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IRRADIATION PROCESSING DEPARTMENT
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By R. M. Stein

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RICHLAND, WASHINGTON

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SUMMARY**DECLASSIFIED**RESEARCH AND ENGINEERING OPERATION

Seven natural uranium, Zircaloy-2 jacketed, seven-rod cluster elements were discharged from KER-3 loop on May 14 after reaching the goal exposure. Four eighteen inch enriched tube-and-tube elements being irradiated in KER-2 have attained 66 percent of a 3500 MWD/T goal.

The concentration of Pu²³⁸ in Hanford fuel elements at various exposures was calculated and reported to the AEC.

Improved control strength calculations and recent measurements on ceramic materials were combined and showed that it is now possible to meet NPR requirements with a ceramic ball material containing samarium.

A total of 95 smooth bore C Reactor, Zircaloy process tubes are on site and nine have been installed. In addition to orders previously placed, an order for 15 C size tubes was placed with Bridgeport Brass Company to pilot a new cold extrusion process which should result in lower costs for future Zircaloy tubes.

The "Sentinel", a prototype monitoring instrument for use in remote locations, has performed satisfactorily in test at C Reactor; additional units to provide C with a full complement have been ordered and will be installed for further testing before the number required for all reactors is established.

The need for criticality monitoring facilities proposed by CGI-887 has been evaluated; it was concluded that such instrumentation is not required in unirradiated metal storage locations but is recommended for irradiated storage locations.

The operational experience tests on the subcritical monitor system have been completed for all eight reactors.

Poison spline use continued to be highly beneficial at C and K Reactors. For the second month in succession no temporary poison discharge outages were required.

The primary power level limit was based on fuel element failure control at all reactors except H which was restricted by bulk outlet temperature limitations.

MANUFACTURING OPERATION

Record reactor input production was 5.4 percent above the previous maximum achieved during January, 1960. The production forecast was exceeded by 10.5 percent with the six old reactors being 4.4 percent above and the K's 19.7 percent above. Forecast was exceeded due to high time operated efficiency and average operating level.

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Over-all time operated efficiency was 85.2 percent (82 percent forecast); 82.9 percent at the six old reactors and 91.8 percent at the K's. Efficiency was high at the K's due to the completion of scheduled work during abnormally low unscheduled outage time.

There was no increase in the combined reactor instantaneous power level or the individual reactor record power levels. Individual reactor production records were achieved at B and KE where previous highs were exceeded by 5.5 and 10.1 percent, respectively.

Nine ruptures, four I&E regular metal and five I&E enriched, were removed from the reactors. The four regular metal ruptures were at D, F, H and KE. Three of the enriched ruptures were at C and one each at B and DR. The number of ruptures during May was 40 percent lower than the previous three months average.

FACILITIES ENGINEERING OPERATION

The downcomer model testing program being conducted at Washington State University progressed with tests to verify the similarity of the downcomer model with the prototype downcomer in service at the 105-DR Reactor Building.

Work continued on the organization of a scope design and testing program in support of a project proposal for the modification of the 105-C Reactor for self-supported fuel elements. A description and broad definition of equipment scope have been prepared as a basis for defining the time and manpower required to complete the design engineering.

A proposal of the Goulton Industries to supply sleeves for the 100-K Reactor horizontal control rods fabricated from zirconium silicate rather than aluminum oxide has been approved. The change represents an estimated savings of \$27,000 in production and an increase of one percent in control rod capacity.

A study of the coolant piping on the discharge face of the reactors has been completed. This reviews the history of reactor rear face piping problems, study activities taken to ascertain the conditions of components, action taken to correct component failures, and programs under way to correct deficiencies.

Overall design completion for Project CGI-791 is 94 percent while detail design is 88 percent complete. One bank of high efficiency filters has been removed from the project at the request of the AEC. A design change recommending deletion of the protective polyvinyl coating from the 117 Filter Building exhaust ducts has been issued.

Design completion for Project CGI-839 is 99 percent. The construction specification and Acceptance Test Procedures have been prepared and approved. The architect drawings and specifications for the hot shop addition to the 1706-KEE Test Facilities Building have been approved.

As a result of the expansion of the K Area water plants a coordinated study of the 4160 volt electrical distribution system has been completed. Results of the study indicate that the 4160 volt emergency system is adequate for anticipated loadings over the next five years provided the building service loads are balanced between the two emergency busses.

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A prototype system involving an inexpensive nozzle mounted valve and a TV located traveling actuator to operate it for a remotely operated rear face was demonstrated in the 108-D laboratory. A completed procedure for operation of the poison column control system was demonstrated. The vendor reports that high speed scanner equipment is essentially complete.

In NPR work evaluation of nozzle to connector joints was completed. Operation of an NPR flow monitor using magnetic amplifiers was demonstrated.

In cooperation with Chemical Effluent Technology Operation, D Area has been selected for the location of the test facility for effluent decontamination with aluminum turnings.

NPR PROJECT OPERATION

Concrete placement on the 181 Building River Pump House was completed to the 395 foot elevation and a portion of the work was carried to the 405 foot elevation.

Work was started May 9, 1960 on the excavation for the 184 Building Standby Power House.

Award of the order to furnish 800 zirconium alloy process tubes was made to Harvey Aluminum Company of Los Angeles, California. Pilot lot tubes were received, sixteen from Allegheny-Ludlum and nine from Harvey Aluminum. Tube Shop modification continued satisfactorily.

Award of the order to furnish core graphite was made to National Carbon Company of Cleveland, Ohio. Reflector graphite was received, 1,619 bars from Great Lakes Carbon Company and 1,455 from National Carbon Company. Existing K stock material is being machined as scheduled. The multiple graphite notching machine was received from Arrowsmith and is being run-in and debugged.

Design output and comments on criteria, drawings and specifications continued at a higher level than last month.

A study of the effects of cost reduction items on N-Plant staffing and operating efficiency was initiated.

Analysis of the initial portion of piping stress studies being made by Electric Boat indicate piping sizes over 18 inches to be within code requirements. Several corrections were recommended for smaller sizes.

Specifications for several items of equipment including flow monitors and the process elevators are being revised to promote more competitive bidding and to reduce capital costs.

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FINANCIAL OPERATION

The biennial physical inventory of Movable Equipment has been completed. Reconciliation between inventory results and books is near completion.

A meeting was held with the Manufacturing Operation staff to assist them in determining the curtailment necessary to operate within their budget allocation. A re-allocation of funds within the Operation was prepared and issued.

The annual physical inventory of coal was taken on April 29.

Processing and essential material inventories were observed at KE, KW and F Areas on April 25.

Overtime hours worked by Department personnel during May, 1960 were 6,769 and within the established control level. Overtime hours worked in April, 1960 were 9,280.

Absenteeism statistics for May, 1960 and year to date are 1.9% and 2.5%, which reflects a decrease in the rate as compared with April figures (2.1% and 2.7%).

An audit report covering the operation of the property pass procedure was issued.

Development activities were applied on the plant-wide study of the planned high-speed communication network for HAPO. meetings were held between members of Manufacturing, Industrial Engineering and Research and Engineering in IPD and Office Procedures and Data Processing representatives, C&AO. Potential needs and uses in the Department for a proposed communication network were indicated; a review of savings and benefits which would accrue using such an installation is being made.

RELATIONS PRACTICES OPERATION

Four experienced BS/MS and three PhD candidates were interviewed with six offers extended. Five employees transferred into the Department from other HAPO components. One exempt employee transferred out of the Department and two resigned from the Company. Two employees retired during the month. Two security violations occurred during May.

GENERAL

ORGANIZATION AND PERSONNEL

ORGANIZATION

Effective May 1, 1960, the Applied Reactor Engineering Operation was established in the Manufacturing Operation which will include the Industrial Engineering, (transferred from Facilities Engineering), Plant Equipment Engineering, Maintenance Practices Operations, and a group of Senior Engineers. Also in Manufacturing, a Maintenance Engineering Operation was established for each Reactor Operation.

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FORCE SUMMARY

	<u>Exempt</u>	<u>Non- Exempt</u>	<u>Total</u>	<u>Changes This Month</u>
General	1	2	3	0
Research & Engineering Operation	105	63	168	+ 2
Manufacturing Operation	372	1370	1742	+21
Facilities Engineering Operation	126	40	166	-17
NPR Project Operation	70	26	96	+ 1
Financial Operation	15	18	33	0
Relations Practices Operation	<u>7</u>	<u>18</u>	<u>25</u>	<u>0</u>
	696	1537	2233	+ 7

E. R. Astley transferred from NPR Project Operation to Manufacturing, as Manager, Applied Reactor Engineering Operation and thirteen exempt personnel were transferred from Facilities Engineering Operation to this Operation. Transfers to Facilities Engineering Operation included L. E. Hollsted from HLO and T. P. Shaw, a new hire. C. R. Oak was hired as a Mechanical Engineer in Manufacturing and R. B. Shoen terminated.

PERSONNEL ACTIVITIES

Final arrangements for HAPO participation in GE's Manufacturing Training Program (MTP) were completed by the Relations Operation, and ten first-year men were assigned to IPD by G.E. Manufacturing Services for arrival this summer. Productive work assignments were identified within the Manufacturing, Facilities Engineering, and Research and Engineering Operations, and final selection was in progress at month-end. The Production Operation is representing IPD in the administration of the program. G. J. Rogers was assigned to participate in the pre-start-up audit of the PRTR to be performed by the Irradiation Processing Department.

SAFETY, SECURITY AND RADIATION EXPERIENCES

Two security violations occurred. There were no disabling injuries or radiation exposures exceeding operational control. One hundred two medical treatment injury cases were treated. IPD has accumulated over 5,340,000 injury free manhours since the last disabling injury.

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.

"Current Integrator for Giving a Visual Indication of Accumulated Radiation Dosage" by G. L. Erickson.

"A Remotely Actuated Flapper Valve" by C. A. Frantz, E. T. Hubbard, and E. C. Wood.

General Manager
IRRADIATION PROCESSING DEPARTMENT

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PROCESS AND REACTOR DEVELOPMENT OPERATION

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REACTOR FUELS

Present Reactor Technology

Projection Fuel Testing

Twenty tubes of collapsible bumper elements and twenty tubes of control elements were charged in D Reactor on May 13, 1960, under PT-IP-262-A. Each tube of bumper elements is paired with a tube of control elements to assess comparative behavior. One pair of tubes is scheduled for discharge at 400 MWD/T, two pairs at 800 MWD/T, and the balance at 1200 MWD/T.

Dingot Uranium Testing

The remaining monitor tubes of alloyed dingot material were discharged from D Reactor at an exposure of 800 MWD/T. The elements are being examined; no results are available yet.

Advanced Reactor Fuels

Development Work at NMI

A time-temperature-pressure cycle has been worked out which produces consistently good closures on NPR inner, KER inner, and 0.60 inch rod stock. This procedure requires 30 sec. to heat the end of the specimen to 1050 C in vacuum of less than 1 micron, by which time the braze is molten. Argon is then admitted and the pressure brought to 5 psig and held constant at 1050 C for 45 seconds at which time the power is cut and the braze allowed to cool. The argon pressure is required to force the molten braze under the cap.

It has also been shown that satisfactory Zr-Be braze alloy can be made by a combination arc melting-extrusion-induction melting process. To date attempts to find lower melting alloys or alloys which do not contain Be have not been encouraging.

KER Testing

A one-inch diameter Zircaloy-2 jacketed rod instrumented with thermocouples in the rod and in the adjacent coolant channel was charged in KER Loop 1 on May 14, 1960, to measure the temperature effect of crud film buildup on the heat generating surfaces. Preliminary data indicate negligible filming in pH 10 coolant at a temperature of about 260 C with a surface heat flux of about 0.38×10^6 B/Hr ft².

The four eighteen inch enriched tube-and-tube elements being irradiated in KER 2 at a coolant outlet temperature of 270 C have attained an exposure of 2360 MWD/T.

Seven natural uranium Zircaloy-2 jacketed seven-rod cluster elements with hot-headed end closures were discharged from KER 3 at goal on May 14, 1960. The elements were irradiated in 270 C coolant to an exposure of 2020 MWD/T.

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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-56-A	Low Hydrogen Dingot U Elements	10	D-KE	Variable		Semi-production scale testing of low hydrogen dingot uranium fuel, solid. Test is discontinued but will not be terminated until material discharged.
IP-84-A	Projection Self-Supported fuel in ribless aluminum tubes	12	B	1200 MMD/T		Preliminary evaluation of self-supported fuel elements. Routine charging to continue until tubes are replaced. Ultrasonically attached supports currently being used. Goal exposure increased from 900 MMD/T and use of end spider supports authorized.
IP-171-A	a) Solid X-8001 & C64-F	1	B	Variable 500 MMD/T	706 MMD/T	Provide for evaluation of alternate aluminum component vendors. Control columns are only ones carried special. Rest are lot charged.
	b) I&E x-8001 OIIIN	6	D	Variable	360 MMD/T	Provide for evaluation of alternate aluminum component vendors. Control columns are only ones carried special. Rest are lot charged. Bridgeport Brass wrought blank components now under irradiation.
IP-216-A	Normal Prod. Nat. OII, KII and KIII fuel elements	91	All	Normal Variable Goal		Provides for monitoring the performance of a sample of all Natural Uranium Lots to assist in development of a Quality Index for Production use. Test is continuous.
IP-255-A	Solid Black Mint	7	H	2 years	7 Mo.	Provides for long term irradiation of solid black mint for conversion ratio, and fuel performance determination. Three control columns discharged for special extraction.

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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-262-A	Bumper Supported fuel in ribbed process tubes	20	D	1200 MWD/T 1 pr at 400 MWD/T 2 pr at 800 MWD/T	~100 MWD/T	Provides for testing of bumper type fuel elements in ribbed process tubes. Each of the 20 bumper columns is paired with a control column.
IP-272-A	CIVN Geometry I&E Self-Supported fuel	9	C	Variable		Provides for testing of CIVN geometry fuel in C reactor ribless zirconium process tubes. First two columns discharged.
IP-288-A	Seven Zr-2 Jacketed Nat. U 7-rod cluster elements with hot-headed end closures	1	KE	2000 MWD/T		Charged in KER Loop 3 on October 29, 1959; discharged May 14, 1960 at 2020 MWD/T.
IP-280-A	OIIN alloyed Dingot	0	D	800 MWD/T		Provides for evaluation of the stability and performance of cores having 100-200 ppm Si and Fe additives as grain refiners. All columns discharged at goal and awaiting post irradiation examination.
IP-292-A	Four Zr-2 Jacketed 18-inch enriched tube-and-tube elements	1	KE	3500 MWD/T	2360 MWD/T	Charged in KER Loop 2 on January 11, 1960.
IP-300 A	8 Nat. U hot-headed tube-and-tube elements	1	KE	2500 MWD/T	300 MWD/T	Charged April 25, 1960, in KER Loop 4
IP-314-A	One thermocouple 1 element; two thirty-six inch tubular heater elements	1	KE	Not over 1000 MWD/T	250 MWD/T	Charged in KER-1 on May 14, 1960.

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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-315-A, IP-317-A	Eleven Zr-2 Jacketed I&E elements; one single rod in sleeve; and one seven-rod cluster element	1	KE	2000 MWD/T	-----	Charged in KER-3 on May 14, 1960; Discharged in May 16, 1960, after about 10 hours of operation as a result of neutron monitor trip. Failure has not been located yet.

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Eleven natural uranium Zircaloy-2 jacketed tubular elements 1.47 inch OD, 0.40 inch ID, with different beta heat treatments, one Zircaloy-2 jacketed seven-rod cluster element, and one 0.89 inch diameter natural uranium Zircaloy-2 jacketed rod in a Zircaloy-2 sleeve were charged in KER 3 on May 14, 1960. Shortly after the reactor started up on May 16, 1960, neutron activity was noted in the loop. The neutron monitor indications increased in severity until the reactor was shutdown with a neutron monitor trip approximately ten hours after start-up. The elements were discharged and are awaiting examination to determine the cause of failure. The loop was not recharged.

Eight natural uranium Zircaloy-2 jacketed tube-and-tube elements with hot-headed closures on the inner tubes are being irradiated in KER 4. The elements have attained an exposure of 300 MWD/T in 288 C coolant.

IBM Design Analysis

Extensive alterations to the IBM Fuel design and analysis program are being made to include the effects of fuel and process tube thermal expansions and contractions during shutdown and startup transients. The program should be back in operation in June at which time the reactivity transients expected in the NPR will be re-run.

REACTOR PHYSICS

Present Reactor Technology

Effective Absorption Cross Sections for 305 Pile

Calculations were made of the effective absorption cross section for a large number of elements in the 305 pile. The results will be of use in testing of N-Reactor uranium. Cross sections obtained will apply to the case of infinite dilution and hence will be of use in evaluating the effect of minor amounts of impurities in Uranium. The results cannot be used without modification in calculations of the absorption in bulk quantities of the various materials. Numerical results of the absorption cross-section calculations will be included in a comprehensive review of the physics effects of impurities in uranium now under preparation.

E-N Load Analysis

Axial thermal flux data taken last month along both wet and dry E-N striped columns have been reduced. The data will allow a more precise estimate of the E-N length ratio required in the full reactor load. The results will also be of use in predicting variations in specific power along the column between successive N-slugs and hence will aid in predicting fuel element performance.

Discussions have been held with Savannah River personnel regarding the separation of the mint material discharged from the recent small scale E-N test. Due to the short-time since discharge a calorimetric method of tritium determination appears not to be feasible. Straight extraction on a laboratory scale will be required. Accuracy of the results of the tritium determination will probably not be better than 2%.

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Metal Coefficient Measurements

A survey of scram transient test results for reactors with I&E loading was made. The results from four such tests yielded an average metal coefficient of -0.75 ih/MW or $-1.875 \times 10^{-6} \text{ } ^\circ\text{K/MW}$. As a comparison the Giant program yielded a metal coefficient of -0.064 ih/MW . Further investigations will be made including evaluating the effect of delayed neutrons on the analysis of scram transient tests. Ultimately the metal coefficient will be of use in refining miscellaneous safety and operational calculations.

Neutron Lifetimes

The effective neutron lifetime in the BRL pile lattice described in the Geneva proceedings was measured as $1.38 \times 10^{-3} \text{ secs}$. If corrections for recent delayed neutron data are made, an effective neutron lifetime of $1.15 \times 10^{-3} \text{ secs}$ results. Calculations have been completed here utilizing the IDIOT program on this lattice and an effective neutron lifetime of $1.13 \times 10^{-3} \text{ secs}$ obtained. This agreement for a simple lattice increases the confidence in the neutron lifetimes arrived at for the more complicated Hanford lattices, and utilized in various safety calculations.

Pu²³⁸ Buildup

As part of a general request from the AEC for the concentration of all Pu isotopes in Hanford fuel elements, calculations of the Pu²³⁸ concentrations at various exposures were completed. Results given below have already been transmitted to the Commission.

<u>Exposure</u>	<u>Grams Pu²³⁸/Ton</u> <u>(Nat. U)</u>	<u>Grams Pu²³⁸/Ton</u> <u>(E Metal)</u>
0	0	0
200	$1.45 \pm .22 \times 10^{-3}$	$1.47 \pm .22 \times 10^{-3}$
500	$14.6 \pm 2.5 \times 10^{-3}$	$15.0 \pm 2.5 \times 10^{-3}$
800	$43.9 \pm 7.3 \times 10^{-3}$	$46.0 \pm 7.5 \times 10^{-3}$
1000	$74.3 \pm 12.4 \times 10^{-3}$	$78.4 \pm 12.6 \times 10^{-3}$

Advanced Reactor Physics

Materials Control

In response to a request from the AEC, HLO personnel have undertaken a definition of the safeguards required for materials control under the program which would allocate fissionable material to foreign countries. In support of this effort recommendations on the necessary measurements, reactor constants, procedures and obtainable accuracy based on production reactor experience are under preparation.

NPR Controls

Improved control strength calculations have recently been completed which account more accurately for epithermal neutron absorption. The results agree with recent measurements made in HLO on the EGCR control rod. These results when combined with recent measurements on ceramic materials

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indicate it is now possible to meet all control requirements in the NPR with a ceramic ball material containing samarium.

NPR Dynamics

Investigation of NPR dynamic characteristics is continuing. No evidence of unwanted resonances in the reactor response to control rod perturbations have been uncovered. To date the investigations indicate that good transients behavior can be expected from the NPR system as designed. Still to be investigated is the performance of the combined reactor and heat exchanger complex.

REACTOR ENGINEERING

Present Reactor Technology

Zircaloy-2 Tube Technology

A total of 95 smooth bore C Reactor Zircaloy process tubes are now on site. Nine have been installed in C Reactor. Additional orders of 100 each have been placed with Bridgeport Brass and Harvey Aluminum. Bridgeport Brass presently has 50 tubes in the inspection process and 64 more in the tube reducing process. Harvey Aluminum has 79 tubes at various stages of drawing and approximately 40 tubes in the form of ingot being fabricated into billets.

A demonstration order has been placed with Wolverine for three C Reactor tubes and one with Allegheny Ludlum for 15 smooth bore K size tubes. The purpose of these two orders is to demonstrate vendor capability and to allow vendors to develop better cost information before bidding on production size quantities. In addition an order for 15 C size tubes has been placed with Bridgeport Brass. Under this contract a new cold extrusion process expected to result in lower cost for Zircaloy tubing will be demonstrated.

Sub-Cooled Burnout

A document summarizing information on sub-cooled burnout has been prepared in rough draft form, and will be issued shortly.

Dichromate Feed Reduction

A production test for reducing the amount of dichromate added to process water has been written and is presently being circulated for approval.

Water Plant Backup

Analysis of all the data obtained in tests designed to determine the adequacy of the water plant backup systems has been completed and a document summarizing the results is being prepared.

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Graphite Temperature Limits

PT-IP-312-A and PT-IP-325-AC providing for an increase in graphite temperatures at the K and DR reactors respectively were prepared and approved during May. The K reactor change was of immediate advantage during startup and the increases are expected to be utilized in DR following the present outage.

Graphite Distortion

February traverses of top center process tubes at B and F reactors showed deviation from the former distortion pattern. The top center of those two reactors were again traversed in May to ascertain the progress of distortion. At B reactor the center of the stack had dropped only about 0.04" and at F the stack center had dropped 0.05". Thus the elevation measurements indicate deviations from "normal" contraction still exist although detailed comparison of measured profiles from front to rear indicate no new changes are occurring. Measurements at the other reactors do not show any changes from previous behavior. Further monitoring and investigation of the anomolous data will continue.

Advanced Reactor Technology

The order for 1700 tons of NPR core and side reflector graphite was awarded May 9 to National Carbon Co. The price per pound was actually slightly less than the top and bottom reflector graphite which was less pure. The core material will receive a chlorine rather than fluorine gas purification process and will have an impurity content very nearly as low as that now in K reactors. The low unit cost of the material is due in large part to exploiting the competitive situation among the manufacturers who bid.

The program of research and development of technology for commercial production of essentially stable graphite has begun. The National Carbon Co., under funds supplied by the Division of Reactor Development, is preparing several experimental graphites for examination and possibly irradiation. This effort, though not funded from 2000 Program sources is of direct interest to the NPR graphite contraction problem.

RADIOLOGICAL ENGINEERING

Radiation Control Experience

The following table summarizes the radiation exposure experience of critical IPD classifications for the first 18 weeks of the 1960 badge year:

<u>Classification</u>	<u>Total Dose</u>	<u>No. of Employees</u>	<u>Average Dose/Employee</u>	<u>Extrapolated Year End Average</u>	<u>No. of Employees over 3r Extrapolated Exposure</u>
Radiation Monitors	91387 mr	85	1076 mr	3107 mr	52
Processing Operators	219429 mr	253	867 mr	2503 mr	56
Pipefitters	74464 mr	93	800 mr	2309 mr	25
Millwrights	57859 mr	76	761 mr	2197 mr	19

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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 Totals</u>
Processing	0	1	0	1	0	0	2	1	5
Maintenance	2	0	1	1	0	0	2	0	6
Supplemental Crews	0	0	0	0	0	0	0	0	0
Research & Engineering	0	0	0	0	0	0	1	0	1
Facilities Engineering	0	0	0	0	0	0	0	0	0
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	2	0	0	5	3	14
IPD General									0

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

Average Reactor Effluent Activity Output

	<u>May, 1960</u>	<u>April, 1960</u>	<u>May, 1959</u>
107-B	46,000 uc/sec.	47,000 uc/sec.	34,000 uc/sec.
107-C	33,000 "	45,000 "	40,000 "
107-KW	74,000 "	90,000 "	54,000 "
107-KE	49,000 "	62,000 "	22,000 "
107-D	40,000 "	28,000 "	31,000 "
107-DR	34,000 "	59,000 "	28,000 "
107-H	37,000 "	42,000 "	36,000 "
107-F	40,000 "	60,000 "	34,000 "
Total	353,000 uc/sec.	433,000 uc/sec.	279,000 uc/sec.

Remote Area Monitoring

The prototype monitoring aid instrument (the Sentinel) has been favorably received on the basis of the field testing made to date. It is planned to fabricate three additional instruments on plant to provide C reactor with a full complement to further demonstrate the instrument before an order is placed to supply all of IPD's needs.

Criticality Monitoring (Project CGI-887)

An evaluation of the actual need for criticality monitoring facilities as proposed under CGI-887 has been carried out. It was concluded that there is practically no possibility of a criticality incident occurring in unirradiated metal storage or handling facilities except as a result of a catastrophe such as an earthquake or an act of war. Therefore, there is little or no need for critical mass monitoring in these locations.

The possibility of a critical mass incident in irradiated storage locations is somewhat less remote and criticality monitoring devices were recommended for these locations. Present monitoring instrumentation leaves something to be desired from the standpoint of effectiveness. Therefore, monitoring installations for these locations as described in the project proposal are desirable.

Reactor Effluent Treatment

Design of a test facility in which the development study of effluent treatment will be carried out is complete. Because of difficulties encountered at 100-K, the facility will be built at 100-D. A work order for construction of the tank and associated piping has been written and bed media for the first test has been ordered.

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PROCESS TECHNOLOGY OPERATION**DECLASSIFIED**REACTOR POWER LEVEL LIMITATIONS

The primary power level limit at all reactors except H was based on fuel element failure control at the goal exposure permitted by the available metal supply. H Reactor power level was restricted by bulk outlet temperature limitations.

WATER TREATMENT

As compared to past years, during the spring season raw water has been easy to treat. Alum feeds, as usual, are high in relation to raw water turbidity. Filter runs are shorter. No difficulties have been experienced thus far.

PROCESS STANDARDSHW-46000 B, Process Standards - Reactor

One new and one revised Standard was issued during the month. These were:

Process Standard C-130 - "Total Control Criterion"

A new Standard was issued which specifies the Total Control Criterion within which the reactor shall be operated. Methods of calculating the reactivity control necessary for operation with the criterion are specified in the Standard.

Process Standard D-060 - "Emergency Evacuation of Personnel"

Prior to area evacuation operation of the ball 3X system or un-bypassing an automatic trip system which functions on water pressure loss was specified in the revision.

HW-46000 D, Process Standards - Reactor

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

Process Standard C-020 - "Power Level Monitoring"

The sub-critical neutron monitor was included in the revised Standard as a primary startup instrument. Since safe startups are dependent upon early knowledge of the neutron flux and period, the development and use of the sub-critical monitor presents a significant gain in safe reactor startup methods.

Power level checking requirements during cold startups have also been added to the Standard. Initially, power level is to be monitored with the #1 galvanometer until an increase in outlet water temperature is measurable. At this point, it is required that the startup instrumentation be calibrated.

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Process Standard C-130 - "Total Control Criterion"

The definition of the criterion was clarified to better present the intent of the criterion as applied to area evacuations.

Prior to area evacuation operation of the ball 3X system or un-bypassing an automatic trip system which functions on water pressure loss was specified in the revision.

HW-46000 K, Process Standards - Reactor

One revised Standard was issued during the month. This was:

Process Standard C-130 - "Total Control Criterion"

The revisions made are identical to those made for HW-46000 D, above.

PROCESS CHANGE AUTHORIZATIONS

Nine Process Change Authorizations were issued during the month to permit temporary deviation for Process Standards - Reactor, HW-46000, and one was issued to permit temporary deviation from Process Standards - Water Plant, HW-27155 Rev1. These were:

PCA #0-38 - "Water Leak, H Reactor"

Process Standard B-010 requires that the reactor be shut down if the water collection rate from the gas atmosphere exceeds 24 gallons per day.

The water collection rate increased slightly over that permitted in the referenced Standard but no reactivity loss was noted nor was the inlet gas dew point excessive. Continued operation of the reactor was authorized provided the following requirements could be met:

- (1) The inlet gas dew point must be maintained below 15°F.
- (2) Water not permitted in the active zone of the moderator as evidenced by local tube temperature depression.
- (3) Daily mass spectrographic analysis of the reactor atmosphere must be taken.

PCA #0-39 - "Critical Pressure, Number 5 Orifice Zone - D Reactor"

Panel low trip pressures are specified by Process Standards. The numerical value of the low trip pressure is a function of the orifice size in certain zones. Changes have been made in the orifice size which resulted in low trip pressure settings not covered by Process Standards.

Equations were provided in the PCA to permit establishing low trip pressure settings not presently covered by Standards.

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PCA #O-40 - "Maximum Pressure Settings for Safety Valves and Rupture Disks -
KER Loops 1, 2, 3, and 4"

Process Standard K-010 specifies safety valve and rupture disk settings at 1500 psig for Loop #1 and 1825 psig for Loops #2, 3, and 4.

As a result of recent studies, the PCA was issued to require that all safety valves and rupture disks in KER Loops #1, 2, 3, and 4 be re-calibrated to a relief pressure of 1720 psig by June 1, 1960, or the next minimum reactor outage thereafter.

PCA #O-41 - "Rear Header Pressure Requirement - K Reactors"

Trip-After-Instability limits are based, in part, on a maximum rear cross-header pressure of 40 psig. Recent measurements of rear crossheader pressures indicate that this maximum limit is being exceeded.

The major parameter affected by rear header pressure is the Panellit gauge low pressure trip setting. The present minimum low trip setting of 55 psig is based on a 40 psig maximum rear crossheader pressure. If the rear cross-header pressure is greater than 40 psig, the Panellit low trip pressure must be increased to maintain adequate low flow protection for individual tubes, or the TAI limit must be decreased. This PCA authorizes use of the TAI limits specified in HW-46000 K, provided the minimum low trip pressures for gauges on the header involved are maintained within the specified range of low trip settings versus rear crossheader pressure.

PCA #O-42 - "Gas Composition - D Reactor"

Process Standard B-010 requires that the N₂ content of the reactor gas, 72 hours after a cold startup, be limited to four per cent. If this limit is exceeded and the two succeeding samples, taken at four hour intervals, show an N₂ increase, the reactor shall be shut down.

During the month, a mass spectrographic analysis showed an N₂ content of 4.96 per cent. The following sample four hours later revealed an N₂ content of 5.06 per cent. At this time the reactor gas pressure was increased with no further evidence of gas atmosphere contamination.

Authorization was given to continue operation provided positive steps were taken to preclude further gas atmosphere contamination. Compliance with the referenced Standard was noted by the spectrographic analysis of a sample taken on the following four-hour interval.

PCA #O-43 - "Raw Water Screens, H Reactor"

Raw water screen mesh size does not presently conform to Process Standards requirements. Authorization was given to operate with these screens until the process pump trip-out tests, scheduled for May or early June, since Production Test IP-289-I authorizes this screen size during the test.

The present screens are not of optimum size, however they are not subject to severe plugging under credible circumstances, and operation for a short time longer will not significantly affect reactor safety.

FCA #O-44 - "Rear Pigtail Failure - C Reactor"

The FCA allowed continued operation and hot startups on failure of a rear pigtail, provided Panellit gauge minimum low trip pressure and minimum tube power requirements which were specified in the FCA could be met.

FCA #O-45 - "Rear Pigtail Failure - K Reactors"

Same as FCA #O-44, above.

FCA #O-46 - "Automatic Scram Feature of the Temperature Monitor, K Reactors"

Startups without process tube temperature trips actuating the #1 safety circuit were authorized due to the number of spurious scrams that have been experienced with this system. In its place, Design Change #258 now provides low temperature annunciator trips on 50 selected tubes. Early warning of poor temperature distribution is thus provided. As a further safeguard, mandatory trip of the #1 safety circuit is required when more than two trips are experienced in any 10 X 10 block of tubes.

FCA #O-47 - "Panellit Coordinate Trip, Identification"

The Panellit Coordinate Trip Identification system at the K Reactors was deactivated in February, 1959, when it was discovered that because of this circuitry, sections of the Panellit system could be inadvertently by-passed by a particular sequence of operation. Since many scrams have been caused by faulty Panellit gauges, it is desired to utilize the coordinate system for identifying the offending gauge. A temporary procedural method utilizing special jumper blocks was authorized by the FCA for use at KW Reactor until a permanent revision can be designed and installed.

PROCESS ASSISTANCE

Auditing

One engineer audited the conformance to Process Standards by making ten inspections at each reactor during the report period.

Graphics

Graphics services prepared 39 charts, graphs, and visual aids for various IPD and HLO components.

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RUPTURE EXPERIENCE

<u>Failure Date</u>	<u>Tube Number</u>	<u>Lot Number</u>	<u>Type of Metal</u>	<u>Exposure</u>	<u>Type of Failure</u>
5/1/60	1366-L	VL-012-D	I&E Natural ⁽⁴⁾	278	Side Hot Spot
5/3/60	2287-C	KG-848-E ⁽³⁾	I&E Enriched ⁽²⁾	596	Side Hot Spot
5/5/60	2780-C	KG-251-E	I&E Enriched ⁽²⁾	577	Side Hot Spot
5/11/60	3171-H	KL-418-C	I&E Natural	645	Side Hot Spot
5/14/60	1661-KE	CR-826-D	I&E Natural	493	Side Hot Spot
5/16/60	3565-KE ⁽¹⁾			Less than 1	Unknown
5/16/60	2887-F	KL-413-C	I&E Natural	686	Side Other
5/20/60	1792-C	KG-244-E ⁽³⁾	I&E Enriched ⁽²⁾	742	Side Hot Spot
5/28/60	3858-DR	KH-151-C ⁽³⁾	I&E Enriched ⁽²⁾	810	Side Hot Spot
5/30/60	0967-B	KH-151-C	I&E Enriched ⁽²⁾	830	Unknown

- (1) KER Loop #3
- (2) 0.94% U-235
- (3) Multiple Failure Lot
- (4) PT IP-280-A-FP (Dingot)
- (5) PT IP-317-A and PT-IP-315-A

Legend:

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.

Unknown - Failed piece could not be located or had not been examined at the time of writing.

OPERATIONAL PHYSICS OPERATION**DECLASSIFIED**PILE PHYSICS ASSISTANCE

Average flattening efficiency as measured by total ECT reached a new high, exceeding 77.5 per cent of all reactor tubes for the first time. This is the fourth consecutive month that average flattening efficiency has exceeded 77 per cent. A new high monthly average ECT record of 1650 was set at H Reactor.

Poison spline use continued to be highly beneficial at C and the K Reactors. For the second month in succession no temporary poison discharge outages were required.

SUMMARY OF OPERATING DATA OF PHYSICS INTEREST
FOR THE MONTH OF MAY, 1960

Reactor	B	C	D	DR	F	H	KE	KW
ECT in May (1)	1465	1700	1485	1580	1435	1650	2520	2500
12-Month Avg. ECT	1440	1645	1480	1535	1445	1610	2470	2475
Equil. Scram Time (2)	14-16	30-40	15-17	30-40	14-20	30-35	20-24*	17-19*
No. of Scrams and Recoveries (3)	2/2	0/0	0/0	0/0	1/1	0/0	0/0	0/0
No. of Non-Scram Outages (4)	1/0	3/0	2/0	3/0	3/0	1/0	2/0	3/0
Recording Period -								
From:	4-25	4-25	4-25	4-25	4-26	4-25	4-26	4-23
To:	5-24	5-24	5-24	5-24	5-23	5-20	5-24	5-22

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

- (1) Effective Central Tubes; this value is defined as pile power level divided by the average 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.
- (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 - S. L. Stewart

Operating efficiency was good during the report period; the ECT was above average, non-equilibrium operating losses were maintained below half of one day by good control practices during the approach to equilibrium, and only two outages interrupted continuity. The first outage was caused by a power loss relay failure - a subsequent scram recovery after 18 minutes down

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failed by 3-4 minutes due to a lack of reactivity. A rupture caused the second outage. During the rupture removal a process tube separated allowing a quantity of water to enter the graphite. The lattice was dried before equilibrium was achieved; however, turnaround power levels were reduced because of the resulting flux distortion.

The first 17 spline caps were installed; these are primarily for shutdown total control purposes because equipment is not yet available for efficient removal of splines during operation. An analysis of the axial flux distribution showed that the recent switch to use number four HCR as a long rod has shifted the flux peak upstream of the center of the metal charge in the vicinity of this rod. - a slight reduction in calculated rupture potential has resulted.

C Reactor - R. A. Chitwood

Use of poison splines for every startup at C Reactor has resulted in at least a 50 per cent reduction in non-equilibrium losses as compared to pre-spline startups. In addition, use of splines during equilibrium operation has resulted in an increase in flattening efficiency of approximately one per cent. A Panellit scram occurred when a spline broke just inside the cap and flushed downstream - power recovery was successful.

A production test is being prepared to permit relocation and addition of enrichment to the front of the central region of about 400 tubes where 3X balls are lodged in adjacent graphite.

Three outages were caused by I & E² ruptures.

D Reactor - J. F. Jaklevick

Progress toward further reductions in non-equilibrium losses through the use of poison splines is presently limited because of the spline usage restrictions necessitated by high personnel burnout rates with the present interim removal equipment; installation of the reel removal system, tentatively scheduled for July, is expected to permit unlimited spline usage.

Movement of two PCCF tubes five lattice units closer to the far side so that they would be nearer the enrichment ring reduced the spline requirements for total control by eight.

Two shutdowns occurred, one due to a fuel element rupture and the other because of a rupture in the raw water back-up system export line.

DR Reactor - D. G. Montague

As the central zone under the unit discharge system approached goal exposure, reactor flux distribution control has been maintained although with the expected increased sensitivity; the increased positive graphite temperature reactivity coefficient due to plutonium buildup contributes in large part to this effect. Although reduced from the start of the current central zone load, the flattening efficiency continues to be about three per cent above that experienced under the staggered discharge method.

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Malfunction of two PCCF charging machines delayed charging of PCCF tubes following a startup and made a reduction in turnaround level necessary. A stuck PCCF ball valve also caused a reduced turnaround level on another startup.

Seven new geminol graphite thermocouple stringers were installed; in addition to better graphite temperature monitoring, longitudinal flux knowledge and control should improve significantly.

The transition to 32 fuel element charges, indicated to be the optimum charge length by Process Technology, will reduce total control reactivity restrictions necessitated by the current 34-piece charge. The present enrichment charge length will be retained, however.

Operating continuity was interrupted by a slug rupture, by a raw water back-up system export rupture, by a process tube water leak, and by need to replace a faulty front tube cap. The water leak did not cause any significant operating problems.

Enrichment requirements for the second cycle of the unit discharge method will be reduced significantly by graphite temperature allowances in a production test co-authored with Process and Reactor Development. During the early phase of the cycle when reactivity is low, graphite limits up to 650°C will permit a greater positive temperature coefficient contribution. Conditions are made in the test for monitoring and controlling temperatures and burnout rates such that burnout is not to exceed two per cent per 1000 operating days on an integrated basis.

F Reactor - C. D. Wilkinson

PCCF charging machine malfunction while charging poison following a startup made a reduction in turnaround level necessary; although the ball valve remained inoperable after the charge machine was cleared, no significant operating difficulties resulted. A water leak caused one shutdown; however, subsequent operation showed that no water had entered the active portion of the lattice. Two outages occurred because of I & E natural uranium slug ruptures, and one outage followed by a secondary cold startup resulted from failure of a process pump relay trip.

H Reactor - A. R. Kosmata

A new high monthly average ECT of 1650 was attained. Eighteen fringe tubes (for shield protection) were charged with "black" mint. Comparison of tube power factors before and after charging the "black" mint indicated a power reduction in adjacent process tubes about 40 per cent greater than that with natural mint; this exceeds preliminary estimates of the effect of the transition. Displacement of enrichment columns 32 inches upstream in the region of the pile influenced by the H-1 loop flattened the axial flux in this region so that the flux peak was reduced to about two per cent lower than that of a cosine distribution. Prior to the displacement the reactivity poisoning effect of the H-1 loop caused the flux to be peaked significantly downstream. Operating continuity was high, being interrupted only by a Panellit trip and a slug rupture indication during the subsequent power recovery attempt.

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KE Reactor - F. C. Franklin

A new record in non-equilibrium (startup) losses, 0.19 days production, was attained through the use of poison splines for reactivity and tube temperature control; the average loss for all four startups during the report period was less than 0.30 day equivalent production per startup. This compares with a non-equilibrium loss per startup without splines equivalent to at least a full day's production.

The octant monitor chambers were all withdrawn approximately one inch in order to reduce the sensitivity of this system. To use the octant flux monitoring system for control it was necessary to reduce its sensitivity to be comparable with the sensitivity of the other monitoring used for control; otherwise, reliance on the octant monitor system led to over-control in favor of the corners of the reactor to the occasional detriment of central region of the reactor. The withdrawal of the chambers reduced the sensitivity of the number one galvanometer (which runs the octant chamber signals) so that it was no longer sensitive to less than 500 watts as required for a back-up startup flux monitor; however, availability of subcritical monitoring has replaced this back-up need for the galvanometer.

Three of four shutdowns were caused by KER safety circuit trips. Fortunately, two of these occurred during non-equilibrium operation; thus scram recoveries were made in both cases. The other outage was caused by an I & E natural uranium slug rupture.

KW Reactor - A. D. Vaughn

Flattening efficiency remained high; the only flux distribution cycling resulted from a temporary jamming of the reel spline removal system. This was the first failure of the reel system during the two months that it has been installed on the reactor. Shortly after number two HCR was returned to service early in the report period, number four HCR stuck and had to be removed from service. The loss of number four rod has not hampered operation except for increasing spline requirements for startup slightly. The Sub-Critical Monitor continued to have mechanical problems with the malfunction of the automatic chamber positioner. Operating continuity was interrupted by one I & E rupture, one Beckman bypass switch failure, and one Panellit trip.

PROCESS PHYSICS STUDIES

Safety Control Studies

The operational experience tests on the subcritical monitor system have been successfully completed for all eight reactors.

Except for F Reactor all reactors have made the transition to the "square pile" method of total control evaluation with virtually no efficiency or economic losses; F Reactor is scheduled in June to make minor PCCF location changes and to install a few spline caps to permit insertion of poison while the 3X safety system is locked out during reactor shutdown.

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A task force was organized for performing an audit requested by HLO of their PRTR startup and operational plans. Members of the group include representatives from other Research and Engineering components and from Manufacturing. The study is expected to be completed in August.

File Reactivity Studies

NPR startup transient calculations have been modified to include the reactivity effects resulting from thermal expansion and contraction of lattice components. Recent investigations by Process and Reactor Development indicated that these dimension changes may have a pronounced reactivity effect.

Control Efficiency Studies

The DR Reactor block discharge occurred following an unscheduled outage May 28; the exposure at discharge of the entire central zone averaged over 650 MWD/T. Readjustment of the size of the block based on tube power distribution resulted in the elimination of about 60 tubes on the periphery of the zone. Although the PITA for this method of operation expired with the discharge, DR Reactor is continuing to operate in this manner.

As a result of nearly full spline usage the average non-equilibrium loss for C and the K Reactors for April and May was 0.28 of an equilibrium day. This compares with one full day average loss per startup in the fourth quarter of CY 1959, a period representing pre-spline startups, and 0.7 of a day loss per startup for these three reactors during the first quarter of CY 1960, a period when spline usage was being expanded at the K Reactors.

The average flattening efficiency during CY 1960 as measured by total ECT has averaged about two per cent higher than the 1959 average; spline usage and the block discharge at DR have been major contributors.

Shielding Studies

Thermal shield cooling system purge equipment similar to that in use at DR and H Reactors was installed by Maintenance Engineering at D Reactor to aid in cleaning the cooling tubes and in maintaining the rotating vane type flow monitors in good working condition. A further improvement was achieved in D Reactor shield flow monitoring by trimming about one-eighth of an inch from the blade tips of approximately 90 rotating vanes to compensate for a slight swelling of the vanes caused by a long period of contact with water.

HW-64951, "Attenuation Effectiveness of the Hanford Reactor Iron Masonite Shields," was issued during May. This document covers:

1. Observed shield deterioration rates.
2. Present and predicted effectiveness of the iron-masonite shields.

The conclusions reached in the document are that for anticipated conditions of reactor operation during the next ten years, including use of fringe poison, radioactive leakage escaping the reactor shields will not present any significant problems. However, the rate of increase in leakage through

the top shields will be such that in subsequent years additional measures will be required for protection of personnel around the areas adjacent to the tops of some of the reactors.

Reactor Fundamentals Training

The FY 1960 training programs for the operating Reactor Specialists and the Utility Operators were completed. Essentially all of the Utility Operators have completed the Fundamentals course; specialists on days and in training will be offered equivalent training to that given in the operating specialist class after the vacation season ends. Attendance averaged about 84 per cent for the Reactor Specialists classes scheduled during normal working hours, and 95 per cent for the Utility Operator classes.

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TESTING OPERATION**DECLASSIFIED**IRRADIATION TESTING OPERATIONDR-1 Loop

The DR-1 Loop was not operated with a test loading during the month, due to repair work on the motor-generator sets. The generators were sent to the vendor's service shop for examination. The generator shafts were found to be badly bent or twisted. All three shafts have been replaced and the rotors balanced. All three motor-generator sets have been re-installed. Two units are operating satisfactorily. The vibration in the third unit is still excessive and the cause has not yet been determined.

Thermocouple connectors have been installed on the MGCR-IIA test element assembly and tentative identification has been established for the six internal thermocouples. The MGCR-II-A test was installed in the in-reactor tube on May 30, and the in-reactor tube was on recirculation cooling at month-end.

A dimensional mock-up of the round-shroud 19-rod test element (MGCR-III) was test inserted into the in-reactor tube. The mock-up was fully charged with some difficulty when the smallest set of gas seal rings provided were used on the assembly.

Hanford test reactor irradiations of a nuclear mock-up of the heterogeneous 19-rod fuel element have been completed. Five irradiations were made, four of UO₂ enriched to various levels and one of an aluminum oxide-uranium oxide ceramic admixture, to provide data for the selection of enrichment level to be used in the test fuel element. The results reveal that 45 grams of U-235 (38 grams of U-235 per foot of element) will be required if the test fuel is to be UO₂, and that 40 grams of U-235 (34 grams of U-235 per foot of element) are sufficient if the fuel is a ceramic mixture. Design test fuel element power generation at these enrichments is 40 kilowatts.

Messrs. H. C. Hopkins, Jr. and A. D. McWhirter, General Atomic Division of General Dynamics Corporation, San Diego, California, visited HAPC the week of May 2, 1960. Discussions were held regarding the details of the proposed heterogeneous fuel element irradiation and the results of the examination of the MGCR-II fuel element by General Atomic.

H-1 Loop

The empty in-reactor loop was on recirculation cooling for 40 per cent of the report period and on process water the remainder of the time. A new protective circuit was designed and installed that will automatically turn off the power to the line heaters in the event of a sudden loss of pressure or in the event heater casting temperatures exceed 1000 F. The system is self monitoring with respect to thermocouple integrity.

Preparations have been completed for the insertion of the BAPL-120-8B test, which insertion now awaits final approval of the test by Naval Reactors.

DECLASSIFIEDSample Irradiations

The following samples were irradiated or undergoing irradiation during the month:

<u>Reactor</u>	<u>Test Hole</u>	<u>Facility</u>	<u>Request Number</u>	<u>No. of Samples</u>	<u>Material - Purpose</u>
D-DR-H		PCCF	HAPO-184	15	Washington-Designated Program
DR		Process Tube	HAPO-215	2	UO ₂ (ceramic fuel element test)
DR		PCCF	HAPO-218	4	Natural uranium (fission product release studies)
B-H		Process Tube	HAPO-218	2	Natural uranium (fission product release studies)
F	E	Quickie	HAPO-219	2	Strontium (isotope production)
DR		PCCF	HAPO-223	1	Na-Be (neutron source activation)
F	E	Quickie	HAPO-227	1	UO ₃ (isotope production)
F	E	Quickie	HAPO-229	10	UO ₂ (thin films for damage studies)
C	G	Bare test hole channel	HAPO-117	2	Graphite (damage studies)
KW	4C	Snout	F&WS-105	2640	Cobalt (fish tags)
C	D	Bare test hole channel	HAPO-237	2	Inconel (PRTR Gas Loop materials)
KW	4B	Snout	NAA-110	3	GdO ₂ , SmO ₂ (control rod material study)
KW	3A	General purpose	HAPO-236	1	Zirconium (creep test)
KE		Gamma	HAPO-148	4	Plastics and rubber (damage studies)
KE		Gamma	HAPO-171	1	Plastics and rubber (damage studies)
KE		Gamma		10	Plastics and rubber (damage studies)

Borescope Activities

Process Channel 2060, 105-KW - The channel was clear except for a piece of metal stuck to a trunion block at a distance of 28'7" from the front Van Stone.

Horizontal Control Rod 4, 105-KW - The channel and track were in good condition; however, the step plug was slightly scored.

Process Tube 3969, 105-D - There were chatter marks one foot in from the front Van Stone, 10 to 15 mills deep. The top of the tube had a rough appearance from two inches in from the front Van Stone for a distance of six feet.

DECLASSIFIEDVertical Bowing Measurements

A summary of the results of vertical bowing measurements follows. All distances are measured from the front Van Stone.

<u>Date</u>	<u>Area</u>	<u>Number</u>	<u>Distance</u>	<u>Results</u>
4-28-60	105-KE	2160-KE	46'	No change at 13' since 5-5-59 Down .18" at 25' since 5-5-59
4-28-60	105-KE	Y-2 channel	40'	Down .02" at 11' since 12-10-59 Down .14" at 25' since 12-10-59
5-3-60	105-KW	5868-KW	38'	No previous data
5-11-60	105-B	4574-B	36'	Up .06" at 9' since 2-9-60 Down .04" at 20' since 2-9-60
5-21-60	105-F	4676-F	36'	Up .12" at 9'4" since 2-2-60 Up .05" at 20' since 2-2-60
5-21-60	105-F	4494-F	33'	Up .24" at 9'8" since 9-17-59 Up .21" at 20' since 9-17-59

COOLANT TESTING OPERATION

During May, 1960, activities of the Coolant Testing Operation included operation of the 1706-KE in-reactor and out-of-reactor equipment; operation of the 1706-KE in-reactor loops, and start-up of new and revised facilities.

A summary record of activities involving each facility follows, including significant items of performance, changes, and improvements:

1706-KE Single-Pass Tubes

Four of the six central zone process tubes used for special testing were supplied water by 1706-KE high-head pumps during the month. The other two tubes were supplied water from the normal 190-KE process water pumps. The four tubes used for testing operated under the following conditions:

<u>Tube</u>	<u>pH</u>	<u>Water</u>	<u>Dichromate</u>
4355	7.0	Filtered	1 ppm
4456	7.0	Filtered	1 ppm
4963	6.5	Process	2 ppm
5063	6.5	Process	2 ppm

1706-KE Mock-Up Tubes

The mock-up tubes were started up on May 21, and operated during the balance of the month on the following tests:

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1. Corrosion evaluation of sample lots of nickel-plated I&E slugs from lots of slugs which have been charged into one of the old reactors. These tests are being run in 120 C and 165 C process water.
2. Tests of Cermet coupons in 120 C process water. These Cermets are being evaluated for possible use as reactor process tube material.

Out-of-Reactor Loops

ELMO-1 - The loop has remained shut down during the month awaiting repair of the raw water pump, which supplies water for the secondary side of the test heat exchanger.

ELMO-4 - The loop has remained shut down during the month, awaiting delivery of pump parts.

ELMO-5 - The loop continued operation at 290 C and pH 10.0 for uniform corrosion tests of:

Zircaloy-2	Nickel
Stellite-6	D-979 Nickel Alloy
Stellite-12	J&L Steel #313472
Hasteloy-C	Hasteloy-X
Monel	Inconel
Carbon steel, Zircaloy-2 galvanic couple	

During the month, uniform corrosion tests were completed on:

Zircaloy-4
Graphite, Zircaloy-2 galvanic couple

ELMO-6 - The loop has remained shut down during the month, awaiting delivery of a replacement canned motor pump. During this time the loop has been decontaminated (for non-radioactive crud removal), using the Turco-4502 and 4518 processes.

ELMO-7 - The loop continued normal operation until May 3. During a routine shutdown and test inspection, it was observed that one of the Zircaloy-2 clad uranium test pieces had ruptured, resulting in all of the 1.358 pounds of uranium in the test piece being decomposed and deposited around the loop. The loop remained shut down during the balance of the month, awaiting completion of decontamination.

ELMO-8 - The loop has remained shut down during the month, awaiting corrective action for the faulty welds observed during initial operation.

ELMO-10 - Eighteen of a series of 30 decontaminant-scanning tests were completed during the month. These tests are being run at low flows (5 gpm) and low pressure and temperature (110 C maximum).

CEP-1 - Three cyclic decontamination tests were completed during the month, using Turco-4502 followed by Turco-4518, with a nitrogen purge for excluding all oxygen during decontamination runs. Loop conditioning

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between decontamination runs was performed at 300 C and pH 10.0

CEP-2 - The loop continued operation at 300 C and pH 10.0 during the month for cyclic fretting corrosion tests of Zircaloy-2 PRTR components. The fretting corrosion elements are being mechanically vibrated for accelerated fretting corrosion attack.

CEP-3 - Installation of the loop is complete and final checks are being made in preparation for shakedown operation.

CEP-4 - Following shakedown testing, three cyclic decontamination tests were completed during the month, using Wyandotte 1113 followed by Turco-4512. Intermediate loop conditioning runs were performed at 300 C and pH 10.0

REP - Loop revisions were completed during the month and the loop is operating on conditioning runs, preparatory to a gross contamination-decontamination test.

In-Reactor Loops

KER-1 - Shakedown testing following the new tube installation was completed during the month. During the May 14 reactor outage, the loop was charged with a thermocouple train test, as authorized by PT IP-314-A, for determining the effect of fuel element film build-up on core temperatures. The charge consists of one one-inch diameter natural uranium rod 10.78 inches long with five imbedded thermocouples and two enriched 36-inch tubular heater elements. All thermocouples functioned satisfactorily during the balance of the month. Equilibrium operating conditions are 288 C at pH 10.0.

KER-2 - The loop continued operation during the month at 269 C and pH 10.0 with NPR candidate fuel element shapes authorized by PT-IP-292-A.

KER-3 - The loop continued operation at 275 C and pH 10.0 with fuel elements authorized by PT IP-288-A until the May 14 outage. Since the above elements had reached goal exposure at this time, they were discharged and the tube recharged with elements authorized by PT IP-315-A and PT IP-317-A. This charge consisted of six nine-inch natural uranium I&E fuel elements and one 0.89-inch D natural uranium rod 12 inches long, all encased in Zircaloy-2 sleeves for optimum flow distribution, plus one seven-rod, eight-inch natural uranium seven-rod cluster.

During the reactor start-up following the outage, rupture indications began to appear. Ten hours after start-up the indications became conclusive and the reactor was shut down, the elements discharged, and the tube recharged with dummies. Due to high contamination conditions in the KE Reactor storage basin, it has not been possible to examine the fuel elements closely for visual rupture confirmation.

KER-4 - The loop continued operation during the month at 288 C and pH 10.0 with fuel elements authorized by PT IP-300-A. During the month,

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feed-and-bleed operation was initiated at conditions approximating those anticipated for NPR.

KER Changes and Improvements

Installation and shakedown of the NPR prototype feed-and-bleed equipment was completed during the month. The presently installed equipment permits running two loops under feed-and-bleed conditions, with facilities provided to allow running four loops under these conditions with the addition of a second controlled-volume positive-displacement pump.

Coolant Testing Operation Outage Performance

One unscheduled outage was caused by Coolant Testing Operation activities during the month. This was caused by the KER-3 fuel element rupture which occurred shortly after reactor start-up on May 16. A total of 10.8 hours of outage time was incurred during the month. This is itemized as follows:

<u>Production Test</u>	<u>Description</u>	<u>Hours</u>
IP-314-A	Charge KER-1 thermocouple train	1.7
IP-292-A	Repair leak on KER-2 rear face tubing connection	2.0
IP-288-A	Special discharge on KER-3 fuel elements	4.9
IP-315-A and IP-317-A	KER-3 fuel element rupture and discharge	<u>2.2</u>
	TOTAL	10.8

COMPONENT TESTING OPERATION

Irradiated Material Examination

Examinations were completed on the fuel elements from the following 18 tubes at the 105-C Metal Examination Facility during the month of May:

<u>PT No.</u>	<u>Tube No.</u>	<u>PT No.</u>	<u>Tube No.</u>
216A	1559-D	219A	1278-DR
219A	1275-DR		1277-DR
	1274-DR	280A	2673-D
	1273-DR		2668-D
	1272-DR		2664-D
	1271-DR		2881-D
	1281-DR		2874-D
	1280-DR		2870-D
	1279-DR		2776-D

In addition, data from 41 tubes of IP-216-A that had previously been examined were transferred to the new data sheets for IBM processing.

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Process Tube Corrosion Monitoring Program

In-reactor measurements of 569 process tubes were completed during the month. Listed below are the number of tubes measured per reactor and the document numbers of the reports issued.

<u>Reactor</u>	<u>No. of Tubes Probologged</u>	<u>Report No.</u>	<u>HW Number</u>
F	56	19	64995
B	179	20	65020
D	108	21	65040
B	72	22	65222
H	39	23	65263
F	95	24	65312
H	20	25	65397

Visual examination, wall thickness and rib height measurements, were completed on three H Reactor process tubes. Tubes 0581 and 2065 were removed because they were leakers. Tube 2079 was removed because the ribs were misaligned when the tube was installed.

At the request of Coolant Systems Development, Hanford Laboratories Operation, 15 one to two inch samples were taken from an irradiated process tube and transported to 200-W Area for decontamination studies.

Front Face Flexible Connector Examination

A thorough inspection was made of all front face flexible connectors at 105-KE and KW this month. The purpose of this inspection was to find all connectors with broken wires, to examine the ends of the broken wires and to determine whether they were broken due to cavitation or mechanical damage. Of the 160 to 170 connectors on each reactor which had broken braid wires, all were a result of mechanical damage.

Inspection was also made on 64 connectors at 105-B and 18 at 105-H, on which reactor personnel had found broken wires. Again the wires were examined to determine whether they were broken due to cavitation or mechanical damage. No broken wires due to cavitation damage were found.

Detailed reports of these examinations have been issued.

Panellit Programs

Gauges processed in instrument maintenance shops during the month totaled 347. Component Testing Operation inspection of these gauges resulted in detection of 98 gauges which did not meet inspection criteria, for a rejection rate of 28.3 per cent.

In-board reliability examinations were performed on 1,786 gauges, almost double the average monthly examination requirements, during the month. Of the 1,786 gauges examined, 184 were found to be substandard or defective in some way, and were removed from service. This is a percentage defective of 10.3, very close to the defect detection rate

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anticipated with program conception, and is approximately 3 per cent less than the average per month for the past year.

In-board Bourdon coil leak examination of 683 gauges resulted in detection of no leaking coils. These particular gauges have received numerous examinations, one within a month of the most recent examination, and detection of leaking coils was not anticipated.

Response times were determined on a total of 1,786 gauges during the month. Of this number, 2.7 per cent, 48 gauges, showed slow response and received corrective action. During the past month the lowest rate of slow response detection, since response determination provisions were instituted, was experienced. Comparative percentages are listed below:

November, 1959	12.0
December, 1959	9.5
January, 1960	12.5
February, 1960	7.5
March, 1960	4.8
April, 1960	4.85
May, 1960	2.7

The continued reduction of slow response conditions is attributed to more judicious use of damping oils and increased flushing and re-oiling of sensing lines as contrasted with a former practice of adding damping oil without pre-flushing sensing lines.

"Critical components" inspection of Panellit gauge components for warehousing and direct-to-user supplies was as follows:

<u>DT-100-T Switches</u>		<u>Bourdon Coils</u>	
Inspected	84	Inspected	36
Rejected	25	Rejected	0
Accepted	59	Accepted	36
Per cent Reject	29	Per cent Reject	0

HWS-7847, Procurement Specification for 2B-X3-EW and 2B-X4-EW (early warning) switches (pilot lots for testing and evaluation) was formulated, approved and published during the month.

JH Brown 6/16/60

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PRODUCTION, ENGINEERING & REACTOR OPERATIONS

PRODUCTION OPERATION

PRODUCTION PLANNING & SCHEDULING OPERATION

Planning

Studies were made and assistance rendered on plutonium quality separation and the Plant Improvement Programs.

Production Scheduling

Discharge Concentrations

The discharge goal exposure for I&E regular and enriched uranium at KE Reactor was reduced from 700 MWD/T to 650 MWD/T. All other goal exposure plans remained unchanged during May. The trend toward better uranium utilization continued; the values reported in the table below represent another new high for over-all exposure levels for CY 1960.

	<u>Discharge Exposure Comparison (MWD/T)</u>					
	<u>Regular Solid</u>		<u>Regular I&E</u>		<u>Enriched I&E</u>	
	<u>6 Old</u>	<u>2 K's</u>	<u>2 Old</u>	<u>2 K's</u>	<u>6 Old</u>	<u>2 K's</u>
March	694	637	618	659	787	694
April	727	746	644	701	826	731
May	724	749	691	677	795	730

A resume of discharging outside the established goal exposure plan is provided in the table below:

<u>Reactor</u>	<u>Tons Disch.</u>	<u>Tons Excess Usage</u>	<u>Material Type</u>	<u>Reason</u>
B	0.9	0.4	Reg.	To adjust enrichment.
C	3.4	0.8	Enr.	Rupture prone lots KG244E, KG250E and KG848E.
D	3.9	0.9	Reg.	To charge bumper slug PT-IP-262-A.
H	6.0	1.9	Reg.	Discharge of C-64-F clad slugs as a rupture control measure.
	10.8	3.2	Totals for regular	
	3.4	0.8	Totals for enriched.	

DECLASSIFIEDPRODUCTION COMPUTING OPERATION

Tube-by-tube source data were processed to establish the current production and corrosion status for each tube in all reactors. Routine and emergency reports were issued to implement the scheduling, forecasting, and accountability functions of the Production Operation. Charge-discharge and tube replacement information for each reactor operation was provided in accordance with production schedules. Production data were supplied to each Pile Physicist for reactivity evaluations, and to Process Technology for EDM processing. Individual tube source data were supplied to the Nuclear Materials Operation for calculating weights of SS material in discharges and month's end inreactor inventories.

ESSENTIAL MATERIALS

Rail and truck shipments received in April were as follows:

Carload shipments for IPD	127
Carload shipments for other Depts.	186
Truck shipments for IPD	<u>165</u>
Total	478

In addition to the routine duties involved in the procurement and delivery of essential materials, the following items were included in the group's activities during May:

- (1) As of May 31, D, DR, F and H were using liquid aluminum sulphate as a water treatment chemical replacing the dry aluminum sulphate formerly used.
- (2) Continued to expedite the manufacture and delivery of aluminum boron splines to meet the increase in use of this material.

PRODUCTION REPORTS & STATISTICS

Routine processing of the Daily and Monthly Reports continued. A large volume of both routine and non-routine data were supplied to IPD personnel. Some routine data were also supplied to FPD, CPD & HLO. The annual report on Safety Experience - Reactor and Critical Facilities was issued.

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REACTOR OPERATIONS STATISTICS - PROCESSING

	B		C		D		DR		F		H		KE		KW		TOTAL	
	NO.	HRS.	NO.	HRS.	NO.	HRS.	NO.	HRS.	NO.	HRS.	NO.	HRS.	NO.	HRS.	NO.	HRS.	NO.	HRS.
INPUT PROD.-PU (% OF FORECAST)	116.0		110.2		99.1		86.5		111.0		103.9		129.0		110.8		110.5	
TIME OPER. EFF. (% OVERALL)	88.6		86.6		81.2		73.1		89.1		79.0		93.3		90.4		85.2	
NO. OF REACTOR OUTAGES 5 HOURS																		
SCHEDULED	0	63.2	0	30.7	0	94.1	0	136.9	0	70.8	0	83.0	0	27.2	0	49.6	0	555.5
UNSCHEDULED - SCRAMS	2	7.5	1	0.4	0	-	0	-	1	0.4	2	1.5	1	2.2	3	18.6	10	30.6
- OTHER	2	13.8	3	68.8	3	45.5	4	63.3	2	10.2	5	71.8	1	20.8	0	3.3	20	297.5
TOTAL	4	84.5	4	99.9	3	139.6	4	200.2	3	81.4	7	156.3	2	50.2	3	71.5	30	883.6
BREAKDOWN OF REACTOR OTSE HRS.																		
PLANNED																		
CHARGE-DISCHARGE	29.7		25.7		39.3		80.0		26.7		37.7		13.3		30.0		282.4	4.7
TUBE REPLACEMENT	11.0		-		8.9		23.0		5.3		4.5		-		-		52.7	0.8
PROJECT WORK																	5.5	0.1
PRODUCTION TEST	0.2				11.4		0.7						8.6				20.9	0.4
MAINTENANCE	22.3		5.0		34.5		33.2		38.8		40.8		4.9		14.1		193.6	3.3
MISCELLANEOUS													0.4				0.4	
SUB - TOTAL	63.2		30.7		94.1		136.9		70.8		83.0		27.2		49.6		555.5	9.3
UNPLANNED																		
CHARGE - DISCHARGE			-		5.3		3.8				3.1		2.2				12.2	0.2
PRODUCTION TEST					1.0								20.8		0.7		3.2	0.1
RUPTURE REMOVAL	7.3		66.3		24.0		20.5		2.4		5.3						147.3	2.5
WATER LEAK	1.2		-		-		11.2		4.8		33.2						50.4	0.8
MAINTENANCE	5.3		2.5		15.2		27.8		3.0		31.7				1.6		87.1	1.5
INSTRUMENTATION	7.2		-						0.4						10.0		17.6	0.3
PANELLIT	0.3		0.4												8.6		9.3	0.1
MISCELLANEOUS															1.0		1.0	0
SUB - TOTAL	21.3		69.2		45.5		63.3		10.6		73.3		23.0		21.9		328.1	5.5
TOTAL	84.5		99.9		139.6		200.2		81.4		156.3		50.2		71.5		883.6	14.8
NO. BLUB RUPT. (ALL TYPES)	1		3		1		1		1		1		1		-		9	
NO. NEW TUBES INSTALLED					1		12				2		1				16	
TYPE OF WATER LEAK - TUBE	1		1		-		3										5	
VAN STONE					-						2						3	
Helium Used - M Cu. Ft.	614.7		751.3		314.1		276.7		527.2		333.7		285.5		397.9		3501.1	

Remarks:

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MONTH		REACTOR OPERATIONS STATISTICS - POWER										SHEET 1	
May, 1960		100-B	100-C	100-D	100-DR	100-F	100-M	100-KE	100-KW	TOTAL			
RIVER WATER (BLDG. 181)													
TO RESERVOIR (BLDG. 182)		9890		4364		1697	2697			18648			
TO FILTER PLANT (BLDG. 183)		62506		88258		79677	76400	180800	160300	647941			
TO FILTER PLANT (CSDR)		108270		56109						164379			
TO R & E (KER) & FEO				203				159		362			
TOTAL		180666		148934		81374	79097	180959	160300	831330			
TOTAL		8064.9		6648.4		3632.5	3530.9	8078.0	7155.8	37110.5			
RESERVOIR WATER (BLDG. 182)													
TO POWER HOUSE (BLDG. 184)		33		44		388	48			513			
TO COND-SYSTEM (BLDG. 190)				1620		1161	2649			5430			
TO COND-SYSTEM (180DR & 183F)				2700		148				2848			
TO EXPORT SYSTEM		9857								9857			
TOTAL		441.5		194.8		75.7	120.4			832.4			
FILTER WATER (BLDG. 183)													
TO POWER HOUSE (BLDG. 184)		145		155		113	147			560			
TO PROCESS (BLDG. 190)		73296	84454	72212	67854	76789	71300	173809	157254	776968			
TO 108		2500	4500	152		1098	1230			9480			
TO 108DR				152						152			
TO FILTER PLANT (BLDG. 183DR & 183F)			15596	13008						(28604)			
TO F & S SYSTEM		128		352						909			
TO R & E (KER) & FEO				153		241	138		50	153			
BACKWASH		2033	3720	2074	1263	1436	3585	6991	2996	24098			
TOTAL		3486.4	4833.2	3939.8	3085.4	3556.8	3410.5	8070.9	7155.8	37538.8			
PROCESS WATER (BLDG. 190)													
TO REACTOR		72896	84054	71812	67454	76389	70800	171200	155100	769705			
TO REACTOR		81000	94800	82000	82500	83000	85300	181600	168000	858200			
POWER HOUSE (K AREA)								25	12	37			
108 (KE - KW)								1605	1742	3347			
TO R & E (KER)								579		579			
BUILDING USAGE		400	400	400	400	400	500	400	400	3300			
TOTAL		3271.9	3770.0	3223.5	3029.0	3427.9	3182.8	7758.8	7019.8	34683.7			
RIVER DATA													
ELEVATION (MSL, FT.)		400.5		390.1		376.8	382.0		395.1				
		392.2		382.9		369.2	375.7		386.2				
		396.5		386.7		373.2	379.0		390.8				
TEMPERATURE		50.9		51.0		52.3	50.7		51.4				

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May, 1960

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 BLDG. 183	MM GALS	2790.3	4833.2	3939.8	2504.7	3556.8	3410.5	8070.9	7155.8	36262.0
	MM GALS									
<u>CHEMICAL CONSUMPTION</u>										
CHLORINE (BLDG. 182) (BLDG. 183)	LBS.	14850	27576	21460	14010	20272	20163	56400	50900	225631
	LBS	0.6	0.7	0.6	0.7	0.7	0.7	0.8	0.9	0.7
	AVG PPM									
ALUM	LBS	152733	229552	224092	150716	192000	181558	539600	454800	2125051
	AVG PPM	6.6	5.7	6.8	7.2	6.5	6.4	8.0	7.6	7.0
SEPARAN	LBS	100	150	450	350	300	550	920	850	3670
	AVG PPM	.004	.004	.014	.017	.010	.019	.014	.014	.012
SULPHURIC ACID (AQ 100%)	LBS	161364	242045	276706	141960	247850	225486	479500	493200	2268111
	AVG PPM	6.9	6.0	8.4	6.8	8.4	7.9	7.1	8.3	7.5
DICHROMATE	LBS	48500	55800	39200	36800	51419	43975	104800	94100	474594
<u>PURGE MATERIAL CONSUMPTION</u>										
SOLIDS	LBS	0	1200	0	0	0	0	0	0	1200

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REACTOR OPERATIONS STATISTICS — POWER										SHEET 3
MONTH	100-B	100-C	100-D	100-DR	100-F	100-H	100-KE	100-KW	100-KW	
ANALYTICAL DATA										
RAW WATER										
PH	8.2	8.0	8.3	8.3	8.3	8.2	7.5	7.5	7.5	
	7	8	14	15	13	11	13	15	15	
FINISHED WATER										
PH	7.1	7.1	7.1	7.1	7.0	7.1	7.1	7.1	7.1	
TURBIDITY	.007	.008	.008	.009	.015	.008	.007	.006	.006	
CL ₂ RESIDUAL	.05	.05	.05	.05	.05	.05	.05	.05	.05	
DICHROMATE	1.79	1.79	1.80	1.80	1.80	1.84	1.80	1.80	1.80	
STEAM DATA										
100-B	100-D	100-F	100-H	B-D-F-H TOTAL		KE	KW	KE-KW TOTAL		
88000	123000	63000	70000	344000	52000	53000	105000			
81000	81000	54000	54583	270583	-	-	-			
75600	82463	53975	52300	264338	34008	32282	66290			
56289	61352	40157	38894	196692	25302	24018	49320			
47733	52026	35338	32982	168079	22772	21616	44388			
508	674	2439	2309	5930	-	-	-			
3619	3848	2259	2267	11993	-	-	-			
20298	24089	17871	19631	81889	-	-	-			
7.78	7.97	8.89	8.58	8.20	-	-	-			
GALLONS										
OIL RECEIVED	397574						-	397574		
CONSUMED	233396						231630	465026		
IN STORAGE	695982						516516	1212498		
GALLONS										
GEN-STEAM/GAL.OF OIL	108.4						103.7	106.0		
ELECTRICAL DATA										
TOTAL GENERATED KW HRS.										
1556800						1652000	3208800			
68800						164000	232800			
Peak Demand Control										

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APPLIED REACTOR ENGINEERING OPERATIONINDUSTRIAL ENGINEERING OPERATIONAchievements58-9 - Rear Face Improvements, All 105-Reactor Buildings

Improved handling system for rear face nozzle caps incorporates use of a gravity roll conveyor, nozzle cap trucks, and cap trays, used in conjunction with an engineered system of removing, servicing, and replacing nozzle caps for charge-discharge activities. The engineered system has been installed and is in routine use in the KE and KW Reactors. To improve charge-discharge rates in the older reactors, rear face nozzle cap handling equipment similar to that installed in the K Reactors has been programmed for the remaining reactors.

Purchase orders have been issued for all of the equipment necessary for the system. Status of the equipment is as follows: Thompson Metal Fab of Portland, Oregon, was the successful bidder for the 30 nozzle cap trucks at a total price of \$8,920.50. An alteration was issued, increasing this amount to 31 trucks, increasing the total price to \$9,217.85. This additional truck was ordered for KE Reactor Operation. Fabrication has been completed on the first six units, and they are being prepared for shipment on June 1, 1960.

A purchase order for 720 fiberglass reinforced polyester resin cap trays was placed with Ram Plastics, Inc. of Seattle, Washington. The revised price for the 720 trays is \$4,896. The vendor has completed the manufacture of one tray, and has delivered it to the General Electric Company for inspection and evaluation prior to beginning full-scale production.

Bid quotations have been returned from the prospective vendors for rear face gravity roller conveyors. Fryer Knowles, Inc., of Seattle, Washington, was the successful bidder, at a lot price bid of \$1,967 for the 18 conveyor sections. Scheduled shipping date for the conveyors is June 16, 1960.

58-27 - Program of Tube Replacement Improvement

The need for improved tube replacement performance is apparent. To determine the opportunities that may exist in reactor operations for attainment of better rates of tube replacement, we have initiated studies of current tube replacement practice.

Representative tube replacement work at 105-F Building has been studied in detail by analysis of motion pictures (14,000 feet). A new technique of filming simultaneous activities on the front and rear faces of the reactor was tested on a tube replacement job in 105-F Building. This new approach combines the pictures of work on the front elevator, pictures of work on the rear elevator, and the original vocal job communications on a single 16 mm film with a synchronized optical sound track. The technique of simultaneous filming of two widely separated but interrelated work activities has proven successful.

The data obtained from the film analysis are being used to prepare a specific program for tube replacement improvements. Work is continuing on assistance to Facilities Engineering and Manufacturing Operations personnel in their planning and scheduling of large-volume tube replacement activities at 105-C Reactor. A third symposium and film review was conducted on tube replacement activities for members of the Radiological Engineering Operation, to assist them in their work concerning radiation exposure problems. We are continuing to render assistance in this effort.

58-31 - Metal Handling, 300-100 Areas

58-31A - 105-Reactor Work Area Metal Handling, All Old Areas

The design-development of a suitable magazine container for storage and shipping of fuel elements is in progress. The key item in the material handling system has been identified as a fuel clip, and recent activity has been devoted to studies aimed at reducing the cost of manufacturing this item. The fuel clip was subjected to value analysis in the HAPO Value Analysis Seminar, April 25 through May 6, 1960. At the outset, the fuel clip manufacturing cost was estimated at \$23 each in units of 500. At this price, fuel clips are closely competitive with wooden pallets for storing and handling before IPD use. (Fuel clips are expected to provide unique manpower benefits in IPD during the reactor charging periods.)

At the completion of the value analysis, the fuel clip had been redesigned according to value principles and the manufacturing cost was estimated by a Kennewick metal fabricating shop at \$15 each in units of 500. Simultaneously, bids were received from an aluminum extrusion plant at Torrance, California, which led the analysts to believe that the cost of fuel clips can be reduced to approximately \$10. Currently, work on fuel clips is following the suggestions of those who participated in its Value Analysis. Design and installation of overhead monorails for the fuel handling system has not progressed since last report.

59-20 - Water Leak Study, 100-F

At the request of the Manager, F Processing, studies have been conducted to determine alternative solutions to the tube water leak problem in the F Reactor. One development derived from that study was the discovery of an electrical current flow phenomenon between process tubes and the face of the reactor (ground). The information at disposal of Industrial Engineering Operation on this subject has been transmitted to Reactor Engineering Operation personnel for further study and development. It is presumed that it is possible to locate water leaks by electrical measurements.

If this premise is real, it will be necessary to attach electrical leads to process tubes in some manner for measurement of the current flow. Means have been developed by W. W. Porter of Reactor, Plant Engineering Operation to attach electrical leads to the lip of the front van-stone flange of process tubes.

59-21 - Service to D-DR Reactors Operation

To better serve the needs of the D-DR Reactors Operation, and with the concurrence of the manager, an industrial engineer has been assigned to duties in the D-DR Area.

Films on methods and procedures of pre-insertion of downstream dummies, rear face setup, and charge-discharge with charge seaters were shown and discussed with three shifts prior to the unscheduled May 1st outage at 105-D. Assistance was provided during the charge-discharge for the initial use of these methods, procedures, and equipment in D Reactor.

The outage analysis and comments about future performance were furnished to the Manager, D Processing. A suggested spline procedure for charge-discharge was outlined to minimize misunderstandings and errors.

Maintenance performance, problem areas, and suggestions were discussed in a letter to J. W. Hedges and in discussions with R. Robinson of D-DR Maintenance Engineering.

59-37 - Program of Charge-Discharge Improvements

A program of charge-discharge improvement in the six older reactors was defined in June, 1959, and has been followed since then. The improvements in method and equipment are being adopted for use as development and installations are completed.

One of the improvements relates to pre-marking of tubes selected for re-fueling. A tagging system has been worked up for this purpose, and necessary tags have been procured and distributed for "regular" and "special" charge-discharge work.

59-42 - Metal Unloading Ramp

An engineered system of unloading fuel elements and other material from delivery trucks at the 105-Reactor Buildings is being provided at B, D, DR, and F Reactors. One ramp unit, purchased from Magline, Inc., of Pinconning, Michigan, has been delivered to F Reactor. Testing of this prototypic unit has been completed, and the ramp is being used routinely for unloading unirradiated metal and for loading empty fuel element pallets.

Standard operating procedures and maintenance instructions have been prepared by Industrial Engineering and approved by the Manager, F Processing. Copies of these standard operating procedures have been delivered to the other reactor buildings for use as their ramps are received.

Two additional ramps have been delivered to B and D Reactors, and they are now being routinely used for metal unloading. The remaining ramp for DR Reactor is being assembled by the vendor for shipment on schedule.

A training session for operation of fork lift trucks on the Magliner ramp was conducted on May 11 at B Reactor. Approximately 20 operators from B Reactor and Supplemental Crews were given the opportunity to receive training and to participate in the actual unloading of the fuel elements.

60-3 - Program of Charge-Discharge Improvements in KE-KW Reactors

A program of charge-discharge improvement in the KE-KW Reactors was defined in January, 1960, and has been followed since then. The improvements in method and equipment are being adopted for use as the developments and installations are completed.

The tentative procedure for charging with charge seaters in the K Reactors was devised and tested at the KW outage of April 28, 1960. The charging procedure checked out very well on cycle times and on the attendant unavoidable delays in the operation. However, due to excessive avoidable delays, the charging rate predicted by this procedure was not made. The charging rate averaged 36.2 tubes per hour for 17.33 hours. The actual charging rate, after elimination of the unavoidable delays in the operation, should have averaged a little better than 67 tubes per hour. Out of the 17.33 hours consumed by the charging operation, a total of 7 hours, 58 minutes was tabulated as avoidable delay. The test on this procedure was run without the benefit of the splash guards, which were to have been installed on the charging machines. Further tests on this procedure are planned as soon as manpower will permit. At the next test, it is expected that the splash guards will be installed and the procedure will be followed as written.

60-5 - Assistance to Supplemental Crew Activity

A program of Work Simplification, Motion Economy and Methods Development Appreciation has been devised for presentation to supervisors and specialists of Supplemental Crews. Two sessions have been held with Supplemental Crew supervisors who have been sent to Industrial Engineering Operation for the week's training in methods and methods development. This program was well received by these people, and it was decided to offer it also to all Processing supervisors and specialists. A letter was issued with a schedule which would allow all supervisors and specialists in all reactors to attend sessions of this course. These sessions were arranged to familiarize the supervisors with Work Simplification principles utilized in establishing methods and procedures for tasks in the reactors and to discuss supervisory techniques and responsibilities.

The course material consists of the following topics:

1. Work Simplification for the Supervisor
2. Outage Procedures and Films of Outage Work
3. Quality Control
4. Outage Analysis - Variance Reporting
5. Planning and Scheduling of:
 - a) the outage
 - b) individual jobs
 - c) manpower tasks within jobs
6. Union Relations and the Supervisor
7. Resources Available to the Supervisor

Since this is being offered during the summer months, in the event that some of these people are unable to attend, this course is to be rescheduled again for September and October.

The Day Supervisors' Meeting was attended in 1704-F Conference Room on May 18. The subject for discussion at this meeting was "Dynamic Production Scheduling", and was conducted by R. D. Gilbert of Industrial Engineering Operation. The Maintenance planners and schedulers were also invited to this meeting.

60-8 - Background Music Service

To improve the opportunity to supply a pleasant working environment, many General Electric plants have installed background music systems in selected plant locations. The same opportunity exists in Irradiation Processing Department. To determine the cost of suitable installations, and with the concurrence of the Manager, F Reactor Operation, invitations to bid on supplying background music service were submitted to the trade. Vendors of background music service were asked to submit their proposals for a test installation in two 100-F Area buildings, 1717 and 1704. Four bids were received and necessary engineering in support of bid evaluation is being conducted.

60-10 - Pre-insertion Charging Machines

An investigation is being made to determine the means of improving pre-insertion rates. The possible use of machines to perform this function or a revision of other equipment to reduce the time necessary for this operation are being investigated.

Preliminary investigations and discussions with Facilities Engineering people have indicated that the development of a charging machine capable of charging 1,000 tubes of downstream dummies in one hour is not feasible. Another investigation was made at the suggestion of Tom Hall, at that time Analyst, KE Processing, to consider the possibility of providing a one-piece downstream dummy charge which could be self-supporting during insertion into the process tube. A preliminary investigation of this possibility has indicated that this also is not feasible. Materials with appropriate nuclear properties do not have the strength or are too expensive to be used for this type of an application. Further investigation is being made to investigate all alternatives.

60-13 - System Evaluation: Data Acquisition and Communication

A study was conducted to determine the benefits which could be derived from the high-speed data transmission system proposed by R. C. McGee, Electronic Data Processing Operation. Benefits were determined for the radio frequency transmission of management control information. A letter was sent to R. C. McGee describing the values and savings the proposed system would have. It was concluded that courier service is suitable for the immediate needs of Irradiation Processing Department. Radio frequency transmission becomes attractive when data can be transmitted by this means for a cost of less than \$30,000 per year.

60-15 - Centralized Reactor Outage Planning and Scheduling

A report, "Utilization Control of Hanford Reactors", R. D. Gilbert to J. C. L. Chatten, dated May 12, 1960, discussed the implications and suggested a structure for "outage control" scheduling on a Department-wide basis.

The problems associated with centralized loading, scheduling, and dispatching of reactor outages and outage work are being considered.

Preliminary mathematical calculations have been made to determine the probabilities of reactors operating for given periods of time after a significant operating period. Probabilities seem to indicate that statistically, conditions are in favor of adopting central control of outage scheduling based on Department optimization of T.O.E. rather than optimization of individual reactor T.O.E.

MAINTENANCE PRACTICES OPERATION

ACHIEVEMENTS

Productive Maintenance

Engineering assistance was furnished to 100-H Area in connection with the overhaul of No. 11 pump, 181-H Building. This involved bearing spider specifications and dimensions.

Preliminary work was accomplished toward the preparation of recommendations for improved safety of cranes, hoists, and rigging equipment. Task Force No. 3 has been delegated to perform this function. Chairman, R. M. Scott, requested Maintenance Practices participation.

Third Party Inspections were arranged for Irradiation Processing Department plants on May 25th and 26th. John A. Cronin was the inspector for Travelers Insurance Company. Boilers, elevators, and unfired pressure vessels were included in these inspections.

A check list was published and distributed to the various plants on the hazards and proper maintenance of abrasive grinding equipment. A letter warning of the hazards connected with such equipment was distributed to those concerned with its maintenance.

Preparation of Maintenance Specification 165-K-3 continued. Publication will be made in the near future.

Assembly of information for maintenance Specification 181-4 continued. Correspondence with the manufacturer of the 181 pumps resulted in the provision of pump dimensions and specifications which have not been available previously at this location.

Spare Parts

New Line Items Added to Spare Parts and Items Increasing Stock Levels	63	\$10,690
Line Items Deleted from Spare Parts and Items Decreasing Stock Levels	14	293
Line Items Changed, i.e., Description, etc.	23	
Spare Part Items Authorized by Letter to Project Engineering	15	987
Spare Equipment Items Authorized by Letter to Project Engineering	0	0
Spare Part Items for Projects by Stock Adjustment Requests (SAR's)	15	732

Spare Equipment Items for Projects by SAR's	0	\$	0
Spare Part Items for 100-K	7		1,334
Engineered Items Reviewed	38		
Drawings Ordered Revised	2		
Stock Adjustment Requests (SAR's) Processed	35		
Stores Stock Requests Processed	5		

A special study evaluating and forecasting spare parts inventory dollar value as of July 1, 1960, was completed. It is forecast that the Irradiation Processing Department portion of this account will not exceed \$1,775,000.00. This study evaluated disbursements, purchase commitments, and receiving schedules. The plants were notified not to take spare parts credit action which would inflate this inventory value.

A total inventory review has been in progress during May to evaluate plant requirements and deletion of obsolete items.

Assistance was provided in coordinating Design Engineering and Purchasing efforts on the charge seaters and poison splines to be used in all areas to expedite procurement. Similar effort was expended on procurement of the crossheader expansion joints for the 100-K's. Assistance was provided 100-B, 100-F, and 100-H on direct procurement of 700 venturi bodies.

Standards and Codes

Draft No. 12 of Accident Prevention Standard No. 13 was prepared in conjunction with W. D. Richmond and forwarded to Irradiation Processing Department representatives for comment and action at the next Central Safety Council Meeting.

Standards

The proposed Standard Specification for Construction of Low Pressure Air Ducts was approved by the Mechanical Standards Study group and forwarded to the Standards Council on May 20th.

A proposed new Guide for Plastic Piping has been received from the HAPO Standards group and is presently being circulated in the department for comment. Formal approval action on this proposed guide, after some minor revision, will take place at the next study group meeting.

Minor revisions were approved to Mechanical Standard B-3-0 concerning cylinder gas piping systems.

Irradiation Processing Department comments on revisions to HAPO Welding Standards were accepted without exception and incorporated into a completely new draft of these standards. The Brazing Standards were withdrawn at this time for a complete re-write at some future date.

The proposed Guide for Steam Traps as revised has been approved by the Standards Council and is now in the process of publication. This guide will be of particular benefit to Irradiation Processing Department Maintenance activities.

The proposed Standard for Rubber Hose Couplings has been approved by the Standard group and is now in the process of publication. This is another standard proposed by Irradiation Processing Department for direct application in the plants.

Codes

A review was made of the zirconium process tube autoclaves being installed in the White Bluffs Tube Shop. A meeting was held with NPR project representatives at which code considerations concerning this equipment were discussed. The recommendations made relative to temperature and pressure safety and relief requirements were accepted and the NPR project representatives are forwarding a letter to Kaiser Engineers requesting these modifications.

At the request of Mechanical Development Operation, a review was made of the safety circuit on the 189-D NPR Test Loop. Recommendations on code compliance and safety were accepted, and modifications are scheduled.

On the basis of the assistance provided during the April 15, 1960 Information Meeting with NPR personnel, another presentation has been prepared for the Legal and NPR Staff personnel on installation, operation and maintenance aspects of pressure vessels and pertinent code and statutory requirements.

Craft Training and Testing

Nine training classes were conducted on the fundamentals of AC and DC electricity. Six instrument trainees attended each class.

Instrument trainees were tested for proficiency in DC electrical theory.

Instrument Specialist Selection Test results were reviewed with four participants.

The servicing schematics on the iodine spectrometer used in the reactor confinement program was completed. Compilation of material for a service manual on this system is progressing.

Two eight-hour training classes on tube replacement and rupture removal were attended by nine millwrights and pipefitters.

Six two-hour training classes were presented on the 105 charge seaters with five mechanical maintenance supervisors and forty-eight craftsmen attending. All four shifts attended along with the regular day shift. Seven hours overtime were necessary in the presentation of the charge seater classes to shifts.

Sixteen two-hour training classes were held to update permits for the gunpowder actuated hand tools. Twenty supervisors and 177 craftsmen have attended, to date. The classes will continue throughout the year on the first Tuesday of each month.

B-C REACTOR OPERATION**DECLASSIFIED**GENERAL

Administrative Activities - A revised Bus Procedure was initiated within B-C Area, eliminating the unloading and reloading of buses at the Main Gate. Trial and subsequent performances have been satisfactory.

Personnel Development - Exempt - Three B-C Managers continued the "Business Operation In Our Changing Environment" course. Thirty-four first line supervisors participated in the "B-C Supervisory Training in Basic Principles". Seventeen supervisors participated in seven on-the-job courses related to their work.

Cost Control Activities - Additional measures adopted to further reduce the potential for overrun of the FY 1960 budget included stringent controls imposed on issuance of work orders, store orders, purchase requisitions and overtime work requests.

Landlord Activities - A paved passenger loading zone strip was installed north of Building 1704-B in conjunction with adoption of the revised bus loading procedure.

Suggestions - On hand beginning of the month - 51; received - 15; completed - 11; end-of-month backlog - 55.

B PROCESSING OPERATION

Production - Input production was 116.0 percent of forecast and TOE for the month was 88.6 percent; tube power was a limiting factor. A new high production record for B Reactor was achieved, exceeding the previous record by 5.5 percent.

Operating Experience - There were four unscheduled outages and no scheduled outages:

<u>Date</u>	<u>Hours</u>	<u>Cause</u>
10	50.4	Scram due to failure of the 2-C power-loss relay in the 105-B Area.
12	1.1	Shutdown to repair defective outlet temperature thermocouple No. 2875.
15	0.3	Panellet scram - Row 17, oscillating gauge.
30	32.7	E metal rupture, Tube No. 0967, Lot No. KH-151-C; the charge was removed with a maximum force of 5,800 pounds.

To avoid additional rupture outages, twenty-two charges of Lot No. KH-151-C were discharged below goal exposures; this was the second rupture experienced with this lot, the first occurring at 105-DR on May 28.

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Equipment Experience - An original tube (No. 1990) developed leaks internally and at the Van Stone Flange during the May 30 outage. Two hoppers of 3X balls were circulated through the hoppers with no indication of clustering. One hundred and twenty-two reamed venturis were installed. Six rear-face bellows were replaced to reduce gas losses. Failure of a time-delay relay coil effectively by-passed the yellow system switch in the Ball 3X system; repairs were accomplished during operation. Reclaimed dummy pieces lodged in Tube 2389-B during charge-discharge operations damaging the tube to an extent requiring its removal from service; more rigid inspections of reclaimed dummies have been initiated. A cracked Parker fitting at the rear crossheader on Process Tube No. 2776-B was repaired. Two rear-face connector failures occurred, both during operation.

Improvement Experience - A portable ramp for material handling was placed in service. Ram-type charge seaters were used for the first time during the May 30 outage. A and B rods were tied into the scram circuit. Piping for air monitoring sample lines is 95 percent complete. Concrete work on the "confinement" filter building continued.

Radiation Monitoring Experience - Particles with activity levels up to 37.6 rads/hr were found on the floor of the wash pad following equipment decontamination and were successfully removed. Three employees experienced dose rates up to 5 r/hr while setting up rupture removal equipment. Maximum exposure received was 100 mr. Maximum personnel dose rates of 1 r/hr were experienced during rupture removal and burial of solids and tubing. Swabs of probologging cable were contaminated up to 1 rad/hr.

Events Influencing Costs - 79 manhours of nonexempt overtime were used. There were no helium startups. 7,650 poison pieces and 7,930 dummies were decontaminated for re-use.

C PROCESSING OPERATION

Production - Input production was 110.2 percent of forecast and TOE was 86.6 percent. Power level was limited by an Operating Severity Index for rupture control.

Operating Experience - There were 4 unscheduled outages:

<u>Day</u>	<u>Hours</u>	<u>Cause</u>
3	32.0	Rupture - Tube 2287 (enriched I&E slug); removed with force of 3,500 pounds.
5	35.8	Rupture - Tube 2780 (enriched I&E slug); removed with force of 3,700 pounds. The leaking tube was removed and the channel blanked off as an air channel.
14	0.4	Scram - Panellit trip on gauge 3962. The tube contained a portion of a poison spline broken during removal attempt May 8.
20	31.7	Rupture - Tube 1792 (enriched I&E slug); discharged with the charging machine.

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Equipment Experience - The G hole assembly positioning motor of the Low Level Neutron Flux Monitor burned out and was removed for repair. Five exit water thermocouples and five blown Hansen fittings were repaired. A ruptured inlet hose on the controls of No. 9 Horizontal Rod was replaced.

Improvement Experience - Work was continued on ventilation modifications for Reactor Confinement.

Radiation Monitoring Experience - Skin contamination of 100,000 c/m was encountered by an operator during rupture removal work. Rags, contaminated to a maximum of 4,000 c/m, were removed from a project vehicle. Personnel dose rates of 5 r/hr were experienced during rupture removal work. Shielding pieces were removed from the G hole low level neutron monitor assembly and decontamination work performed in the Metal Examination Facility with maximum personnel dose rates of 500 mr/hr. Decontamination was successful in two reported cases of skin contamination up to 100,000 c/m and two cases of personal clothing contamination up to 6,000 c/m. During rupture removal, personnel dose rates of 5 r/hr were encountered in the discharge area; decontamination reduced dose rates to 400 mr/hr.

Events Influencing Costs - Necessary work during 99.9 hours of outage time required 260.6 nonexempt manhours of overtime work.

B-C POWER OPERATION

Operating Experience - No. 3 boiler at 184-B was inspected by Traveler's Insurance Company and reported in good condition.

Equipment Experience - Class(A) inspection of all 4500 HP Synchronous motors in 190-B has been completed. No. 2A Cone Valve in 190-B Annex was replaced with a new valve. Nine pump operation was maintained at 190-C despite pump impeller failures; the last four impellers inspected have required replacement. No's 3 and 6 pumps at 183-B were overhauled, this completing Class A inspections of the 183-B Process Pumps.

Improvement Experience - Two 3,000 - 4,000 KVA transformers from 182-B were exchanged with two 2,500 KVA transformers from 181-B/C. An acid head tank and piping have been installed in 183-B in preparation for Bauxite treatment of process water.

Events Influencing Costs - Maintenance costs were high due to extensive work required on 190-C pumps and 190-B motors.

MAINTENANCE ENGINEERING OPERATION

An analytical study of the flux monitoring systems at B and C Reactors has been completed and the report is being prepared. A study was initiated to determine interchangeability of the three area Flexowriters between B and C Reactor temperature monitor systems. All of the necessary equipment has been received and tested for foam rubber repair of bellows at B and C Reactors. Studies were continued on methods for clearing the VSR channel obstructions at C Reactor. Methods are being investigated for reclaiming and resizing damaged poison slugs and dummies. Reports of the Ball 3X system LPY relay failure at B Reactor on May 5, and the instrument power supply failure at B Reactor on May 10, were issued. Design

Change No. 367 Addendum has been prepared for installation of the HCR "deadman" switch control and the PCCF bulk outlet temperature lockout. Design Change No. 369 has been approved to install electrically operated A and B rods in the No. 2 Safety Circuit.

MAINTENANCE OPERATION

Equipment Experience - Of the 184.4 total outage hours experienced at B-C Reactors, 17 percent was devoted to reactor maintenance. The major work accomplished was: At 105-B, a complete check out of the 105-B emergency generator was made and four rear-face gas seal boots were installed; at 105-C, 106 rear nozzles were tightened and an overhaul of the No. 9 Horizontal Control Rod was completed; at 190-C, faulty impellers in Nos. 2 and 3 process pumps were replaced with vendor modified impellers; no replacement unit was available for the No. 4 impeller, which also is cracked, and the unit is out of service.

Improvement Experience - At 105-B, 46 pressure monitor sensing line surge suppressors were installed making a total of 881 suppressors installed to date; a prototype flow controller was installed in the X Sample Room to determine if the proposed controller meets criteria for stable flow. At 105-C, a major revision in the building communication system was started and was 20 percent complete at month end.

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D-DR REACTOR OPERATION**DECLASSIFIED**GENERALAdministration Activities

Assistance was provided in developing an evaluation of the First Line Supervisor Study as it applies to D-DR Reactor Operation. G. I. Henjum, welder, was awarded \$730 on May 31. for a suggestion involving repair of the Kanthal heating elements used in the NPR Tube Rupture Test facility at Building 189-D.

Personnel Development

A Relations Information Meeting for D-DR Reactor first line supervisors was held on May 17. This was the first such D-DR Reactor meeting in this new series of meetings being conducted by the Manager, Relations Practices and the Union Relations staff. W. B. Anderson, Technical Graduate on the rotational program began a three month assignment in D-DR Maintenance Engineering on May 1. No other technical graduates were assigned to D-DR Reactor at month end.

Cost Control

A forecast of the operating costs for FY-1960 was made by extrapolating line items from the 10 month average and adjusting each item for expected variance during the remaining two months. This approach indicated that budgeted controllable costs would not be exceeded. Closer control of expense in essential materials, applied materials and supplies was established by assigning target costs to the Level 5 components for the remaining two months.

Landlord Activities

The site for the foundation of Building 1760-D (Project No. CAI-835, Additional Office Space - 100-D Area) was staked out on May 5. Excavation work for the dormitory foundation was started on May 31.

D PROCESSING OPERATIONProduction

Input production was 99.1 percent of official forecast. Operating levels were limited by a tube power rupture control limit. Time operated efficiency was 97.8 percent of forecast.

Operating Experience

There were three unscheduled outages during the month for a total of 139.6 outage hours.

<u>Date</u>	<u>Hours</u>	<u>Reason</u>
5-1-60	64.3	Rupture 1366-D
5-12-60	39.3	Export line leak
5-28-60	36.0	Front fitting leak

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Operating Experience (Con't.)

All outages were controlled shutdowns, the first because of increased pressure on the rupture tube Panellit gauge, the second when repair of an export water line was necessary and the third when a front pigtail leak was noted. Outage time was used in charge-discharge, venturi replacement and rear face leak repair. Twenty tubes of bumper slugs were charged.

Equipment Experience

One tube was replaced because of rupture damage. Forces up to 9500 pounds were required to discharge the rupture, a hot-spot failure, in a tube of dingot metal. Charge seaters and pre-insertion poles were placed in operation during the month. Seven J-2's and 35 original pigtails were replaced.

Improvement Experience

PT-IP-188C - "Test of Start-up Procedures with Sub-Critical Monitoring" - Immediately prior to start-up on 5-30-60, critical tests were performed to evaluate the performance of the CG 707 Sub-Critical Monitors at 105-D. CG 791 Confinement Project - Concrete pours for the 117-D Building were completed during the month. Conduit runs were made in the 105-D Fan room in preparation for controls.

Radiation Monitoring Experience

One lapse of radiation control occurred when water and vapors from a weld failure spread contamination up to 80,000 c/m over pavement behind the wash pad. The line is a stub from a DR effluent line, formerly used for drainage. The leak occurred when DR Reactor switched from the far to the near downcomer. Maximum dose rate received in the month was 3 rads/hr when a storage basin bucket was raised to position a new ruptured slug can.

Events Influencing Costs

A total of 227.5 hours of overtime was used during the month. Helium losses averaged 10,000 cu ft/day. Spline usage increased because of two spline start-ups during the month.

DR PROCESSING OPERATION

Production

Input production was 86.5 percent of the official forecast. Time operated efficiency was 88.1 percent of forecast. Production was significantly lower than forecast due to the four unscheduled outages during the month.

Operating Experience

Operation was interrupted by four unscheduled outages during the month. A breakdown of the shutdown time follows:

<u>Date</u>	<u>Hours</u>	<u>Reason</u>
5-1-60	33.3	Continuation of April outage

DECLASSIFIEDOperating Experience (Con't.)

5-13-60	41.7	Shut reactor down due to break in export water backup system at 186-D Building.
5-20-60	35.8	Shut reactor down due to water leak in tube 2672-DR
5-22-60	0.6	Shut reactor down to correct leaking front cap
5-27-60	88.8	Reactor scrambled by rupture-leaker in tube 3858-DR

Equipment Experience

Twelve tubes were replaced, three where the channels had been used for graphite stringers, three leakers, three for out-of-pile examination and three because of probolog results. The rupture was a hot-spot failure in I & E enriched metal. A stuck charge required 4500 pounds pressure to discharge.

Improvement Experience

PT-IP-278-A - Verification of Transient Bulk Temperature Surges at the DR Reactor - A pressure gauge was installed in the far effluent line near the base of the far downcomer to determine the back pressure at the base of the downcomer. PITA-294C - Evaluation of Unit Flattened Zone Discharge at DR Reactor - The second block discharge was performed during the 5-27-60 outage. PT-IP-188-C - Test of Start-up Procedures with Sub-Critical Monitoring - This production test was performed at the conclusion of the 5-27-60 outage. AEC-160 Recirculating Gas Loop - The second fuel element was charged into the gas loop tube during the 5-27-60 outage.

Radiation Monitoring Experience

Two lapses of radiation control occurred during the month. The first, with an assigned severity of 6, occurred when a processing employee received contamination of 20,000 c/m on his neck while in the discharge area. The second occurred when a wooden plug blew out of a line in the 20' tool room when downcomer flow was switched from the far to the near. Two employees received low level clothing contamination when investigating the condition. A severity of 11 was assigned. The plug has been replaced with a metal cap.

Events Influencing Costs

A total of 61.5 overtime hours were used during the month.

D-DR POWER OPERATIONOperating Experience

Standard quality water was produced throughout the month with only normal seasonal fluctuations in the quality of river water. Boiler operation was normal with the steam generating load at 82,463 pounds per hour average. The raw water supply from the export system to 105-D and 105-DR was removed from

DECLASSIFIEDOperating Experience (Con't.)

service May 13 to repair a leaking bell joint at a point southwest of 186-D Building. Repairs to several other joints were made after removing portions of the encasements to obtain access to the joints. Additional leakage in the export system was found at a "T" west of 115-D Building. Two bell joints will be repoured during a future outage.

Equipment Experience

181-D - No. 13 pump unit was found in need of motor re-wedging and replacement of motor leads because of deterioration of insulation. 183-D - No. 1 process pump motor failed during a routine start. A spare was installed and a damaged stator shipped to Spokane for repair. 183-DR - A liquid alum feed facility was completed and placed in service May 10.

Events Influencing Cost

Completion of the liquid alum feed at 183-DR puts the D-DR Power Operation in a position for substantial savings in essential materials in future months.

D-DR MAINTENANCE OPERATIONEquipment Experience

Seven Geminol stringers and the associated control room read-out instruments have been installed in DR Reactor. D Reactor's Geminol equipment is ready for installation when outage time permits. Oil in the impulse lines to Panellit gauges in 105-D is being replaced 100 percent because of questionable quality. The No. 2 horizontal rod tip at 105-DR was removed because of binding in its guide. A new rod tip was installed without a radiation incident. Steam line supports in the vicinity of the raw water line leak near 186-D settled and the steam line was brought to grade by adjusting hangers.

MAINTENANCE ENGINEERING OPERATION

Improved Flexowriter Systems, 105-D-DR - A study of maintenance costs has been made for this system and a report transmitted to 105-D Processing to serve as back up for the project proposal justification for up-grading components of this system. Charge Seater Rear Face Door Interlock Circuit - Design Change 371 incorporating the new charge seaters in the regular charging machine rear face door interlock circuit has been prepared and installation of this modification is in progress. Deadman Switch, 105-D-DR Design is complete and materials are on hand for installation of this system. Final installation and testing at DR is planned for any available outage during the month of June. Relay Testing, 100-D Area - The annual testing of protective relaying throughout the area was started this period and is approximately 80 percent complete at this time. The relays have not changed significantly from the original setting. Modification of Orifice Assemblies, 105-D - A design change covering the details of the revised orifice pattern for increased flow at 105-D is now being routed for approval signatures. Charging Machine Improvements, 105 D-DR - Modifications of the overhead hose handling improvements are nearing completion in 105-DR. Spline Coiler Installation, 105-D - The new spline coiler is scheduled for completion

MAINTENANCE ENGINEERING (Con't.)

and installation on the elevator in early July, 1960. Gamma Monitor Heat Exchanger, 105-D - Design of a prototype heat exchanger is complete and a work order has been issued to Central Maintenance to cover fabrication of this unit.

Events Influencing Costs

Overtime usage amounted to 1372 man-hours during May due to seven unscheduled reactor outages, all running through week-ends and with both reactors down on six of the outage days. The export line leak was another contributor to overtime usage.

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F REACTOR OPERATION

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GENERAL

Administration Activities

An F Reactor Operation Business Review meeting was held on May 2 in the 1704-F Conference Room. Those present, in addition to the F Area staff, included R. L. Dickeman, Manager - Manufacturing Operation, and C. A. Priode, Manager - Production Operation. Functional components reviewed the high lights of activities associated with their respective operations and also, operational problems encountered. A summary by the F Reactor Manager was followed by a tour of the 105-F facilities.

The results of the 1960 HAPO First-Line Supervisory Study were reviewed and proposals were submitted, outlining improvements which we plan to make with regard to problem areas.

Suggestion plan statistics for the month were as follows: start of month-29, received-9, completed-10, end of month-28.

Personnel Development

Exempt: Individual management contacts with four exempt employees were made to review individual performances and to outline improvements desired.

The Plant Manager attended a "Value Analysis" orientation meeting on May 10. The Maintenance Manager, Maintenance Engineering Supervisor, and three Maintenance Engineers attended the "Value Analysis" presentation by Plant & Industrial Engineering on May 23.

Nonexempt: Participation was as follows:

<u>Training</u>	<u>Number</u>
Review of Electricity	1 (completed training course)
Tube Replacement and Rupture Removal	6
Charge Seater	3
Gunpowder-Actuated Hand Tools	22

Cost Control Activities

A routine cost review meeting was held on May 25 to review current costs and to discuss forecasts for May and June. A "cost reduction program" meeting was held on May 26, conducted by the Plant Manager. Primary objective of the meeting was to identify specific areas where cost reductions could be realized. A subsequent meeting was called for June 3 when a more thorough review of points discussed at this meeting would be made and efforts put forth to outline a program.

Landlord Activities

Work was started on proposed improvements to the personnel and lunchroom facilities in the 105-F Building. An approval of \$6500 in Capital funds was

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obtained to cover work to be done in the current fiscal year.

The removal of the Blue Tool Room within the work area of the 105-F Building, and the cutting of the doorways into the labyrinth of the #9 and #10 fan for blue tool storage, were completed during the month.

Sidewalk and roadway improvement in the area required approximately 10,000 square feet of blacktop surfacing. This included widening of roadways to improve turning radiuses and eliminate safety hazards.

F PROCESSING OPERATION

Production

Input production was 111.0 percent of forecast, with a TOE of 89.1 percent. Equilibrium operation was limited by rupture control tube power limits.

Operating Experience

Reactor outages totaled 81.4 hours for this month. Operating continuity was affected as follows:

<u>Outage Date</u>	<u>Hours</u>	<u>Reason</u>
5-16-60	46.0	Rupture 2887-F.
5-20-60	35.0	Water leak.
5-22-60	0.4	#7 pump motor failure.

Equipment Experience

Ninety-five tubes were probologged, of which five tubes probologged medium to severe. Three of these were leak tested and charged 35 solid aluminum. The other two were leak tested and recharged regular metal because of reactivity considerations. We experienced a tube rupture on May 16. The tube was discharged with charging machine, leak tested and recharged. Seven tubes probed all passed a 10" probe to 12'. Vertical traverses were completed on 4494-F and 4676-F.

Selective pressurizing of the bottom 10 crossheaders indicated a leak on header 9. Stinger testing of header 9 confirmed a rear Van Stone leak on 0977. The rear Van Stone was found to be split upon inspection. Boots were replaced on the rear of 3282 and the front of 1659.

Replacement of central zone venturis with a 0.320 venturi was initiated during the month to alleviate the problem with TAI limits. A total of 144 was installed.

A total of 64 rear face pigtails was replaced with "J" type pigtails.

Improvement Experience

A spline tank was installed in the "C" elevator pit in preparation for poison spline usage.

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Installation of gas instrumentation (CGI-706) was continued throughout the month.

Radiation Monitoring Experience

F Reactor Operations sustained no radiation lapses of control or personal contamination cases during the month. No personal radiation exposure in excess of 3 r/hour rates were required.

F POWER OPERATION

Operating Experience

The eighth process water pump in 190-A was placed in service on May 21. This also required an additional pump at the 181 Building. No serious problems have been experienced to date in maintaining the unprecedented flow rates through the filter plant. However, difficulty is being encountered in maintaining the high quality water from the filter supplying the sanitary water system and the 105 Building storage basin. The temporary liquid alum feed facility was placed in service on May 31.

Low frequency on the BPA system at 8:22 a.m. on May 25, resulted in a momentary pressure drop of 4 psi on process water system. No equipment was affected.

Equipment Experience

A faulty RTD in the No. 7A motor winding resulted in the motor relaying off the line at 2:20 a.m. on May 22 and scrambling the reactor. The defective element was disconnected from service. Further investigations into the extent of damage to the motor stator winding are scheduled for a future reactor outage.

The No. 3 boiler was inspected by a third party inspector on May 25. The class "A" maintenance and repair work on this unit is seventy-five percent complete.

Improvement Experience

Various operational tests were performed with respect to Design Change No. 322-F, "Emergency Generator Safety Devices in the 184 Building."

Work is approximately seventy-five percent complete on the liquid alum feed equipment installation in the 183 Building.

Events Influencing Costs

Class "A" repair work on the No. 3 boiler.

F MAINTENANCE OPERATION

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Equipment Experience

Eleven rear face thermocouples were repaired, 4 Panellit gages were replaced, 1707 pressure monitor Panellit gages were adjusted, the No. 3 Beckman chamber was insulated to assure improved response, the ruptured diaphragm on the drip legs was replaced, and removal of the P.C. system instrumentation was completed.

Further testing and evaluation was made of the new Ball 3X time delay relays, and conduit and circuits from the "C" and "D" elevators were removed in preparation for elevator modifications and spline control equipment. Extensive test data were compiled on the (RTD) temperature detectors in the No. 7 motor to evaluate the usefulness of the No. 6 RTD, and a flashing red signal was installed on top of the 190 annex control room to indicate that the crane power circuit is energized.

Two bellows (3282-F and 1659-F) were replaced to reduce gas losses; new stainless steel decontamination tanks were installed on the wash pad at 105-F.

A valve gate was replaced in the No. 5E backwash valve; leathers and bottom plate were replaced in the No. 13 influent control valve and the new alum feed system was completed to the degree where one pump could be used and the system placed in service on May 31 at the 183-F Building.

Work is approximately 75 percent complete on the overhaul of the No. 3 boiler and installation of new grates at the 184 Building. The modifications were completed to the three-inch recirculating lines to the individual pumps in the 190 Annex Building to permit the pumps and motors to operate under shutdown conditions.

F MAINTENANCE ENGINEERING OPERATION

Design Changes are being prepared for removal of the undervoltage relays and provide for automatic synchronization on the 4500 HP motors. Further tests and evaluations are being conducted on LPY and LPR time delay relays to determine the reason for drift during operating periods. Materials have been ordered for installation of safety devices on the emergency generator at 184-F. Check prints for widening the "D" elevator have been completed. A survey of the export line is being made to determine the probable condition and the maintenance action required. Partial funds have been approved for installation of the tank car chlorine handling facilities.

H REACTOR OPERATION

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GENERAL

Administration Activities

The Work Stoppage Personnel Listing was completed and forwarded to the Work Stoppage Committee.

The final procedure for the new bus loading procedure was completed and issued. The procedure will go into effect on June 8, 1960.

Results of the First-Line Supervisor Attitude Survey were reviewed and Component comments were consolidated and forwarded to Relations Practices.

Personnel Development

J. W. Frymier attended the annual conference of the Northwest Section of the American Water Works Association. E. E. Mitchell attended the Instrument Society of America and Institute of Radio Engineers joint conference at Seattle.

Approximately nine first-line supervisors attended a seminar on Union Relations conducted by Relations Practices on May 31.

Personnel also attended Company-sponsored courses in Fundamentals of Manufacturing, BOCE, and miscellaneous ones pertaining to various craft training programs.

Cost Control Activities

The H Reactor Cost Reduction Council held its first meeting on May 27. Cost and production charts were reviewed and a general course of action for a cost program was initiated. A review of costs for the remainder of FY-1960 was prepared and appropriate action undertaken to keep the Operation from overrunning the 1960 Expense Budget.

Landlord Activities

A review was made of 100-H Area occupancy. Revisions were forwarded to the Financial Operation. With the concurrence of all parties concerned, a series of office moves in 1760 and 1761-H Buildings was made to provide office space for portions of the newly activated Reactor Engineering Operation. A letter was written to all Level 3 IPD Components presently housed in 100-H Area, requesting a forecast of future office requirements.

H PROCESSING OPERATION

Production

Input production was 3.9 percent above forecast. Equilibrium power levels reached 1850 MW. The bulk temperature limit was reached early in the month.

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Operating Experience

The operating continuity of H Reactor was affected by the events listed below:

<u>Date</u>	<u>Hours</u>	<u>Reason</u>
5-11-60	46.8	I & E natural rupture in 3171.
5-24-60	47.6	Tube leak, 4162.
5-26-60	1.3	Loose rear cap, 0963.
5-26-60	0.9	Loose rear cap, 2279.
5-28-60	0.2	Rear pigtail failure, 0490.
5-28-60	34.5	Replace rear pigtail, 0490.
5-30-60	25.0	Tube leak - 4372.

Equipment Experience

Fifty-nine process tubes were probologged to verify calculated wall thickness. Seven were recharged inactive and scheduled for tube replacement. Two original tubes had rear Van Stone flange failures which required two separate outages to locate and replace.

Three stuck charges were encountered but were removed with relative ease after using a maximum force of 2,000 lbs. to break loose. All tubes were recharged active.

An additional 45 reamed venturis and 40 modified double orifices were installed.

Improvement Experience

One process tube was charged with a split enriched charge in conformance with PT-IP-281-C. Four tubes were discharged and two were charged, leaving a balance of 7 charged tubes in the reactor under PT-IP-216-A, "Evaluation of Performance of Normal Production I & E Fuel Elements."

Radiation Monitoring Experience

Rear face dose rates up to 500 mr/hr at the center of the tube pattern and 100 mr/hr at the end of the elevator were encountered during the month. This is normal for this time of year. These dose rates were encountered during thermocouple and bellows sealing work.

H POWER OPERATION

Operating Experience

Electrical power surges occurred at 10:57 and 10:59 a.m. on May 16, due to

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difficulties on the BPA distribution system. Although a pressure drop was experienced, operating continuity was not affected.

The average steam generating rate was 52,300 lbs. per hour. An evaporation rate of 8.58 lbs. of steam was attained.

Standard quality water was produced throughout the month with an average alum and separan feed of 6.4 and .019 ppm, respectively. On several occasions, it was necessary to increase alum dose rates on the east side to improve turbidity for 105 basin "pick-up."

Equipment Experience

In the 183-H Building, an "A" inspection was completed to No. 1 emergency process pump; sedimentation basins No. 1 through 13 were cleaned; rebuilt valves were installed in Nos. 7-E, 7-W, and 12-E Palmer sweep lines and a ruptured air diaphragm was installed in No. 8 filter controller.

In the 184-H Building, a bent shaft of No. 4 stoker on No. 2 boiler was repaired and repairs were completed to the Capstran car puller.

In the 190-H Building, Nos. 5 and 6 annex pump units were inspected by Facilities Engineering Operation on May 11 and 25, respectively. Cavitation wear is in evidence. A report of the inspection will be documented by C. F. Quackenbush. Annex unit cone valve leak tests were conducted on May 31, and all were seating properly at that time. Repairs to No. 4 cone valve are suspended pending further tests, and No. 3 turbine butterfly valve was repaired.

Improvement Experience

Liquid alum facilities were placed in service on May 27, and will result in annual alum cost savings of approximately \$16,000. Minor completion items remain on the current facility scope.

MAINTENANCE ENGINEERING OPERATION

Instrument Engineering

One radiation hand and foot counter has been modified and is presently in operation. Performance of this equipment will be evaluated after a reasonable period of time to see if the objectives of reduced maintenance costs were accomplished. If the results are favorable, the remaining instruments will be modified.

The work has been completed on the Horizontal Rod Seal modification except for connection of CO₂ pressurizing lines to seals on rods Nos. 10, 11, 13, and 14. High radiation continues to be a deterrent to completion of this job.

Fabrication of Geminol thermocouple stringers was 90 percent complete at the end of the month. Graphite channels Nos. 1585, 2785, and 3982 were assigned by the Processing Operation for temperature monitoring use.

DECLASSIFIEDElectrical Engineering

A design change has been prepared to permit removal of the 4500 hp motor undervoltage relays from the power loss panel at 190-H. Protection afforded by these relays is provided by the power loss relays and this duplication is no longer considered necessary.

A design change is being developed to change the surge suppressor control circuitry in the 182-H Building to prevent inadvertent operation. In the past, whenever a power failure was experienced at the 182 Building, the surge suppressor control circuitry caused the surge suppressors to go through their operating cycle. This has not caused serious difficulty; however, with greater dependence being placed on the back-up function of the raw water system, it is considered wise to eliminate this possible interruption to this source of last ditch water flow to the reactor.

Mechanical Engineering

Vendors' bids on specified equipment for the Turco System modifications at 190-H were found to be extremely high. This system was re-engineered and materials were substituted of lesser but adequate quality. Orders have been placed for the revised equipment.

Following formal recent trip-out tests, analysis of the data disclosed inadequacy of high tank water as a last-ditch cooling medium during the hot summer months. Study of this problem revealed a relatively simple means of eliminating this condition through diversion of the thermal shield water through the high tanks. Preliminary design work has been completed. Further work is being held in abeyance pending more detailed analysis of the situation by Research and Engineering.

Manual Writing

Activities during the month included:

Preparation of procedure to check resolution of Gamma Monitor photomultiplier tube and crystal. Assisted draftsmen with as-building of the gas make-up system. Assisted with development of a new pressure gauge check-up listing for the PM system. Designed and prepared working sketch for Lucite HM covers. Designed skid to facilitate loading and handling of graphite stringers. Computed corrections for liquid alum flow through rate meter and prepared scale to show actual flow. Made sketches and estimate for moving process water heise gauges - 190-H Control Room. Assisted instrument supervisor with modifications to the hand and foot counters and galvanometers.

H MAINTENANCE OPERATIONEquipment Experience

Ninety-two rear face nozzle-to-crossheader connections (J-2 pigtails) were replaced to correct water leaks and other conditions indicating possible failure such as the old DuPont pigtails. Several pigtail crossheader adapters, loosened by vibration of the crossheaders, were tightened.

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A total of 125 rear face tube temperature monitor thermocouples were repaired, including replacement of 14 broken wells. Ninety of these were not registering accurate temperatures with respect to normally charged adjacent tubes.

The modification and waterproofing of the rear face communications were completed except for the tie-in of the voice-power system to the new system. The communications circuitry was replaced in waterproof ducts and new waterproof speakers were installed.

Fourteen rear face gunbarrel bellows were sealed with silicone foam rubber during the month to reduce helium gas leakage from the reactor to the atmosphere. Twenty-four bellows have been sealed so far.

The No. 1 reactor control galvanometer neutron chamber in E-test hole has shorted out. The leads were transferred to the bucking voltage chamber under No. 8 riser and the system is back in service. The chamber in the E-test hole is faulty beyond repair and must be replaced.

The No. 11 pump in the 181-H Building was assembled and placed in service, but was shutdown due to excessive vibration. Cause was determined to be misalignment at the couplings. The vibration problem was corrected and the unit placed back in service.

CENTRAL MAINTENANCE OPERATION

Engineering and Planning

Detail sketches were prepared to supplement design drawing on Project CG-785. Furnished design to facilitate installation of chain mat for Facilities Engineering Operation development work. Helped firm drawings up on Project CG-871, which were incomplete.

Shops

Work included the following:

Routine repair or decontamination of miscellaneous tools and equipment such as caps, venturis, splitters, broaches, air guns, etc.

Project fabrication work included projects MJA-8; CG-666; CG-707; CG-785; CG-817; CG-839 and CG-871. In addition, 15 "K" tubes were double wrapped with steel, 300 orifices were made, two pump shafts were metallized; fourteen sample bombs, component parts for an electromagnet, zirconium tube bearing fixture, four critical flow test sections, fuel element baskets, neutron counting chamber, and a reject mechanism were fabricated.

Project and Special Services

Project activity during the month included CG-666, CG-706, CG-707, CG-785, CG-806, CG-817, CG-865, and MJA-8.

The paint program concentrated on closing out fiscal year commitments and included transformers, duct work for MJA-8, and a 107-KW tank.

Sheetmetal installations and repairs included: splash guards, air dampers, decontamination hoods, and duct work. Sixty-four assorted valves from 1/2" to 16" were repaired and tested. Installed valve operators at 105-D. Installation of bauxite system for B Area was started. Installation of test frame at the 190-D pool was completed. Completed annual scale weight calibration. Routine checks and repairs to IPD fire alarm system were performed. Manpower to IPD engineering components to support their studies was supplied.

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KE-KW REACTOR OPERATION**DECLASSIFIED**GENERALAdministration Activities

The revised bus service procedure was placed in effect to accommodate recent security clearance and health badge changes. Arrangements were made to facilitate participation by plant personnel in Operation Alert, 1960. Descriptions of proposed training assignments for Manufacturing Training Program participants were developed.

Suggestion Plan Statistics for the month were as follows: Start of Month-35, Received-15, Completed-14, End of Month-36.

Personnel DevelopmentExempt

<u>Meeting</u>	<u>Attendance</u>
Fundamentals of Manufacturing	3 (6 sessions)
Value Analysis Seminar	1 (6 sessions)
Reactor Fundamentals (Reactor Specialists)	3 (1 session)
Union Relations	10 (1 session)
Management Orientation	3 (1 session)

Non-Exempt

Four Processing utility operators participated in Reactor Fundamentals training sessions. Twenty electricians attended the Fundamentals of Electronics training session. Thirty-five Maintenance craftsmen attended "on-the-job" training sessions. Five Power operators attended training sessions on Nuclear Energy & Power Plant Application.

Cost Control Activities

A detailed review was made of the funds remaining in the FY-60 budget as compared to past expenditure patterns. An analysis was made of the FY-61 budget basis.

At the monthly cost meeting, R. L. Olson presented an introduction to "Value Analysis." As part of the program, four participants of the recent HAPO Value Analysis Seminar described team projects in reducing the fabrication cost of various plant items.

A review of past cost reduction activities was submitted to the Manufacturing Section manager, and a revised program for FY-61 was developed.

Landlord Activities

Arrangements were made to provide pedestrian gates at each exclusion area to accommodate recent changes in the health and security badge procedure.

DECLASSIFIED

KE PROCESSING

Production

Input production was 129.0 per cent of forecast and represents a new high monthly production figure. Power level was limited by the rupture control point.

Operating Experience

Reactor outage time totaled 50.2 hours. Operating continuity was effected by the following events:

<u>Day</u>	<u>Hours</u>	<u>Remarks</u>
14	48.0	Reactor was shut down to remove a rupture from tube 1661 (KIII). The charge was removed by the stuck charge removal procedure at a maximum force of 8500 psi. Processed 382 tubes.
16	2.2	Scram as a result of a fuel element failure in KER-3. The tube was discharged at normal pressures, and a recovery was successful.

Equipment Experience

The effluent line leak near the transfer area was repaired during the month's first outage. Five leaking expansion joints were replaced.

Ten Panellit gages that failed the high-low trip check were replaced.

Improvement Experience

All preliminary work was completed for the installation of a portable radiation shield for personnel on the end of the "D" elevator.

Radiation Experience

Five Lapses of Radiation Control occurred for a total severity of 41. One involved the removal of a tool from the storage basin without monitoring and involved skin and clothing contamination to five persons. This occurrence was investigated and reported in HW-65416.

A dose rate of 5 r/hr was incurred during removal of poison splines from process tubes.

KW PROCESSING OPERATION

Production

Input production was 110.8 per cent of forecast. Power levels were limited during the five pump operating period, May 1 until May 13. At this time the sixth pump was put into operation, and a slow rise in process water flow and power level was started and continued until its interruption by the Panellit trip on May 17. All additional adjustments were completed before reactor startup.

DECLASSIFIEDOperating Experience

Reactor outages totaled 71.5 hours. Operating continuity was affected by the following events:

<u>Day</u>	<u>Hours</u>	<u>Remarks</u>
3	30.8	The reactor was scrammed by a dual Beckman trip which resulted from a defective by-pass switch. A total of four tubes were processed. Rear face installation work of CG-806 was continued.
17	33.3	Panellit gage scram on tube 1779 during the large scale dial adjustment program during conversion to full six pump flow. A total of 495 tubes were processed.
31	7.4	The reactor was scrammed by a Panellit gage trip on tube 0280. Planned charge-discharge was in progress at month end.

Equipment Experience

A large scale dial adjustment program was attempted starting on May 13 to try and achieve full six pump operation without shutting down the reactor. After making 7316 dial adjustments (two-thirds of the total), a Panellit trip on gage 1779 was experienced. The reactor scram of May 3 during a routine Beckman calibration check was caused by a defective by-pass switch on Number 2 Beckman.

Three horizontal traverses were conducted on tube channels 1741, 1798, and 5865. These measurements confirmed the situation of graphite side shifting and contraction of the top, center.

Comparison of the thermocouple readings of graphite stringer RS-6 with nearby permanent thermocouples showed the stringer temperatures to be high by at least 80 C°. This failure raises the total of defective removable stringers in the reactor to six.

Improvement Experience

A production test, IP-312-A, was approved and placed into effect to permit a temporary 50 C° increase of maximum graphite temperatures.

Radiation Experience

There were three Lapses of Radiation Control for an assigned severity of 33. Two of these involved the spread of irradiated "specks" outside a controlled zone and the other, the inadvertent raising from the basin of a irradiated metal piece in a bucket of dummies.

The maximum dose rate to personnel was 2.5 r/hr during spline removal difficulties.

DECLASSIFIEDKE-KW POWER OPERATIONOperating Experience

The peak control point was maintained at 324 until May 19 during the period of five high-lift pump operation at KW. At that time, under previous agreement with BPA, interruptible power was purchased. To month end, the control point was maintained at 337 megawatts.

Frequency disturbances on BPA lines occurred on two occasions. No equipment was lost in either surge, however, variations in process water pressure resulted from the disturbances.

On April 30 the 190-KW building started up with five pumps in service to permit Class "A" overhaul of Number 5 and 6 high-lift pump units and the installation of a new, prototype impeller in Number 1 high-lift unit. Six-pump operation was resumed on May 13. Two pump changes were performed during reactor operation without incident.

Equipment Experience

On May 1, during a routine change, Number 3 generator at 165-KE would not go on the line. The trouble was traced to a reversal of polarity on a rheostat control circuit. Following repair of the component, the generator was placed in service.

On May 15 the Number 1 generator at 165-KW was removed from service because of malfunctioning governor. The commutator showed severe and uneven burning. It was dressed, tested and the generator was returned to service. The Number 1 high-lift pump motor at 190-KW would not start due to a fault in the 13.8 kilovolt switch raising mechanism which prevented full contact. The spare 13.8 kilovolt switch was installed and raised to full travel enabling the motor to start and operate satisfactorily.

Improvement Experience

The casing of Number 1 high-lift pump at 190-KW was modified slightly to receive a CG-883 prototype impeller. The prototype impeller, recently removed from Number 1 high-lift unit at 190-KE for factory modifications, was installed in the unit at 190-KW. On May 9 this unit was placed in regular service at reduced speed, pending installation of a low-lift motor of increased capacity.

KE-KW MAINTENANCE OPERATIONEquipment Experience

Range changes and checks were made 10,778 times to Panellits, 7848 of these during operation. On the bulk outlet temperature recorder, a dual range and a low temperature trip with a manually variable set point was installed in both 105 buildings. The installation complies with the recommendations of KE-KW Maintenance Engineering Operation.

A design change, Number 317-Riser Pressure Switch Replacement, was completed in both 105 buildings.

DECLASSIFIEDEquipment Experience (Cont'd)

The controls on the 190-KW 25 ton crane were placed on a slide wire to permit operation from any point along the length of the crane, thus reducing the need for a signalman. The change completes the work in both 190 buildings.

A feed and bleed injection system was installed in 1706-KER. This system permits automatic chemical feed into the KER loop to replace that lost due to leaks. Class "A" overhauls were completed on Numbers 2, 5, and 6 high-lift pumps and associated equipment in 190-KW and the Number 6 pump at 181-KW. All the backwash valves in 183-KE including the hydraulic cylinders were repacked, and all the surface wash valves on the east half of 183-KE basins were overhauled.

KE-KW MAINTENANCE ENGINEERING OPERATIONEngineering Evaluation

Engineering assistance was provided for determining condition of high-lift motor windings and liquid rheostats for process pump units Number 2, 5 and 6 at 190-KW. Process pump motors were found in good condition, winding ties and wedges were tight and no coil movement was observed. Minor corona damage was present in all three machines. The number 1 unit was completely dismantled and re-insulated with air dry varnish.

Liquid rheostats were inspected and three cell insulator and gasket assembly failures were detected. In determining the failure cause, it was concluded that gasket compression release occurs from the collapse of mica sleeves. Plans were made to purchase one set of Micarta sleeves for installation as a prototype.

A study of electrical peak demand and load of the 4160 V system was completed. A similar study was made of the 480 V system to determine the load of each 480 V motor control center. An equipment priority list was established to determine emergency load in case of a BPA power outage.

Equipment Modifications

A modification of the work area crane control pendant was made to change the circuit voltage from 440 volts to 24 volts. The change was made to eliminate the hazard of high voltage at the controls.

A design change was issued to provide for removal of all unnecessary circuitry and components originally installed to provide individual Ball 3 X drops in case of single VSR drop failure.

SUPPLEMENTAL CREWS OPERATIONMethods and Procedures

The following procedures were distributed to the Processing Managers:

DECLASSIFIEDMethods and Procedures (Cont'd)

Rear Face Pre-Marking, (All Areas)
Rear Face Set Up, (105-KE-KW)
Rear Face Button-Up Conveyor, Carts and Trays Method,
(105-KE-KW)

Time Distribution

The non-exempt time distribution from May 2 through May 29 was as follows:

<u>AREA</u>	<u>PERCENT</u>	<u>HOURS</u>	<u>AREA</u>	<u>PERCENT</u>	<u>HOURS</u>
100-B	8.8	650	100-F	13.5	1013
100-C	15.3	1145	100-H	17.4	1306
100-D	14.4	1068	100-KE	7.5	548
100-DR	12.4	918	100-KW	10.7	804

R. L. Dickeman, Manager
Manufacturing Operation
IRRADIATION PROCESSING DEPARTMENT

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FACILITIES ENGINEERING OPERATION

REACTOR MODIFICATION DESIGN

RESEARCH AND DEVELOPMENT

The downcomer model testing program being conducted at Washington State University under Contract DDR-95 progressed during the month. Tests were performed to verify the similarity of the downcomer model with the prototype downcomer in service at the 105-DR Reactor Building. Also basic studies were performed on smaller models to determine the similitude relations for two phase flow conditions.

Organization of a scope design for conversion of one reactor for use of bumper fuel element has been initiated. Project Representatives have been appointed.

A description and broad definition of equipment scope has been developed in support of the proposed project proposal modifying 105-C Reactor for self-supported fuel elements. Based on the above outline, a design program has been prepared defining the time and manpower required to complete design engineering. Design test requests have been prepared in rough draft form for nine equipment components.

The proposal by the Goulton Industries to supply sleeves for the 100-K Reactor horizontal control rods fabricated from zirconium silicate ceramic rather than aluminum oxide ceramic has been reviewed and the vendor requested to proceed with the order using the zirconium silicate material. Compared to the original material the change represents an estimated savings of \$27,000 in production and an increase of one percent in control rod capacity.

A study of the coolant piping on the discharge face of the reactors has been completed and documented. This document reviews the history of reactor rear face piping problems, study activities taken to ascertain the conditions of components, action taken to correct component failures, and programs underway to correct deficiencies.

DECLASSIFIEDDESIGN PROJECTSCG-775 - 100-K Water Plant Expansion

This project progressed satisfactorily with the continued in-service testing of the revised impeller in the No. 1 pumping unit at the 190-KE Main Pump House.

CGI-791 - Reactor Confinement

Overall design completion for this project is 94 percent. Progress of design is being delayed due to the slowness in receiving certified drawings from the vendors. At the request of the Atomic Energy Commission the second bank of high efficiency filters to be installed in series with the first bank has been deleted from the project; however, the General Electric Company has requested that this action be reconsidered since the performance criterion of the filter system has been established at 99.95 percent of the particulate matter carried by the reactor exhaust stream.

The requirements of the protective polyvinyl coating which is to be applied to the inside concrete surfaces of the connecting ducts and 117 Filter Building were re-evaluated. The decision was made to increase the thickness of the protective film upstream of the filters and to omit this film from the exhaust duct. A design change has been issued recommending these changes.

Detail design is 88 percent complete. This figure includes the 16 detail design drawings which were issued for comment and the 11 drawings which were approved during the report period. Detail design of the filter handling equipment has been initiated. The second draft of the Phase III construction specification was issued for comment.

The overall completion of the test program is 98 percent complete. Progress of tests not completed are summarized below:

DT-1050 - Environmental Component Testing

An analysis of the dust sample taken from the 105-F prefilter has been received. The analysis confirmed the suspicion that graphite dust was responsible for the abnormal increase in pressure across the filter during the tube replacement outage in January.

Development Program Adhesive Metal Bonding

This series of tests was initiated to evaluate the feasibility of fabricating the aluminum filter frame assemblies using epoxy adhesive bond joints rather than the conventional welded joints. A typical filter frame cross section eight feet long, using adhesive bonded joints, was tested under uniform loading. At a loading of 2325 pounds the angular deflection was measured and the bond stress of the beam joints was calculated to be 7000 psi. The loading was increased to 3250 pounds with no apparent failure of the bonded joints. Additional tests are planned.

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CGI-839 - Modification of Fuel Element Test Facilities

Design completion for this project is 99 percent. All drawings have been completed and approved; however, some minor revisions of cell piping drawings may be required upon receipt of the vendor's recirculation pump drawings.

The construction specification covering the modification of the KER piping and 1706-KER Test Facilities Building has been completed and approved. Acceptance Test Procedures for the loop recirculation pumps, loop primary heat exchanger, instrument system modifications, and power supply have also been completed and approved.

The architect drawings and specifications for the hot shop addition to the 1706-KER Building were received from the architect-engineer and have been approved.

Flow tests on the KER nozzles for Loop No. 3 and Loop No. 4 have been completed. Data indicates that sufficient allowance was made for the nozzle assembly in establishing the overall loop system curve which was used for establishing the requirements for the recirculation pump. The prototype nozzle assembly has been instrumented with strain gauges to provide a complete strain pressure temperature analysis.

CGI-844 - 100-K Coolant Backup System

The revised project proposal has been approved by the Atomic Energy Commission and a directive has been issued authorizing \$235,000 for detail design and management services. Since the directive did not provide funds for engineered equipment, design may be delayed awaiting vendor information on installed equipment.

All scope drawings have received the approval of Project Representatives.

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

Scope design for the total project is 98 percent complete. The design criteria have been completed in rough draft form and circulated for comment.

One high lift pump unit at the 190-KW Main Pump House has been modified by installation of a new impeller. Modifications to the associated low lift pump are planned during the scheduled outage in June.

As a result of the expansion to the K Area water plants a coordinated study of the 4160 volt electrical distribution system has been completed. Results of the study indicate that the 4160 volt emergency system is adequate for anticipated loadings over the next five years if building service loads are balanced between the two emergency busses. This balance of loads will require constant monitoring until completion of Projects CGI-844 and 883 when generation requirements will be reduced well below the maximum.

CGI-884 - Rear Face Crossunder Lines - B, D, DR, F, and H Reactors

Design for this project which will increase the capacity of the existing rear face drain piping systems at B, D, DR, F, and H Reactors was initiated during the month.

EQUIPMENT DEVELOPMENT OPERATION**DECLASSIFIED**EXISTING REACTOR WORKRemote Rear Face

Prototypes of the Mark IV flapper valve and an inexpensive ball valve for rear face installation in place of a nozzle cap and a simple push-pull actuator on a traveling carriage for under elevator mounting were completed and installed on a demonstration mock-up in the 108-D Mechanical Development laboratory. Testing indicates the success of this conceptual system for opening and closing the rear of a process tube assembly remotely. The mock-up was completed with TV cameras installed and a demonstration completed.

Poison Column Displacement System

A complete procedure was demonstrated to KW Processing Management personnel on the Poison Column Displacement Control System, including remote cable cutting and flush discharging of the charge thru a droop snoot into the basin. Flow tests of the strung charge were continued at 189-D Mechanical Development laboratory where the charge was moved back and forth in a process tube beyond operational cycle expectancy under full flow conditions. After completion of these off-pile tests the charge and tube were removed for examination.

Decontamination

105-C was decontaminated for the first time with an internal-external chemical flush. Using essentially the same system proven so successful at the K Reactors the entire rear face of 105-C was decontaminated on April 20, 1960. The flush took approximately 18 hours to accomplish, but saved almost half of an estimated five shift maintenance job. Exposure to personnel was reduced by a factor better than four, efficiency was improved 100 percent, and a number of comments by craftsmen and supervisors indicated a considerable morale boost was also credited to the decontamination effort.

Panellit Row Relay

Laboratory tests were completed which led to the conclusion that removal of panellit row relays to produce a net increase in safety system reliability is feasible. The idea is that all panellit gauge switches in one panel will be connected in series with a single set of paralleled summing relays instead of being arranged row by row and summing the row relay contacts. Identification of first-to-trip gauge will be effected by a trip identification system similar to that operating in DR Reactor.

In a test to simulate variation in switch resistance it was established that components work well with switch resistances up to 2-1/2 times normal. A suitable summing relay for the panel was selected. The safety factor of the improved ground detector was found to be even greater than that of the row relay system.

In other panellit work a circuit was developed and tested to check the row and column logic and lamps.

DECLASSIFIEDHigh Speed Scanner

The vendor reports that this equipment is essentially complete and has scheduled acceptance tests to begin June 1.

NEW PRODUCTION REACTOR WORKNozzle to Connector Joints

This development work has been completed and a recommendation for joint selection submitted to Process Design Operation. Recommendations included one joint preferred on the basis of more extensive testing, three as potential alternates on the basis of a single thirty day test, and recommendations for the rejection of others on the basis of failure in test.

Rupture Monitor

The 100 point gross gamma rupture system which was installed in 105-C is not yet in operation. Corroded and partially plugged assembly lines were cleaned and repaired to permit flow rates and hold-up times within the design limits.

Flow Monitor

Thirty-four magnetic amplifiers have been assembled into a low limit monitor breadboard and the system is being tested. Preliminary results indicate satisfactory operation but testing is continued.

Static Inverters

Two devices for inverting from 125 volt battery supply to 60 cycle AC have been received from vendors. A one KVA unit failed on test and was returned. Testing of the 250 VA unit was initiated.

DECLASSIFIEDPLANT AND INDUSTRIAL ENGINEERING OPERATIONDRAFTING OPERATION

The summary of services provided by the Drafting Operation is as follows:

New Engineering Drawings	245
Revisions, Layouts and Sketches	82
Microfilm prints reproduced	223
Drawings added or retired	2310
Ozalid Check prints reproduced	878
Customers serviced - microfilm files	235
Customers serviced - catalog files	38
Catalogs added	92

REACTOR, PLANT ENGINEERINGGamma Monitor Improvements for Six Older Reactors

Rupture data for the period since December 1, 1959 was obtained from records in order to supply additional justification for proposal preparation. Comments on the draft copy of the project proposal have made it necessary to consider additional items for the scope. These are being investigated. A schematic scope drawing for use in the project proposal is being prepared.

Tape Recording

A tape recorder has been procured for installation in the F reactor communications system. This recorder is to be used for monitoring outage conversations and studying work methods. Plans have been made to provide equipment which will introduce a time signal on the tape.

K Area Material Handling

The revised scope of this study is to determine a means of moving the loaded bridge cranes with less effort than is presently required. One Rail King tractor to motorize a bridge crane has arrived on site. Installation has been delayed due to lack of maintenance time.

Charge Seaters

Equipment to take the place of the charging machine during the fuel piece seating portion of the cycle has been delivered to all areas. The seaters were operated during recent KE, KW, D, and DR outages. No design changes are anticipated at this time. Craft training has been started.

Ventilation Improvement C Reactor Building

Recommended design for improved ventilation of specified locations in the C reactor building was provided to C Processing Operation. This report supplements the one issued on March 30 in supplying ventilation recommendations. Ventilation improvements are being considered in the following areas. New Conference Room, new offices at old Conference Room location,

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(continued)

Near Side Gamma Monitor Room, Far Side Gamma Monitor Room, Ready Room and Shop, and Gas Instrument Room.

Hycar O-Rings - H Reactor Building

In earlier contacts, the vendor-fabricator of Hycar O-rings for the H reactor rear face connectors reported difficulty in retaining specified dimensional tolerance of manufacture. Investigation revealed that he was attempting to use his standard molds to cast the special material required in these units. The vendor has now procured new molds. Recent reports indicate that the casting operation is progressing satisfactorily.

Ventilation Noise Problem, 1706-K Building

Consultation was provided Project Engineering Operation on noise control measures to be incorporated with a new cooling system for 1706-K. Steps for reducing noise in the existing system were also suggested.

Poison Splines

Tests have been completed on the spline submitted by Technical Research Group, Yonkers, New York. The tests indicated the spline was satisfactory and a recommendation made to Essential Materials personnel for purchasing a trial order of two-hundred (200) splines.

Rear Face Decontamination - H Reactor Building

Production Test PT-IP-322-E, HW-65149, was prepared to permit H Processing Operation to decontaminate the rear face piping using Turco 4306-B.

WATER PLANT AND UTILITIES ENGINEERING

Engineering in Support of Power Forecasting

Daily evaluations of peak power demands during May were made and enabled IPD to maintain control at the firm power level. The result of the control program for the month of May resulted in significant savings of electricity to the department.

Forecast studies were completed and the Two-Year and Five-Year Power Forecasts were issued with management approval.

Assistance was given to Financial Operation with analysis of individual area demands.

Effluent Treatment Facilities

Further assistance was provided Chemical Effluent Technology Operation in locating the test facility for effluent decontamination with aluminum turnings. The location agreed to is in D Area, with the 107 basin pumps to be used for supplying effluent to the test tank.

DECLASSIFIED184-284 Turbine Generator Safety

Arrangements were made with Electrical Development Operation to develop a voltage sensitive relay to be used as a "backup" overspeed trip on the emergency generator. Suggested circuits include a solid state controlled rectifier which has many desirable features for this application. Further study of overspeed protection on the 184 Terry turbines revealed that a spring to close the governor valve is not helpful since oil pressure to the governor is not lost when the oil dump valve opens; nor is the alternate, a butterfly trip valve considered desirable. Prints of solenoid trip and nylon ball trip linkage have been received from vendors.

Columbia River Scale Model

The A.E.C. has requested that, before the project proposal for the river model is approved, proposals be solicited from interested universities for model construction and operation off-site.

A description of the proposed program of investigation for which the river model is required, with additional technical details, was prepared for use in soliciting such proposals and forwarded to Contract Administration.

Upgrading the D Area Raw Water Backup System

At the request of D Area Maintenance Engineering, Water Plant and Utilities Engineering Operation is looking into the possibility of upgrading the D Area raw water backup system. Various methods of improving the backup system are being studied. Installing dresser clamps at the bell and spigot joints seems to have considerable merit.

Downcomer Modifications for Increased Capacity B, D, and H Reactors

Design Change No. 374, covering proposed modifications to the B, D, and H downcomers, has been prepared and is out for approvals. The recommended work includes removing all vent pipes, perforating all trays, and cutting out a section of the I-Beam supporting the top tray.

The effectiveness of these proposed changes for increasing the capacity of the downcomers has been confirmed by model tests performed at Washington State University and by the modified DR and F downcomers.

DECLASSIFIEDPROJECT ENGINEERING OPERATIONPROJECTSCGI-791 - Reactor ConfinementPhase I - Fog Spray

No conclusive results have been obtained from the tests of the modified sampling system in the 105-B Reactor Building. The tests are continuing.

Thermocouple duct shields are held up by material delivery. All drawings have been checked in the individual areas and marked up so that fabrication can proceed immediately upon receipt of material.

Phase II-B - Filter Buildings

The R. B. Miles Company is approximately 42 percent complete with their contract as compared with a scheduled 55 percent.

Twenty-four concrete pours have been made since April 28, 1960. As of May 25, 1960, 3154 yards have been poured out of a total of 6293 yards.

Phase III - Ventilation Modifications and Tie-ins

A Directive was received authorizing \$6,180,000 to complete the project, with the scope reduced; a reduction of \$200,000 in the funds requested. The directive was accepted to keep the project work progressing as rapidly as possible. The reduction apparently represents the Commission's estimate of the cost of the second bank of high efficiency filters and filter frames. The position of the General Electric Company in this matter has been expressed to the Commission in a letter to J. E. Travis, dated May 16, 1960.

The J. A. Jones Company has started work in F, H, DR, B, and C Areas, on the installation of conduit, tubing, piping. Shop fabrication of the ventilation ductwork for F and H Areas has been started.

The procurement status for engineered materials for this phase of work as of May 23 was \$478,886 worth of material on order; five requisitions out for bid with an estimated value of \$87,550.

Commercial Steel Fabricators, Incorporated, Seattle, Washington has completed their first filter frame. They have stated that this is their best effort. We have agreed to let them ship this one frame, protected for shipment to their specifications, to Hanford. It will be inspected on arrival for dimensional tolerances and workmanship. The right of rejection after on site inspection is retained.

A new fabrication schedule was furnished on May 4, 1960, which promised one frame ready for test every three days after May 17, 1960. This schedule has slipped to six days for the first one already.

DECLASSIFIEDCAI-835 - Additional Office Space - 100-D Area

The work on this project consists of moving a dormitory from the 1100 Area to the 100-D Area and converting it into office space. A construction contract was awarded to Ray Britton, Kennewick contractor, and work started on May 5, 1960. The contractor is performing all of the modification work at the present site in Richland and plans to move the building in one complete section rather than dividing it into several sections as was done previously. The moving schedule is tentatively set for June 14, 15 and 16, 1960. All persons involved in this work have been notified.

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

Purpose of this project is to provide improved remote handling of dummy and poison slug decontamination equipment in Buildings 105-B, C, D, DR, F, and H. The components, which when assembled, will form the new dummy decontamination facility for each area consisting of a monorail and electrically driven hoists; a series of tanks in which the contaminated dummies and poison slugs will be decontaminated; a feeder-sorter device which will sort the bulk mass of decontaminated pieces so that they may be fed singly through an automatic radiation monitor. This monitor will reject pieces which are too hot for re-use. Off-site procurement of the major items is complete in the sense that all equipment has been ordered. The electrically driven hoists will soon be on plant and the first unit for the feeder-sorter assembly being manufactured by Syntron Company arrived on plant May 20, 1960. Central Maintenance is fabricating the balance of the equipment and it is planned to assemble the principal pieces in a mock-up so that initial testing may be performed. Final production of the feeder-sorter will not be continued until sufficient testing has been performed on this initial mock-up.

CGI-890 - Improved Ventilation - 1704-K Building

The purpose of this project is to provide supplemental evaporative cooling units and air distribution system to the 1704-K building. Some reduction of ventilation noise will be accomplished in connection with the existing ventilation system. The construction work, which is being performed by J. A. Jones Company, is approximately 80 percent complete and should be available for beneficial use during the first week of June. Efforts will then be directed towards the noise reduction portion of this job.

MJA-8 - Ball 3X Electrical Modifications, 105-B, D, DR, F, and H

The purpose of this MJA-8 is to completely renew the electrical portion of the ball 3X systems at 105-B, D, DR, F, and H Reactors. Unusual preparation work is required because all of the work has to be accomplished during a reactor outage and this is generally five days. Work has been completed at 105-F and B, and is scheduled at 105-H during a shutdown planned for June 13. The systems installed by Central Maintenance at 105-F and B have been functioning correctly except for a variation which occurred in the low pressure time delay relay at 105-F building. The problem is being studied by the operational electrical people at F Area as well as the designer. At 105-B Reactor there was an apparent holding coil failure on their low pressure relay. The faulty coil was removed and sent to the manufacturer for evaluation.

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MJA-28 - Noise Abatement Program - 165-190 KE and KW, and 190-C Buildings

The purpose of this MJA is to reduce the excessive sound levels in the 190-C, KE and KW pump rooms and basements, and the 165 KE and KW pipe galleries. This work was assigned to J. A. Jones Company, and the Royal Company submitted the apparent low bid of \$42,990 to J. A. Jones on May 20, 1960. The fair cost estimate on this work was \$69,000. The Jones Company will perform installation work in those areas where it is impractical to use a lump-sum contractor, and the balance is incorporated in the lump-sum contract. No work will be started prior to July 1, 1960 upon request of the manufacturing components.

AR-59-IP-63 - Crossheader Valve Operators, All Reactors

The purpose of this appropriation request was to install air powered cross-header valve operators for the front and rear faces of all reactors. Work has now been completed at all areas except 105-F. Completion of the work at F is dependent upon available outage time.

PROJECT PROPOSALS

Project Proposals Approved By AEC

CGI-791 Reactor Confinement

Rev. 4

Authorized increase in funds from \$5,000,000 to \$6,180,000 for total project except that second bank of filters and frames not approved at this time.

CGI-824 Remotely Operated Cap Remover, KE Reactor

Rev. 1

Authorized increase in funds from \$250,000 to \$420,000 to provide one cap remover at KE Reactor.

CGI-844 100-K Area Coolant Backup

Rev. 1

Increase in interim authorization from \$30,000 to \$235,000 for total design and related management services.

CGI-899 Cask Handling Facility, 105-KW Building

Total project, \$37,600.

Other Projects Awaiting Approval

CGI-844 100-K Area Coolant Backup

Rev. 1

See above. Balance of funds (\$1,865,000) in FY-61.

CGI-868 Columbia River Scale Model

CGI-869 Operational Charge-Discharge - C Reactor

CGI-887 Critical Mass Monitoring, All Hanford Reactors

Letter prepared in response to HOO-AEC request for additional information.

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CGI-889 Effluent System Modifications, 100-B/C

For remaining funds, \$451,000.

CGI-892 Ventilation Improvements, 181 Buildings

Project Proposals Submitted to AEC

CGI-839 Modifications to Fuel Element Test Facilities, 1706-KER
Rev. 2

Requests Received for Project Preparation

R-20936 Improved Water Backup - B, D, and F High Tanks

CPFF CONSTRUCTION SERVICE CONTRACTOR - LIAISON

We have issued five new work orders, supplemented one project for a total of \$20,145 to J. A. Jones Company for the month of May. Of the five new orders, four are classified Davis-Bacon and one development.

PLANT FORCE WORK REVIEW

The Labor Standards Board approved seven jobs for assignment to plant forces, which are estimated to cost \$554,895.

MANAGER
FACILITIES ENGINEERING

RT Jessen:msw

NPR PROJECT OPERATION**DECLASSIFIED**PROCESS DESIGNResearch and Development

An additional \$50,000 of R & D funds has been made available to Process Design for FY-1960. This should be sufficient to permit work in support of the NPR program to proceed at an effective level.

Work has been initiated on development of methods for predicting the reliability of various instrumentation and mechanical systems. Initially, the objective will be to make effective comparisons among alternate design approaches by adaptation of techniques which have been successfully utilized elsewhere.

Project CAI-816

The possibility of providing additional graphite cooling tubes to facilitate operation at higher flattening efficiencies was proposed during the month but there has been no definite decision as yet.

A proposal by Burns and Roe, Inc. for disposal of dump system effluent by means of a quench tank, in lieu of dumping directly into the 109 pipe gallery, proved unacceptable due to failure to meet essential criteria.

Justification of efforts to provide a sealed surface for the concrete walls of the primary confinement zone was discussed with the conclusion reached that such coatings should not be provided as a part of initial construction for the purpose of reducing confiner leakage rates.

Necessary security clearances were finally obtained for Electric Boat personnel and the initial portion of their primary piping stress analysis work was completed. The larger sized piping (18 inch) was found to be well within code allowance but overstressed conditions were found in minor portions of the six-inch piping which was studied. Recommended corrective action called for relocation of an anchor point and addition of an expansion loop. The feasibility of these modifications is currently under study. In the meantime, Electric Boat is proceeding on the next phase of the stress analysis which includes the nozzle-to-header connectors.

The specification for the NPR process tube flow monitors was rewritten along functional lines to permit solicitation of engineering proposals.

Process elevator specifications were rewritten to obtain essential capabilities at minimum initial capital cost.

Representatives of R & E, Operations, and Process Design were again in residence at the A-E offices late in the month to facilitate technical guidance as well as processing of scope material.

DEVELOPMENT AND TESTING**DECLASSIFIED**Nozzle to Connector Joints

This development work has been completed and a recommendation submitted for joint selection. Recommendations included one joint preferred on the basis of more extensive testing, three as potential alternates on the basis of a single thirty-day test, and recommendations for the rejection of others on the basis of failure in test.

Rupture Monitor

The 100 point gross gamma rupture system which was installed in 105-C is not yet in operation. Corroded and partially plugged assembly lines were cleaned and repaired to permit flow rates and hold-up times within the design limits.

Flow Monitor

Thirty-four magnetic amplifiers have been assembled into a low limit monitor breadboard and the system is being tested. Preliminary results indicate satisfactory operation but testing is continuing.

Static Inverters

Two devices for inverting from 125 volt battery supply to 60 cycle AC have been received from vendors. A one KVA unit failed on test and was returned. Testing of the 250 VA unit was initiated.

FIELD AND OPERATIONS ENGINEERING**DECLASSIFIED**Construction

Concrete has been placed in four walls of the 181-N Building to elevation 405'-0". The remaining walls have been poured to elevation 395'-0".

George A. Grant Company started excavation for the 184 standby power house May 9, 1960, and has made two concrete pours on the foundation. Excavation has been completed.

It was necessary to relocate a portion of the 100-K to 100-N telephone cable to clear the railroad which is presently under construction.

The electrical subcontractor started construction of the underground electrical duct bank underneath the railroad adjacent to the 151 Building.

Efforts are under way to obtain two 8,250 gallon stainless steel tanks from the 200 Areas for use in the 100-N Area water treatment system.

The excavation for 105 and 109-N Buildings is now essentially completed. Pressure grouting for stabilization of subsoil has been discontinued and replaced with a procedure involving gunite and dry packing steeply excavated slopes. This procedure has now been approximately 80 per cent completed and has permitted completion of the deep areas of excavation. Forming has been started for the reactor foundation base slab. There have been 512 cubic yards of concrete placed in footings and floor slabs in Areas 1, 4, and 5. The installation of the electrical grounding mat is approximately 40 per cent complete, and several embedded conduit items and various pipe sleeves and drain lines are now being installed.

In order to meet the close tolerance for plumbness of the elevator casings the sub-contractor is installing oversized casings and plans to then install the 42" OD casings inside the oversized ones. The "F" elevator oversized casings have been driven through the water table. This has caused some delay due to the casing receiving water faster than it can be bucketed out. Western Drilling Company is in the process of driving an 8-inch pipe inside the casing to install a pump for removing the water. Driving of the second casing for the "D" elevator was started May 25, 1960, with a second drilling rig.

The preparation of erection procedures and inspection guides and the design of inspection tools for the reactor continued.

Graphite

The procurement order for the core graphite material was placed with National Carbon Company, May 6, 1960, with delivery of 6 x 6 material to start September 10, 1960.

The requisition for the front and rear graphite reflector blocks and the graphite tube sleeves was issued May 27, 1960. Delivery of these items is required February 1, 1961. They are required for mock-up. They will be

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furnished as completely machined except for possible special details.

A shipment containing 1619 4 x 5 reflector bars was shipped from Great Lakes Carbon Company, May 21, and a shipment of 1455 similar size material was shipped from National Carbon Company, May 20, 1960.

Machining of existing graphite inventory is continuing and is scheduled to be completed by June 10, 1960. Following this, details for the Master Layer are scheduled to be fabricated.

The Arrowsmith notching machine arrived on-site early in May. Preliminary run-ins and final adjustments are continuing with the goal of initiating production of 4 x 5 reflector bars after completion of Master Layer details.

Zirconium

The contract for the 800 tube order was submitted to Harvey Aluminum for signature May 9, 1960 as of May 31, 1960, the signed contract had not been returned.

Sixteen process tubes from Allegheny-Iudlum for the pilot order were received May 16, 1960. These are undergoing ultrasonic testing. Nine tubes received from Harvey Aluminum have been tested for ultrasonic and Zyglo defects. All are acceptable in regard to ultrasonic tests and minor surface conditioning should correct the Zyglo indications.

The modification work accomplished during this period in the Tube Shop consisted primarily of procuring and installing mechanical equipment including deionizer, ball transfers, packing table, straightness check table, autoclave carriage racks, tube storage racks, tube dryer, monorails, and second immerscope carriage. The sprinkling system was completed, tested, and put into operation. Installation of the autoclaves was 90 percent complete on May 31, 1960.

Procurement

Following is the status of procurement as of May 31, 1960:

Reactor Plant

General Electric Originated - Kaiser Engineers Purchased
(80 Requisitions - 53 Alterations)

46	Open Requisitions - Estimated Cost	\$7,227,729.00
20	Open Purchase Orders - Actual Cost	328,946.00
7	Completed Purchase Orders - Actual Cost	11,456.00
3	Cancelled Requisitions	-- --
TOTAL:		<u>\$7,568,131.00</u>

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General Electric Originated - General Electric or AEC Purchase
(5 Requisitions - Zirconium and Graphite)

8 Open Purchase Orders - Actual Cost \$12,870,181.00

Heat Dissipation Plant

Burns & Roe Inc. Originated - Kaiser Engineers Purchase
(74 Requisitions - 154 Alterations)

37	Open Requisitions - Estimated Cost	\$17,719,100.00
24	Open Purchase Orders - Actual Cost	11,783,273.00
7	Cancelled Requisitions	-----
4	Requisitions being held (lock sets)	-----
		<u>\$29,502,373.00</u>

NPR Related

General Electric Originated - Kaiser Engineers Purchase
(10 Requisitions - 2 Alterations)

6	Open Requisitions - Estimated Cost	\$ 23,345.00
1	Open Purchase Order - Actual Cost	33,160.00
3	Complete Purchase Orders	<u>55,475.00</u>

TOTAL: \$ 111,980.00

TOTAL ALL ORDERS: \$50,052,665.00

Administration

The following material was issued by Drawing and Specification Control during the month:

Routine Work Processed April 23 through May 22, 1960:

Drawings	539
Criteria	32
Specifications	43
Requisitions	73
APT	-
Other	<u>65</u>
TOTAL:	<u>752</u>

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

On Detail Drawings	255
On Scope Drawings	23
On Specifications	<u>41</u>
TOTAL:	<u>319</u>

Operational Planning

A plywood reactor console mock-up with cardboard instruments was set up in Building 712-A to help resolve the many variances of opinions on instrument placement.

Results of the K reliability comparison study were not received from Operations Analysis. An extension of time until June 15, 1960, was granted.

A study was initiated to determine the effect of construction cost reduction actions on operational manpower requirements, time operated efficiency and plant production.

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PROGRAM EVALUATION**DECLASSIFIED**Design Status

	<u>Wt'd Total</u>	<u>Certified Schedule</u>	<u>Actual % Complete</u>
<u>Reactor Plant as of 5-31-60</u>			
<u>Title I</u>			
Scope*		100	99.7
<u>Title II</u>			
Drawings	70	61.0	66.9
Specifications	8	75.0	48.8
Requisitions	8	16.0	14.2
ATP's	4	7.0	.9
Development and Testing	<u>10</u>	<u>71.0</u>	<u>63.0</u>
Total	100	55	58.19

Heat Dissipation Plant as of 5-28-60

<u>Title I</u>		
Scope Criteria	100	88.5
<u>Title II as of 5-28-60</u>		
Detail Design	51	51

	<u>No. Req'd</u>	<u>No. Issued to Scheduled</u>	<u>5-28-60 Actual</u>
Criteria	23**	18	18
Preliminary Drawings (bid)	722	225	278
Detail Drawings (for const.)	732	132	168
Specifications (bid)	162	68	78
Requisitions	173	74	85
ATP's (No. being developed)	-	0	0

<u>Composite Design Completion</u> (Reactor and Heat Dissipation Combined)	<u>Certified Schedule</u>	<u>Actual % Complete</u>
Total	58.8	59.3

* Two additional reactor criteria are being prepared, one on code compliance - piping systems and pressure vessels, and one for the helium leak detection system.

** Dump condenser area package combined with heat exchanger building package.

Cost Estimate

A new cost estimate is being prepared starting June 6, and will be issued by Kaiser Engineers later this month.

Schedules

Kaiser Engineers are preparing a new construction schedule which will be issued early in June.

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MANAGER
NPR PROJECT

JS McMahon:mf

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FINANCIAL OPERATION

GENERAL ACCOUNTING OPERATION

During May, twelve IPD employees attended meetings of Professional and Trade Societies, and four employees attended offsite courses. Expenditures were \$1,550 and \$728, respectively.

The biennial physical inventory of Movable equipment has been completed. Reconciliation between inventory results and books is nearing completion.

The Fixed Property Inventory report was issued on May 18, 1960.

Information regarding equipment and supplies provided by Westinghouse for use with the H-1 Loop was given to Westinghouse as requested.

Plant Improvement Program summary expenditure pattern and area detail correction requirements by cases were provided for Facilities Engineering use.

PRODUCT COST & BUDGET OPERATION

A meeting was held with the Manufacturing Section staff to assist them in determining the curtailment necessary to operate within their budget allocation. A re-allocation of funds within the Section was prepared and issued.

"N" Startup problems and budget allocations of personnel and amounts were discussed with G. Collins and T. Hall.

The annual physical inventory of coal was taken on April 29.

Processing and essential material inventories were observed at KE, KW and F Areas on April 25.

A revised essential material pricing schedule for use by Contract and Accounting for the fourth quarter was issued.

The overtime lunch procedure was revised and distributed.

PERSONNEL ACCOUNTING

Overtime hours worked by Department personnel during May, 1960 was 6,769 and within the established control level. Overtime hours worked in April, 1960 were 9,280.

Absenteeism statistics for May, 1960 and year to date are 1.9% and 2.5%, which reflects a decrease in the rate as compared with April figures (2.1% and 2.7%).

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AUDITING

Revisions to fourteen AEC Manual Chapters were reviewed for their effect on IPD Operations.

An audit report covering the operation of the property pass procedure was issued.

Assistance on a payroll audit was given to Contract and Accounting auditors by checking certain data with IPD wage rate records.

A test check of timekeeping was made by comparison of Between Shift Registers with time cards. Possible discrepancies in payments were referred to section managers for explanation.

Three Organization and Policy Guides were reviewed and comments for the Department prepared.

PROCEDURES

Development activities were applied on the plant-wide study of the planned high-speed communication network for HAPO. Meetings were held between members of Manufacturing, Industrial Engineering and Research and Engineering in IPD and Office Procedures and Data Processing representatives, C & AO. Potential needs and uses in the Department for a proposed communication network were indicated; a review of savings and benefits which would accrue using such an installation is being made.

Studies were made regarding two data acquisition and handling problems: (1) the pressure gauge recording of basic reactor operating data from panellit boards; and (2) the capture in machine language of fuel element identification data.

Communications and instructions were given to all Section and Plant Managers concerning the current efforts to complete and update our records management flow and retention schedules. A formalized manual of existing schedules prepared by the Records Operation, C & AO, was also sent out to all sections to assist them in this effort.

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RELATIONS PRACTICES OPERATION

Four experienced BS/MS candidates were interviewed with one offer extended. Five employment offers were extended to previous interviewees. Four acceptances were received leaving fifteen offers open at month end. Three PhD candidates were interviewed with no offers extended. One Manufacturing Training Program candidate and three Advanced Engineering candidates were interviewed with no offers extended. Five employees transferred into the Department from other HAPO components. There were two resignations and one transfer out of the Department.

A total of \$920 in awards was paid to 18 suggesters. The largest award was \$730.

Mass communication activities included the publication of nine Management News Bulletins, one Round Table Guide, two IPD Headliners and two priority messages. Two IPD OPGs and two HAPO OPGs were issued during May. GE NEWS coverage included fourteen items about IPD activities totaling 148 column inches.

A guide, comparing salary and wage escalations, was prepared for supervisors of exempt employees.

Two IPD employees retired during May. Participation in the benefits plans is as follows:

Insurance	99.8%
Pension	99.7
Stock Bonus	52.6
Savings & Security	96.1

Two security violations occurred during the month. No disabling injuries were reported but 102 medical treatment injury cases were treated. IPD has accumulated over 5,340,000 injury free hours since the last disabling injury.

W. A. Shanko

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SIGNIFICANT REPORTS ISSUED

HW-57992
through
HW-65996 Heat Dissipation System Project Representatives Minutes Nos. 45 through 49, inclusive.

105-N Design Communication Letter No. 4, "105-N Confinement System," J. R. Carrell, dated May 5, 1960.

HW-65021 Revised NPR Emergency Cooling Water Requirements, May 3, 1960, H. G. Johnson.

HW-65199 NPR Decontamination Meetings, May 12, 1960, W. D. Bainard, Unclassified.

HW-65210 Primary Loop Emergency Dump, 100-N Trip Report - Visit to Burns and Roe, Inc., Hempstead, N. Y., May 3, 1960, H. S. Davis, N. O. Strand.

HW-65212 Comparison of "Frozen" and Irradiated Zircaloy-2 Clad Uranium Rods, May 13, 1960, M. C. Fraser.

HW-65266 Effect of Thermal Transients Upon NPR Control Rod Integrity, May 17, 1960, M. C. Fraser.

HW-65274 NPR Primary Piping Fatigue Analysis, May 20, 1960, W. A. Massena.

HW-65276 NPR Project Section - Monthly Design Test & Development Program Status Report - CAI-816, April 30, 1960, W. J. Morris.

HW-65299 Summary of NPR Safety Circuit Signals, May 20, 1960, D. L. Condotta.

Stress Distribution in Thin Web T Section Under a Thermal Gradient, May 9, 1960, W. J. Love, Unclassified.

HW-59862 Conditions and Ground Rules for Further Optimization Studies on Power Generating Facilities - NPR, May 25, 1960, W. J. Dowis.

HW-65403 Trip Report - Visit to Ingersoll Rand Company - Phillipsburg, New Jersey, May 31, 1960, M. H. Schack, Unclassified.

HW-65301 Project CG-775 and CGI-883 Representatives Meeting No. 9, May 23, 1960, M. H. Schack, Unclassified.

HW-64603 FY 1962 PA&C Budget, Continuity of Operation, Reactors, L. B. Brinkman, N. F. Fifer, & W. W. Porter, April 25, 1960, Secret.

HW-65161 Adaptation of Recirculation Water Systems to Existing Reactors - Preliminary Feasibility Study, N. F. Fifer, P. J. Hollifield, & F. J. Kempf, May 9, 1960, Secret.

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HW-63761 CGI-884 Project Representatives Meeting No. 2 - February 2, 1960, May 16, 1960, D. F. Watson, Confidential.

HW-65220 Study of K Area Emergency Generator Loading, May 16, 1960, L. M. Keene, Unclassified.

HW-63658 Project CGI-791 Representatives Meeting No. 16, May 2, 1960, E. L. Etheridge, Confidential.

HW-64081 Project CGI-791 Representatives Meeting No. 17, May 2, 1960, E. L. Etheridge, Unclassified.

HW-64284 Project CGI-791 Representatives Meeting No. 18, May 2, 1960, E. L. Etheridge, Unclassified.

HW-65414 Methods for Reducing Reactor Effluent Radioisotope Release, May 27, 1960, H. W. Heacock, P. C. Jerman, Confidential.

HW-65269 Existing Reactor Rear Face Piping Review, May 25, 1960, D. F. Watson, et al., Secret.

HW-64499 Modification of 105-D Nozzles for Self-Supported Fuel Elements, April 18, 1960, C. A. Munro, Unclassified.

HW-64975 Comments on Data Logging Instrumentation Drawings, April 29, 1960, R. Sherrard, Unclassified.

HW-65211 Status Report Replacement Analogue to Digital Converter System for Presently Installed Data Logging Systems in 105-B, C, D, DR, F, and H Reactors, April 28, 1960, R. Sherrard, Unclassified.

Evaluation Report - Minneapolis-Honeywell Log N and Period Monitor, May 2, 1960, A. N. Iverson, Unclassified.

HW-65066 Counter EMF Cells, May 16, 1960, G. C. Minor, Unclassified.

HW-64505 Seismoscope Relay, April 11, 1960, J. H. Greer, Unclassified.

HW-65314 Some Applications of High Power Zener Diodes, May 27, 1960, W. Dalos, Unclassified.

HW-64942 Final Report-Development Test IP-66-E, Vertical Safety Rod Gas Seal Modification for the K Reactors, April 27, 1960, H. F. Jensen, Unclassified.

HW-64982 Final Report-Development Project #11 for CAI-816, New Production Reactor Horizontal Control Rod Gas Seal, April 28, 1960, H. F. Jensen, Unclassified.

HW-64983 Final Report-Development Project #12 for CAI-816, New Production Reactor Moderator Cooling Bellows Gas Seal, April 29, 1960, H. F. Jensen, Unclassified.

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HW-56001G Interim Report No. 8 on Chemical Decontamination Activities, 105 Reactors During the Period July, 1959 through April, 1960, May 10, 1960, H. F. Jensen, Unclassified.

HW-65181 Production Test Authorization IP-323-AE, 105 Reactor Through Process Tube Decontamination Tests with Turco 4306-B and Alternate Materials, May 12, 1960, H. F. Jensen, Unclassified.

HW-65182 Final Report, Design Test 1046 - CAI-816, Electrical Conduit Cable and Wire Seals for 105-N, May 12, 1960, H. F. Jensen, Unclassified.

HW-64574 Design Test 1059 - KER Nozzle Flow Test, April 15, 1960, C. W. Higby & C. D. Emmons, Unclassified.

HW-64820 Report No. 4 - Design Test 1033 - NPR Diversion Valve, April 22, 1960, C. W. Higby, Unclassified.

Status Report-NPR Fitting Development Activity, May 12, 1960, J. H. Fastabend, Unclassified.

HW-64929 NPR Connector to Nozzle Fitting Evaluation, May 20, 1960, J. H. Fastabend, Unclassified.

Basis for Contract Negotiations-Effluent Dilution Studies with a Columbia River Scale Model, May 4, 1960, J.P. Corley, Unclassified.

Recommendations for Automatic Synchronizing of 4500 HP Synchronous Motors, May 18, 1960, V. G. Blanchette, Undocumented.

HW-64940 IPD Five Year Electric Power Forecast-Fiscal Years 1961 through 1965, May 6, 1960, V. G. Blanchette, Secret.

HW-64939 IPD Two Year Electric Power Forecast - Fiscal Years 1961 and 1962, May 6, 1960, V. G. Blanchette, Secret.

HW-64953 Suitability of Northern Pacific Coal, April 28, 1960, J. C. Baudendistel, Unclassified.

CGI-791 Reactor Confinement-Inspection of Turbines Used as Exhaust Fan Drives, May 5, 1960, to E. L. Etheridge from A. McDonald, Undocumented.

HW-65051 Work Simplification, Motion Economy, and Methods Development Appreciation-Session I, April 4, 1960, C. T. Hayner, Secret.

HW-64885 Program to Increase Bulk Temperatures Limit at DR Reactor, May 17, 1960, D. S. Lewis, Secret.

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TRIPS

W. W. Walker attended the joint National Board - ASME Boiler and Pressure Vessel Committee meeting held in Denver.

W. D. Hamilton attended the Instrument Society of America Show at San Francisco and consulted with Maintenance Engineering people at Vallecitos and San Jose.

J. W. Frymier and J. D. Turner attended the annual conference of the Northwest Section of the American Water Works Association in Portland.

E. E. Mitchell and F. R. Guyer attended the joint Technical Conference and Exhibit of the Instrument Society of America and Institute of Radio Engineers in Seattle, May 24 through 26, 1960.

M. H. Schack visited Phillipsburg, New Jersey on May 4 to 11 to witness tests performed by the Ingersoll Rand Company on replacement pumps for Project CG-558.

C. W. Botsford visited Norfin, Inc., Seattle, Washington, on April 27-29 to consult on DDR-93.

J. W. Green attended the Division of Reactor Development sponsored symposium on in-core reactor instrumentation and conducted one afternoon session in Washington, D.C. on April 28-29.

R. K. Smith visited Nuclear Metals, Inc., Boston, Mass., on May 5-19 for technical discussion in joining Zircaloy to carbon steel.

R. B. Willson visited Decoto Brothers, Yakima, Washington on May 10 to discuss fabrication problems and costs for roving actuator operated, nozzle mounted ball valves.

A. McDonald made a trip to General Electric Company Service Shop, Seattle, Wash., to conduct engineering technical tests and develop a course of action appropriate to restoration of the failed 4500 HP stator.

V. G. Blanchette and A. McDonald visited Dr. E. W. Greenfield, of Washington State University, Pullman, Washington, to discuss motor coil insulation problems.

R. G. Knirck visited the Homer City, Pennsylvania plant of the Syntron Company on May 4, 1960 to witness the testing of the first feeder-sorter equipment being manufactured by Syntrol for use on Project CGI-871.

J. M. Fox attended the "Metallic Materials for Nuclear and Conventional Power Plant Application" conference at Wrightsville Beach, North Carolina, May 16-20.

R. W. Pitman attended a meeting of the American Water Works Association in Portland, Ore., 5/4-6/60.

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N. T. Hildreth visited APED, San Jose, California, to attend the Instrument Society of American Convention, 5/8-14/60.

W. K. Alexander visited Nuclear Metals, Inc., Concord, Mass., to review contracts, 5/15-20/60.

T. W. Evans and D. H. Curtiss attended the Sheath Meeting of the Atomic Energy of Canada, Limited, Chalk River, Canada. Mr. Evans also attended the American Society of Metals Meeting in Detroit, Mich., and Mr. Curtiss visited the Bridgeport Brass Co., Bridgeport, Conn., for zirconium tube consultations, 5/15-21/60.

M. A. Clinton, W. A. Nechodom and G. F. Owsley visited the Dresden Atomic Power Station, Morris, Ill., Argonne National Laboratory, Lemont, Ill., and The Savannah River Plant, Aiken, S.C., to discuss mutual technological programs and problems, 5/23-28/60.

M. H. Russ, E. W. Wilson, and A. C. Whiteside were at Burns and Roe, Inc. Headquarters at Hempstead, New York from April 25 through May 6, 1960, engaged in design consultation and scope review and approval. Mr. Russ and Mr. Wilson returned to New York on May 31, 1960 for a two week visit to expedite design progress.

W. D. Bainard visited the Los Angeles area on May 6 and 7, 1960 to discuss NPR decontamination with Turco, Wyandotte, and Burns and Roe, Inc. personnel.

H. S. Davis and N. O. Strand visited Burns and Roe, Inc., on May 2-4, 1960 for technical discussions regarding dump of primary loop in 109-N Building.

J. D. McCullough attended the Instrument Society of America Exhibit at San Francisco and visited General Electric, APED, San Jose, California, for discussions regarding instrumentation pertaining to NPR design with factory engineers attending the Exhibit and at APED.

H. S. Davis, F. C. Fisher and J. E. Stice visited the Yuba Manufacturing Division, Benecia, California, on May 20, 1960 to examine their facilities and capacity for fabrication of primary shield crates.

E. M. Kratz visited the General Electric Medium Turbine and Gear Department in Boston, Massachusetts on May 24-25, 1960. He attended a meeting with General Electric Medium Turbine and Gear Department and Burns and Roe, Inc., on the design of the NPR standby turbine-generator.

W. J. Love traveled to Los Angeles, California May 31, 1960 to attend a pump test at the Byron-Jackson Pump Company.

G. L. Swezea attended the Institute of Radio Engineers Conference and Exhibit in Seattle, Washington on May 26, 1960.

D. R. Resner attended a hydraulic clinic presented by Mobil Oil Company May 20, 1960 in Portland, Oregon.

G. V. R. Smith recruited in Cincinnati, Ohio April 26 and 27, 1960.

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G. R. Klingler, E. A. Grimm, and G. W. Morrow visited the Shell Oil Company plant at Anacortes, Washington May 11 and 12, 1960, to review the use of chromatographs for gas analysis.

VISITORS

G. L. Locke, Consultant on Contract CA-222, visited HAPO on May 19 - 20, 1960.

Members of the NPR design audit team visited HAPO on the following dates:

J. F. Cage, Jr.	May 16-18, 1960
G. D. Collins	May 16-20, 1960
W. W. Kendall	May 16-18, 1960
A. E. Galson	May 23-25, 1960
P. E. Novak	May 23-25, 1960

H. H. Roth, S. P. Higgins, Jr., and R. C. McNally, representatives of the Military Products Division of Minneapolis-Honeywell Regulator Company, demonstrated a high speed scanning type monitoring system at HAPO on May 19, 1960.

Inlet and Diversion Valve discussions were conducted with representatives of the following companies during the month: Mason-Neilan, Norfin, Teleflex, and Chandler Evans.

The following Burns and Roe personnel visited Hanford during May for conferences with NPR project personnel:

G. T. Lewis	P. DiRienzo
A. J. Loiacono	L. Stone
M. A. Forrest	M. Naparste
A. J. Fiehn	J. Pfeffer
F. Steinbrucker	M. Zizza

R. E. Selff, K. W. Newman, and F. J. Morris, Turco Products, Inc., visited W. D. Bainard on May 4 and 5 to discuss NPR decontamination.

C. C. Thomas of Systems Engineering and Planning Operation, Utilities Group General Electric Company, visited the plant on May 20, 1960 for consultation.

J. Nash of Worthington Pump Company visited on May 25, 1960 to discuss general pump technology.

G. A. Moudry, D. O'Boyle, and R. Scheliker of Harvey Aluminum Company visited the plant May 23, and 24, 1960 to discuss NPR tube contract and review zirconium tube shop testing arrangements.

Kelly McBean of Holmes and Narver, Inc., Los Angeles, California, visited during the month to discuss the results of their study of earthquake vulnerability of the existing reactors and facilities.

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P. Hodel and C. Freeling of Huntington Rubber Co., and Product Engineering Co., respectively, visited HAPO on May 4, 1960 to discuss spline seals.

Ralph Wilkins of United Products Co., Tacoma, Wash., visited on May 4, 1960 to discuss manufacture of flapper valves.

Messrs. McSparrin, McMillin, and Christensen of Kaiser Engineers, Richland, Wash., visited on May 5, 1960 to consult on NPR fittings.

D. Williams of Chem Seal Corporation, Bellevue, Wash., visited on May 4-6 to discuss coatings and paints.

R. J. Mitchell of Chemical Sealants Co., Tacoma, Wash., visited on May 4 to discuss sealants and coatings.

R. C. Benton of Englehard Industries, Newark, New Jersey visited on May 4, 1960 to discuss catalytic gas purification equipment.

W. L. Shannon, Shannon and Wilson, was at HAPO to provide consulting advice on job modifications of the 181-B/C Pump House.

K. N. Mathes, General Engineering Laboratory, Schenectady, N.Y., was at HAPO for consultation on rotating equipment.

H. C. Hopkins and A. D. McWhirter of General Dynamics, General Atomic Division, La Jolla, California, visited HAPO to discuss DR-1 heterogeneous fuel element irradiation and nuclear mock-up test, 5/2-3/60.

A. R. Kaufmann of Nuclear Metals, Inc., Concord, Mass., visited HAPO to consult on NPR fuel development, 5/12-13/60.

M. G. Michel, Byron-Jackson Pump Company, visited HAPO May 5 to inspect pumps in 100-B, E, C.

R. L. Towers, Tower Equipment Company - Seattle, inspected equipment in 100-D Area May 11.

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