38729
TO PLANT	M LBS	41873	41909	25670	26770	136222	16840	18016	34856
COAL RECEIVED	TONS	3568	3366	1156	2365	10455			
CONSUMED	TONS	2743	2688	1789	1820	9040			
IN STORAGE	TONS	14764	19050	14252	6960	55026			
GEN. STEAM/LB. OF COAL		9.00	9.19	8.15	8.67	8.82			
OIL RECEIVED	GALLONS						501577	353438	855015
CONSUMED	GALLONS						233288	208339	441627
IN STORAGE	GALLONS						1228853	1229103	2457956
GEN. STEAM/GAL. OF OIL							124.7	104.1	114.0
ELECTRICAL DATA									
TOTAL GENERATED KW HRS.							1215200	1248800	2464000
Peak Demand Control							15200	48800	64000

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HW-71230

APPLIED REACTOR ENGINEERING

MAINTENANCE PRACTICES OPERATION

Equipment Maintenance Standards

In conjunction with the Supervisor, Plant Equipment Engineering, a schedule for issuing Equipment Maintenance Standards was developed. The first Standard on Flux Monitor, Seismoscope, and Ball 3X (instrument portion) has been completed in rough draft and was issued for comment. Portions of other Standards in the mechanical, electrical, and instrument fields are in stages of partial completion.

Tube Replacement - 105-DR

Inspections were made of tubes 2561, 2563, and 2567 at DR Reactor. The regular metal charges became stuck on their first attempt to charge these tubes. After the charges were removed, the tubes were removed and saved for inspection. They showed extreme galling on the outside.

Confinement Instrumentation

Confinement Instrumentation in B Area was checked out and calibrated, and B Area instrument personnel were trained to maintain the equipment. Acceptance Testing of this equipment was performed in KE, KW, and B Areas.

Charging Platform

The Maintenance Job Authorization for early reduction of weight on the charging platforms was approved by the Atomic Energy Commission. The platform weighing has been completed in all areas and work is well under way by Maintenance in most areas on immediate weight reduction.

Platform Master Plan

The platform criteria document to provide a basis for design of new or modified front and rear platforms has been re-drafted. It will be issued for area review after limited internal review.

Vertical Safety Rod Sphincter Seal - B, D, and F

The design of this seal was revised to provide a thicker section at the compression points to eliminate a potential stress riser.

Rear Face Pigtails - Old Reactors

The second order of rear face pigtails for the older reactors is arriving on plant. The following table shows the number on hand as of September 28, 1961:

	<u>B</u>	<u>D</u>	<u>DR</u>	<u>F</u>	<u>H</u>
Regular Type - 2nd Order	160	100	490	600	450
Total of 1st and 2nd Orders	560	600	770	1400	1910
Zone Temperature Type	100	100	120	100	150

A recent inspection of the rear face of 105-H indicates excellent progress in bringing this area to a dry condition.

Zone Temperature Wye Adapters

Two hundred and fifty wye adapters have been received on plant. Of these, 150 have been delivered to H Area and the other 100 to Spare Parts. Another 100 will be delivered to H Area as they are received.

Tool Standardization

Power Actuated Van Stone Flange Tool

A purchase requisition and specification was completed for bid purposes. Bid opening date is October 3, 1961. An Appropriation Request has been prepared and will be submitted for approval as soon as the bid amount is determined. Mock-up tests have demonstrated this tool is ready for on-reactor use.

Pigtail Cutoff Tool

Design and fabrication for a high speed pigtail cutoff tool was completed. Testing has indicated additional improvements are possible. Additional work on these modifications is presently under way.

Gunbarrel End Reconditioning Tool

The gunbarrel end reconditioning tool that reconditions by impact proved very satisfactory in recent on-reactor rear face tests. This type of gunbarrel reconditioning will be essential when the powder actuated Van Stone flanging tool is applied to assure maximum strength in flanges.

Service Manuals

A comprehensive service manual on the Reactor Confinement EMF to Current Converter was completed and distributed to the areas.

Training

The following training was given during this report period:

- 1) 105-C Mechanical Overbore Equipment and Hardware - 129 craftsmen and supervisors.
- 2) Instrument Maintenance of Radiation Detection Devices and Linear Amplifiers; also, Fundamentals of Tube Electronics - 24 craftsmen.
- 3) Vertical Safety Rod System - Electrical Portion - 65 craftsmen.

PLANT EQUIPMENT ENGINEERING OPERATION

Equipment Maintenance Standards

Drafts of the initial Standards were issued for comment. These cover the Flux Monitors and the Seismoscope.

K Reactor Gunbarrel Flange Retaining Rings

Inspection gages and instruction in their use were provided to Component Testing Operation for the scheduled inspections of retaining rings at the K Reactors. Tests were completed to establish the holding strength of the assembly for partially seated retaining rings. The correlation of test results and inspections provides a sound basis for assessing inlet face component integrity.

Modified CG-558 Inlet Nozzles

A Design Change was approved and issued to authorize use of a modified inlet nozzle which is produced by impact extrusion and accepts bumper fuel elements. Several other refinements are incorporated. This design will be a Spare Parts item in the future.

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B-C REACTOR OPERATIONOPERATING EXPERIENCE

Power levels at both reactors were limited by bulk outlet temperatures.

Unscheduled outages (3) at B Reactor were required for elimination of internal water leaks and for repair of a defective exit water thermocouple.

A routine charge-discharge outage provided the only significant interruption of operation at C Reactor.

EQUIPMENT EXPERIENCE

At B Reactor, 87 new tubes were installed to replace 82 having thin walls, three leaking tubes, and to equip two air channels. Thirty of the new tubes were equipped with bumper fuel element nozzles. Outlet connectors (J-type) on 105 rear nozzles were replaced with Inconel pigtails. Sixty rear crossheader Parker fittings and 55 rear nozzle fittings were reamed to original size to restore normal type flow conditions.

At C Reactor, the No. 10 horizontal control rod, with poisoning effect depleted, was removed and buried. Replacement with a half rod was accomplished in accordance with authorized Design Change No. 504.

External water leaks were repaired on 110 rear nozzle assemblies at C Reactor.

At Building 190-B, a new impeller assembly was installed in the No. 3-A process pump to replace a cracked impeller discovered during a routine inspection.

At Building 190-C, the No. 9-C process water pumping unit was returned to service following the installation of new bearings to eliminate excessive vibration at the flywheel component.

At Building 105-B, replacement of the sanitary sewer line was necessitated by multiple breaks and collapsing of original clay tile piping.

IMPROVEMENT EXPERIENCE

Installation, testing and activation of the Flux Monitor-Pressure Monitor Intertie was completed at B Reactor in accordance with authorized Design Change No. 498.

One overbored channel at C Reactor was equipped with a zirconium tube and prototype nozzles as prescribed for PT IP-421-AE.

RADIATION MONITORING EXPERIENCE

No personnel overexposures occurred. Maximum dose rates encountered were 2.5 r/hr during burial of tubes, 1.5 r/hr during spline removal and 500 mr/hr during reclamation of dummies. Three cases of skin contamination (maximum - 4000 c/m) were easily corrected. One instance of

personal clothing contamination (40,000 c/m) and one of shoe contamination (80,000 c/m) were experienced. Formal investigation is in progress on an unplanned exposure of one employee during removal of an irradiated spline from the "C" platform at B Reactor.

D-DR REACTOR OPERATION

OPERATING EXPERIENCE

Power levels at both D and DR Reactors were limited by bulk outlet temperature and the nonequilibrium conditions following the frequent start-ups. Both reactors began the month in outages starting in August. D Reactor then experienced shutdowns from two ruptures, three from water leaks, a broken spline and two power failures. The latter two outages resulted from switching errors in the 151-D substation, with power loss to 190-D process water pumps. DR Reactor shut down for a scheduled block discharge, two ruptures and two scrams. The latter were from a faulty spline cap and a low trip on an oscillating Panellit gauge.

Irradiated metal was inadvertently pushed against a rear cap at DR, creating high radiation levels in the discharge area. The cap was successfully removed using a mechanical manipulating device on the discharge platform.

Twenty-nine vertical safety rod channels at DR were swept with electromagnets, removing an estimated 4,000 3X balls and resulting in a measurable reactivity gain. Channels were viewed with a television camera to provide a good estimate of ball removal progress by the magnet method.

EQUIPMENT EXPERIENCE

Replacement of thermocouples, pigtails and bumper nozzles continued at both reactors as platform and outage time permitted. D Reactor is 40 per cent complete on rear thermocouple replacement. Installation of Inconel pigtails is 20 per cent complete at D and 25 per cent complete at DR. The bumper nozzle installation at DR continued, with 68 installed this month for a total of 432.

A stator coil failed on restart of No. 7 motor in 190-D after the switching error and scram. A replacement stator was installed in 35 hours.

IMPROVEMENT EXPERIENCE

A 25 per cent reduction in helium usage was effected at DR Reactor by replacing a VSR sphincter seal, a badly leaking rear bellows and the foaming of two more.

A Beckman-Panellit intertie (Design Change 448) was completed at DR Reactor. The new circuitry ensures conformance to process standards when power level exceeds 2 MW with a bypassed Panellit system.

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C-12

RADIATION MONITORING EXPERIENCE

Two lapses of radiation control, chargeable to D-DR personnel, occurred during September. A maintenance employee received skin contamination up to 35,000 c/m while removing protective clothing after working on a stuck rupture in the 105-D discharge area. A second lapse of control occurred during spline removal at DR Reactor when a coiled spline fell on the platform floor. An operator received a dose rate of 5 r/hr disposing of the spline to a chute.

F REACTOR OPERATIONOPERATING EXPERIENCE

Power level throughout the month was controlled by the bulk outlet temperature limit. Production was limited by a series of five outages for rupture removal and water leaks. A sixth outage, lasting about 2.6 hours, resulted when a poison piece stuck in a ball valve.

EQUIPMENT EXPERIENCE

During outages due to ruptures and water collection, seven tubes were removed. Four of these were replaced and three were blanked off.

Flexowriter problems continue to plague control room personnel. Although intense effort is being made to rehabilitate it, a delay is being experienced because of the lack of spare parts for the "read in" and "read out" stepping switches. Assemblies are on order but delivery is delayed due to Vendor shutdown.

A draw-down test indicated that reactor process water flowmeters were within 0.2 per cent of actual flow.

Wooden boxes in the bauxite-acid feed system became badly deteriorated and are being replaced. A new lead box was installed at the east feeder as a replacement for the wooden one. Another lead box is under construction for replacing the west feeder box.

One hundred seventy-seven tubes were probologged during the month. Significant items replaced were: 31 process tubes, 45 process tube thermocouples due to failure, seven rear face gas seal boots, 13 front nozzles for the Bumper program, seven pressure monitor Panellit gauges and six zone temperature pigtails. Also replaced were parts in the temperature monitor flexowriter and a Dew Cell moisture monitoring gas vacuum pump with one of greater capacity. Thirty-one rear face thermocouples were repaired and approximately 514 Panellit gauges were adjusted. One hundred forty-eight rear face water connectors were replaced with Inconel pigtails, bringing the total under the present program to 803.

IMPROVEMENT EXPERIENCE

The top and bottom of the enrichment ring is currently being shifted from the seventh to the sixth lattice space in an effort to improve reactor flattening.

A new combination tube puller and chopper was placed on the discharge platform for use during the next tube replacement outage.

Revisions to the Dew Cell Leak Detection System in accordance with the latest developments for improved operation are in progress. New shields and a vacuum pump of sufficient capacity have been installed. Re-piping of the cell housing and tilting to provide drainage has been started.

RADIATION EXPERIENCE

F Reactor Operation sustained one lapse of radiation control during ruptured fuel element removal. Contamination was readily reduced to background levels. Tongs and other equipment used for storage basin work were found contaminated up to nine rads/hr. above the basin water line. There was no evidence of spread of this contamination to personnel of non-regulated areas.

H REACTOR OPERATION

OPERATING EXPERIENCE

Equilibrium power levels were limited by bulk outlet temperature. The highest power level attained was 1610 MW.

In addition to one scheduled outage, nine unscheduled outages occurred. Two of these resulted from internal process tube leaks, two by fuel element ruptures in E-N loaded tubes, four from Panellit scrams, and one from a faulty PCCF ball valve.

During the two extended outages, on September 10 and September 28, the entire E-N Block was discharged and recharged with E-N.

EQUIPMENT EXPERIENCE

Eleven tubes were removed as leakers. Nine of these had internal leaks including two with transverse cracks, one of the tubes had a rear Van Stone leak, and one was a rupture blowout.

There were two ruptured fuel elements, both of which were bumpered enriched fuel elements in E-N loaded tubes. One rupture was classified as a "side-other" and one as a "hole" failure. Two lots containing 69 charges were considered rupture prone and discharged.

Eighty-six process tubes were installed. This included the installation of tubes in twelve air channels.

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With the installation of 350 Inconel rear face connectors, the Inconel replacement program is now 89 per cent complete. In addition, the broached nozzle replacement program to accommodate bumper fuel is 83 per cent complete.

The overflow system from the 1904-H outfall box to the river was inspected on September 13. Inspection disclosed no adverse effects on this diversion system due to effluent discharge line plugging (see July and August reports).

Results of the 181 forebay soundings conducted on August 24, indicate the total sand accumulation has reduced from 6,451 cubic yards (April 21, 1961, survey) to 5,100 cubic yards. As a result of this reduction, no immediate plans for removal are contemplated.

Comprehensive inspections were completed to the runner assemblies on No. 1 and No. 6 annex pump units. Results indicated that, although minor new cracks had formed, the cracks detected in the first inspection (March, 1961) had not changed significantly.

The stator of the No. 1 annex pump motor was replaced with one of the modified Class "A" installation. Three units now remain for completion of this program.

IMPROVEMENT EXPERIENCE

A new outage control center, established for achieving improved outage planning and scheduling, was placed into operation during the outage of September 24.

Improvements in the helium leak test procedure to detect leaking process tubes have reduced the required outage time from six to four hours.

The charcoal filters (Reactor Confinement - CG-791) were installed in the 117-H cells, completing the filter installation.

RADIATION MONITORING EXPERIENCE

There were no significant contamination problems and dose rates to personnel were adequately controlled.

Internal rear face hardware decontamination with Turco 4306-B reduced rear face dose rates from 72 mr/hr to 36 mr/hr on September 11. The same low dose rate was present during the second portion of the block discharge and tube outage of September 24, after a week of operation.

KE-KW REACTOR OPERATION

OPERATING EXPERIENCE

Equilibrium power levels were limited by bulk outlet temperatures.

A change of inboard horizontal control rod configuration was used at KE Reactor to move the point of highest neutron flux towards the front as a means of reducing slug rupture potential and lowering the rates of process tube corrosion.

In addition to continuation of the scheduled outages in progress on August 31 at KE Reactor, two outages were caused by Panellit trips and one was caused by the neutron monitor instrumentation of KER Loop 1. KW Reactor experienced an internal failure of a horizontal control rod, causing the reactor to be shut down an hour before the start of a scheduled shutdown and a brief outage shortly after start-up to repair a leaking rear face tube cap.

EQUIPMENT EXPERIENCE

An internal failure of horizontal control rod Number 3 at KW Reactor, between the cooling water channel and the boron cavity, permitted the neutron absorption agent to be flushed into the rod cooling water effluent stream. The reactor was shut down and the rod was subsequently replaced.

Functional testing of the ball 3X system was carried out at both reactors by vacuuming out the retrievable portion of 3X balls prior to opening the drop gates of selected ball hoppers. Following the testing of two hoppers at KW Reactor, restricted movement of four horizontal control rods was experienced due to balls migrating into the rod channels. Three of the rods were returned to normal service and the fourth remained with a nine per cent limitation of travel distance.

Based on the water leak experienced in a tube previously charged with light weight C-type metal due to "chatter" of the slugs, forty-two process tubes that once held a similar charge were checked by probologging for damage and corrosion. One tube having deep tube wall chatter marks was replaced.

IMPROVEMENT EXPERIENCE

Two defective graphite thermocouple stringers were removed at KW Reactor and replaced with Iron Constantan stringers. Insertion of a sheathed stringer into RS-1 at KE Reactor completed the replacement of all the original stringers with the exception of RS-4.

Design Change Number 495, "Removal of 'D' Platform Lockout Pins", was completed in KE Reactor, thereby completing the change in both 105 Buildings. The lockout pins were replaced with a power contactor system as a lockout device to improve reliability, safety aspects and to reduce maintenance costs.

SUPPLEMENTAL CREW OPERATION

A new K Reactor charging record for the number of tubes processed in an eight-hour shift was established at KE Reactor.

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O. Schroeder

Manager, Manufacturing

OC Schroeder:DLD:bam

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FACILITIES ENGINEERING

REACTOR MODIFICATION DESIGN

RESEARCH AND DEVELOPMENT

Engineering and technological assistance has been requested from the General Engineering Laboratory concerning the graphite distortion problem. Initial efforts will be directed toward evaluation of alternate materials for use as sleeves in the vertical safety rod channels.

Graphite distortion data collection continued at 105-C Reactor with boroscope and traverse measurements completed on vertical safety rod channel No. 37. This channel, which is centrally located in the rod pattern, is relatively straight when compared to measurements previously obtained on channels in the rod pattern fringe; however, the channel is obstructed by a protruding block at a location below the full in rod position.

At 105-DR Reactor, nine vertical safety rod channels were visually examined with a closed circuit television system. Observed graphite breakage was typical of that noted during previous boroscopic examination. Photographs were obtained of typical graphite damage and of the third safety system balls lodged in the gaps between graphite blocks.

An overbore size zirconium process tube with flapper inlet nozzle and rear bellows assembly was installed on 105-C Reactor as a prototype of the process tube equipment proposed for installation on the 20 tubes that remain to be completed in the 40 tube overbore pattern. The installation of the welded zirconium tube collar was hindered by excess water leakage from surrounding regular process tube assemblies. This equipment is functioning satisfactorily.

The critical problem of prolonging existing reactor process tube life is being evaluated. Designs for new process tubes and assemblies are being considered, as well as transverse process tube cracking and interim measures such as pH adjustment.

A study has been initiated to evaluate modifying the existing process tube equipment or to provide new equipment for the 105-K Reactors. Four cases are being studied. These are: 1) modifications necessary to correct current problem areas, 2) modifications necessary to install 2,500 zirconium tubes, 3) modifications necessary to install 2,500 zirconium tubes and include new nozzles, outlet flapper caps and connectors, and 4) modifications necessary to install 3,200 zirconium tubes, provide new process tube equipment and gas seals. In all cases some significant modifications or replacements of charging equipment are required to maintain current charging rates.

DESIGN PROJECTS

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

The Process and Functional Requirements document for the two-out-of-three type loop safety circuit system has been issued for comment. This system provides that each monitored process variable in the safety circuit has three independent and identical sensing devices and tripping channels. An over limit trip on two of the three channels will cause the 105-KE Reactor to shut down.

CGI-844 - 100-K Coolant Backup System

An alternate design (block out method) has been provided for installing the pump discharge header in the 182-K Emergency Pump House; this revision was required to prevent delay in the construction schedule, due to delays in header delivery.

CGI-883 - Increased Process Water Flow - 100-K Area

An investigation revealed that the modified low lift pump installed in the 190-KW Main Pump House was operating with approximately six feet greater head and two per cent greater efficiency than a similarly modified unit in 190-KE. This is attributed to the polished impeller supplied with the KW unit. Installation of these polished impellers has been recommended for all low lift pump units in 100-K Area. A document justifying the installation has been issued.

CGI-905 - Modifications for Improved Coolant Backup B, C, D, DR, F, and H Reactors

A Project Directive has been received authorizing the initiation of design on this project. A document outlining the process and functional requirements was issued for comment.

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EQUIPMENT DEVELOPMENTEXISTING REACTOR WORKOperational Fueling Facility

Operational fueling cycles were performed at 105-KE Reactor on August 30, September 18, and September 24, 1961. A complete record of nozzle pressure variations was recorded. Difficulty, since corrected, was experienced on two occasions with check valves which would not seat. This problem was dealt with by discharging the tube and leaving it empty.

Flush discharge tests were performed in the laboratory with overbore fuel elements. The overbore fuel can be flushed, but with somewhat more difficulty than normal size.

Remote Manipulator

The remote manipulator vehicle was sent onto the discharge platform of 105-DR Reactor through the 10-foot, near labyrinth on September 28, where it removed the cap from a nozzle which contained an irradiated fuel element.

Instrumentation

Alternate reactor flux measuring concepts of potential nuclear values are being checked. An intensity of 30 microlumens was found for the Cerankov radiation seen through a window in the nozzle cap of tube 1494-C. This is an overbored channel operating at a tube power equivalent to a central zone tube. Visually, the annulus and central hole on the first slug are outlined in blue, and the intensity is a function of power level.

NEW PRODUCTION REACTOR WORKDesign Tests

Principal design test activity was on process tube flow monitoring, fuel handling, production horizontal rods, and ball safety equipment. Activity was reported on a total of 14 NPR design tests; three were reported complete.

Development

Flash butt welding of instrument lines was proven feasible in the laboratory and proposed for use in construction.

PLANT ENGINEERING OPERATION

DRAFTING

Services provided during the month:

New and revised drawings	289
Layouts and sketches	109
Microfilm prints reproduced	562
Microfilm drawings added	1264
Microfilm drawings voided	361
Ozolid check prints reproduced	1506
Catalogs added to files	258
Customers serviced - Microfilm files	305
Customers serviced - Catalog files	49
B.P.F.'s and Specifications added to files	19

EQUIPMENT APPLICATION ENGINEERING

Charge Platform Modification

As a result of a third party inspection of the reactor charge and discharge platforms, several recommendations were made to improve the operational safety of the units. These recommendations prompted consideration of a modification program incidental to initiation of this program. A determination of platform weights has been undertaken. All charge platforms have been weighed in preparation for a review of capacity of the equipment. Haughton Elevator Company engineers have completed preliminary inspection of the hoist equipment, platform structures and load distribution; related stress studies are underway. Meanwhile efforts are underway to remove miscellaneous equipment which is not vital to efficiency of the operation.

REACTOR, PLANT ENGINEERING

Gunbarrel Flange Snap Ring Failure - K Reactors

An investigation to determine the cause and a remedy for in-service cracking of K Reactor gunbarrel flange retaining rings is underway. Since preliminary investigations indicate that the problem is one of materials, a quantity of 100 each of cadmium plated steel, beryllium copper, and phosphor bronze rings have been procured and are being laboratory tested. A production test has been prepared to authorize trial installation of some of these rings on the reactor.

WATER PLANT & UTILITIES ENGINEERING

190-H Outfall Line Blockage

The interior of the 1904-H overflow flume was inspected for evidence of damage which may have resulted from full operating flow during July caused by plugging of the outfall lines. Although there is some evidence of wear the flume appeared to be structurally in good condition.

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Repair of 105-C Far Effluent Line Expansion Box

An inspection of the far effluent line expansion box at 105-C revealed that the packing in both expansion joints was gone and that structural failure was occurring on the downstream portion of the box and on the floor slab. Leakage through the broken walls and floor slab was the cause of the cave-in adjacent to the box.

PROJECT ENGINEERINGPROJECTSCGI-791 - Reactor ConfinementPhase III

Acceptance Tests on the Ventilation balance are 90 per cent complete at 105-KE, KW, B, C, and F.

Charcoal filters have been installed in 117-B, D, F, KE, and KW Buildings.

Acceptance Tests on the 119-KE and KW Sample Building instrumentation are complete with the exception of the air particulate samplers. Acceptance Test of the Sample Building instrumentation in 100-B is complete except for the test on automatic operation.

General

The actual completion for the total project is 1.4 per cent behind schedule due to the failure of the inflatable seals for the charcoal filter frames.

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

This project, scheduled to be 52 per cent complete, is actually only 32 per cent. The absence of pipefitters for two weeks combined with delays in pump deliveries has caused approximately one month delay. The first two zero leakage recirculating pumps for Loops 3 and 4 have now been received and are being installed. The third pump was shipped on September 29. The fourth pump is scheduled for shipment within one week.

CGI-844 - 100-K Area Coolant Backup

The No. 2 Backwash Pump in 190-KE Building has been installed. The first of two steam driven turbine secondary backup pumps has been installed and steam and water piping is in process. This project, scheduled at 15 per cent complete, is actually 17 per cent.

CGI-861 - Expansion of Electrical Distribution Systems, 105-B, D, and F Buildings

Revision 1 to the Project Proposal for scheduled extension due to delays in cable procurement, is being submitted for approval. Three thousand feet of interlocking armored cable was received from Westinghouse and has been installed at 105-B. The remainder of the shipment (6,000 feet) has been rescheduled for shipment October 5, 1961.

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CGI-904 - Improvements to Gamma Monitoring Systems, Buildings 105-B,
C, D, DR, F, and H

A revised proposal, requesting authorization for replacement of rear face sample lines at 105-D and F and consolidation of the sample rooms at B, D, and F, was forwarded to HOO-AEC September 18, 1961. The installation of the 105-D near side sample room components was completed September 9, 1961.

CGI-905 - Coolant Backup System Modifications, 105-B, D, F, and H

An interim authorization of \$10,000 to initiate design has been received from the AEC.

CGI-933 - Water Treatment Pilot Plant, 100-K Area

Three drawings have been completed; ten more are approximately 90 per cent complete. Design is still behind schedule due to the required head house plan revisions to accommodate the equipment.

MJA-21, 25, 29 - Pressure Monitor System Improvements, 105-C, H, KE, and
KW Buildings

Approximately 300 gages and 450 acceptable switches have been received. Bezel plates for 105-H and KE-KW are in production. Seventy gages have been installed in 105-C.

CPFF CONSTRUCTION SERVICE CONTRACTOR-LIAISON

Issued five new work orders and supplemented five old jobs for a total of \$117,395 to J. A. Jones Construction Company.

PROJECT PROPOSALS

Project Proposals Submitted to AEC

CGI-871 Improvements to Dummy Decontamination Facilities, Buildings
Rev. 1 105-B, C, D, DR, F, and H

CGI-904 Improvement of Gamma Monitor Systems, 105-B, C, D, DR, F, and
Rev. 1 H Buildings

W. Seeburger

For R. T. Jessen
Manager, Facilities Engineering

W Seeburger:dgm

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NPR PROJECT

PROCESS DESIGN OPERATION

Research and Development

The development of a co-extruded carbon steel to zirconium process tube joint could reduce the cost of process tubes in new reactors or replacement tubes in the NPR. The development of such a joint was examined during NPR design, however, it was concluded that the NPR schedule did not permit sufficient development time. Studies have continued, however, and prototypes by Nuclear Metals have undergone preliminary testing. Prototype joints have demonstrated acceptable heat cycle and bending characteristics; also burst strengths are comparable to that of the zirconium tube. Additional tests are planned to further evaluate this type of joint.

Project AEC-179

Work Authority Number AEC-179(3) dated September 22, 1961, has been received. This directs the termination of all work connected with NPR conversion studies. Work order stop charge notices and a project physical completion notice have been issued.

Project CAI-816

A purchase order contract for Bailey Meter Company to provide the 109-N instrumentation in the amount of 1.7 million dollars has been approved. Copies of the Bailey Engineering Report on a method of measuring water level in the NPR main steam generators have been received. The information for this report was obtained by Bailey engineers at Kreisinger Development Laboratory of Combustion Engineering in Chattanooga, Tennessee. The 109 instrumentation task force met on September 12, 1961, in Richland and Bailey estimates the number of their design drawings to be between 500 and 750.

The prototype horizontal rod drive unit now under test at 189-D has displayed minor difficulties at the start of slow speed operation. Due to the compressibility of the hydraulic oil, the rod demonstrated a dwell of a few seconds before uniform movement which has been resolved. The rod drive has been approved for start of production of the 87 drive units with a hold on the hydraulic valve panel pending final specifications for the added valves.

Tests have been initiated on the prototype discharge conveyor which carries the fuel elements from the discharge basin to the fuel sorting equipment. The conveyor is part of the discharged fuel handling equipment being designed, fabricated and tested by American Machine and Foundry. The manufacture of the other components of the system are progressing on schedule with several of the items delivered to the AMF test facility. AMF has received clearance of the test facility from the AEC security and accountability aspects. Their license now includes clearance to receive the Hanford fuel elements.

An IBM program for analyzing reactor shielding that will compute the distribution of both the neutron and gamma fluxes has recently been perfected by Hanford Laboratories. This program has been used to reproduce the experimental results obtained in the DR shielding walls. The program was used to evaluate the NPR inlet, outlet, sides and top shields. Based on the results obtained, the inlet shield concrete was increased in density from 220 pounds per cubic foot to 245 pcf. The density was changed by increasing the amount of iron used in the concrete aggregate with no effect on the construction schedule.

DEVELOPMENT AND TESTING

It is estimated that NPR development and testing is 89 per cent complete, on schedule.

A prototype horizontal rod drive and a prototype Ball 3X trip mechanism were tested. Rod acceleration and deceleration rates were checked, partially repeating factory tests to confirm the necessity for an adjustment. The test installation was completed for the ball trip mechanism. The unit was successfully operated through 100 cycles of drop, reset and lock-out by use of the upper operating coils. The lower coils have been scheduled for the next test sequence.

Wear tests were performed on the chain-mat prototype of the irradiated slug fuel handling equipment. Approximately 230 simulated fuel element drops on one area produced noticeable wear. Plans were made to reinforce the chain link net and continue the life tests. A meeting was held for design and development engineers to review fuel element tip-off concepts under evaluation. Based on fuel element drop test results, limitations placed by building appurtenances, elevator considerations, and required control over fuel element attitude during fall, a revised criteria for tip-off design and development was prepared.

Three prototype flow monitor controllers were subjected to additional tests. The Avien model appears to be superior to the Hydro-Aire and General Dynamics concepts. Phase shift checks were made on differential transformers potentially for use in the Swartwout pressure-to-electrical transducers. Procurement of the test data, which show significant improvement over the original prototype differential transformers, complete testing of the Swartwout units. The four Barton transducers which were sent to the factory to be reworked have not been returned.

The prototype component test loop operated through the month with no maintenance outages. Approximately ten days of operation were devoted to flow restrictor tests. Eighteen operating days were directed toward thermal cycle testing of diversion valves, nozzle closure samples and the Resistance Temperature Detector test section. Replacement pressurizer heater elements were received.

An actual NPR rear nozzle was installed on the full-tube mockup. A rolling induced tube twist of 5-1/2 degrees was established by using this mockup. Two sample front rolling operations were performed. The first consisted of restraining both front and rear nozzles and absorbing the 5-1/2 degree twist in the tube. The second consisted of restraining the front nozzle with the rear free and oriented 5-1/2 degrees opposite the direction of roll. In the first case the restraining torque was determined to be about 300 ft-lbs. In the second run, the rear nozzle moved ~~to~~ lead center with no twist in the tube.

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FIELD ENGINEERING OPERATION

Construction

105-N and 109-N Buildings

The installation of light weight concrete and built-up roofing is in progress in Areas 1, 4, and 5 of the 105-N Building. This work is estimated to be 90 per cent complete in Area 5.

The application of elastomeric coatings and the installation of the confinement seals has continued in the outlet and inlet pipe spaces. The confinement seal testing program is also under way. The application of coating on the underwater concrete surfaces in the storage basin is also under way.

The Kaiser Engineers' instrument piping and tubing situation has progressed to an acceptable brazing procedure prepared from actual fabrication of 1/2 inch copper tube joints which complied with the ASME Code Section 9. However, two trials for the qualification of operators have failed because of procedure deviations in material and methods.

The subcontractor on surface drainage and gas system piping has made good progress throughout the past month. This work is being performed by Harder Industrial and Bay Company with both organizations now producing good quality work throughout.

It has been necessary to request the heating and ventilation subcontractor, M & N Sheet Metal, to do considerable rework to bring the duct work up to the specification minimum.

Johnson Service Company, the subcontractor for installation of the ventilation control system has now qualified procedures and operators for the installation of capillary action solder joints in copper tubing.

Installation of interlocking armored cable is now estimated to be approximately 60 per cent complete in the 105-N Building. The first two of the motor control centers for the 105-N Building have arrived at the job site and are being installed.

The control room lighting installation has been completed and the installation of the bus way in the maintenance shop started September 26.

Primary loop heat exchanger No. 3B, which is installed in the 109-N Building, was opened by Kaiser Engineers on September 29, 1961 for inspection of the interior for shipment damage.

At the request of Burns and Roe, Inc. the fabricator of the dump condensers is now in the process of doing considerable repair work on these vessels. This work is being performed after the condensers have been installed.

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116-N Stack

The concrete in this stack has now been placed approximately 172 feet above the foundation.

117-N Building

The forming for the floor slabs at (-) 22 foot elevation is almost complete.

The drainage piping necessary in the slabs is now essentially complete.

It has been necessary to require the mechanical subcontractor to replace several piping embedments due to poor weld quality.

151-N Building

No change since the last report period.

153-N Building

No change since the last report period.

181-N Building

All of the primary pump drive motors have now been installed and the alignment of one unit has been completed.

182-N Building

The diesel engines for three standby pumps have now been set in this building. The concrete work to the 0' 0" level is nearly complete.

Thermal insulation is now being applied to the exterior of two of the four water storage tanks.

163-183-N Buildings

Work continued on the installation of the piping and equipment.

184-N Building

The concrete work on this building including the interior floor slabs is now essentially complete. Floor tiling has been placed in the offices, change room, and control room.

The alignment work on the turbine generator set has now been completed and work is under way on the installation of the exciter and controls for this unit.

Sealwell for Outfall Structure

The placement of the concrete for the seal structure has now been completed.

An earth filled dike has been placed in the river to approximately 60 feet beyond the eventual location of the end of the effluent line.

Underground Piping and Electrical

The work on this subcontract has continued in the past month but at a slow pace

Pile Erection

With the receipt of bottom thermal shield plates, installation of inlet crates was started. Some indication of minor pile foundation settlement was noted. A three-day hold was placed on the setting of side and outlet crates to permit placing of additional inlet crates.

A strike of ironworkers and boilermaker welders brought all work to a complete halt from September 15 through September 26, 1961. Work resumed on September 27, 1961 for installation of No. 3 tier inlet crate. Three outlet and four crates on each side are now installed.

Fabrication of boron plate assemblies at Baldwin-Lima-Hamilton is still not progressing at a rate to insure delivery as required. The problem is now one of machining capacity and not of welding techniques.

Cast iron thermal shield blocks which were being fabricated at Stearns-Rogers at Denver at the time of the strike in that plant, have been shipped to Hanford for machining in the 2101 Building.

By subcontracting a portion of the gun barrel assemblies to other plants, Union Machine Company in Seattle has stepped up production to the point that delivery is expected to be as required.

Graphite

Mockup, (including teardown) of the final layer group of moderator layers was completed on September 22. The contractor's work force has been reduced to 32, which includes supervision, clerical personnel, and construction craftsmen. Machining of ball channel bars, remachining of Layer No. 11, machining of spare details, and splitting of graphite tube sleeves are the principle work items remaining to be completed prior to final moderator placement at 105-N. Other work to be completed includes assembly of lay-up tools and equipment, final material accountability, and general building cleanup and restoration.

Zirconium

Of the 1,014 process tubes on plant, 785 have been accepted as complete. Twenty-five tubes are awaiting final inspection, 62 tubes require grit blasting and reprocessing, 35 have been rejected as not meeting procurement specifications, 28 are being held pending further negotiations with the vendors and the remainder are in process. Actual tube completion now stands at 75 per cent complete compared to the scheduled 88 per cent.

Forty-five additional tubes were received from Harvey Aluminum on September 8, which leaves a balance of 53 to be delivered for completion of both the pilot and production orders.

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The Vacu-Blast equipment for removal of oxide film successfully removed from the OD film from 74 tubes. Test runs for ID blasting are in progress.

Administration

The following material was issued 9-21-61 through 9-17-61:

Drawings	130
Criteria	3
Specifications	11
Requisitions	68
ATP's	6
Other	32
Total	250

Reviews were completed and formal comments offered on engineering material as follows:

Drawings	9
Specifications	5
Scope	0
ATP's	4
Total	18

Bailey Meter material processed as of 9-17-61 is as follows:

Drawings Released for Fabrication (as noted)	7
Drawings Released for Comments	25
Total	32

SPECIAL ASSIGNMENT - PRIMARY LOOP

Pipefitters returned to work in the HUICO shop Tuesday, September 5, 1961, after being on strike since August 28, 1961.

Progress in the HUICO shop has been slow. No material has been shipped to the field for the past five weeks. Total tonnage to the field remains at 37.9 tons, or 2.2 per cent of the total. Shipments to HUICO from HUICO's suppliers now total 644.4 tons, of which 162 tons represent high-pressure primary piping.

A potentially serious problem of cracked welds in Ladish-produced piping was discovered. Investigations of the extent of the problem and its solution are under way.

Status of HUICO approval data as of 9-29-61 is as follows:

Total Number Received	1571 (include 765 received for information only)
Number Approved	513
Number Approved With Exceptions	41
Number Not Approved	233
Number Currently Being Reviewed	19
Number Received for Information Only	765
No approval required	

PROGRAM EVALUATIONDesign StatusReactor Plant as of 10/1/61Title I

Scope

<u>Wt'd</u>	<u>Certified</u>	<u>Actual</u>
<u>Total</u>	<u>Schedule</u>	<u>% Complete</u>

100

100 (1)

Title II

Drawings
Specifications
Requisitions
ATP's
Development and Testing

70

92.0

91.5

8

100.0

96.4

8

84.0

83.0

4

58.0

35.7

10

86.0

89.5

Total

100

89.0

88.8

Heat Dissipation Plant as of 10/1/61Title I

Scope

100

98.75

Title II

Detail Design

94.0

92.0

Preliminary Drawings (bid)
Detail Drawings (for const.)
Specifications (bid)
Requisitions
ATP's

Req'd

<u>No. Issued to</u>	<u>9/28/61</u>
<u>Scheduled</u>	<u>Actual</u>

934

930

930

1037

942

942

153

152

152

173

171

171

-

0

0

Composite Design Completion as of 10/1/61
(Reactor and Heat Dissipation Combined)

<u>Certified</u>	<u>Actual</u>
<u>Schedule</u>	<u>% Complete</u>

Total

93.0

91.4

(1) This percentage represents only the completion of 44 criteria and does not include updating or revising.

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Cost Estimate

A cost review meeting will be held on October 3, 1961.

Schedules

On September 28, 1961, Kaiser Engineers submitted a revised construction schedule to the AEC for approval.

The construction status as of 10/1/61 is as follows. (Reference AEC Certified Construction Schedule dated 2/24/61.)

	<u>Scheduled</u>	<u>Actual</u>
Temporary Construction	73.0	73.0
General Area Systems	42.0	28.0
105-N Building	41.0	23.0
109-N Heat Exchanger Building	34.0	24.0
163N-183N Water Treatment Facilities	61.0	71.0
181-N River Water Pump House	100.0	99.0
182-N High Lift Pump House	11.0	27.0
184-N Standby Power House	46.0	64.0
NPR Project (CAI-816)	41.0	29.0

Manager, NPR Project

JS McMahon:mf

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GENERAL ACCOUNTING OPERATION

IPD has assigned the following Assistance to Hanford jobs to other General Electric components:

General Engineering Laboratory - Schenectady, New York

ATH	IP-1-62	"C" Reactor Graphite Distortion Problem	\$10 000
ATH	IP-2-62	Technical Appraisal of System Stability and Control of NPR Cooling System	<u>25 500</u>
Total funds authorized to date			<u>\$35 500</u>
FY 1962 Allocation			<u>\$86 000</u>

PRODUCT COST AND BUDGETS OPERATION

Estimates were made of burial ground and waste disposal costs for Contract and Accounting to comply with a request from AEC.

An analysis of maintenance craft forces shift assignments was made to investigate the possibility of reducing overtime by redistribution of day shift workers to other shifts.

PERSONNEL ACCOUNTING

Total number of employees assigned to the Department at month end was 2 304, the same number as last month. Included in the total number are two temporary employees.

AUDITING

Revisions to twenty-four AEC Manual Chapters were reviewed for their effect on IPD operations.

for R.E. Thomas
Manager - Finance

RELATIONS PRACTICES

The reorganization of Relations Practices was completed during the month. With the exception of the manager position and two temporary assignments, all staff work has been discontinued or reassigned with the operating work to other components.

W. A. Shanks
Manager - Relations Practices

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SIGNIFICANT REPORTS ISSUED

<u>Number</u>	<u>Class'n.</u>	<u>Author</u>	<u>Date</u>	<u>Title</u>
HW-69740 Sup. 1	Unclass.	NF Fifer	9-11-61	Design Test 1092, Supplement 1, 105-C Overbore Outlet Connector Test
HW-71090	Secret	FJ Kempf	9-18-61	Temperature Time Curves 105-C Graphite
HW-71056	Secret	FJ Kempf	9-14-61	Outlet Water Temperature Work Sheet, 105-C
HW-71061	Secret	LM Keene	9-22-61	Performance Characteristics Low Lift Pump, 100-K Area
HW-71083	Unclass.	EL Etheridge	9-19-61	Field Leak Testing of HAPO Reactor Confinement Filter Installations
HW-71062	Conf.	EC Wood	9-15-61	Operational Fueling Incentives- Cursory Estimate
HW-70434	Unclass.	DF Arnold	8-17-61	Marginal Check - Maintenance Flexowriter Typewriters
HW-70902	Unclass.	JD Maguire	8-25-61	Design Test 1092 - 105-C Modified Outlet Connector - Final Report
HW-70905	Unclass.	JD Maguire	8-30-61	Design Test 1121 - NPR Process Tube Assembly Gas Seals
HW-70992	Unclass.	JD Maguire	9-8-61	Test of Holding Ability of Non-Dented Nozzle Caps
HW-70993	Unclass.	VR Weil	9-8-61	Design Test 1128 - NPR Air Flow Test for Control Tubing Final Report
HW-71047	Unclass.	RJ Robinson	9-14-61	Design Test 1108 - C Overbore Zircaloy-2 Tube Van Stone Test Final Report
HW-71126	Unclass.	JD Maguire	9-21-61	Design Test 1125 - 105-C Over- bore Inlet Nozzle Strength Test Final Report
HW-70897	Secret	PB McCarthy	8-30-61	Operational Fueling Facility Tests at KE Reactor on August 30, 1961

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HW-71230

Number	Class'n.	Author	Date	Title
--	Unclass.	PB McCarthy	9-27-61	Pigtail Cavitation - K Reactor
--	Unclass.	PB McCarthy	9-27-61	KE Reactor O.F.F. Test Work, September 17-18, Outage
--	Unclass.	PB McCarthy	9-28-61	KE Reactor O.F.F. Test Work, September 25-26, Outage
HW-70997	Unclass.	HF Jensen	9-8-61	PTA IP-435-AE Through Reactor Chemical Decontamination in Support of Tube Replacement at 105-B
HW-68844 Rev. 1	Unclass.	JH Greer	9-14-61	Static Overspeed Trip Relay
HW-70825	Secret	DH Frieling	9-6-61	100-K Area Downcomer Test Data for Project CGI-883
--	Unclass.	DH Frieling	9-19-61	Bulk Outlet Temperature Sampl- ing Pipe Heat Loss - H Reactor
--	Unclass.	LB Brinkman	7-6-61	Design Change No. 497 - Inter- change Export Pumps at B and F Areas
HW-70632	Unclass.	VG Blanchette	8-3-61	Proposal for Development of a Power Loss Relay
HW-71004	Unclass.	VG Blanchette	8-15-61	Electric Power Demand Control Instrumentation
HW-70819 RD	Unclass.	JP Langan	8-23-61	Development Test IP-435-E - 190 Bldg. Turbine Driven Process Pump Testing & Im- peller Modification
HW-70864	Unclass.	P Mann	8-31-61	Voltage Level and Controls B/C Area
HW-71134	Secret	JP Corley	9-22-61	B and D Downcomer Prototype Data
HW-71137 RD	Unclass.	WD Bainard	9-25-61	Protection of NPR Piping Systems Prior to Operation
HW-70839 RD	Conf.	FJ Mollerus, Jr.	9-11-61	Design Data - NPR Heat Dissipation System

Number	Class'n.	Author	Date	Title
HW-70943	Conf.	HR Kosmata	9-9-61	Cost Evaluation - N Single Purpose Reactor
HW-62150 RD3	Secret	GF Bailey RK Robinson	9-11-61	NPR System Parameters
HW-71081	Secret	DL Condotta	9-18-61	Reactor Design Analysis Monthly Report
HW-SA-2242	Unclass.	WD Bainard-GE WR Conley-GE EW Wilson-GE WF Dietrich-B&R	9-4-61	Water Treatment for Hanford's New Production Reactor
--	Unclass.	WJ Love	9-8-61	Trip Report - Bingham Pump Company - ASME Boulder Heat Transfer Meeting - APED, San Jose, California
HW-68458 REV	Secret	WI Neef	9-1-61	Blanket & E-N Economics - A Linear Program Study
HW-68459 REV	Secret	WI Neef	9-1-61	Blanket & E-N Economics - Background Data & Linear Program
HW-70856	Secret	WI Neef	9-12-61	Reactor Optimization with Pulp & Linear Programming
HW-71185	Secret	T Prudich	9-28-61	IPD Discharge Goal Exposure Plan

TRIPS

Name	Firm & Location	Date	Purpose
PJ Hollifield	Harms Tool Co. Norfin, Inc. Seattle, Wash.	9/8/61	Discuss problems on the manufacture of gas tubes and adapters for C overbore process tube assemblies
HW Heacock	WSPE Yakima, Wash.	9/29- 10/1/61	Attend WSPE Annual Meeting
LM Keene	Byron Jackson Pumps Los Angeles AIEE-ASME Conference San Francisco	9/24-29/61	Discuss Project CGI-883 pump performance requirements. Attend AIEE-ASME National Power Conference

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HW-71230

Name	Firm & Location	Date	Purpose
R Sherrard	Epsco-West (Astrodata) Anaheim, Calif.	9/14-15/61	Review progress on high speed scanning - Design Contract DDR-113
	Instrument Society of America Los Angeles	9/11-13/61	Attend ISA Conference and present paper on High Speed Data Acquisition System for Reactor Process Monitoring and Control
DF Arnold	Epsco-West (Astrodata) Anaheim, Calif.	9/13-15/61	To review progress on high speed scanner - Design Contract DDR-113
A McDonald	General Electric Co. Seattle, Wash.	8/31- 9/1/61	To inspect faulted coils of 4500 HP stators and to re-evaluate delivery schedule. Perform collateral investigation for Project Engineering on damaged high-voltage switchgear
HA Kramer	Grand Coulee Dam Coulee Dam, Washington	8/30- 9/13/61	To measure thermocline in support of the Columbia River Cooling Program
JA Dear	Product Engineering Co. NW Copper Co. Portland, Oregon Vaupell Industrial Plastics, Inc. Seattle, Wash.	9/25-26/61	Explore fuel clip fabrication techniques with vendors
WC Royce	Byron Jackson Co. Los Angeles, Calif.	9/21/61	To discuss pump schedules for CGI-883 and to review performance of their power operated pump dolly
	Midwest Piping Co. Los Angeles, Calif.	9/22/61	To discuss contract to produce special high pressure pipe fittings being manufactured for use on CGI-844
CA Simsen	Epsco-West (Astrodata) Anaheim, Calif.	9/14-15/61	To consult on High Speed Scanning equipment they are developing

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HW-71230

Name	Firm & Location	Date	Purpose
RA Rohrbacher	Astrodata, Inc. Anaheim, Calif.	9/13/61	Inspect and discuss testing of control rod display equipment
	Electro-Optical System Inc., Pasadena, Calif.	9/14/61	Discuss nickel plating techniques
GT Haugland	Alan Mold & Engineering Co., North Hollywood, Calif.	9/1/61	Discuss fabrication problems encountered in the fabrication of primary shield expansion joint gas seal
CE Bonham AB Dunning	Union Machine Works Seattle, Washington	9/15/61	Review fabrication and inspection requirements of the process tube assembly tube sleeves
JF Nesbitt	PEL Engineering Los Angeles, Calif.	9/26/61	Discuss trip mechanism for the ball system
	Willamette Iron & Steel Co., Portland, Oregon	9/27/61	To view the portions of the ball skip hoist in their plant.
HR Kosmata	AEC Sponsored Superheat Conference San Jose, Calif.	9/13-15/61	Attended conference
FC Fisher	Puget Sound Naval Shipyards Bremerton, Washington	9/19/61	Calibration of precision standards for process unit inspection
JW Helton	BIF Industries Providence, R. I.	9/6-7/61	Discuss problems relating to manifold connector venturi tubes
RE Trumble DH Curtiss	San Jose, Calif.	9/4-6/61	Attend meeting of Subcouncil of GETHC
OH Greager	San Jose, Calif. San Mateo, Calif.	9/4-9/61	Attend GETHC and Subcouncil meetings
	Vallecitos Atomic Lab. Pheasanton, Calif.		Discuss licensing procedures

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<u>Name</u>	<u>Firm & Location</u>	<u>Date</u>	<u>Purpose</u>
DH Curtiss	Wolverine Tube Co. Allen Park, Mich.	9/11-15/61	Review tubing contracts
	Chase Brass & Copper Waterbury, Conn.	" "	" "
	Tube Reducing Corp. Wallington, N. J.	" "	" "
JH Brown	Atomic Power Equip. Dept. San Jose, Calif.	9/20-23/61	Consult on NPR reviews
TM Clements	North Carolina State College	9/6-8/61	Attended joint Nuclear instrumentation Symposium
	Savannah River Plant Aiken, S. Carolina	9/11-12/61	Discuss control of mainten- ance and modification of equipment critical to reactor safety
WD Hamilton	ISA Conference and Maint. Clinic, Penn Meter Co. & Barber-Coleman Co., all at Los Angeles, Calif.	9/9-16/61	Discuss component specifi- cations for new process water flow measuring elements for 190-C and new moisture monitor recorder for 105-C and discussions on plant maint. engineering problems
ER Keplinger GW Wells	San Francisco, Calif.	9/25-27/61	Attend ASME-AIEE National Power Conference

VISITORS

NH Wood	General Engineering Laboratory, New York	9/12/61	Discuss graphite restora- tion problems
E Vynne, Jr.	Cascade Distributors Seattle, Wash.	9/14/61	To discuss cartridge Van Stone flanging tool
R Ebbert	Di-Cor Detroit, Michigan	9/14/61	To discuss diamond core bits
HP Vail W Stackhouse	General Electric Co. Seattle, Wash.	9/27/61	To review operating problems on turbine gear drives supplied by the General Electric Company

Name	Firm & Location	Date	Purpose
D White R Creps	Haughton Elevator Co. Toledo, Ohio	9/26-28/61	To inspect and review authorized capacity of the charge platforms
B Forrest P DeRienzo	Burns and Roe New York, New York	9/19-22/61	Metallurgy of NPR piping
HS Blumberg	Metallurgy Consultant New York, New York	9/1/61	To discuss impact values of stress relieved connector bends
M Zizza GT Lewis	Burns and Roe, Inc. Hempstead, New York	9/13-15/61	109-N design
HT David	Bailey Meter Company Cleveland, Ohio	9/12-15/61	105-N - 109-N instrumentation
GL Locke	Joseph, Oregon	9/19/61	To discuss previous technical work done by Mr. Locke for Reactor Design Analysis
A Smith J Preston	Allegheny-Ludlum Pittsburgh, Pennsylvania	9/7-8/61	Visited the Tube Shop to review latent defects on NPR process tubes
GA Maudry	Harvey Aluminum Co. Los Angeles, Calif.	9/26/61	Visited the Tube Shop to review latent defects on NPR process tubes
WH Coleman	General Electric Co. Ft. Wayne, Indiana	9/14-15/61	Discuss Mfg. Training Program
D Guy	Alcoa Co. Seattle, Wash.	9/28/61	Discuss problems involving fabrication and shipment of process tubes
RB Dodds DD Cummins	Worthington Corp. Wellsville, New York	9/27/61	Discuss Worthington turbines and generators in service in 165-KE & KW and 190-C
Five Visitors	Boise Cascade Corp. Kennewick, Wash.	9/27/61	Discuss work sampling techniques and simplification of paper work.
B Olson	West Chemical Co. Seattle, Wash.	9/19/61	Discuss methods and materials used by Maintenance Services Group

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