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Series A

MONTHLY RECORD REPORT

IRRADIATION PROCESSING DEPARTMENT

HW--55462

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MARCH, 1958

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IRRADIATION PROCESSING DEPARTMENT SUMMARY MONTHLY RECORD REPORT MARCH, 1958

RESEARCH AND ENGINEERING OPERATION

The I & E normal uranium fuel element irradiations continued normal during the period. At D Reactor the run-to-rupture test of the standard "old pile" size I & E and solid fuel elements has attained an exposure level approximating 1000 MWD/T without a failure of either type. Three failures of enriched I & E fuel elements occurred at KW Reactor; failure mechanisms have not been isolated.

Preliminary evaluation of the performance of M-388 aluminum alloy cladding indicates that inadequate bonding may be a prime contributor to the recent rupture experience.

Testing of advanced reactor fuel elements including stainless steel jacketed four-rod cluster elements and enriched 1.8" OD wafer elements is progressing satisfactorily.

Preliminary specifications have been prepared and bids requested for 300 Zircaloy process tubes of the B, D and F type for procurement and installation in FY 1959.

Conditions were established under which oil may be used in panellit gauge pressure sensing lines to control oscillations caused by pressure variations in the primary coolant supply.

Corrosion limits for aluminum slug claddings were established.

The annual review of prediction problems, reactivity and operating trends was completed and issued as two documents, HW-54415 and HW-54416.

PRODUCTION AND REACTOR OPERATIONS

Input production for March was 101.2 percent of forecast and output production was 123.3 percent of forecast. Output production was above forecast due to discharges during unscheduled outages late in the month which were forecasted for April.

The maximum power levels were increased 25 megawatts at KE, 15 at H, and five at F. The increase at KE was due to a combination of improved flattening and increased flow; the F and H increases to improved flattening.

A record combined power level for all reactors was established March 22, when the previous record (February, 1958) was exceeded by 95 megawatts.

Fifty-four reactor outages, of which 27 were scrams, resulted in an overall time operated efficiency of 75.7 percent. Forecast was 76 percent.

Eighteen ruptures were removed from the reactors as follows:

	<u>B</u>	<u>DR</u>	<u>H</u>	<u>KE</u>	<u>KW</u>	<u>Total</u>
Regular-solid	4	2	2		2	10
Regular-cored				2		2
"E" metal-solid			3	1		4
"E" metal-I & E	—	—	—	—	2	2
Total	4	2	5	3	4	18

Significant items of equipment experience were:

1. One hundred eighty-seven process tubes were installed; 60 at DR, 48 at D, 37 at F, 19 at B, 15 at H, 5 at KE, 2 at KW and one at C.
2. Eight water leaks were corrected; 3 at F, 2 each at DR and H, and one at B.
3. A pane of glass failed on the discharge area side of the C Reactor central viewer, resulting in the draining of the shielding water from the viewer.
4. C Reactor failed to recover from two scrams due to the malfunction of No. 8 (obstruction in channel) and 16 HSR's (faulty winch brake).
5. At DR Reactor, four regular VSR's were replaced with new type high temperature-resistant rods making a total of fifteen rods replaced. This completes the first phase of the DR-VSR replacement program.
6. Excessive noise and vibration in the speed increaser gear unit of No. 6 high lift pump in 190-KW on March 6 necessitated its being shut down, with the resultant shutdown of 105-KW due to the spare pump also being out of service.

There were no disabling injuries, security violations or technical over-exposures to radiation during March.

Statistics for the Processing, Power and Radiation Monitoring Operations in the individual reactor areas are tabulated on pages Ch-1 through Ch-6 of this report.

FACILITIES ENGINEERING OPERATION

Supplementary information to the NPR report was given to AEC. Specific points included the effect on calculated NPR unit product cost of including distribution of fixed charges and the effect of alternate sites and financing methods on both capital and unit product costs.

Economic data on a Power Demonstration Reactor concept as a dual-purpose plant was up-dated and transmitted to HOO-AEC.

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A meeting was held with Construction Engineering at which IPD presented conclusion of IPD to retain design management responsibility.

Scope drawings were completed for the NPR Prototype Concept Evaluation Loop. Cost estimate for the loop is \$272,000 with 1958 costs estimated to be \$100,000.

A program was formulated to study the need and feasibility of providing containment for existing reactor plants.

Recommendation was made to AEC that we proceed with general studies of the design features and process conditions that should be considered for an advanced developmental gas-cooled reactor.

Close-out of Project CG-642, "Continuous Charge-Discharge Equipment - C Reactor," is being completed as a result of deferment of the on-pile installation until FY-1960 or later.

The expense portion of CG-741, Revision 1, was approved by HOO-AEC as maintenance work not requiring a directive. The capital portion of the project is being reviewed by HOO-AEC.

Authorization was received to proceed with design work under Project CG-775, "Water Plant Expansion - 100-KE and KW."

Ten inventions were reported by Equipment Development, Facilities Engineering Operation.

EMPLOYEE RELATIONS OPERATION

A Register of all exempt positions in the Department was completed. Preliminary tests indicate it to be a useful tool in planning transfer of individuals for developmental purposes. The "Creative Approach Seminar" was started with 16 persons, including two from other HAPO Departments, enrolled. A study of first line supervisor training needs was started with the formation of a task force to develop a comprehensive training program proposal. PhD recruitment activities increased while BS-MS recruitment remained curtailed by virtue of force reductions. Concerted effort continued in the placement of exempt and nonexempt employees on ROF status. Eight additions and 48 removals were processed through the Employment Office. All requisitions were on hold status at the end of the report period.

Mass communication activities for the month of March included the publication of five Management News Bulletins, one "Memo from the General Manager" and three Union Relations Information bulletins. Four issues of "Management Information for Foremen and Supervisors" were distributed during the month, as was the health bulletin and the "Monogram." The March-April issue of the "GE Review" was also distributed to those individuals in the Department on the distribution list. Communication activities in response to the "white collar" organizing campaign included the following: 1) a written discussion of the conduct of our supervisors during organizing campaigns sent to all IPD exempt people; 2) a letter from the General Manager to all IPD exempt people; 3) a letter to all secretarial and clerical people from the General Manager; 4) a summary of questions and answers about the

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OEIU drive with a cover letter signed by the Manager-Employee Relations sent to all exempt people; 5) a refutation of the claims made by the union on their "Authorization cards" with a cover letter from the Manager-Employee Relations sent to all IPD exempt people.

A revised overtime distribution procedure for Maintenance employees was placed into effect on March 17. Arbitration notices were received for two grievances during the month. The Manager-Union Relations presented a speech entitled "Union Relations Aspects of Craft Training" to all HAPO Maintenance Managers on February 24 in the 300 Area. The HOO-AEC Labor Standards Board approved three jobs for assignment to plant forces during the month.

Exempt positions have been revised, evaluated and established in connection with the organizational modifications in the Facilities Engineering and Reactor Operations. A detailed review was made of 4th level manager and equivalent individual contributor positions in the Facilities Engineering and Research and Engineering Operation. An interim budget allocation of \$25,000 was received from the Commission enabling us to proceed with HAPO suggestion awards. Necessary changes have been made to our present Vacation Plan for the integration of HAPO-wide practices which will accommodate the new vacation policy.

An effective Welding & Cutting Procedure was completed and endorsed by the Commission Safety Operations, and will require compliance by all outside contractors. IPD will become eligible for the General Manager's Safety Award on or about April 28, 1958. Twenty-five Safety Suggestions were processed during March. Seventeen safety meetings were conducted by Specialists-Health & Safety. An average of 20 employees attended each meeting.

Fire Protection Operation responded to one alarm during the month of March. Material in the 100-D Burial Ground ignited spontaneously March 26th, necessitating a control detail for 24 continuous hours. Chief and Day Captains attended an instructional class on Fire Alarm System Maintenance. Controlled burning at several locations in White Bluffs. Nonexempt Force was reduced by extending Fire Extinguisher maintenance and eliminating one Serviceman. A First Aid class was given to eight IPD members by Day Captain.

FINANCIAL OPERATION

Advice 4.3.1, "Compensation, Gifts or Gratuities From Vendors or Subcontractors," was cancelled and re-issued as OPG 1.16, to insure compliance.

Semiannual inventory of Special Materials and Precious Metals disclosed a shortage valued at only \$.14.

The month's major effort was directed toward completion of the FY 1960 and Revision of FY 1959 budgets due April 1.

Physical inventory of essential materials in 100-K Area was taken as of February 28, 1958 and report issued.

Production for all reactors for the month of January, 1958 was calculated from recorded power levels and compared with reported data. Procedures for the recording of power levels and the calculation of production were reviewed.

IRRADIATION PROCESSING DEPARTMENT
MONTHLY REPORT OF INVENTIONS OR DISCOVERIES

MARCH, 1958

All persons engaged in work that might reasonably be expected to result in inventions or discoveries advise that, to the best of their knowledge and belief, no inventions or discoveries were made in the course of their work during the period covered by this report except as listed below. Such persons further advise that, for the period therein covered by this report, notebook records, if any, kept in the course of their work have been examined for possible inventions or discoveries.

<u>Name</u>	<u>Title</u>
W. E. Cawley H. F. Jensen	Combination Nozzle Flow Adaptor and Van Stone Flange Seal
R. L. Loundagin	Configuration of a Three-Conductor Electric Instrument Cable
W. E. Cawley	Method for Continuously Removing Fission Gases from Fuel Elements in a Heterogeneous Reactor
W. E. Cawley	Nitrogen Addition to the Atmosphere of a Graphite-Moderated Reactor as a Means of Providing Supplemental Start-up Control
W. E. Cawley C. E. Frantz R. Willing	Method for Reducing the Energy Required for Metal Forming Operation
W. E. Cawley	Method for Obtaining Maximum Bulk Outlet Temperature from a Pressure Tube Power Reactor
W. E. Cawley	A Method for Reducing Absorption of Neutrons and Changing Moderation Effect of a Reactor Coolant
W. E. Cawley	Method for Controlling Heat Cycles in a Heterogeneous Reactor
W. E. Cawley	Reactor Control Rods with Variable Poison Strength
W. E. Cawley	Method of Controlling a Heterogeneous Reactor by Symmetrically Displacing Fuel Elements During Operation
E. Bailey R. Pitman	Continuous Process for Making Dilute Aluminum Sulphate Solution

General Manager
IRRADIATION PROCESSING DEPARTMENT

A. B. Greninger:mnk

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RESEARCH & ENGINEERING OPERATION

MARCH 1958

VISITORS AND BUSINESS TRIPS

Prof. T. B. Drew, 3/11-14/58, of the Dept. of Chemical Engineering, Columbia University, New York, N.Y., visited HAPO to discuss the heat transfer program.

George D. White, William C. Thurber, and Lawrence D. Schaffer, 3/27-28/58, of ORNL, Oak Ridge, Tenn., visited HAPO to discuss DR Gas Loop problems.

R. Nilson, 3/3-4/58, visited the University of Washington, Seattle, Wn., to recruit PhD graduates.

R. L. Dickeman, 3/5-8/58, visited the United States AEC Division of Production, Washington, D.C., for the NPR Hazards Review.

N. O. Strand, 3/8-12/58, visited Hammel-Dahl Co. of Providence, R.I., to discuss high temperature, high pressure valves.

W. K. Alexander, 3/10-15/58, visited the Fernwald Plant, Cincinnati, O., and Nuclear Metals, Inc., Boston, Mass., to review progress of fuel element development work at NMI.

R. E. Baars, 3/15-21/58, visited the Batelle Memorial Institute, Columbus, O., General Engineering Laboratory, Schenectady, N.Y., Hynes Electric Heating Division, Newark, N.J., and Stearns-Rogers Mfg., Denver, Colo., to confer on 100-DR Recirculating Gas Loop problems.

W. J. Gartin, 3/15-22/58, attended the Nuclear Engineering and Science Conference, Chicago, Ill., and visited the Crane Company, Chicago, Ill., to discuss high temperature, high pressure valves.

E. C. Wood, 3/16-25/58, attended the Nuclear Congress Conference, Chicago, Ill., and visited the Fernwald Plant, Cincinnati, O., for discussions regarding NPR.

S. M. Graves, 3/17/58, visited Washington State College, Pullman, Wn., to discuss studies to be conducted by their Hydraulic Research Group.

J. F. Music, 3/17-18/58, visited Washington State College, Pullman, Wn., to present a talk to the Engineering Faculty.

W. C. McGee, 3/17-20/58, attended the GE Computer Symposium, New York, N.Y. and consulted on technical data processing problems at the General Engineering Laboratory, Schenectady, N.Y.

L. W. Lang, 3/19-26/58, visited ORNL, Oak Ridge, Tenn., and the Fernwald Plant, Cincinnati, O., to discuss Combined Operations problems on enriched processing.

D. H. Curtiss, 3/22-4/4/58, visited ORNL at Oak Ridge, Tenn., and KAPL, Schenectady, N.Y., for consultations on the zirconium program and contracts.

ORGANIZATION AND PERSONNEL**DECLASSIFIED**

	<u>*Permanent</u>		<u>Rotational</u>	
	<u>Feb.</u>	<u>March</u>	<u>Feb.</u>	<u>March</u>
Management and Administration	5	5	-	-
Process & Reactor Development	38	36	5	6
Process Technology	40	40	2	2
Operational Physics	20	20	6	4
Irradiation Testing	20	20	3	4
Coolant Testing	25	25	1	1
Component Testing	18	18	1	1
	<u>166</u>	<u>164</u>	<u>18</u>	<u>18</u>

* Includes three engineers on loan

Process & Reactor Development: J. H. Brown, Supervisor, Reactor Physics, transferred to D-DR Reactor Operation, 3/17/58. K. W. Hess, Engineer I, resigned 3/21/58.

PROCESS AND REACTOR DEVELOPMENT OPERATIONReactor FuelsI&E Slugs - Development Loading Status

The status of the I & E loadings at C, KW, KE, and D Reactors is as follows:

	<u>C-Reactor</u> <u>IP-19-A</u>	<u>KW-Reactor</u> <u>IP-70-A</u>	<u>KE-Reactor</u> <u>IP-70-A</u>
1. Number of I & E charges loaded this month	152	381	842
2. Total tubes charged to date	2551	1310	1233
3. Tubes discharged this month	312	18	0
4. Average exposure level (MWD/T) of tubes discharged this month	782	686	----
5. Number of I & E charges under irradiation at month end	1155	1290	1233
6. Number of I & E ruptures to date under these tests	None	None	None
7. Specific power of highest power* I & E metal being irradiated under these tests (KW/ft)			
a) Average over tube	45	45	45
b) Maximum	64	64	64

* Assumes cosine front-to-rear flux distribution.

C-Reactor Experience

The I & E fuel element irradiations in C-Reactor proceeded normally during the month. The testing of mixing elements to secure improved bulk mixing of the cooling water in the asymmetrical tube-slug geometry as a way of alleviating high top-of-annulus temperatures continues with the prime immediate concern being that of localizing process tube damage. A slight suggestion of localized tube damage has been observed in channels with mixing slugs in identical locations over about a six month charging experience. Examination of fuel elements have disclosed no damage resulting from the use of mixing elements. A redesigned mixing slug possessing greater resistance to crushing is now under irradiation.

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The "thin-skin" C-size I & E fuel elements are now being charged to C-Pile; approximately 110 channels are so charged and these elements will be used essentially exclusively for future loadings. The OD of the canned "thin-skin" element has been reduced from 1.474" to 1.460" to secure a larger cooling annulus at the top of the slug column.

K-Reactor Experience

The temporary limit imposed on the charging of I & E fuel elements at the K reactors, that is, one-half of the reactivity weight in I & E fuel, has been re-evaluated on the basis of recent statements by the AEC and Advisory Committee on Reactor Safeguards. Both KE and KW reactors are proceeding to full central zone loadings of I & E elements and this condition should be essentially achieved during May of 1958.

Four monitor columns of the redesigned "thin-skin" K-size I & E component are under irradiation and early data show that the hydraulics and heat transfer are as predicted. It has further been shown that from the hydraulics and heat transfer viewpoints the mixing element could be used effectively at the K reactors if desired. The can wall reduction in the K reactor "thin-skin" element is being utilized to accommodate a larger uranium core size and thus secure improved neutronics rather than to secure a reduced can slug dimension.

D-Reactor Experience

A run-to-rupture comparison test of the standard old pile I & E element and solid slugs has attained an exposure level approximating 1000 MWD/T without failure in either type of element. Four columns of reduced diameter I & E elements of the older piles are being procured to initiate testing of this design and are expected to be charged next month.

Enriched Fuel

Three failures in enriched I & E fuel elements (.94 weight percent U-235 in uranium) have been experienced at KW-Reactor during the report period. Detailed examination or re-construction has not yet been possible and the failure mechanisms have not been isolated. However, considerable attention is being given to slug misalignment, peak power distributions, and to accelerating the charging of reduced diameter enriched metal as remedial steps.

M-388 Alloy Testing

Three elements clad with M-388 aluminum alloy (aluminum containing about 1% Ni and .5% Fe to secure improved inter-granular corrosion attack resistance) failed during the report period; one was a cored element, two were solids, and all three possess a Blunt-Nose, Tru-Line feature which is expected to assist in maintaining slug column alignment. Preliminary evaluation of the M-388 cladding performance indicates that inadequate bonding may be a prime contributor to the recent rupture experience and solutions to this problem are being developed in the Fuels Preparation Department.

Advanced Reactor Fuel DevelopmentA. Cluster Fuel Elements

The irradiation of stainless steel jacketed four-rod cluster elements in KER Loop No. 3 at an outlet temperature of 235°C continues without incident. It is expected that the fuel elements will be discharged in approximately June at a goal exposure of 2000 MWD/T.

The final phase of KER Loop No. 1 testing on four-rod stainless steel jacketed cluster elements under production test IP-144-A is proceeding satisfactorily with coolant temperatures approaching 270°C having been obtained.

B. Wafer Fuel Elements

The first test of 1.8" OD, enriched to 1.6 weight percent U-235 in uranium, prepared by the hot-press canning method is under irradiation in KER Loop No. 4 under production test IP-134-A.

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TABLE I

PRODUCTION TESTS - FUEL DEVELOPMENT

Test Number	Type Metal	No. of Tubes	Reactor Goal	Exposure	Current	Exposure	Remarks
105-586-A	U-S1 Ingots						
	U-S1 Ingots	4		2 ruptures			Not yet charged.
	U-S1 Cored Control	3		900			Not yet charged.
		4		2 ruptures			Not yet charged.
DT-105-623-A	Regular		DR	Normal goal			Provides for hand seating of charges loaded on alternate outages. Investigates effect upon failure rate.
IP-4-A	Cored	433	KE, H				Authorizes irradiation of production quantities of cored slugs. Goal induced (?) to variable 400.
IP-19-A	Lead Dip Canned I & E	1155	C	Variable	800		Provides for loading of central zone at C-Reactor with I & E slugs.
IP-44-A	Vacuum Canned I & E Slugs		C	400,600,800			Columns discharged, awaiting examination.
IP-45-A	Hot Press Canned I & E		C	400,600,800			Columns discharged and awaiting examination.
IP-56-A	Dingot U	180	DR	Normal			Uranium cores are low hydrogen dingot U. Six control tubes charged 2-8-58.
IP-58-A	Alpha Extruded Uranium		F	300,500,700			Test irradiation complete. Columns awaiting examination.
IP-60-A	Recrystallized 20 Uranium Test		H	500,700		500	Comparison test of recrystallized and regular uranium elements with low and normal hydrogen concentrations

TABLE I (Continued)

<u>Test Number</u>	<u>Type Metal</u>	<u>No. of Tubes</u>	<u>Reactor</u>	<u>Goal Exposure</u>	<u>Current Exposure</u>	<u>Remarks</u>
IP-70-A	Lead Dip Canned I & E	16 2523	KW, KE KW, KE	Variable 800 Variable 800		Provides for lot charging of I & E fuel at the K reactors. Charged six additional control tubes during report period and discharged four at goal.
IP-74-A	Nat. Uranium SS Jacketed 4-rod Cluster Elements	1	KE	2000 MWD/T	1600 MWD/T	Normal operation at 235°C outlet water temperature in KER Loop 3.
IP-80-A	M-388 BNWL	767 Solid	C, DR, KE	Normal		Provides for quantity charging of M-388 jacketed slugs.
IP-81-A	BNWL Regular 1245 Alloy	912	D	Normal		Provides for quantity charging of 1245 jacketed BNWL slugs.
IP-91-A	Reduced Auto- clave Cycle	4	D	Normal E		Two tubes charged 12-23-57. Irradiation complete.
IP-95-A	Lead Dip Canned I & E	4	D	2 ruptures	1000 MWD/T	Charged 10-19-57.
IP-106-A	Regular Metal	4	D	2 ruptures	1000 MWD/T	Charged 10-19-57.
IP-109-A	Wafer I & E (preliminary evaluation)	4	C	400,600,800	275 MWD/T	Test charged 2-3-58.
IP-109-AC	I & E Enriched Fuel Elements	830	C, KE, KW	1000,1300		Authorizes production-scale usage of enriched I & E fuel at C and K reactors.

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TABLE I (Continued)

Test Number	Type	Metal	No. of Tubes	Reactor	Goal Exposure	Current Exposure	Remarks
IP-120-A	Ingot		20	DR	2 ruptures	400 MWD/T	Low hydrogen dinged material.
	Dinged rupture comparison test		20	DR	2 ruptures	400 MWD/T	Normal production ingot material as control for above.
IP-123-A	Enriched SS Jacketed 7-rod cluster elements		1	KE	2500 MWD/T	Not charged	Will be charged in KE front-to-rear test hole during first outage in February
IP-124-A	M-388 pitting 16 Attack Investigating		16	B	600 MWD/T	125 MWD/T	Test charged 1-30-58.
IP-134-A	Hot-Press Canned 1 1.6% Enriched Element in A-2 Alloy		1	KE	24-45 days	15 days	KER Loop 4, 240°C outlet.
IP-144-A	Four-Rod SS Jacketed Cluster Elements		1	KE	up to 1050	300 MWD/T	KER Loop 1, 270°C outlet.
IP-148-AC	Thin-Skin Enriched I & E Fuel Elements			C, KE, KW	1200 MWD/T		Authorizes pilot-scale testing of enriched I & E fuel elements in thin aluminum components.

Reactor Physics

Existing Reactor Program Support

Technical bases for Process Standards possessing reactor physics content are under preparation. The bases for Standards pertaining to the handling and storage of enriched fuels are now complete.

The change in cold, clean lattice physics which would be experienced through the substitution of zirconium tubes for aluminum tubes with attendant changes in fuel element dimensions have been assessed. Reactivity gains of about .5% ΔK and conversion ratio increases of about 1.5% are made possible.

Additional analyses of a series of Hanford test pile reactivity measurements on the design of internally-externally cooled enriched-depleted uranium loadings and enriched-poison loadings have been made in support of isotope production programs. A program to facilitate the computation of fast effect has been completed and approximately 100 cases calculated for varying dimensions in the I & E slug geometry. The values of fast effect calculated thus far agree with the experimental data available to within 0.2%. Theoretical recipes have also been derived to extend the calculation to cluster and tube-in-rod fuel elements which are of interest in advanced reactor programs.

Advanced Reactor Programs

The program of buckling measurements by HLO for a range of lattices of interest in the IPR and NPR programs has continued. Components of the one-half inch cluster rod assembly have been obtained and measurements on this assembly will begin immediately to supplement previous measurements performed using .926" diameter cluster assemblies; these lattice measurements will be performed with air, water, and organic cooling.

The preliminary calculations of the dynamic stability of a high temperature water-cooled reactor concept such as those advanced under the NPR program have been completed through an analog simulation of the reactor-heat removal system. Standing power oscillations, following power level perturbations, appeared to be of sufficiently slow frequency that they could be easily damped by compensating control rod movement and/or heat exchanger controls. Furthermore, the oscillations appear to be self-regulating if the system has a negative coolant density coefficient of reactivity.

A new reactor physics computer program is being written for the IBM-702 which will permit reactor calculations to be performed using more detailed and versatile techniques.

Nuclear Safety

The hazards evaluation of a full reactor E-N load has been largely completed and will be transmitted to AEC next month.

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General

A paper on reactor lattice physics which was submitted for the Geneva Conference has been accepted. This paper, "Lattice Parameters Derived From Neutron Distributions," authored by W. E. Niemuth and R. Nilson, has been submitted in manuscript form for publication.

Reactor Engineering

Existing Reactor Program Support

Preliminary specifications for B,D,F type Zr-2 process tubes have been prepared and requests for bids on the procurement of 300 such tubes in FY-1959 have been let. An attempt is being made to secure fixed price quotations and proof of the ability of each prospective vendor to produce will be required. The final tube dimensions remain to be selected on the basis of economic optimization which considers the gains possible from improved physics as slug size is increased on one hand and the gains possible from increased flow rates as the slug size and hence the hydraulic resistance is reduced on the other hand.

An analysis of problems associated with increasing production rates through increasing the bulk coolant outlet temperature limits is about 90 percent complete.

The insertion of oil into the pressure sensing lines, coupled with the Panellit gauges serves to damp the response of the gauge to pressure variations in primary coolant supply. At some reactors damped gauges oscillate sufficiently to require special attention in range and trip settings in order to avoid spurious scrams. It has been found that excessive oiling leads to an over-damped condition which markedly reduces the speed of response of the gauge to pressure changes of the type which would result from partial flow blockage. It has, therefore, been necessary to restrict the conditions under which insertion of oil is acceptable in controlling gauge oscillation.

The available data describing the corrosion of aluminum slug claddings have been analyzed and corrosion limits established for use in the reactors possessing a top-of-annulus coolant temperature problem in their I & E loadings. The limiting corrosion rates, which are a function of cooling temperature, can temperature, and heat flux, are 6-1/2 mils per month for 1245 clad elements and nine mils per month for M-388 alloy cladding; at higher rates the corrosion mechanism appears to change yielding an accelerated corrosion attack.

A study is underway to estimate the effectiveness of various fission product containment schemes for existing reactors. This study emphasizes the development of estimates of the rate, quantity, and character of the fission product release from a reactor for incidents ranging from a single burning slug in the discharge area to a complete reactor melt-down. These estimates will assist in determining the effectiveness of various containment concepts in reducing local and off-site hazards.

Advanced Reactor Development

A development contract for the production of NPR-size Zr-2 tubes with Hunter-Douglas Corporation is nearly negotiated. This work will explore the basic feasibility of fabricating Zr-2 tubes through direct cold extrusion techniques; if successful, this process would be the simplest and would secure further reductions in fabrication costs.

A study of the KER loop system is being made to establish the maximum flow rates and pressure attainable with alternate modifications made in the system in an effort to determine the most effective way to more closely prototype NPR process conditions for in-pile testing of the fuel elements. At present the test tubes operate at 300 KW/tube power with 27,000 pounds per hour of coolant flow and a pressure drop of about 190 psi with most of the pressure drop occurring in the 1250 feet of piping and in numerous fittings in the system. Modest changes will effect pressure drop reduction sufficient to permit flow increases to 32,500 pounds per hour. Major system changes, including new pumps, are necessary to increase the flow to the range of 80,000 pounds per hour.

Estimates have been made of the time required for the uranium in a cluster fuel element to reach the melting temperature of either the cladding or the uranium as a function of time after shutdown as the fuel cooling becomes inadequate through onset of film boiling or a total expulsion of coolant from the tube; these calculations are critical to further refinements in the nuclear safety analyses on the NPR system.

Several experiments associated with the development of carbon steel technology, which has potential application to the NPR concept, are now underway. Included are studies of the rate and extent of film build-up, the methods of decontamination for removal of fission products and corrosion products, corrosion characteristics of the decontamination solutions, evaluation of several types of corrosion including uniform corrosion, crevice corrosion, pitting, and stress corrosion. Corrosion samples have been obtained, but no results reported to date. Plans are also being made to install a small carbon steel heat exchanger in the EIMO-5 or EIMO-7 loop to study the corrosion and scaling effects of Columbia River water when used as coolant in a carbon steel system. Problems are being encountered with this test due to lack of suitable facilities to perform the test under the desired conditions.

Radiological Engineering

Radiation Control Experience

No one in IPD was overexposed to radiation during the month. Twenty-two Reports of Lapse of Radiation Control were issued during the month.

Because of the high exposure experienced by Radiation Monitors, Processing Operators, and certain Maintenance crafts for the calendar year to date, there is need to concentrate effort toward the reduction of exposure. A program is being prepared which includes investigation and evaluation of rear

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face internal and external decontamination, improved methods and equipment, remote tools and manipulators, and remote monitoring methods. Industrial Engineering will participate with Radiological Engineering in this program.

There were nine cases during the month of spread of contamination to the skin or personal clothing of employees of such a magnitude as to be judged lapses of Control. In only one of these cases did the employee receive a significant exposure from the contamination. In this case a Maintenance employee was found to have specks of high level contamination on the right side of his face after rupture removal work. The estimated dose rate was 50 mrad/hour to one square centimeter of skin. This contamination may have been on the man's skin for as long as 1-1/2 hours.

LAPSE OF RADIATION CONTROL
DISTRIBUTION BY REACTOR AND OPERATION

	<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	2	0	1	1	0	2	0	1	
Maintenance	1	2	0	0	0	1	0	1	
Supplemental Crews	0	0	0	1	0	0	0	0	
Research & Engineering	0	3	0	0	0	0	0	0	
Facilities Engineering	1	0	0	1	0	0	0	0	
Reactor Area	2	1	0	0	0	1	1	2	
Assigned Totals	<u>5</u>	<u>4</u>	<u>1</u>	<u>2</u>	<u>0</u>	<u>4</u>	<u>1</u>	<u>4</u>	<u>21</u>

IPD Unassigned

1

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

Effluent Water Statistics

This data is reported through the cooperation of the Radiation Protection Operation, HLO.

Activity in the River Water at Pasco-Kennewick*

December	<2.7% MPC _{GI} **	<54% off-plant limits
January	<3.0% "	<60% " " "
February	<2.0% "	<40% " " "

Activity in Pasco Sanitary Water*

December	<0.5% MPC _{GI}	<10% off-plant limits
February	<0.6% "	<12% " " "

Activity in Kennewick Sanitary Water*

January	<2.6% MPC _{GI}	<52% off-plant limits
February	<1.0% "	<20% " " "

Activity in Raw Water at 100-F Area*

December	<6.6% MPC _{GI}	<66% plant limits
January	<9.5% "	<95% " "
February	<9.6% "	<96% " "

Activity in 100-F Sanitary Water*

December	<3.0% MPC _{GI}	<30% plant limits
January	<3.4% "	<34% " "
February	<2.9% "	<29% " "

Average Reactor Effluent Activity Output

	<u>March 1958</u>	<u>February 1958</u>	<u>March 1957</u>
100-B	20 x 10 ³ µc/sec.	24 x 10 ³ µc/sec.	12 x 10 ³ µc/sec.
100-C	39 x 10 ³ "	35 x 10 ³ "	32 x 10 ³ "
100-KW	28 x 10 ³ "	30 x 10 ³ "	52 x 10 ³ "
100-KE	28 x 10 ³ "	32 x 10 ³ "	40 x 10 ³ "
100-D	29 x 10 ³ "	22 x 10 ³ "	***
100-DR	22 x 10 ³ "	14 x 10 ³ "	19 x 10 ³ "
100-H	22 x 10 ³ "	26 x 10 ³ "	25 x 10 ³ "
100-F	22 x 10 ³ "	15 x 10 ³ "	23 x 10 ³ "

* This data includes some values that were below detection limits. The detection limits were substituted for real values which were unknown.

** MPC_{GI} - Maximum permissible concentration in drinking water based on exposure to the gastro-intestinal tract. These values were calculated on the basis of limits quoted in the Radiation Protection Standards (HW-25457 Rev. 1) for continuous occupational exposure.

*** 105-D Reactor was shut-down during March 1957 for CG-558.

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PROCESS TECHNOLOGY OPERATION

REACTOR POWER LEVEL LIMITATIONS

Equilibrium reactor power level limitations at the end of the report period were approximately as follows:

Reactor	Limit	Basis
B	975 kw maximum for the average of the ten highest powered process tubes	Fuel element failure control
C	Top-of-annulus outlet temperature (equivalent to 1050 kw per tube)	Fuel element failure control - prevention of local boiling in I & E tube charges
D	985 kw maximum for the average of the ten highest powered tubes	Fuel element failure control
DR	975 kw maximum for the average of the ten highest powered tubes	Fuel element failure control
F	975 kw maximum for the average of the ten highest powered tubes	Fuel element failure control
H	900 kw maximum for the average of the ten highest powered tubes but not more than 1440 MW reactor power level	Fuel element failure control; ACRS limit
KE	1275 kw maximum tube power	Fuel element failure control
KW	1300 kw maximum for the average of the ten highest powered tubes	Fuel element failure control

WATER TREATMENT

Aluminum Oxide-Sulfuric Acid Feeder

A prototype aluminum oxide-sulfuric acid feeder at 183-B is successfully reducing the cost of chemical treatment of raw water.

Model Filter Plant Studies

Experimental studies of coagulants, filter conditioner chemicals, and filter materials were continued during the month. Experiments with automatic control of alum feed were also conducted.

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NPR Filter Plant Design

At the request of the Process Design Operation, plans for the NPR water filter plant were reviewed. Several improvements were suggested.

PROCESS STANDARDS

HW-46000 B, Process Standards - Reactor

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

Process Standard C-030 - "Flux Monitors"

Trip settings for hot startup were made slightly less restrictive to increase the number of successful hot startups. Reactor safety was not significantly reduced; automatic shutdown will still occur before excessive temperatures are reached.

Process Standard C-100 - "Number of Inoperable Rods and Ball 3X Hoppers During Outages"

The revision specified new requirements for reactivity control during outages. The change was necessary to ensure reactor safety when the reactor is enriched to the extent permitted in revised Standard F-020, below.

Process Standard F-020 - "Make-Up of Tube Charges"

The revision authorized use of additional enrichment. The revision specified that HCR's or additional poison remain in the reactor during outages to compensate for the added enrichment, thus ensuring reactor safety. The revision included a method of calculating the compensating reactivity control.

HW-46000 D, Process Standards - Reactor

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

Process Standard C-100 - "Number of Inoperable Rods and Ball 3X Hoppers During Outages"

The revision was identical to that issued for HW-46000 B, above.

Process Standard F-020 - "Make-Up of Tube Charges"

The revision specified an improved method of calculating the number of horizontal rods that must remain in the reactor during extended outages when the reactor is enriched beyond the capacity of the vertical rod system. This method allows earlier withdrawal of control rods for initial cold startup, thus increasing production.

HW-46000 F, Process Standards - Reactor

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

Process Standard C-030 - "Flux Monitors"

The revision was identical to that for HW-46000 B, above.

Process Standard C-100 - "Number of Inoperable Rods and Ball 3X Hoppers During Outages"

The revision was identical to that for HW-46000 B, above.

Process Standard F-020 - "Make-Up of Tube Charges"

The revision is identical to that for HW-46000 D, above.

HW-46000 H, Process Standards - Reactor

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

Process Standard C-030 - "Flux Monitors"

The revision was identical to that for HW-46000 B, above.

HW-46000 K, Process Standards - Reactor

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

Process Standard C-030 - "Flux Monitors"

The revision was identical to that for HW-46000 B, above.

Process Change Authorizations

Six Process Change Authorizations were issued during the month to permit temporary relaxation of Process Standards - Reactor, HW-46000. These were:

PCA #294 - "Loss of Generator - KW Reactor"

To avoid a costly shutdown after failure of one generator, the PCA permitted operation of the KW Reactor to continue during a two hour period while attempts were being made to restore generator coverage to the two required by the Standards. There was no significant effect on reactor safety during the short period involved because the KW Reactor was operating at half-level and adequate emergency cooling was available from the high pressure cross-tie. The reactor was shut down when a second generator could not be placed in service within the two hour period.

PCA #295 - "Water Leak, F Reactor"

After start-up of F Reactor on February 11, 1958, the water collection rate remained high. Examination of available data indicated the leak was most likely in a rear Van Stone flange, in which case little water would enter the graphite stack. To permit efficient scheduling of maintenance manpower, the PCA allowed a delay in shutdown provided no significant cold spots appeared and provided the inlet dewpoint remained below the inlet water temperature.

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PCA #296 - "Water Leak - H Reactor"

Water collection rates at H Reactor were in excess of that allowed by Standards, and examination of available data indicated the leak was most likely in a rear Van Stone flange, in which case little water would enter the graphite stack. To permit efficient scheduling of Maintenance manpower, the PCA allowed a delay in shutdown provided no significant cold spots appeared and provided the inlet dewpoint remained below the inlet water temperature.

PCA #297 - "Start-Up Outlet Temperature Monitoring - KE Reactor"

Water used in decontaminating the rear face at KE Reactor short circuited several hundred temperature monitor leads. In past incidents of this type, a high percentage of the monitors have become operable after a short drying period. In this particular case, three of the inoperable monitors were on newly charged tubes, in which event, the Standard requires the monitors to be repaired before start-up. The PCA permitted reactor start-up provided pressures in these three tubes remained normal.

PCA #298 - "KER Loops 1 and 3 - KE Reactor"

During a KE Reactor outage, it was desired to leave KER Loops 1 and 3 recirculating while repairs were made on the Loop 4 dump valve in the KER effluent system. The KER loops dump to the effluent system automatically if flow drops to 10 gpm. To eliminate the potential hazard to personnel working on the dump valve, the PCA permitted by-passing the automatic trip on Loops 1 and 3, under specified conditions.

PCA #299 - "Oiling of Panellit Gauges - All Reactors"

Preliminary information indicates that oiling Panellit sensing lines on gauges with trip spans greater than 50 psi may result in gauge response time exceeding that believed necessary to ensure reactor safety. The PCA was issued to halt further oiling of sensing lines on wide-span gauges until the situation is clarified.

Process Assistance

Graphics services included preparation of 96 graphs, charts, visual aids and temperature maps for various IPD and HLO Operations.

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RUPTURE EXPERIENCE

Failure Date	Tube Number	Lot Number	Type Metal	Exposure	Type Failure
3-1-58	1264-B	CA-824-A	8" Regular	373	Side H.S.
3-3-58	3475-B	CA-818-A	8" Regular ⁽²⁾	381	Side H.S.
3-5-58	3780-B	MA-011-A	8" Regular ⁽²⁾	267	Side H.S.
3-8-58	1552-KW	KA-037-A	8" Regular	387	Split L.
3-10-58	3376-DR	KA-055-D	8" Regular ⁽³⁾	410	Side H.S.
3-12-58	4967-KE	KD-013-D	8" Cored ⁽³⁾	408	Side H.S.
3-14-58	2553-KW	KA-030-A	8" Regular	438	Split L.
3-19-58	0871-H	KE-012-A	6" Solid E ⁽¹⁾	375	Side H.S.
3-20-58	3366-DR	KA-026-D	8" Regular ⁽³⁾	470	Side H.S.
3-20-58	3892-KW	KG-027-A	6" I & E-E ⁽¹⁾	511	Side H.S.
3-21-58	5088-KE	KE-022-A	6" Solid E ⁽¹⁾	313	N.A.
3-22-58	1660-H	KA-051-A	8" Regular	303	Side H.S.
3-23-58	0565-H	KE-023-A	6" Solid E ⁽¹⁾	357	Side H.S.
3-24-58	3489-H	CA-036-A	8" Regular	462	Side H.S.
3-26-58	3370-B	CA-824-A	8" Regular ⁽²⁾	487	N.A.
3-28-58	2576-KE	KD-014-D	8" Cored ⁽³⁾	409	N.A.
3-29-58	5158-KW	KG-042-A	6" I & E-E ⁽¹⁾	293	N.A.

(1) 0.94% Enrichment

(2) Second failure in this lot

(3) M-388 Bluntnose Truline Jacket

Legend:

Side H.S. - Failure probably caused by accelerated corrosion in a localized region of high surface temperature (a hot spot).

Split L. - Uranium cleaved along the axis of the slug.

N.A. - Information not available.

OPERATIONAL PHYSICS OPERATIONPILE PHYSICS ASSISTANCE

The planned control rod pattern change from 9 to 10 rod at KE Pile to control the "cycling" problem was made and has been effective. There has been no front-to-rear instability for two operating periods, and the expected increase in central graphite temperature has not been excessive.

The annual review of reactivity trends, prediction problems, and operating trends has been completed and issued as two documents (HW-54415 and HW-54416). As expected the operating trends were such as to increase reactivity prediction problems. The documents are too comprehensive to summarize here, but a few especially significant items will be mentioned. The average power level before shutdown for B, D, DR, and F increased 27% over 1956; for the K's the increase was 26%. The number of normal length outages increased 10% and 36% for the same reactor groups; scrams increased 84% for B, D, DR, and F and decreased 10% for the K's. The average ECT values increased 3% and 5%. The apparent root-mean-square value of the prediction error increased 36% and 20%, but this is misleading because of changed HCR values following calibration tests; the initial start-up periods (ih) declined 15% and 3%. Current and planned work by Operational Physics in related fields is listed in the document summaries.

TABLE I

SUMMARY OF OPERATING DATA OF PHYSICS INTEREST
FOR THE MONTH OF MARCH 1958

Pile	<u>B</u>	<u>C</u>	<u>D</u>	<u>DR</u>	<u>F</u>	<u>H</u>	<u>KE</u>	<u>KW</u>
ECT in March*	1440	1545	1440	1460	1425	1600	2465	2410
12 Mo. Avg. ECT	1380	1585	1390	1470	1375	1540	2400	2420
Equil. Scram Time**	25-30	14-24	23-30	25-30	25-30	40-55	18-22	15-20
No. of Scrams & Recoveries#	0/0 6/5	1/1 3/0	1/1 3/1	0/0 2/1	1/1 1/1	1/1 5/2	1/1 0/0	4/4 2/0
No. of Non-Scram Outages##	3/0	4/0	3/1	4/0	3/0	5/0	3/2	7/1

* Effective Central Tubes; this value is defined as the pile power divided by the average of the ten most productive non-enrichment tubes in the pile.

** This is defined as the maximum time available in minutes between scram and the first indication of start-up.

The first pair of numbers shows the number of brief outages from which secondary cold start-ups would be made and the number of successful start-ups. The second pair shows the numbers of brief outages from which hot start-ups would be made and the number of successful recoveries.

The first number shows the number of ordinary outages, and the second shows the number of additional outages to discharge temporary poison.

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PILE PHYSICS OPERATION (Continued)**DECLASSIFIED**B Pile - W. R. Smit and D. I. Monnie

There were six scram shutdowns and five successful hot start-ups; no recovery was attempted from the scram at 2330 on 3-1-58 because of a rupture. Three rupture outages occurred during the report period and another at the end of this period.

A pile period meter was installed in connection with the under-pile PC; operation of the instrument has been satisfactory.

A nuclear safety review is being made by B-C Reactor Operation; material pertaining to the Area Physics function was contributed by the B Pile Physicist.

C Pile - F. C. Franklin and D. I. Monnie

Scram recovery time was increased by about 8-10 minutes during the month. The flattening was improved considerably from what it was last month with the use of the thin thin skin (1.454") I & E "E" metal. The solid "E" metal discharged from the enrichment ring could not be replaced previously because the 1.454" I & E "E" metal was not available for charging into low corrosion index tubes.

The initial PT-IP-132-AC "Production of High Pu-240 Plutonium at C Reactor" loading was charged this month. Flattening and control problems, expected to increase with this loading, have not caused operating difficulties to date.

A recorder and period meter were connected to the PC chambers this month, a "stop gap" measure until the Project CG-707 low level flux monitoring system can be installed.

D Pile - D. T. Houser

A new high power level was reached during the month, but a scram occurred before it became officially a new high production level. The increased use of splines has brought some new problems and some solutions. During the 3-1-58 start-up a spline broke during removal causing a panellit scram, and the pile went sub-critical during the removal operation. On 3-10-58 a leaking spline and cap assembly caused some concern, but a special cap fabricated to enclose the normal cap stopped the leak and no production was lost. On 3-20-58 a power cut of 50 MW was required which was caused in part by a spline insertion the night before; the power cut was temporary. An unstable situation developed on 3-24-58 that was cured by inserting one spline; there was no power cut.

The fission chamber sub-critical monitor is in service again. The zone temperature monitor is expected to be in service for the start-up of 3-29-58; about forty splines will be used for this start-up also.

PILE PHYSICS OPERATION (Continued)DR Pile - R. D. Carter

During the early part of the month all limiting tubes were on 23 and 24 rows; these tubes all reached goal exposure together because of a discharge problem several months ago. Later in the month the in-pile residual exposure reached a post-CG-558 low of 182 MWD/T. This caused a new low in control rod of 250 ih, lower ECT values, and limiting graphite temperatures.

A gamma-compensated ion chamber was installed for testing; test results are inconclusive at this time. A log count rate recorder and period meter were installed on the under-pile PC; they have worked satisfactorily. This equipment will be connected to the fission chamber sub-critical monitor when it is installed.

F Pile - C. E. Bowers

High ECT values permitted power levels as high as the all time high experienced in February. Approximately 1200 tubes are now charged with the 34-piece charge; a change in the equilibrium control rod configuration has improved stability.

While shutting down on 3-7-58 a 200 MW power increase occurred from a level of 300 MW; this was caused by incorrect use of the half-rods. The event re-emphasizes the need for continual training efforts.

H Pile - G. R. Gallagher

Another new high in pile power level and ECT was reached in March. Four ruptures occurred in a week's time, two of which were E-metal ruptures; two quickie attempts failed because the charges were stuck. The ruptures were in various parts of the pile and could not be correlated with any anomolous operation. About 2000 gallons of water were removed following the 3-11-58 outage; this came from flange leaks and there were no reactivity effects.

A period meter was installed on the under-pile PC; operation has been satisfactory. This equipment will be connected to the fission chamber sub-critical monitor when it is installed.

A scram transient test was run and analyzed. The data were not optimum since the pile power was reduced too slowly, requiring a long extrapolation to obtain the metal coefficient. Another test is planned.

KE Pile - J. T. Worthington

Following the change to the use of all outer rods for equilibrium control, absolutely no front-to-rear cycling tendency has been observed for two operating periods. The only undesirable effect encountered so far (and it may not be due completely to replacing #9 with #10 rod) is limiting graphite temperatures in the center of the pile at gas compositions 2 to 3 per cent higher in helium than previously encountered. This indicates some degree of flux peaking; the extent will be confirmed with a flux traverse.

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DECLASSIFIEDPILE PHYSICS OPERATION (Continued)KE Pile - J. T. Worthington (cont'd)

On March 3 during the secondary cold start-up following the temporary poison discharge, it was necessary to scram KE Reactor due to high tube temperatures in the bottom enrichment ring. On all poison-free start-ups there is a definite heat shift toward the bottom as turnaround approaches due primarily to the fact that there is one more row of tubes below the HCR system than above and the enrichment in the bottom is thus one more lattice unit removed from the horizontal control rods. Usually the start-up following the scram is easy to control and at a sufficiently high level so that the production loss from the short outage is negligible. Poison splines would appear to be an ideal method for eliminating this problem.

Increased use of enrichment to permit higher tube power and ECT values and non-symmetrical discharges caused by previous operating problems enhance the problem of temperature distribution control at turnaround still further.

KW Pile - G. R. Parkos

With six scrams, four recoveries and seven full-length outages the real limits to operation were non-equilibrium conditions. Reactivity equilibrium was attained only once and then for only three days; during this time the rupture control point was not quite reached because of limiting graphite temperatures.

Severe flux distortions to the bottom of the reactor developed during the start-up reactivity transients on 3-13 and 3-22-58. On both occasions the distortions became so severe that it was necessary to manually scram the pile. As in the case of KE Pile, the vertical asymmetry of the HCR system and previously initiated block discharge cycles aggravate distortion tendencies.

Splines would be an ideal solution to the problem; however, experience indicates that prior to their availability a forced start-up procedure would probably result in some production gain over the low-level start-up technique. Under this technique an initial start-up of 60-70% of normal equilibrium level would be used instead of the 45-50% now used. When tube powers approached 95-98% of the rupture control point, the pile would be manually scrambled. A second start-up would then be accomplished in about one hour to a level of about 60% equilibrium, then level would be raised rapidly after turnaround.

This technique is not greatly different from the forced-poison start-ups used occasionally at the 9-rod reactors before the PCCF was installed. The buildup of xenon in the top and bottom of the pile following the initial operation would make it possible to raise power much faster during the second phase of the start-up than would otherwise be possible. Experience during the start-ups of 3-13 and 3-22 when manual scrams were necessary appear to confirm the above conclusions.

PROCESS PHYSICS STUDIES**DECLASSIFIED**Pu 240 Program - PT IP-132-AC

Charging of the first third of the depleted columns authorized by this test was completed in two steps during the month. Ten D columns were charged on 3-9 and 19 were loaded on 3-18. In both cases enrichment compensation was loaded in a ratio of 3.5 E columns per D column. Comparison of rod positions before and after these loadings indicates that nearly exact initial compensation would be achieved with a ratio of 4 to 1; this latter value checks well with predictions based on Hanford Test Pile measurements corrected from 305 dry to 105 wet conditions. The D columns will intentionally be under-compensated at the start in order to accommodate the long term gains which are anticipated in this loading. The remaining D columns will be charged during the next two months; in order to achieve the desired D column exposure a large number of the E columns will be recharged as they reach their goals.

E Metal Usage

The E metal supply continues to be adequate for current requirements. The C and K Reactors are using E slugs exclusively in I and E form at present, C using the thin-skin slugs under PT IP-148-AC and the K's employing the thick-skin I & E E slugs. Supplement A of PT IP-109-AC, which would allow higher goals on thick-skin I and E E metal was still circulating for signature at the end of the report period.

Calculations for optimizing E column charge length on an economics basis have been largely completed for the C and K Piles. Process and Reactor Development Operation is currently calculating the effects of charge length on corrosion rates; these rupture-probability calculations will be included in the final published recommendation for establishing optimum column length.

Pile Safety Studies

Calculation of supplementary disaster control requirements was continued during the month. Under current exposure conditions, the B, D, and F Piles could be limited during minimum start-ups whereas the others would not be.

A study is currently underway to provide the bases for standards under the revised total control criteria whereby sub-criticality would be guaranteed until the pile components have been rendered useless rather than indefinitely. It is expected that this study will be completed in April.

A pile period reactivity comparison of an old type VSR, ball 3X channel, and a new type VSR was made at the DR Pile on March 13. The data have not yet been analyzed; indications were that the ball 3X column was slightly stronger and the new VSR slightly weaker than the old VSR. The original DR and H Pile VSR's are being replaced because of their susceptibility to thermal damage.

A study of the relation of background increase rates to rod withdrawal rates was completed during the month. It is in final form for publication as HW-55510. Calculated indications to be checked by empirical tests are that safe start-ups may be made considerably faster with sub-critical monitoring by observation of the "apparent" period which is caused by the changing background.

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HW-55462

PROCESS PHYSICS STUDIES (Continued)

Horizontal Rod Calibrations

The final report on PT IP-108-C which authorized partial calibration of the C Pile HCR system is in final form for issue as HW-55507.

A qualitative discussion of the validity of calibrations made by the pile period method was also completed during the month as HW-55385. Conclusions are that it is a very valuable method for use in making operating predictions but of questionable value in the determination of absolute magnitudes of reactivity coefficients. Factors such as distorted flux distributions and shadowing effects tend to be self-cancelling in the first case, whereas they may be additive in attempts to make absolute evaluations.

Supplementary Control

The Equipment Development Operation expects to begin installation of the spline system at the K's during the next month. Although initial usage will be limited prior to installation of the flush disposal system, even a small number of splines above and below the rods should help flux distribution control considerably during turn-around conditions.

The use of splines during the D Pile start-up of March 30 appeared satisfactory; however, their aid to start-up efficiency will increase as more reliance is placed on their functioning when needed.

A supplement to PT IP-64-CE authorizing displacement column testing was issued which authorizes the testing of a "split column" system. A cable arrangement used with I and E half charges permits the up and down stream halves to be separated during operation, the water in the center of the column acting as inserted poison. The mechanics of this system are also being tested by Equipment Development.

Potential Gains Studies

Non-equilibrium losses were unusually large during the reported period because of the large number of outages experienced at the B, C, and KW Piles and especially because of the low total production at KW relative to which the percentage applied. Although the low KW production was due in part to the February 5 water leak, direct water leak losses are not included in the following table. Four cold and three hot start-ups were included for B Pile, 4 cold and 1 hot for C, and 6 cold start-ups were experienced at KW in the mid February to mid March period.

PROCESS PHYSICS STUDIES (Continued)Potential Gains Studies (cont'd)POTENTIAL GAINS - OPERATIONAL PHYSICS ASPECTS
FEBRUARY 16, 1958 THROUGH MARCH 15, 1958

Reactor	<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>AVERAGE</u>
Equilibrium Potential With Existing Limits	0.8	*	0.2	0.9	1.1	2.8	3.4	*	1.5
Non-Equilibrium Potential, Operating	13.7**	10.3**	6.8	8.3	2.7	3.5	5.5	29.5**	10.0
Temporary Poison Outages	0.0	0.0	0.0	0.0	0.0	0.0	1.2	3.4	0.6
Total Non-Equilibrium	13.7**	10.3**	6.8	8.3	2.7	3.5	6.7	32.9**	10.6

* No representative equilibrium data.

** See preceding paragraph for explanation of outage frequency effects.

Significant Documents Issued During the Month

HW-46100, Chapter 100, "Glossary", D. E. Clark, March 20, 1958. (Pile Physics Manual of Standard Practices)

HW-54250, "PT-IP-132 AC, Production of High Pu-240 Plutonium at C Reactor", S. R. Stamp, 2-12-58.

HW-54415, "Reactivity Trends and Prediction Problems Vs. Operating Trends - B, D, DR, and F Reactors, 1953 Through 1957", D. E. Goins, February 28, 1958.

HW-55168, "Reactivity Balance and Associated Reactor Physics Data - February 1958", D. E. Goins, March 4, 1958.

HW-55327 Through HW-55334, "Operational Physics and Process Engineering Quarterly Forecast for B, C, DR, F, H, KE, and KW Reactors, April Through June, 1958", W. R. Smit & C. M. Hebb (B), F. C. Franklin & E. E. Leitz (C), D. T. Houser & J. H. Gerety (D), R. D. Carter & C. C. Wheeler (DR), C. E. Bowers & A. Russell (F), G. R. Gallagher & M. A. Clinton (H), J. T. Worthington & J. L. Benson (KE), G. R. Parkos & R. H. Gay (KW), 4-1-58.

HW-55374, "Possible Invention - Shipping and Storage Containers for Fissionable Material", R. O. Brugge, March 19, 1958 (Unclassified).

HW-55385, "Discussion of HCR Calibration Results", D. E. Simpson, March 19, 1958.

HW-55507, "Final Report - PT IP-108-C, Horizontal Rod Calibrations - C Pile", V. I. Neeley and E. H. Lockwood, March 27, 1958.

HW-55510, "Theoretical Study of Start-Up Procedures with Sub-Critical Monitoring", V. I. Neeley, March 27, 1958.

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IRRADIATION TESTING OPERATION

KAPL-120 LOOP

The loop was at reference conditions 26 per cent of the time the reactor was in operation. Process water cooling was necessary during the remainder of the period.

Although considerable effort was expended, little was accomplished toward the repair of the leaking inlet isolation valve during the unscheduled outage of February 22. The valve was repaired during the scheduled reactor outage beginning March 10. During the early stages of the repair work, a hairline crack was discovered in the valve bonnet. It was necessary to obtain, on an emergency basis, a replacement bonnet assembly for immediate installation. A subsequent radiographic inspection of the valve bonnet has revealed several more cracks. Arrangements have been made for a complete metallographic study of the assembly.

DR GAS LOOP

A survey of the background activity levels on the X-1 level at DR reactor indicates that existing test hole shielding will require modifications to reduce personnel exposure to a level acceptable for efficient construction activity. A study is in progress to determine the most efficient means of making the alterations.

Several of the vendors for gas loop components and the Battelle Memorial Institute were visited. The General Engineering Laboratory personnel stated that the design, development, and fabrication of the compressors were on schedule. There are two problems which require further detailed study: 1) the lubricating gas supply to the bearings; 2) the electrical system requirements to assure safe acceleration and deceleration through the critical speed range. From a discussion of these problems, it was concluded that GEL should procure the auxiliary equipment for the lubricating gas and the power supply equipment associated with the compressors.

Satisfactory progress was noted while visiting the plants of the vendors which are supplying the preheater and the heat exchanger.

Gas loop information was exchanged with personnel at the Battelle Memorial Institute.

OTHER OFF-SITE EXPERIMENTS

WAPD-115

Rise factor calculations have been performed on the IBM 650 computer for all combinations of fuel enrichment proposed for the WAPD 115 slugs. Three sample slugs have been received from WAPD for rise factor measurement in the Hanford Test Reactor. The experimental measurements will provide a check upon the calculated rise factors. These data will guide the final choice of a test assembly design.

HAP0 FUEL ELEMENT IRRADIATIONS

The present status of the process tube water stream temperature measurements which are being made in support of the I & E fuel element development program (HAP0-159) is as follows:

Number of I & E charged tubes monitored:

<u>This Month</u>	<u>Last Month</u>	<u>Reactor</u>
10	4	C
4	4	D
7	10	KW
8	4	KE

Number of solid charged tubes monitored:

<u>This Month</u>	<u>Last Month</u>	<u>Reactor</u>
4	0	B

A production test authorizing the irradiation of samples of uranium dioxide at low flux in DR reactor (HAP0-215) has been routed for approval. This particular test and similar tests which are in the planning stage are in support of the development of fuel elements for the Plutonium Recycle Reactor.

OTHER IRRADIATION TESTS AND SERVICES

1. A total of nine sets of activation analysis samples were irradiated in the Poison column control facilities at D and DR Piles. These samples are identified as follows:
 - A. Seven sets of HAP0 184 samples in support of a Washington Designated Program assigned to HLO.
 - B. One sample of UO₃ (HAP0-203) to provide a Np²³⁹ tracer in support of a HLO Chemical Separation study.
 - C. One set of effluent water residue samples (HAP0-172) in support of an HLO study of the radioisotopes in effluent water.
2. Two Snout irradiations of HAP0-184 samples were completed at KW reactor (4C test hole) to study the effect of the K pile flux spectrum upon the activation analysis techniques.
3. One Snout assembly containing flux monitors inside the charging tube (HAP0-173) was irradiated to determine experimentally the flux in the fringe portion of the facility.
4. Twelve tensile specimens (HAP0-212) were charged into the Magazine facility (2 D test hole) KE reactor to determine the effect of irradiation upon the properties of candidate reactor materials.

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5. The following activities were carried out in support of the Radioisotope Distribution Program.
 - A. Five isotope samples were discharged from the 2 D test hole magazine at KW reactor. The isotopes produced were: Calcium-45, Tin-113, Mercury-203, Iron-55, Iron-59, and Antimony-125.
 - B. Seventeen isotope samples were charged into the 2 D test hole magazine at KW reactor.
6. Three AF-100 canisters completed exposure in the Air Force gamma facilities. (KE)
7. Thirty baskets began exposure and twenty-nine baskets completed exposure in the Hanford (KE) gamma facilities. The majority of these irradiations are being sponsored by the Non-Metallic Materials Development, HLO.

The irradiation of thermocouple leads insulated with quartz and asbestos continues in the 4 B test hole at KW reactor as reported last month.

TEST FACILITIES

A large capacity safety valve for the PRV stations which supply steam to the heat exchangers associated with the several heated test facilities in the K reactors has been installed at both KE and KW. In addition, the steam supply has been orificed to restrict steam flow to about 4500 lb/hr. These modifications are necessary to prevent an overpressurizing of the heat exchangers in the event of a PRV failure.

Venting of the side-to-side test hole drain riser at KW reactor has eliminated the vacuum in the test hole drain headers. Drain header pressures with shut down flows and with operating flows are as tabulated:

Header No.	<u>DRAIN HEADER PRESSURE - INCHES OF WATER</u>	
	<u>FULL FLOW</u>	<u>SHUTDOWN FLOW</u> (on crossunder tie)
1	≥ +8"	≥ +1 1/2"
2	≥ +8"	≥ +1 1/2"
3	+1/4"	-1/8"
4	+8"	+1 1/2"

It has been necessary to eliminate the negative pressure on the drain headers to prevent the test holes from being sucked dry in the event of an inlet water line rupture. The side-to-side test hole drain riser in the KE reactor will be similarly modified.

Chemical dosimeter measurements are being made of the gamma dose rate in the Co⁶⁰ gamma irradiation facilities at KE reactor. The purpose of these measurements is to provide a field standard for gamma dose rate measurements and to permit routine calibration checks of the Victoreen Roentgen Ratemeter (or other field instruments) used to measure daily dose rates of samples undergoing irradiation in other facilities. Arrangements have been made to send HAPO chemical dosimeters to the MTR for irradiation and analysis in their facilities. This will provide a correlation between MTR and HAPO dosimetry techniques.

The modifications to the 36 inch shield plug facility in C reactor which were required to eliminate several safety hazards, were completed. The installation of a piston with lip-type seals in the auxiliary hydraulic cylinder is completed. This minor revision was necessary to facilitate emergency insertion of the shield plug by means of a hand pump and the auxiliary hydraulic cylinder. The drawing changes to reflect the modifications are being checked by IPD drafting.

BORESCOPING

1. A total of eleven KE process tubes, which had a "doe" metal history, were borescoped to determine the extent of the damage from "chattering". The results are as follows:

Tube No. 1087 - Tube badly damaged by the first seven pieces.

Tube No. 5088 - Tube damaged by the first 2 pieces.

The remaining nine tubes showed no damage.

2. Horizontal Control Rod #8, C pile, was borescoped to determine why the rod was sticking. Two pieces of loose material, which appeared to be metallic, were found lying in the channel at about 12 feet and 22 feet from the pile skin. The two pieces were about the same size (15" long x 3/4" wide x 1/8" thick) and could be moved with the borescope. Preliminary efforts (by Maintenance) to remove the obstructions were unsuccessful.
3. Process channels 2472 DR and 3666 DR were borescoped in an effort to assist Maintenance with problem tubes. Channel 2472, containing a partial graphite stringer with imbedded thermocouples, was found to be clear of obstructions from the rear. Although the thermocouple leads were bunched against the graphite cylinders in the upstream portion of the tube, the inspection did not reveal a definite reason for the stringer being stuck.

A stuck "potato drill" was located in Channel 3666 at about 20 feet from the front face. The guide for the drill had been broken off but the drill appeared to be properly aligned in the channel. Two graphite tube blocks were split and the two trunion blocks were broken out. Observations from the rear were limited due to gross amounts of graphite dust, chips, etc., which piled up in front of the borescope.

4. Replacement Thermocouple Channel 3A in KE reactor was borescoped to a distance of 42 feet from the pile skin prior to the installation of a new thermocouple stringer. The following observations were made:
 1. A considerable amount of loose graphite dust and chips were seen at approximately 7 feet.
 2. A separation of about 1" between graphite blocks was noted at about 10 feet.
 3. There were graphite chips in the channel at approximately 40 feet and a 1" separation of blocks was also noted at that point.

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Otherwise, the channel appeared to be in good condition. After vacuuming, an attempt was made to install the stringer but it would not enter the channel beyond approximately 7'. It was removed and the gunbarrel was borescoped. Marks left by the stringer indicated that the gunbarrel was slightly out of round on the inner-end.

VERTICAL BOWING MEASUREMENTS

A summary of the results of vertical bowing measurements follows. The distances are measured from the front vanstone for F area and from the front pile face for K Area.

<u>Area</u>	<u>Date</u>	<u>Tube No.</u>	<u>Results</u>
100-F	3-6-58	4676 F	Down 0.13" at 10' since 12-11-57 Down 0.09" at 20' since 12-11-57
100-KW	3-12-58	Y-3	Down 0.14" at 10' since 8-24-56 Down 0.17" at 20' since 8-24-56 Down 0.16" at 30' since 8-24-56 Down 0.13" at 40' since 8-24-56

Visual examination of the Y-3 (KW) traverse hole revealed a considerable amount of horizontal bowing.

COOLANT TESTING OPERATION

Coolant Testing Operation activities during March included the operation of the 1706-KE in-pile and out-of-pile facilities, operation of the KER loops, continuation of the organic program, and planning of additional facilities.

1706-KE SINGLE PASS TUBES (PT-150-550-E)

Operation of the six central zone single pass tubes, with weighed regular production slugs, continued under established programs. The tubes were operated in pairs at pH's of 6.0, 6.5 and 7.0. On the outage of 3-13-58 the charges were removed from tubes 4456, 4557, 4963 and 5063 and replaced with new charges. Tube 2943 continued to be operated with a dummy charge until the results of the previous test of radiation effects on corrosion rates could be evaluated.

MOCK-UP TUBES

Programs in progress during March were:

1. Determination of corrosion rates for M-388 aluminum and carbon steel in low temperature 6.5 to 7.0 pH process water. Results continued to be favorable.
2. Duplication of conditions which resulted in groove type corrosion of M-388 aluminum jackets on downstream slugs in certain tubes at H reactor. One test was operated with normal H reactor type process water containing 2 ppm of sodium dichromate. Another test was operated with 1 ppm of sodium dichromate and a purge once each week. Examination of one M-388 jacketed slug and one 1245 aluminum jacketed slug from this test showed no indication of the groove type corrosion.

ELMO LOOPS

ELMO-1 - ELMO-1 continued to be operated during March for studies on the rate of scale build-up on recirculating system heat exchangers cooled with untreated Columbia River water. Scale build-up continued to be slow although there was more build-up on the carbon steel raw water baffles than on the stainless steel tubes.

ELMO-2 - The loop circulating pump failed during March and was replaced with a spare pump. The test section was charged with M-388 aluminum coupons and A-272 carbon steel coupons and operated at 180°C and a pH of 5.5. 100-200 ppm of dihydroxy-anthraquinone were added as a corrosion inhibitor.

ELMO-5 - ELMO-5 was operated at 290°C and a pH of 10.0 with LiOH addition for corrosion studies on carbon steel and stainless steel coupons. Hydrazine was used as an oxygen scavenger.

ELMO-6 - ELMO-6 was operated at a pH of 4.5 and a temperature of 300°C with phosphoric acid addition. M-388 and A-1 aluminum alloy fuel elements were charged into the test section to determine the corrosion effects at fluid velocities of 20 feet per second. The slugs were examined on a weekly basis and no blistering or pitting had been detected by month end.

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ELMO-7 - During the month a 45 hp canned motor pump was installed in the system. The loop was operated at a pH of 4.5 and a temperature of 300°C for tests on hot pressed wafer elements, A-1, A-2, C-1 and C-2 aluminum fuel element jacket materials, PRTR Zircaloy-3 clad fuel elements, four-rod stainless steel clad cluster elements, NPR connectors and nozzle caps, and for thermal cycling of PRTR connections and nozzle caps.

ELMO-9 - A test of sensitized stainless steel coupons at 280°C and a pH of 4.5 was completed during the month with the coupons showing only slight amount of intergranular corrosion. A corrosion test of M-388 aluminum coupons and A-212 carbon steel coupons at 250°C and a pH of 5.5, with a saturated solution of 1-5 dihydroxy-anthraquinone, was initiated during the month.

KER FACILITY

LOOP #1 - In-pile recirculation of Loop #1, with a charge of 19 stainless steel jacketed cluster elements, at a temperature of 265°C and a pH of 10.0, continued during the month. Several leaking connections and valves were encountered but repairs were completed during available outage time so that regular loop operation was not interrupted. The Loop #1 mock-up tube was utilized for exposure of carbon steel and zircaloy coupons to the loop coolant.

LOOP #2 - KER Loop #2 was operated on single pass during the month, awaiting canning and testing of the next fuel element charge.

LOOP #3 - In-pile recirculation of Loop #3 with stainless steel jacketed cluster elements, at an outlet temperature of 235°C, continued during March. Demineralized water was used in the loop.

LOOP #4 - On 3-14-58 the loop was charged with ten enriched hot pressed canned wafer elements with A-2 aluminum alloy jackets. Operation of the loop at 235°C and a pH of 4.5 continued through month end.

KER PERFORMANCE

There were no unscheduled K reactor outages resulting from Coolant Testing Operation activities during the month. Seven outage hours were charged for KER work and .5 outage hours were charged for 1706 work.

ORGANIC COOLANT TEST PROGRAM

ORA-1 - ORA-1 was operated at 710°F during the month, with monoisopropylbiphenyl as the coolant. A test of 1050 hours was completed on coupons of Zircaloy-2, carbon steel, stainless steel and aluminum alloys M-388 and M-257. Two aluminum canned fuel elements, one with a nickel bond layer, and one with a graphite diffusion barrier, were also tested. No test pieces showed any physical damage except the fuel element with the graphite diffusion barrier, which showed some cross sectional area reduction between the end caps.

A new test was then initiated to confirm the above results. In addition, two M-388 aluminum canned, cored fuel elements, with collapsible rail supports, were tested.

ORA-3 - ORA-3 continued to be operated for the purpose of testing a Barco ball joint expansion pigtail and for tests on gasket materials.

NRL CONTRACT - Pump revisions were completed about mid-February and operation with unirradiated MIPB resumed. The pump functioned well and the fresh MIPB runs were completed. Hanford irradiated MIPB has been charged into the loop for testing.

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COMPONENT TESTING OPERATION

IRRADIATED MATERIAL EXAMINATION

Detailed examination of the following 25 tubes and partial examination of the following 9 tubes of irradiated metal was completed during the month.

<u>Detailed Examination</u>		<u>Partial Examination</u>	
<u>Pt. No.</u>	<u>No. Tubes</u>	<u>Pt. No.</u>	<u>No. Tubes</u>
4A	2	19A	3
19A	4	81A	3
44A	4	91A	3
45A	4		
56A	2		
58A	6		
81A	1		
109AC	1		
550	1		

C Processing Operation personnel expressed concern regarding the heat which might be generated during the shipment of freshly discharged slugs. To confirm calculations made by Process Standards personnel an experiment was performed in the 105-C MEF. A thermocouple was attached to an I&E slug four days out of the reactor, the assembly placed in the air weigher and after drying, readings were taken until a constant temperature was achieved. The maximum temperature recorded was 196°C and after one week the maximum was 136°C. A Process Standard will be issued covering this problem.

PROCESS TUBE CORROSION MONITORING PROGRAM

In-pile measurements of 294 process tubes were made this month using the Probolog. Listed below are the number of tubes measured per reactor and document numbers of the reports.

<u>Pile</u>	<u>Tubes Probed</u>	<u>Report Number</u>
DR	50	12, HW-55203
D	60	13, HW-55217
F	36	14, HW-55229
B	55	15, HW-55266
C	7*	16, HW-55291
DR	71	17, HW-55322
H	14	18, HW-55323
C	5	Not Reported.

* Four of these tubes were Probologged last month.

Seven tubes were examined in the basin facilities and measured in the Metallurgical Laboratory. Tubes 2169-C and 3681-C which were air tubes in the reactor for a short period of time were examined. During removal of these tubes, they were pulled apart, necessitating removal of the largest portion from the front of the reactor. Both tubes pulled apart approximately 17 and 18 feet from the rear Van Stone flange. Samples of these areas are

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being sent to the Radiometallurgy Laboratory for more specific examinations, to determine if the metal actually melted at these areas. Tube 2160-C had operated with the possibility of steam formation above the downstream pieces in the column. Some accelerated corrosion was observed on the top wall of the tube located between $11\frac{1}{2}$ and $16\frac{1}{2}$ feet from the rear Van Stone flange. This corrosion occurred in a band approximately one inch wide and was not uniform. Some areas appeared to have small worm grooves, and other areas appeared similar to coarse sand paper.

Leakers examined this month were tubes 1577-DR, 3465-DR, and 3565-DR. A longitudinal slit approximately $2\frac{1}{2}$ inches long was found in tube 1577-DR located between $10\frac{1}{2}$ and 11 feet from the rear Van Stone flange.

In tube 3465-DR, a pin hole leak was found just above one rib located 10 feet from the rear Van Stone flange. The hole was caused by external corrosion. The leak was not found in tube 3565-DR; however, the appearance on the outside surface was similar to that of tube 3465-DR. It is very probable the leak occurred in or about the same area as tube 3465-DR.

PANELLIT PROGRAMS

Failure analysis was performed on 46 Panellit gauges, and 1413 gauges were process inspected in the Central Panellit Shop and the individual areas.

In-board reliability examination was made on 80 gauges at 105-C Area with 33 found to be defective, and 8,353 gauges were examined in all areas specifically for possible Bourdon tube leaks with 52 removed as leakers.

A functional evaluation of Panellit gauges and their component systems was issued as a Scram Analysis Report (HW-55257). This report will be issued quarterly as an effort to determine the exact cause of scrams and thus minimize their recurrences.

The new DT-100-T Panellit gauge switches have operated without failure for the fourth month. Inspection activities in the shop detected two failures of these switches.

INVENTIONS

All Research and Engineering Operation personnel 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 March 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.

Inventor (s)

Title

None

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Manager, Research and Engineering
IRRADIATION PROCESSING DEPARTMENT

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PRODUCTION AND REACTOR OPERATIONS SUMMARY

MARCH, 1958

Input production for March was 101.2 percent of forecast and output production was 123.3 percent of forecast. Output production was above forecast due to discharges during unscheduled outages late in the month which were forecasted for April.

The maximum power levels were increased 25 megawatts at KE, 15 at H, and five at F. The increase at KE was due to a combination of improved flattening and increased flow; the F and H increases to improved flattening.

A record combined power level for all reactors was established March 22, when the previous record (February, 1958) was exceeded by 95 megawatts.

Fifty-four reactor outages, of which 27 were scrams, resulted in an overall time operated efficiency of 75.7 percent. Forecast was 76 percent.

Eighteen ruptures were removed from the reactors as follows:

	<u>B</u>	<u>DR</u>	<u>H</u>	<u>KE</u>	<u>KW</u>	<u>Total</u>
Regular-solid	4	2	2	0	2	10
" -cored	0	0	0	2	0	2
"E" metal-solid	0	0	3	1	0	4
" " -I & E	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>2</u>	<u>2</u>
Total	4	2	5	3	4	18

Significant items of equipment experience were:

1. One hundred eighty-seven process tubes were installed; 60 at DR, 48 at D, 37 at F, 19 at B, 15 at H, 5 at KE, 2 at KW and one at C.
2. Eight water leaks were corrected; 3 at F, 2 each at DR and H, and one at B.
3. A pane of glass failed on the discharge area side of the C Reactor central viewer, resulting in the draining of the shielding water from the viewer.
4. C Reactor failed to recover from two scrams due to the malfunction of No. 8 (obstruction in channel) and 16 HSR's (faulty winch brake).
5. At DR Reactor, four regular VSR's were replaced with new type high temperature-resistant rods making a total of fifteen rods replaced. This completes the first phase of the DR-VSR replacement program.
6. Excessive noise and vibration in the speed increaser gear unit of No. 6 high lift pump in 190-KW on March 6 necessitated its being shut down, with the resultant shutdown of 105-KW due to the spare pump also being out of service.

There were no disabling injuries, security violations or over-exposures to radiation during March.

Statistics for the Processing, Power and Radiation Monitoring Operations in the individual reactor areas are tabulated on pages Ch-1 through Ch-6 of this report.

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B-C REACTOR OPERATION
MARCH, 1958

I. ORGANIZATION AND FUNCTIONS

The B-C Radiation Monitoring Operation was deactivated and all personnel and functions were transferred to the B and C Processing Operations with the conjunctional elimination of the position, Manager - Radiation Monitoring.

II. PERSONNEL

A. Force Summary

	<u>February 28</u>			<u>March 31</u>			<u>Net Change of Total</u>
	<u>E.</u>	<u>N.E.</u>	<u>Total</u>	<u>E.</u>	<u>N.E.</u>	<u>Total</u>	
General	1	1	2	1	1	2	0
Plant Admin. Operation	3	2	5	3	2	5	0
B Processing Operation	14	30	44	16	40	56	/ 12
C Processing Operation	14	26	40	17	36	53	/ 13
Power Operation	15	99	114	15	98	113	- 1
Rad. Mon. Operation	5	21	26	0	0	0	- 26
Maintenance Operation	<u>22</u>	<u>111</u>	<u>133</u>	<u>22</u>	<u>104</u>	<u>126</u>	- 7
Total	74	290	364	74	281	355	- 9

A net reduction of nine in the B-C Reactor Operation nonexempt force was made during March. Ten jobs were eliminated and one Miscellaneous Operator vacancy was filled. Jobs reduced included two Jr. Power Operators, one General Clerk "C" (Rad. Mon.), three Plumber-Steamfitter Journeyman, one Electrician-Journeyman, one Electrician Trainee, one Light Truck Driver, and one Pipecoverer.

B. Movement of People

Movements affecting total force were confined to nonexempt personnel and consisted of seventeen additions (by transfer in) and twenty-six separations (twenty-two transfers out, two terminations for lack of work, and two resignations).

Integration of the Radiation Monitoring and Processing Operations resulted in the following internal changes: Twenty nonexempt R.M. personnel were transferred to the B and C Processing Operations, 10 to B, 10 to C; the R.M. General Clerk was promoted to Stenographer and transferred to C.P.D. as a reduction of B-C force; R.M. exempt personnel were transferred, one Analyst-Radiation Monitoring and one Supervisor-Radiation Monitoring to the B Processing Operation, and one Analyst and one Supervisor to the C Processing Operation; L.V. Barker, Manager, Radiation Monitoring Operation was reclassified to Supervisor, 100 Operations I and transferred to the C Processing Operation.

III. PERSONNEL ACTIVITIES

No significant activities

IV. SAFETY AND SECURITY

No disabling injuries or security violations were reported; nine Medical Treatment injuries were experienced.

V. NON-ROUTINE REPORTS

No significant non-routine reports were issued.

VI. INVENTIONS AND DISCOVERIES

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 therein covered by this report, notebook records, if any, kept in the course of their work have been examined for possible inventions or discoveries.

VII. COMPONENT ACTIVITIES

B-C PLANT ADMINISTRATION OPERATION

A. Administration Activities

Planning and coordination of all moves necessary to execute the five-man reduction of IPD Junior Power Operator forces (two from B-C Power Operation), was accomplished during March. No terminations were required, as the affected personnel were reclassified and/or transferred to recently developed openings.

A two week campaign was started on March 31 as part of a HAPO-wide drive for greater participation in the G.E. Savings and Stock Bonus Plan.

A survey was made of action taken as a result of the last Attitude Survey. The information obtained was forwarded to the Department Communications Specialist. Suggestions for improving future attitude survey questionnaires were submitted to the Employee Relations Operation.

B. Personnel Development

A total of 37 exempt personnel attended training and development courses during the month.

C. Cost Control Activities

A review was made of operating costs for FY 1958 through February. Level 4 Managers were apprised of their financial status (cost vs budget) and of cost reductions necessary to stay within the budget during the remainder of FY 1958.

Review and revision of the FY 1959-1960 budget for Planned Maintenance was completed during the month.

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D. Suggestions

Under study at start of month - 23
Received for evaluation during month - 45
Completed evaluation during month - 43
Under study at month's end - 25

B PROCESSING OPERATION

A. Production

Input production (Pu) for March was 102.3 percent of forecast. Operating level was limited by tube power limits.

B. Operating Experience

1. Operating Continuity

There were ten unscheduled and no scheduled outages in March.

<u>Date</u>	<u>Cause</u>	<u>Outage Hours</u>
3-1-58	Panellit trip - Leak in Toggle Valve during Heise Check	.2
3-1-58	No. 3 Beckman trip - Delay in changing trip setting	.1
3-1-58	Ruptured Slug - Tube 1264 (stuck)	31.4
3-4-58	Ruptured Slug - Tube 3475 (stuck)	21.9
3-5-58	Panellit Scram - ruptured Bourdon Tube - Scheduled outage work	.7 102.9
3-12-58	Panellit Scram - Row 32 (Unexplained - See below)	.4
3-12-58	Panellit Scram - Row 32 (Unexplained - See below)	.2
3-18-58	Panellit Scram - Leaking Gage 3261	.3
3-25-58	Panellit Scram - Gage 0175 Leaking Bourdon Tube	.3
3-26-58	Rupture Slug - Tube 3370	52.4
	Total	210.8

Four slug ruptures were experienced during the month. The ruptured slug in Tube 3780 was confirmed (on a follow-up check of minor rupture indications received prior to the scram) during the panellit scram outage on March 5. All four ruptures were stuck and required removal of the tubes. One of the tubes (3370) was removed by splitting and the channel was left empty.

As a result of the rupture experience this month, two lots of material suspected of being rupture prone were discharged short of goal. These lots were No. CA-818A with 27 tubes and No. MA-011A with 29 tubes.

2. Equipment Experience

A new graphite thermocouple stringer was installed in Channel 3773. Approximately 140 tubes were pressure tested as a result of higher-than-normal water collection rates from the dryers; Tube 0857 was found to be a leaker. During the month, 19 tubes were removed and replaced; of this number, 15 were due to thin wall considerations, three as a result of slug ruptures, and one due to a water leak. Seven tubes in the upper pile fringe were probed; as a result of probe failure to pass the prescribed distance, two tubes were charged with 4" slugs.

C. Improvement Experience

1. Production and Process Tests

PT-IP-124A, "Investigations of Severe Pitting of M-388 Alloy Slug Jackets" - Thermocouple leads to monitor temperatures were installed in the downstream dummies of the four tubes charged with M-388 metal. This test is to determine the corrosion effect of elevated temperatures on M-388 metal.

PT-IP-14 AC, Supplement A, "Use of E Metal in Shield Protection" - The test was initiated with nine tubes containing depleted uranium and 15 containing 0.94 percent "E" metal (solid).

PT-IP-23A, "Graphite Studies" - Graphite samples were removed from Channel 3461 and others were charged. An attempt was made to obtain core samples from Channel 1385, but the equipment broke down and the work was postponed.

PCA-189, "Doe Material" - Three tubes of DOE metal were discharged and the test completed.

2. Other

Design change 137-B, "105-B Building Safety Circuit Revisions", was initiated. Part of this design change is intended to reduce overload on the Panellit board circuitry and reduce chances of scram.

The installation of the air-water package for the rear face was completed except for trail hoses for the various services.

During the March 6 outage, a water-cooled jacket prototype was installed in C Sample Room to determine its effectiveness in cooling the water from the rear face. Initial results from several tests appeared encouraging; however, further study was planned to determine the justification for installing cooling jackets in all rooms.

D. Radiation Monitoring Experience

1. Radiation Occurrences

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A highly contaminated gunbarrel knocker was found in the 10-foot level tool storage room; maximum dose rate was 22.5 rads/hr at surface, including 100 mr/hr at two inches. An employee's shoe was found contaminated to 30,000 c/m following work in the "C" Sample Room; source of contamination was not determined and decontamination was not successful. Two roofers for a lump-sum contractor contaminated their shoe soles to 50,000 c/m when they left their roof work by descending the near rear stairs without benefit of foot protection; the shoes were decontaminated to < 100 c/m. A speck indicating 60,000 c/m was found on the seat of a pickup during a routine survey; source of the particle was not determined; decontamination was effected by removal of a portion of the seat cover.

Two employees received shoe contamination following a localized airborne spread in the work area corridor. Survey of one indicated 1000 c/m on the sole and was easily removed. Shoes of the other employee indicated 20,000 c/m on each sole. This was reduced to 600 c/m and held pending further decontamination. Survey of the work area corridor indicated smearable activity to 25,000 c/m outside of the radiation zone.

2. External Exposure Experience

Removal of ruptured fuel elements in the discharge area was accomplished under personnel dose rates to 2.5 r/hr; dose rates up to 150 r/hr were observed at the rupture tube pigtail. Dose rate to personnel for installation of locking bars on the 3X ball hopper gates was 150 mr/hr maximum. Decontamination of perforated dummies was done with maximum dose rate of 50 mr/hr; similar treatment of poison pieces was accomplished, with dose rates to 300 mr/hr experienced. Push pole removal on the front face was done with dose rates to 3 rads/hr; activity levels to 20 rads/hr were noted on poles.

Dispersal of pieces of thermocouple wire, during discharge of a graphite stringer column to the rear, among the nozzle assemblies below B-3773, occasioned personnel dose rates to 1 r/hr while attempting to remove the lodged pieces to the basin. Spread of contamination below Tube 3370 on the front face caused dose rates to 100 mr/hr for normal charging work. Draining of condensate in the 115 dryer cells was done with dose rates to 500 mr/hr being encountered.

3. Contamination Control

There were 124 vehicles surveyed and two were found contaminated; both were decontaminated. A total of 82 air samples were taken; none indicated activity densities greater than the permissible limits for respiratory protection worn. There were seven cases of skin contamination, none of which constituted an exposure problem; all were readily decontaminated. Six instances of personal clothing contamination were recorded; all but two were decontaminated.

E. Events Influencing Cost

1. Overtime Usage

Eight exempt and 248.6 nonexempt man-hours were required in March. (including 148 man-hours for radiation monitoring).

2. Gas Usage

Gas usage continued to be high. In addition to gas leaks, excessive use is due in part to increased use of helium and the need for increased flow and pressure to remove water from the graphite stack.

C PROCESSING OPERATION

A. Production

The C Reactor input production (Pu) for March was 125.9 percent of forecast. The controlling limit to power level was the top of the annulus saturation temperature in tubes containing I & E charges.

The production was greater than forecast as a result of a change in schedule for the Ball 3X Modification Program (CG-741).

B. Operating Experience

1. Operating Continuity

Six unscheduled outage (and no scheduled outages) were experienced during the month. The cause and outage time are as follows:

<u>Day</u>	<u>Cause</u>	<u>Outage Time</u>
4	Manual shutdown - unbalanced flux distribution	33.3
9	Scram - #3 flux monitor - faulty power amplifier tube	33.7
17	Scram - Panellit Trip -(Row 41) cause undetermined	40.0
19	Scram - Panellit Trip (Tube 1778) closed Hoke valve	.9
27	Scram - Panellit Trip -(Gage 2673) wrong gage bypassed	.4
28	Manual shutdown - insufficient reactivity	35.7
	Total	144.0

Recovery from two of the scrams experienced during the month was prevented by inability to withdraw a vertical rod during one recovery attempt and a horizontal control rod during another. See Equipment Experience for details.

2. Equipment Experience

#3 Flux Monitor - A #3 Flux Monitor trip of the #1 Safety Circuit (see Scrams - B.1) was caused by a change in the B-plus supply voltage to the flux monitor controller as a result of an erratic 6 Y 6 power amplifier tube. The tube was replaced.

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#16 Vertical Safety Rod - The mechanical winch brake for the #16 Vertical Safety Rod was out of adjustment, thus preventing withdrawal of the rod during an attempted reactor startup following a scram on 3-9-58. The brake was adjusted during the ensuing outage.

#8 Horizontal Control Rod - The failure of the #8 Horizontal Control Rod to completely enter the reactor on the 3-17-58 reactor scram, and the inability to immediately withdraw the rod from the reactor, prevented recovery from the scram. During the ensuing outage, the rod was manually withdrawn from the reactor. Inspection of the rod channel revealed two unknown obstructions in the rod channel. One obstruction was removed from the rod channel during the March 28 outage. The nature of the item removed has not yet been determined at month end.

#14 Horizontal Control Rod - During the 3-5-58 reactor startup, the inlet hose reel failed to take up the hose slack on rod withdrawal fast enough to prevent kinking the inlet cooling water hose. The hose was straightened out and during subsequent operational checks, the kinking could not be duplicated. The reactor startup was continued. On the 3-17-58 outage, the hose was replaced.

Process Tube 2169 - Process Tube 2169, in which a ruptured fuel element was experienced on November 11, 1957, was removed from the reactor. The tube was separated in the channel, thus necessitating the removal of 18 feet of the process tube via the rear face and the remainder of the process tube via the front face of the reactor.

Central Viewer (Rear Face) - The lower far pane of glass on the discharge area side of the central viewer failed on 3-4-58, resulting in the draining of the shielding water from the viewer. The protective screen over that pane also fell from its normal position on the discharge area rear wall to the pick-up chutes resulting in three mattress plates being dislodged from the discharge chute. The broken viewer was inspected on the March 28 outage. The investigation to determine the cause of failure has not been completed at month end.

C. Improvement Experience

1. Production Tests

Significant Production Test activity during the month:

<u>Production Test</u>	<u>No. Tubes</u> <u>2-28-58</u>	<u>No. Tubes</u> <u>3-31-58</u>	<u>Change</u>
PT-IP-19-A	1076	680	- 396
PT-IP-19-A (Supp.B)	210	0	- 210
PT-IP-109-AC	186	191	+ 5
PT-IP-148-AC	24	183	+ 159
PT-IP-132-AC	0	40	+ 40
PT-IP-141-AC	0	196	+ 196
PT-IP-142-AC	0	213	+ 213

2. Projects

Improved Nuclear Instrumentation - 100 Areas - CG-707

The installation of the Instrument Development managed "stop gap" period meter of Project CG-707 was completed during the month. The purpose of the "stop gap" instrumentation is to provide a recorded rising period during reactor startup.

Continuous Charge-Discharge (Pile Demonstration Unit - CG-651

The pressurized magazine charging machine was delivered to the 105-C Building during the month. Modification of the C Elevator in preparation for the installation of the pressurized magazine charging machine was continued.

3. Other

Probolog - Five production test tubes were probologged during the month to determine the rate of tube wall corrosion.

Graphite Mining - Four cores of graphite were mined from each of two process tube channels (Channel 2160 and Channel 1960) to evaluate the graphite behavior in the reactor.

Power Rate Meter - A prototype instrument to record the rate of power increase per minute was installed during the month. The purpose of the installation is to determine the feasibility of operating the equipment as a part of the octant monitoring system.

D. Radiation Experience

1. Radiation Occurrences

Two employees were exposed to a dose rate of 20 r/hr during tube removal on the charge face. The pipe containing the tube was rolled off the crane onto the work area floor, in the immediate working area of the two employees. There was no overexposure as a result of this occurrence.

A vacuum pump was left running in pit #2 of the metal examination facility. A maximum dose rate of 450 mr/hr was obtained over the pit before the condition was corrected by shutting off the pump and raising the water level.

During the sorting of poison, a piece of irradiated metal was inadvertently raised toward the surface of the water. It was immediately lowered and there was no overexposure involved.

2. External Exposure Control

The maximum dose rate encountered in the central viewer during reactor operation, was 2640 mrem/hr; this resulted from water draining when the viewer glass broke in the discharge area. Horizontal rod #8 was removed and a piece of material removed from the channel with a maximum dose rate of 2 r/hr; dose rate of the material removed was 20 r/hr at one foot; the average dose rate was 25 mr/hr for all work. A downstream dummy T/C train was removed

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and returned to the laboratory. The maximum dose rate of 1 r/hr. Front face tube removal occasioned dose rates to 20 r/hr. The C Elevator pit was found contaminated to 10 rads/hr; decontamination was performed with the maximum dose rate of 500 mrad/hr, and contamination was reduced to 15 mrad/hr. A maximum dose rate of 450 mr/hr was encountered while attempting to clear the Ball 3X pipe to the cave on the experimental level; dose rate on the pipe was 300 r/hr.

3. Contamination Experience

Of the twelve vehicles surveyed, all were found to be free of contamination. A total of 38 air samples was taken; none indicated activity densities greater than the permissible limits for respiratory protection worn. There were three cases of skin contamination, none of which constituted an exposure problem and all were readily decontaminated. Two instances of personal clothing contamination were recorded; decontamination was effective in one case. Reactor atmosphere gas leaks continue as an exposure problem on the charge face, with dose rates up to 2 rads/hr measured; the sealing of bellows has successfully reduced a portion of these leaks.

E. Events Influencing Cost

1. Overtime A total of 187 man-hours nonexempt (including 104 hours radiation monitoring) and eight man-hours of exempt overtime was required during the month.
2. Other - Six unscheduled outages during the month resulted in 144.0 hours of down time.

B-C POWER OPERATION

A. Operating Experience

The Export Load was supplied by 100-D until March 31, when it was transferred to 100-B Area.

B. Equipment Experience

190-B Building - Inspection of No. 2-A cone valve on March 5, revealed a twisted shaft key and possible shaft damage. Repair was completed and the unit placed in service on March 10.

190-C Building - Installation of a new fluid drive impeller in No. 2-C unit was completed on March 2; this is a new design impeller, using SAE 2330 steel, 39 heavy vanes with no stabilizing ring. Inspection of fluid drive impellers in No. 1-C unit and No. 9-C unit revealed the impellers were in good condition.

C. Improvement Experience

1. Projects

CG-558

- a. Cavitation - 190-B Annex Pumps - Inter-stage sleeve modification was completed on pumps No. 2-A, No. 8-A and No. 3-A. This completed modification of pump sleeves on all units except No. 5-A.
- b. Vibration Correction - 181-B River Pumps - Minor Construction completed alignment and overhaul of No. 14-B pump on March 18, 1958. This pump is on test run but vibration is noticeable.

CG-600

190-C Pump Replacement - Minor Construction completed the pump replacement on No. 1-C and No. 2-C units on March 17. Replacement of No. 9-C pump was started on March 19.

CG-344 - 181 Building Header Correction - Installation of the supports on the 20 inch headers is still in progress.

Project CG-694 - Auxiliary Oil Pump - 190-C Building - The flywheel bearings are being modified in conjunction with CG-600 pump replacement. Bearings No. 1, 2, 3, 5, 9, 10, and 11 are now modified. The portable hydraulic oil pump was received on March 3, 1958, and has been placed in service on the above bearings.

2. Other

Removal of Excess Equipment - 185 Building - The contract for the removal of this equipment has been awarded to the Henry Bacon Company of Portland, Oregon.

181-B-C Building - A new river elevation gage was installed this month. This gage will supply accurate river elevation data on the operating floor of the pump room.

183-B Building - The prototype Bauxite test installation was operated approximately 80 per cent of the month.

151-B Substation - A recording Kilowatt Demand Meter was installed in 151-B to permit better control of Peak Electrical Power Demand.

D. Events Influencing Cost

Maintenance costs remained high during the month due to: (1) Complete Class A overhauls and fluid drive impeller replacements on the 190-C Pump Units; (2) Alignment and repair of the discharge headers at 181 Building; and (3) High raw water turbidity, resulting in a greater quantity of chemicals being consumed.

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B-C MAINTENANCE OPERATION

A. Equipment Experience

1. Instruments

Pressure Monitoring System - B Reactor - A water pressure fluctuation study was started with the installation of pressure transducers on three panellit gauges. Identification numbers have been installed on the backs of all panellits and toggle valves to reduce scram potential by human error through misvalving. Three bourdon tubes failed during the month on panellits; a complete bourdon inspection was made after the first failure and successive inspections have been made after each failure.

Gamma Monitor - B Reactor - The 100 B-C Maintenance Engineering designed cooling chamber was installed in "C" Sample Room and initial observations are being made to evaluate results. It is designed to cool sample water below vapor point and reduce erratic readings of samples.

Bubbler River Level Indicator - 181-B Building - A bubbler-type river level indicator was installed and is in operation at the 181-B Building.

2. Electrical

Pressure Monitor - B Reactor - Design Change Number 137-B which is a circuit change on the panellit system was completed, except the B-C intertie, which will require a simultaneous outage of 105-B and 105-C Reactors.

Poison Column Control System - B Reactor - A modification of the poison column control panel was completed during the March 27 outage. The objective was to isolate the panellit circuit from the poison column system.

D Elevator Cab - B Reactor - All electrical equipment on the D Elevator cab has been disconnected and removed. Two reelites remain to be removed under the elevator.

Horizontal Control Rods - C Reactor - Installed a warning chime system on the HCR's. When a rod is pulled, the chime sounds.

3. Mechanical

Ruptures - B Reactor - Four ruptures occurred during the month all of which were difficult to remove. Extensive contamination resulted during the removal of ruptured metal in Tube 3370-B on March 27.

Tube Replacements - During the Month, 19 tubes were installed at B Reactor, three in air channels left by ruptures. A channel was mined for graphite sample on one tube before the tube was re-installed.

Number 8 ESR - 105 C - Number 8 rod stopped at 170 inches during a reactor scram on March 17 and could not be withdrawn. Mechanically, the rod drive was in proper operating condition. Probologging indicated a piece or pieces of foreign material in the channel. Attempted removal during the March 17 outage was unsuccessful. During the March 28 outage a piece of material resembling a piece of aluminum approximately 14" long, 2" wide and 3/8" thick was removed. Subsequent probologging indicated tilting of one of the graphite blocks in the back of the channel.

B. Maintenance Engineering

1. Instrument Engineering

Flux Monitor System - B and C Reactors - Several spurious shutdowns have been caused by component failures in the Beckman Model RXG-2 amplifiers in the flux monitor systems at B and C Reactors. This is due to the age, circuit modifications, lack of spare parts and the elevated temperature of the amplifier. A design change (#209-B-C) is being prepared to replace the model RXG-2 amplifiers with Beckman Model V amplifiers.

Pressure Monitor System - B Reactor - A prototype pressure monitor system has been fabricated which incorporates lock-in coordinate lighting and DC operation. The life-test operation of this unit has been satisfactory to date. Specifications are now being revised to improve the quality and decrease the size of the lock-in relays.

Graphite Thermocouple Stringers - B Reactor - Extension lead wire has been installed from test stringers 1073-B and 1284-B to a 12-point recorder on O level-far to provide continuous monitoring of the geminol wire and swaged hot junctions. From the information furnished by these test stringers, recommendations can be made within 3 to 6 months as to the feasibility of using the new type wire and swaged hot junctions.

2. Mechanical Engineering

Foam Rubber Repair of Gunbarrel Gas Bellows

B Reactor - A leak check of the front face bellows previously sealed at B Reactor indicates the repairs were successful.

C Reactor - A crew has been trained and bellows repair is now being accomplished during reactor operation. A new angle drill jig has been designed and fabricated to allow the drilling of both front and rear bellows.

Automobile Decontamination Facility - 111-B Building - A scope report has been completed which presents the necessary building modifications to provide a vehicle decontamination facility at 111-B. The scope includes a minimum facility designed to service B-C Area equipment only and a facility designed for handling all vehicle decontamination in the 100 Areas.

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Flushing Water Supply - C Reactor - At present, there is no high pressure water supply available at the front face of C Reactor for the purpose of flushing tube charges from individual process tubes. A design scope has been prepared for a system utilizing the 190-C purge pumps as the high pressure water source for this purpose.

3. Electrical Engineering

Design Change Number 207-B-C - Flux Monitor Dual Trip System - B and C Reactors - A design change was completed for modification of the flux monitor system to require any two flux monitors out of four to scram the reactor. This system will use the existing controllers, with the scram contacts of the controllers connected in series rather than parallel, and is an interim measure until Project CG-786, "Flux Monitor Dual Trip System - 105-B, C, D, DR, and H", can be installed. The design change is being circulated for approval.

Process Water Pressure Annunciator - 105-B Building - A design was prepared for a system to give audible and visual alarm in the control room when the far riser pressure is less than 60 psig or more than 80 psig during a reactor shutdown. This system will be inactive during reactor operation so that no alarm will be received.

4. Planning and Scheduling

During March, 4499 man-hours of Productive Maintenance work were scheduled. This included 2936 man-hours scheduled for March and 1563 man-hours carried over from the previous months. The total included 85 Class A overhauls, 253 Class B overhauls, 11 Class C overhauls, and 15 lubrications. Of this total, 2697 man-hours, or 60 percent, were completed.

C. Events Influencing Cost

Costs for March should show a reduction, reflecting the decrease in personnel within the operation.

A. R. Maguire

Manager
B-C REACTOR OPERATION

AR Maguire:GSS:mus

D & DR REACTOR OPERATION
MARCH, 1958

I. ORGANIZATION AND FUNCTIONS

There were no changes in the assigned responsibilities during March.

II. PERSONNEL

	<u>February 28, 1958</u>			<u>March 31, 1958</u>			<u>Net</u>
	<u>NE</u>	<u>E</u>	<u>Total</u>	<u>NE</u>	<u>E</u>	<u>Total</u>	<u>Change</u>
<u>A. Force Summary</u>							
General	1	1	2	1	1	2	0
Plant Admin.	2	3	5	2	3	5	0
D Processing	32	13	45	43	14	57	+12
DR Processing	24	13	37	34	14	48	+11
D-DR Power	106	14	120	103	14	117	- 3
D-DR Rad. Mon.	21	5	26	0	3*	3	-23
D-DR Maintenance	<u>135</u>	<u>24</u>	<u>159</u>	<u>132</u>	<u>23</u>	<u>155</u>	<u>- 4</u>
Total	321	73	394	315	72	387	-7

* Transfer of remaining exempt personnel to Processing Operation is effective April 1, 1958.

B. Movement of People

E. W. O'Rorke, Manager, D-DR Reactor Operation, was transferred to the Engineering Section of APED in San Jose, California, as Manager, Fuels and Materials Operation, effective March 17, 1958. J. H. Brown, Supervisor, Reactor Physics Operation, IPD, was promoted to Manager, D-DR Reactor Operation, effective March 17, 1958.

Due to reduction of force, F. S. Coates, Supervisor, Maintenance, D-DR Maintenance Operation, was reassigned in the same operation as a Plumber-Steamfitter Journeyman, effective March 1, 1958.

M. M. Cox, Manager, D-DR Radiation Monitoring was assigned as Analyst, Radiation Monitoring, D Processing Operation, effective March 1, 1958.

C. J. DeBevec, Analyst, Radiation Monitoring, D-DR Radiation Monitoring Operation, was transferred to DR Processing Operation in the same function, effective March 1, 1958.

Nonexempt personnel movement during March included 15 transfers in, 19 transfers out, three terminations and one reassignment from the exempt payroll.

III. PERSONNEL ACTIVITIES

J. M. Fox, Jr., Principal Engineer, discussed the subject of Stress Corrosion at a meeting of D-DR Exempt employees on March 21, 1958.

F. P. Britson attended the American Power Conference in Chicago, Illinois, on March 26, 27 and 28.

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IV. SAFETY & SECURITY

There were 20 medical treatment injuries reported during February.

There were no security violations incurred.

V. NON-ROUTINE REPORTS

HW-55538, "Radiation Occurrence Investigation Report" dated 3-31-58 by M. M. Cox.

VI. INVENTIONS AND DISCOVERIES

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 above. 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.

VII. COMPONENT ACTIVITIES

D-DR PLANT ADMINISTRATION

A. Administration Activities

A follow-up meeting was held with D-DR Reactor Operation Level IV Component suggestion plan coordinators to discuss general problems in connection with suggestion evaluation. Suggestion statistics for the month were:

Received for Evaluation	39
Suggestion Replies	21
Unanswered at Month End	18

Employees of the D-DR Reactor Operation held a social evening, including dancing and entertainment, on March 7 at the Camp Hanford Officers Club.

Approximately 120 HAPO friends and associates bid farewell to E. W. O'Rorke, Manager, D-DR Reactor Operation, at a dinner held at the Camp Hanford NCO Club, Tuesday evening, March 11, 1958.

Position guides for Manager - Processing Supervisor - 100 Operations I, and Specialist Reactor Operations were revised to reflect changes resulting from combining the Radiation Monitoring and Processing Operations in the five Reactor Operations of IPD.

Coordination was provided in developing exempt Personnel Inventories for each Level IV component of D-DR Reactor Operation.

B. Personnel Development

A meeting was held on March 26 with D-DR Reactor Operations Level IV Managers and appropriate Specialists to discuss Supervisor Training. Recommendations were developed for planning of future IPD Supervisor Training activities.

B. Personnel Development (contd)

These recommendations were presented at the meeting with IPD Personnel Development and Placement Operation on Supervisor Training Programs on March 28.

Meetings were held by the Manager, Reactor Operation for all exempt employees of the operation on the subject of Union Organizing Activities. Four meetings were required to cover all shifts.

Three rotational pool technical graduates continued D-DR Reactor Operation assignments throughout the month.

C. Cost Control Activities

The Landlord and Radiation Monitoring portions of the D-DR Reactor Operation Operating Budget for fiscal years 1959 and 1960 were prepared in cooperation with the Estimating and Budgeting Operation during March. Additional work was done during the month in connection with preparation of the IPD Planned Maintenance Budget for Fiscal Years 1959 and 1960.

D. Landlord Activities

A work order was issued to replace the existing tile floor in Building 1719-D (First Aid).

A review of 100-D Area landlord costs was completed to determine needed changes in rental rates and a letter was submitted advising the Financial Operation of desired changes. Overall liquidation of landlord costs was not changed.

Installation of womens lunchroom facilities in Building 1703-D was completed.

A scope and justification report dated March 5, 1958, relative to the preparation of a project proposal for the addition of a new 101 pair telephone cable from the White Bluffs exchange to a central location in 100-D Area, was approved and submitted to the Relations and Utilities Operation for necessary action.

Roof Repair crews resumed work in 100-D Area during the month.

Removal of Building 185-D equipment by L. A. Hunt continued throughout the month.

D PROCESSING OPERATION

A. Production

Input production was 105.6% of official forecast. Maximum operating levels were limited by tube power limits and graphite temperatures.

Time operated efficiency for March was 79.5%, 95.7% of the official forecast.

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B. Operating Experience

The February 27 outage was concluded on 3-1-58. Other outages included one shutdown for thermocouple repair, two scrams, and one scheduled outage.

1. Operating Continuity

<u>Outage Date</u>	<u>Hours</u>	<u>Reason</u>
3-1-58	15.4	Concluded 2-27-58 outage.
3-1-58	2.2	Repair of thermocouples that failed during startup.
3-2-58	25.8	Panellit scram during spline removal from tube 1275-D.
3-10-58	.2	Panellit scram on row #25. Unexplained. (A leaking gage was found later on this row.)
3-25-58	109.2	Scheduled charge-discharge and tube replacement.

2. Equipment Experience

During removal of splines used for start-up control on the 3-1-58 outage, a spline broke inside the nozzle slot in tube 1275-D causing a scram. Because of the indeterminate status of the broken spline, recovery was not attempted. The metal in the tube was subsequently flushed out and the spline removed without further incident. Miscellaneous maintenance items accomplished during this minimum outage included the replacement of "G" stringer 1073, retubing of the empty leaker channel 3785, and the installation of a new gunbarrel and gas seal on the rear of problem tube 2368. A gas leak check of the 14 boots replaced during December, 1957, confirmed the need for early gas leak repair effort.

Fly's eye removal was attempted during the cooling period of the 3-25-58 shutdown. Exposure rates of 300 mr/hr. at the fly's eye location made it necessary to delay this work. Consequently, only partial fly's eye removal was accomplished during the outage. Forty-four tubes listed from previous probolog data, together with two tubes determined from probolog data on this outage and one tube which sustained mechanical damage during the 2-27-58 outage made a total of 47 tubes which were successfully removed and replaced. Only pertinent maintenance items accomplished on this same outage included installation of new lights on the discharge elevator, providing an escape access from the thermocouple catwalk in the rear face to the top of the unit, installation of five rows of 1387 trip span Panellit gauges (this makes a total of 23 rows changed to date), cleaning two VSR channels with the ball magnet, obtaining graphite boron samples from 2477 and 3773, and removal of graphite stringer 3773.

C. Improvement Experience

1. Production and Process Tests

a. IP-12-AE - "Poison Spline Flexible Control System, Suppl. D"

Spline usage was continued throughout the month for both turn-around and flattening control. Splines were used for turnaround control on three start-ups, the number of splines being as high as forty.

b. IP-91-A - "Reducing Fuel Element Autoclaving Time"

Three tubes were discharged under this test.

c. IP-81-92-FP - "Irradiation of Fuel Elements With Blunt Nose Truline End Contours"

Four tubes were discharged under this test.

2. Projects

a. Project CG-707 - "Improvements to Reactor Nuclear Instrumentation"

Further work towards routing of electrical leads for this project was accomplished during the 3-25-58 outage.

b. Project CG-740 - "Replacement of Central Viewers, 105-D"

The removal of the existing fly's eye was partially accomplished on 3-25-58.

D. Radiation Monitoring Experience

1. Radiation Occurrences

One lapse of radiation control was recorded during the month. A fire was observed in the D Processing burial trench on the afternoon of March 26. The cause was unknown. Firemen extinguished the flames within about four hours and the fire was completely extinguished later by covering with dirt. No appreciable amount of contamination spread resulted from the fire. The incident was formally investigated and details were reported in document HW-55538.

2. External Exposure Control

A total of 48 hours monitoring time was spent in connection with the poison spline facility operation during the month. Field dose rates for removal of irradiated splines averaged about 150 mr/hr at a distance of 20 feet. Momentary dose rates up to 2 r/hr at five feet were received from the open casks. It is estimated that under present conditions, at least 25% more exposure is required to operate this facility than would be received from a PCCF. Attempts are being made to reduce the exposure by adding more shielding to the equipment.

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Dose rates at 0' level under the 105-D hose reels have been 1.5 mr/hr during reactor operation. During the month, lead bricks were placed under the hose reels in the outer rod room and reduced the radiation level approximately 50%.

3. Contamination Experience

After connecting water lines at "A" hole facility on "X" level, water overflowed the drain funnel and contaminated the floor. Surface dose rates of 130 mrad/hr were measured on the "X" level floor and 50 mrad/hr were found on the 0' far floor below.

During the month, decontamination of tube removal equipment was started in the 108-D hot shop. Average dose rates at start of this work were about 25 mrad/hr. Techniques improved as the job progressed until by end of month, average dose rates received were in the order of 10 mrad/hr. Contamination control was very good.

Surveys made in the 183-D filter beds revealed contamination levels up to 20,000 c/m.

E. Events Influencing Costs

1. Overtime

A total of 75 hours of overtime was used.

2. Essential Materials

a. Poison

No new poison was used.

b. Gas

Tests run on the gas system have not succeeded in determining a method of operation which reduces gas consumption. Gas consumption per day has remained approximately the same as it has been for the past two months.

c. Absences

There were 252 hours of non-exempt absence and 104 hours of exempt absence during March.

DR PROCESSING OPERATION

A. Production

Production was 113.4% of the official forecast and was achieved by operating at higher than anticipated power levels and time operated efficiency.

Time operated efficiency was 113.4%; 105% of the official forecast.

B. Operating Experience

1. Operating Continuity

During the month of March, reactor operation was interrupted by three unscheduled outages and two scrams. Details are as follows:

<u>Outage Date</u>	<u>Hours</u>	<u>Reason</u>
3-6-58	36.3	Water leaks 1577-DR & 3565-DR.
3-10-58	90.1	Panellit scram caused by rupture 3376-DR. Tube replacement, and charge-discharge.
3-14-58	.8	Panellit low trip during cold start-up.
3-20-58	31.7	Rupture 3366-DR.
3-22-58	2.9	Repair of two rear ball valves that would not close.

2. Equipment Experience

a. Rupture

DR Reactor experienced two ruptures during March. The first was unclassified and occurred in tube 3376 from lot KA-055-D. It was charged 12-29-57, and discharged 3-10-58 with the charging machine. It had a concentration of 410.

The second which was detected by the gamma monitor was a hot spot type in tube 3366, lot KA-026-D. It was charged 12-13-57 and was discharged 3-20-58 with the charging machine using normal pressure. It had a concentration of 471. Both ruptures were canned in M-388 cans.

b. Tube Replacement

Two leaking tubes were replaced during the outage of 3-6-58.

During the outage of 3-10-58, Maintenance forces replaced 58 tubes on the tube replacement program. Part of these were selected from a leak prone area of the reactor while the majority were replaced on the basis of probolog results. While charging the new tubes, a fuel element became stuck in the upstream end of the tube. It was necessary to dislodge it by pushing from the rear. The new tube had to be replaced. Overall performance was good and as a result, the outage took less time than was anticipated.

c. Vertical Safety Rods

Four VSR's were replaced with reworked rods containing a boron-graphite filler. This makes a total of fifteen rods that have been replaced and completes the first phase of the VSR replacement program.

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DECLASSIFIEDd. Building Settling

Hydrostatic tests were run on the drain lines in the transfer area. They were found to leak. Excavation has revealed several voids where the earth has washed away. The excavating and replacement of drain lines will continue in April.

e. Automatic Perf Sorter

A prototype machine to sort poison, solid aluminum dummies, tubulars, and perforated dummies has been placed on the wash pad. The mechanical installation is complete. The electrical installation is approximately 50% complete.

C. Improvement Experience1. Production and Process Testsa. PT-IP-15-D - "Irradiation Service Request No. HAPO-184"

Irradiated four HAPO-184 samples using the poison column control facility.

b. PT-IP-16-AE - "Functional Test of Individual Flow Meters"

Continued testing of the reliability of individual tube flow meters. This type of metering device is being tested for future reactor design.

c. PT-IP-33-A - "Production of Neptunium 239"

Irradiated one HAPO-203 sample using the poison column control facility.

d. PT-IP-68-A-90FP - "Comparison of Void-Free Fuel Elements With Standard Production Fuel Elements"

Charged sixteen tubes of test material in an attempt to determine the corrosion effect of voids in the Al-Si layer of the fuel elements.

e. PT-IP-126-C - "Comparison of Ball 3X Column and VSR Reactivity Effects"

This test was completed during the outage of 3-10-58. The 3X balls proved to be as strong as the VSR's.

f. PT-105-529-SI, Suppl. A - "The Routine Exposure of Special Irradiations Samples"

Irradiated one HAPO - 172 sample using the poison column control facility.

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2. Projects

a. CG-666 - "Zone Temperature Monitoring"

Continued installation of the monitoring equipment in the control room. Leads were brought in from the outer rod room and wiring work is under way.

b. CG-705 - "Rod Coolant Water Instrumentation Modifications"

Installed annunciator system for the horizontal rod water pressure. These are hooked up to the individual rods to give a warning signal in case of high or low rod water flow.

c. CG-707 - "Improved Nuclear Instrumentation"

Installed a period meter in the control room to measure the rate of power rise during start-ups. This is a stop-gap measure to help improve reactor control. Permanent equipment will be installed in the future.

d. AEC-160 - "Gas Recirculation Loop"

Continued construction of cask handling equipment for the loop facilities. Re-routed duct work to allow space for entry to the X-1 level of the reactor building.

3. Other Improvements

a. Noise Suppressor For the Horizontal Rod Water

Installed two orifices in the horizontal rod water supply line. This distributed the pressure reduction and dampened out the high-pitched noise that has plagued DR Reactor for so long.

b. Rear Face Lighting

Installed fluorescent lights on the discharge elevator. This improved the visibility measurably.

D. Radiation Monitoring Experience

1. Radiation Occurrences

Two Lapses of Radiation Control were recorded during the month.

Responsibility in one was charged to Supplemental Crews Operation and shared with Project Engineering Operation in the other. The first lapse resulted when a Supplemental Crew Operator became contaminated to 40,000 c/m while working at the pick-up chutes. The other involved three sub-contractor employees who entered the X-1 level roof without monitoring or protective equipment. Subsequent survey of the men revealed no detectable contamination and survey of the roof indicated that they received no significant external dose.

2. External Exposure Control

Dose rates up to 1.5 r/hr were received by personnel performing rupture discharge activities. The maximum reading observed on a pigtail associated with a rupture was 35 r/hr. Following rupture discharge in both instances during the month fission gas, to a maximum of 45 mrads/hr. was encountered in the storage area.

The highest dose rate received by personnel was 2.5 r/hr. during tube replacement work on problem tube 3666-DR.

A maximum dose rate of 1730 mrem/hr including 1250 mrem/hr due to neutrons was found coming from E hole on X-1 level following a reactor start-up.

3. Contamination Experience

Three cases of skin and one of hand contamination were experienced. The maximum contamination involved was 40,000 c/m on the chest of a Supplemental Crews employee and resulted in the reported lapse of control.

Somewhat higher contamination levels encountered during tube replacement work resulted in one instance of an over-limits air sample out of a total of 73 taken during the month. The sample activity was 6.9×10^{-8} uc/cc and resulted in fresh air protection until the condition was corrected.

E. Events Influencing Costs

Overtime usage rate was 2.7 percent. Controlled unit cost is expected to show some improvement over February.

D-DR POWER OPERATION

A. Operating Experience

Normal process water flow and pressure was maintained approximately 82.4 percent of the time to 105-D Reactor and approximately 80.5 percent of the time to 105-DR.

A surge occurred on the export system on March 28 when the Groves Valve in 100-D Area opened up due to the water level being low in the north high tank.

The average evaporation rate for the month was 7.73 pounds of steam per pound of coal. The steam generating load was 92,100 pounds per hour average, and 141,600 pounds per hour maximum.

In order to maintain water quality during March it was found necessary at each filter plant to increase chemical feeds and reduce filter runs.

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B. Equipment Experience190-D Building**DECLASSIFIED**

No. 4 and 6 annex pump units were removed from service on March 6 and 17 to enlarge the clearance in the inter-stage seal and outboard bushing.

Installation of the power loss relay bypass circuit switches on the main control board for each pump motor was completed and placed in service on March 26.

Installation of the I.R.T. Temperature Relays on each 4500 H.P. motor by Minor Construction was completed and placed in service on March 26.

190-DR Building

Installation of the power loss relay bypass circuit switches on the main control board for each pump motor was completed on March 13. The system was placed in service the same date.

No. 3 pump unit was removed from service at 10:50 p.m. on March 14, due to vibration and excess cavitation. The unit was dismantled on March 17. The outboard impeller ring was found to have worked loose from the primary impeller. Part of suction fin was found broken from the outboard side of the impeller. The tack welds on the high pressure impeller ring were found cracked. The unit was returned to stand-by service on March 19.

No. 12 steam driven pump turbine was given a visible internal inspection on March 13. Extensive erosion was found on the following parts: diaphragm and nozzles, first and second guide blading rings, as well as the windshield tie rods. The high pressure and low pressure stage buckets were found to be in need of cleaning due to excessive deposits on the buckets. Deflector plates will be installed in the bottom and top exhaust casing of the turbine due to the extensive erosion of each half of the casing.

The impellers and wearing rings were inspected on the Numbers 1, 2, 6, and 8 pump units on March 21. It was found that the No. 8 impeller and wearing rings were in need of repairs; this unit was removed from service on March 31 for repairs. The tack welds on all of the pump impeller rings inspected were found to be cracked.

D. Events Influencing Costs

1. Maintenance costs will continue high due to:

Class "A" inspection of the 184-D NO. 5 boiler and No. 5 forced draft fan.

Installation of the 190-D-DR pump motor bypass switches.
Inspection of the 190-DR No. 12 steam driven pump turbines.
Repairs to the 183-D-DR filter hydraulic valves.
Insulating of steam lines in all Power buildings.

2. Total overtime worked by 100-D-DR Power Operation employees during the month of March was 110.9 manhours for non-exempt.

D-DR MAINTENANCE OPERATIONA. Equipment Experience1. Instrumentsa. Temperature Monitor System

Building 105-D - Thirty-five thermocouples were repaired during the month.

b. Pressure Monitor System.

Building 105-D-DR - During the month 1680 gauges in 105-D and 1265 gauges in 105-DR were adjusted during operation.

Building 105-D - Panellit gauges with a 13 to 87 lbs., trip span were installed in rows 32, 33, 34, 35, and 36.

c. Pile Control Instrumentation

Graphite stringers were removed from channels #1072-D and #3773-D. A replacement stringer was installed in channel 1072-D.

d. Miscellaneous Instrumentation

Building 105-D - A six-point selector switch was devised and installed on the Bristol Process Water Temperature recorder which monitors the A and B header inlet temperatures, the near and far loop header outlet temperatures, and the bulk outlet water temperature. Before installation of the switch, it took from 8 to 12 minutes to get hourly readings. All readings can now be taken and recorded in approximately one minute.

Building 183-D - Four Model Rx ph meters in the 183-D Headhouse Lab were replaced with Model W meters.

Building 190-DR - Water-level controllers were put in service on the 105-DR high tanks.

2. Electrical

The red indicator lights on the graphic control panel have been replaced with ET-5 lights to prevent tripping the pump motors in case the indicator lamp accidentally shorts out.

3. Mechanical

Buildings 183-D-DR - A Palmer sweep arm was purchased so that a damaged arm may be changed out and the filter returned to service within thirty minutes. During the period of dirty river water, this time element is very important.

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3. Mechanical (cont'd)

Work was started on the installation of steel doors replacing several deteriorated wooden doors throughout the area.

B. Maintenance Shift Activities

The Maintenance Shift Crews spent 96% of their time in 100-D Area, the balance of which was spent on tube replacement in 100-B Area.

C. Maintenance Engineering and Planning and Scheduling

1. Instrument Engineering

DR-Oxygen Analyzer

Installation of the panels and valves are complete. The piping is complete with the exception of connecting the sensing lines to the gas pipe in the tunnel.

Vacuum Stabilizer

A vacuum stabilizer is being developed for use with the vacuum pump on the helium leak detector in order to eliminate failure caused by pressure changes and water vapor in the vacuum line.

2. Electrical Engineering

105-D Emergency Alternator

A new design is being prepared for the control circuitry of the emergency generators.

#1 Safety Circuit Intertie Circuits

Design Change 199 provides for removal of the automatic scram feature of the intertie. Annunciation is retained. The design change has been issued and the scram contacts jumpered out. Removal of components made obsolete by this change will be accomplished as outage time permits.

3. Mechanical Engineering

Improve Ball 3X Recovery Equipment

Recommendations have been prepared for ball removal improvements. A new tip attached to 50' of plastic pipe was used to retrieve a channel of balls at 105-DR. The balls were removed in 30 minutes at a vacuum of 14 inches.

105-DR Building Settlement Problems

- a. Work in the near downcomer is awaiting delivery of the vibration sensing elements.
- b. The area outside the 0' level was excavated to a depth of approximately 15 feet by Minor Construction. No leaking lines were found but there were indications of settlement around the lines. The hole was backfilled and the cement slab was replaced.
- c. The Transfer area drainage system was tested and leaks badly. Excavations of the lines is underway.

Access Hole From Top of Unit to Rear Face Thermocouple Catwalk

Personnel working on the thermocouple catwalk in the rear face at D-DR have no means of exit in case of fire or high radiation conditions if the rear elevator is down. A means of emergency exit is needed. Cement blocks have been removed from a 24 x 32 inch space through the rear wall to the top of the unit at 105-D. A door with CM relay interlock will be installed. The problem at 105-DR is being studied.

D. Events Influencing Costs

On March 3, the D-DR Maintenance force was reduced by four people due to a planned reduction. One supervisor is still off the payroll while recovering from major surgery.

J. H. Brown

Manager,
D & DR REACTOR OPERATION

JH Brown/WLS/bc

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F REACTOR OPERATION
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I. ORGANIZATION AND FUNCTIONS

The reorganization of the Administrative function was completed on March 1 and the exempt personnel of this group was reduced from three to two employees. The Manager of Radiation Monitoring was reassigned as Analyst - Radiation Monitoring reporting directly to the Manager - Processing also effective March 1.

II. PERSONNEL

A. Force Report

	<u>February 28</u>			<u>March 31</u>			<u>Net Change</u>
	<u>E</u>	<u>NE</u>	<u>Total</u>	<u>E</u>	<u>NE</u>	<u>Total</u>	<u>of Total</u>
General	4	2	6	3	2	5	-1
Processing	14	29	43	16	29	45	+2
Power	8	56	64	8	56	64	0
Radiation Monitoring	4	11	15	2	10	12	-3
Maintenance	<u>14</u>	<u>75</u>	<u>89</u>	<u>15</u>	<u>74</u>	<u>89</u>	<u>0</u>
Total	44	173	217	44	171	215	-2

B. Movement of People

M. L. Smith, Analyst - Radiation Monitoring, transferred to H Reactor Operation effective March 1, 1958.

C. A. Simsen, Engineer - Electrical, transferred to F Maintenance Operation from FEO effective March 1, 1958, to fill the vacancy created by the earlier transfer of an electrical engineer from F Maintenance to FEO.

III. PERSONNEL ACTIVITIES

Thirty non-exempt employees attended three Conference Table Meetings conducted by C. N. Gross, Manager - F Reactor Operation.

One rotational Technical Graduate on assignment to F Maintenance Operation transferred out. No Technical Graduates are presently assigned to F Reactor Operation.

Twelve exempt employees attended IPD training courses.

Nineteen non-exempt employees attended craft training courses.

S. L. Nelson was guest speaker on the subject "Current Radiation Problems" at a Plant and Industrial Engineering safety meeting.

W. G. Westover and W. G. Howell delivered lectures on "Control of Radioactive Contamination" in the Radiation Protection training course.

Three exempt employees enrolled in the Communication Training Course for first-line supervisors.

Eight F Reactor Operation employees attended the Top Secret Work Shop.

IV. SAFETY AND SECURITY

A mass safety meeting was held for all 100-F Area employees with Mr. C. R. Powell, representative of the Lehigh Safety Shoe Company, as the principal speaker. Approximately 200 employees attended.

There were no disabling injuries and no security violations reported. Eleven medical treatment injuries were reported.

V. NONROUTINE REPORTS ISSUED

None

VI. INVENTIONS AND DISCOVERIES

All persons engaged in work that might reasonably be expected to result in inventions or discoveries advise that, to the best of their knowledge and belief, no inventions or discoveries were made in the course of their work during the period covered by this report. Such persons further advise that for the period therein covered by this report, notebook records, if any, kept in the course of their work have been examined for possible inventions or discoveries.

VII. COMPONENT ACTIVITIES

GENERAL

A. Administration Activities

The Plant Administration Operation was discontinued as a level IV component on March 1. The activities of this function were reassigned to the Specialist - Manufacturing Administration and the Specialist - Administrative Programs.

Revised position guides for Manager - Processing Operation, Processing Supervisor I and Specialist - Reactor Operation were reviewed and comments submitted.

Assistance was provided the level IV managers in developing exempt Personnel Inventories.

Suggestion Plan statistics:

Received for evaluation	36
Evaluated and returned	50
Awaiting action	8

Approximately 2,000 man-hours was expended on seasonal painting by the Central Maintenance paint crew in 100-F Area during the month of March.

A survey of automotive and heavy mobile equipment assigned to F Reactor Operation resulted in the return of excess equipment to Relations and Utilities Operation for reassignment and reduced monthly rental charges by approximately \$600 per month.

The first of a series of posters designed to promote an awareness of costs on commonly used items was posted throughout 100-F Area.

C. Landlord Activities

Renovation and painting improvements continued throughout the month in connection with the cycle painting program.

Arrangements were made for spray material and equipment for the seasonal weed control program. Also, a determination was made of areas to be sprayed for control of weed growth.

F PROCESSING OPERATION

A. Production

F Reactor production was 112.6 per cent of forecast during March. Time operated efficiency was 76.7 per cent. Production was above forecast due to high level efficiency. Previous maximums in level and daily input production were exceeded by five and one units, respectively. The reactor operated on nominal 975 KW tube power limits during the month.

B. Operating Experience

1. Operating Continuity

<u>Outage Date</u>	<u>Outage Hours</u>	<u>Reason</u>
3-3-58	103.7	Scheduled charge-discharge, tube removal and maintenance.
3-7-58	2.2	Investigation of high temperature - pressure tube.
3-8-58	0.4	Valving error during PCCF operation.
3-16-58	<u>67.1</u>	Leak testing, charge-discharge.
TOTAL	173.4	

2. Equipment Experience

Water Leaks - The reactor was shut down on March 16 for leak testing and subsequent removal of two tube and one Van Stone leakers. Water collection rates before and after the outage were favorable with the rate at month end being approximately 20 gallons per day. During the month, the feasibility of injecting silicone sealant between tube and gun barrel was successfully demonstrated on two tubes and one sliding gun barrel adapter was installed. Additional development testing is scheduled in April.

Tube Removal - A total of 37 process tubes were installed during the month including 23 of 38 probologged for external corrosion. Replacement is continuing on a selected tube basis.

C. Improvement Experience

1. Production Tests

Production Test IP-98-I, "Revised Tube Charge Pattern for Graphite Annealing" - Charging with 34 pieces below row 38 is 78 per cent complete (an additional 11 per cent are loaded with 33 pieces). Operating experience continued to be favorable.

Production Test IP-25-A, "Graphite Burnout Monitoring Program" - Irradiated samples in channel No. 3580 were discharged and new samples recharged. In addition, two channels were mined for stored energy studies as per special request.

Process Test MR-105-31, "Process Tube Sliding" - The remaining five tubes equipped with special rear "O" ring adapters were returned to normal status due to deterioration of the neoprene seals.

2. Projects

CG-707, "Improved Nuclear Instrumentation" - "Stop-gap" period meter equipment was installed and has operated satisfactorily to date.

Work continued on CG-705, "Improved Rod Water Instrumentation", and CG-666, "Zone Temperature Monitoring".

3. Other Improvements

Rear Face Maintenance - Major rear face maintenance is currently in progress to improve shutdown efficiency. Planned work includes extensive lighting revisions, coating rear wall, cab removal, cleaning out chute area and tagging nozzles. Work is approximately 60 per cent complete.

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D. Radiation Monitoring Activities

1. Radiation Occurrences

No radiation incidents or lapses of control were incurred this month.

2. External Exposure Control

No exposure of personnel to radiation activity levels in excess of 3 r/hr occurred this month. Much of the total exposure incurred was received in the discharge area during reactor outages in a background of around 150 mr/hr and on the charge face during operation of the poison column facility at rates around 35 mrem/hr.

Underwater monitoring of irradiated poison charges served to significantly reduce exposures formerly encountered during their recovery on the wash pad.

3. Contamination Experience

Two instances of personal skin contamination to a maximum level of 4000 c/m were both readily reduced to background levels. There were no instances of personal clothing contamination and no contamination spread outside of regularly established radiation zones.

Approximately five (5) acres of ground area surrounding the 1608 crib facility were surveyed and released from a radiation zone status.

Repair of front face gas leaks last month was effective with no indication of gas activity being detected during charge face operations. All air samples taken during the month were below applicable maximum permissible concentrations.

F POWER OPERATION

A. Operating Experience

1. The river elevation varied between 365.2 and 368.2 feet; turbidity varied between 11.0 and 47.0 ppm. The average chemical feed was 6.3 ppm alum and 11.5 ppm sulphuric acid. Separan feed was required throughout the month with varying feed from .009 to .030 ppm. Specified quality water was maintained without difficulty.
2. An operating error in the 151-F substation at approximately 2:40 p.m. during a scheduled outage on March 6, caused the front 13.8 kv bus in the 151 Building (Substation) to be de-energized which resulted in a 5 psi drop in process water pressure and the loss of electrical supply to approximately 50 per cent of operating equipment including 190 Annex process pumps. All emergency equipment

functioned as per design. Normal shutdown operating conditions were re-established at 2:50 p.m.

B. Equipment Experience

1. 190 Tank Room

The final tie-in of the 190 process storage tank by-pass headers to the 36-inch process water header was completed on March 7. This released equipment in 185 Building for removal.

2. 190 Building Annex

Routine slip ring and carbon brush inspections were completed on March 6, to all 4500 hp motor slip ring assemblies.

The gear driven oil pump for No. 3 process pump was removed for inspection and repairs by Maintenance forces on March 4, because of excessive gear noise during normal operation. A complete new oil pump assembly was installed.

190 Annex Cone Valve Seating Assembly Repairs - The replacement of seating stopscrew, resetting of seating torque and unseating limit were completed to No. 5 valve on March 6, and to No. 7 valve on March 12. It was necessary to redrill holes in seating quadrant to obtain correct seating travel on No. 5 valve.

C. Improvement Experience

1. Project CG-558 Completion

190 Annex Process Pump Interstage Seal and Bushing Modification

Modifications were completed to No. 7 unit on March 18. It was necessary to replace first stage impeller wheel with a rebuilt wheel because wheel ring dowel pins were found sheared and threads damaged. Tapered dowel pins were enlarged from size No. 6 to No. 7. In addition, first stage inboard wheel ring was rack welded to impeller wheel. Second stage impeller wheel rings were retightened and redoweled with the larger size pins. Pump was placed in service on March 19.

Completed work on No. 5 unit on March 26. It was necessary to replace first stage impeller wheel with a new wheel because of damaged threads. The larger dowel pins were installed on first stage wheel rings and the second stage wheel rings were tightened and redoweled. Pump was placed in service on March 27.

Modification of 183 Process Pump Impeller Wheels

The rotating assembly for No. 3 process pump was removed from casing on March 25, and sent to White Bluffs Machine Shop. The leading edges of impeller blades are being modified by Construction forces to reduce cavitation.

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2. Other Improvements

Installation of an instrument at 181-F Building to record river water level was completed on March 10.

The relocation of necessary instruments from 185 Control Room panel to a smaller panel located in 190 tank room was completed on March 14.

The relocation of dichromate injection pump from 185 Building to a central location in 190 tank room is approximately 15 per cent completed.

Installation of emergency Lightalarm battery lights was continued and is 35 per cent completed.

Tele-talk system between 190 Control Room and 151 Building Substation was completed on March 5.

D. Events Influencing Costs

Chemical treatment costs will increase approximately 7 per cent over previous month because of seasonable changes in raw water quality.

Maintenance costs will remain above normal because of the seasonal painting program, replacement of 184 brine pit wooden hatch covers with metal covers.

F MAINTENANCE OPERATION

A. Equipment Experience

1. Electrical

The modification of the rear face lighting system was completed.

Design Change No. 200-F, Flux Monitor-Panellit Seal Out Annunciation was installed. This system will provide a device for determining whether the Beckman Flux Monitor or Panellit System was responsible for initiating a scram of the reactor.

2. Instruments

A total of 65 reactor thermocouples failed during the month. Six of these failures consisted of the second failure within a four-month period. The total number of repeat failures since December 1, 1958, now number seven.

Higher voltage capacitors were installed in the Beckman dual trip controller to increase the reliability of the equipment involved.

3. Mechanical

During the outage of March 3, 1958, 33 process tubes were replaced at a rate of .73 hours per tube.

New cables were installed on VSR No. 35 and 37.

The removal of No.'s 1 and 2 blower equipment from the 115-F Building has been completed.

The center section of the "C" elevator adjacent to the work area was increased in width an additional 12 inches.

A new ratchet type charging machine head has been installed on one of the charging machines for evaluation.

B. Shift Maintenance Activities

F Area crews participated in reactor outages at F, H and K Area. Area activities included the fabrication of tongs, modification to the compressed air system at 105, installation of metal handrails at 183 and fabrication of 50 gun barrel movement devices.

C. Maintenance Engineering

1. Instrument Engineering

Instrument engineering efforts were concerned with testing and development of the 105-F Oxygen Analyzer System, installation of an alternate Foxboro bulk outlet temperature element and developing details for improved performance of the dual-trip Beckman controller.

2. Electrical Engineering

Efforts were devoted to the installation and testing of Design Change 200-F, Flux Monitor-Panellit Seal Out Annunicator, continuing study of the 190 process pump motor brush wear, investigating control of the 190 cone valve operation, developing a protective control system for use with the 184-F car puller and completing a load study of the area emergency feeder.

3. Mechanical Engineering

Testing of equipment and materials for gun barrel bellows repairs was started.

The 105-F downcomer was inspected and recommendations made for installation of a bellows seal at the junction of the downcomer and the cover plate. Other activities included investigation of the stuck gun barrel problem and decontamination of rear face piping.

MANAGER
F REACTOR OPERATION

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H REACTOR OPERATION

March, 1958

I. ORGANIZATION AND FUNCTIONS

Effective March 1, 1958, the Special Maintenance Operation was combined with the Central Maintenance Operation. The consolidated function was titled the Central Maintenance Operation.

II. PERSONNEL

A. Force Summary

	<u>February 28</u>			<u>March 31</u>			<u>Net Change</u>
	<u>E</u>	<u>NE</u>	<u>Total</u>	<u>E</u>	<u>NE</u>	<u>Total</u>	<u>of Total</u>
General	1	1	2	1	1	2	0
Plant Adm. Oper.	4	2	6	4	2	6	0
Processing Oper.	14	28	42	15	39	54	+12
Power Oper.	10	58	68	10	57	67	- 1
Radiation Mon. Oper.	3	11	14	2	0	2	-12
Maintenance Oper.	15	73	88	15	71	86	- 2
Central Maintenance Oper.	11	69	80	19	108	127	+47
Special Maintenance Oper.	9	41	50	0	0	0	-50
	<u>67</u>	<u>283</u>	<u>350</u>	<u>66</u>	<u>278</u>	<u>344</u>	<u>- 6</u>

B. Movement of People

Effective March 1, 1958, D. C. Keck, Manager, H Maintenance Operation was transferred to Expansion Operation, Facilities Engineering Operation as Senior Project Engineer. N. H. Skarshaug, Manager, Central Maintenance Operation was reassigned to Manager, H Maintenance Operation. M. H. Meuser, Manager, Special Maintenance Operation, was reassigned to Manager, Central Maintenance Operation.

M. L. Smith, Analyst, Radiation Monitoring Operation was transferred to H Processing Operation.

B. J. McMurray, Supervisor, Radiation Monitoring was transferred in the same capacity to K Radiation Monitoring Operation.

Nonexempt personnel movement during March included eleven transfers in, fifteen transfers out and one termination.

III. PERSONNEL ACTIVITIES

Twenty-four exempt employees attended five training courses.

IV. SAFETY AND SECURITY

There were no disabling injuries, serious accidents or security violations during the month.

Sixteen medical treatment injuries were reported.

V. NON-ROUTINE REPORTS

None issued.

VI. INVENTIONS AND DISCOVERIES

All persons engaged in work that might reasonably be expected to result in inventions or discoveries advise that, to the best of their knowledge and belief, no inventions or discoveries were made in the course of their work during the period covered by this report. Such persons further advise that, for the period therein covered by this report, notebook records, if any, kept in the course of their work have been examined for possible inventions or discoveries.

VII. COMPONENT ACTIVITIES

H Plant Administration Operation

A. Administrative Activities

Current exposures were obtained on all IPD pipefitters, millwrights, and mechanical supervisors, and recorded on a linedex. This is the first step in setting up a centralized control for maintaining current exposure records and rotating personnel in these critical classifications to lower exposure work as they reach predetermined limits.

Arranged the necessary nonexempt personnel moves and issued transfer papers as required by the combining of the Radiation Monitoring function with the individual Area Processing Operations.

Preliminary details, including revised position guides and position evaluations were prepared during the month for reorganization of the Plant Administration Operation from a fourth level component into three specialists reporting directly to the Manager, Reactor.

Coordinated preliminary planning for all third level components within 100-H Area directed toward an area-wide participation program during Spring Clean Up Week, April 7 to 11.

Guided the preparation of Personnel Inventory sheets for all components of the Operation.

Revised and submitted for issue a revised functional organization chart for the reorganized Central Maintenance Operation.

B. Landlord Activities

Remodeling of 1761-H Building to accommodate the Mail and Duplicating Operation continued during the month.

Initial planning on moving Production Scheduling Operation from 105-H Building to 1709-H Building was started.

Final review of the 100-H Area Landlord property painting requirement for CY 1958 was made, and required work orders were issued to Central Maintenance Operation. The paint crew is scheduled in 100-H Area during April.

The revised scope document for rewiring 1760 and 1761-H Buildings was reviewed and an agreement was reached with Utilities Engineering Operation on further modification of scope.

Approval was given to Facilities Engineering Operation to eliminate the 1703-H Building from the project proposal to install a sprinkler system in the 1760, 1761, and 1703-H Buildings.

C. Radiation Training

The "Processing Supervisor Radiation Protection Training Program" continued during March. It is 60 per cent complete.

Two series of Radiation Monitor training programs were started during the month. One group of seven monitors completed the program on March 28.

The quarterly series of three meetings for IPD exempt personnel on "The IPD Radiation Protection Program" was completed.

H Processing Operation

A. Production

Input production exceeded the forecast by 1.7 per cent. The record power level was increased 15 units because of improved flattening.

Equilibrium power levels were governed by the administrative limit of 1440 MW.

B. Operating Experience

1. Operating Continuity

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

<u>Day</u>	<u>Hours</u>	<u>Reason</u>
10	75.4	Scheduled outage for charge-discharge, tube replacement, and tube leak testing.
15	0.5	Scrammed when compressors failed to provide instrument air because of blown fuses.
19	23.7	Scrammed by a solid E rupture in tube 0871-H.
22	20.1	Removal of a solid regular rupture in tube 1660-H.
23	3.1	Removal of a solid E rupture in tube 0565-H.

Day	Hours	Reason
24	20.4	Removal of a solid regular rupture in tube 3489-H.
30	0.4	Unexplained Panellit trip on row 09.

2. Equipment Experience

- a. Ruptured Slugs - Five ruptured slugs were experienced this month: two solid E's in tube 0871-H, one solid E in tube 0565-H, and solid regulars in tubes 1660-H and 3489-H. All of the ruptures were "hot spot" failures opposite the ribs. Investigation of rib orientation, nozzle alignment, and temperature history revealed no plausible reasons for these ruptures.
- b. Water Leaks - Two rear van stone flange leaks were detected and corrected this month. One was caused by an improper gunbarrel setting, and the other was caused by a poorly formed flange.

C. Improvement Experience

1. Oxygen Analyzer - This instrument was in service and operating satisfactorily at month end. Preliminary efforts to lower gas pressure, as allowed by the oxygen analyzer, have resulted in gas savings of 3000 cu.ft. a day.
2. Ball 3X Vacuum System - A thermostatic-type valve was installed in this vacuum system to admit water into the vacuum pump as required to maintain the discharge air temperature within acceptable limits. This improvement permits continuous operation of the pump at vacuums up to 22-inches Hg. and, in turn, more efficient ball recovery.

D. Radiation Experience.

1. Radiation Incidents

The H Reactor Operation was responsible for four lapses of radiation control this month. None involved an overexposure of personnel.

Two lapses resulted from the improper storage of excessively radioactive poison slugs. One involved an employee who entered a radiation zone without the required amount of protective clothing, and the fourth was a case of skin contamination from an unknown source.

2. Contamination Control

Despite the four ruptured slug outages experienced this month, contamination control was very good. Extensive decontamination efforts on the reactor top have relieved the airborne contamination problems within the building.

E. Events Influencing Costs

Overtime requirements for the month were 185.4 hours. Essentially all this extra coverage was for radiation monitoring.

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H Power Operation

A. Operating Experience

The bottom section of the stem on No. 1 by-pass valve in 190-H Annex broke on March 24, damaging the valve seat. Since this is the second failure in 190-H Building within a short time, Project Engineering Operation has been contacted regarding the feasibility of reversing the direction of flow through this valve. No adverse operating conditions were experienced in the failure of No. 1 valve.

The burning of Mountain States coal was discontinued on March 17 on the basis of evidence that this coal will not pick up fast enough if an emergency full load is placed on the boilers.

The normal steam generating rate was 45 M lbs/hr with an average of 42.2 M lbs/hr. An evaporation rate of 6.68 pounds of steam per pound of coal was attained.

Water treatment coagulant dosage rate averaged 5.9 ppm with an addition of 0.009 ppm Separan. Raw water turbidity averaged 24 ppm.

Analytical Laboratories performed routine control services and special analyses on 84 essential material samples, 46 water samples, 47 process control samples and one special sample.

B. Equipment Experience

The inboard end bell on the 183-H Building high tank pump motor was replaced on March 7, correcting the oil leakage problem. Defective oil splash baffles on this unit have been a constant maintenance problem since the initial installation.

An access platform was installed adjacent to the water gauge glasses on all boilers, eliminating a safety hazard from falls and dropping hand tools.

A prototype stoker line shaft starter was installed on No. 1 boiler on March 21. The installation proved successful and will be installed on the remaining boilers. This action was recommended by the investigating committee of near serious injury No. 58-1.

Individual 190-H Annex motor by-pass switches for the power loss circuit were installed and placed in service on March 12.

The running assemblies from 190-H Annex pump units Nos. 2, 4, and 6 were removed for repairs and modifications in the White Bluffs shops. In practically all units the wheel wear rings were found to be loose, thereby damaging the threads of the impeller hub.

C. Improvement Experience

Correction of Project CG-558 exception list items was completed during March.

D. Events Influencing Costs

Items adversely affecting costs are: 190-H Building air receiver repairs, 190-H Building turbine guard valve replacement and steam condensate return line replacement in 182-H Building.

H Maintenance Operation

A. Instrument Maintenance

Removed bezel plates from Panellit boards for inspection and leak detection. The Panellit board was in good condition. Nine leaking gauges were found and corrected, 26 gauges were oil dampened, No. 3 panel was base checked, and one faulty Hoke valve was replaced. All units functioned properly during a high and low-trip check of the panels.

B. Electrical Maintenance

Installation of individual by-pass switches for the 190-H Annex process pump motors has been completed. This permits removing an individual unit from the scram circuits for checking.

C. Mechanical Maintenance

During the outage of March 10, 1958, the KAPL 120 high pressure valve was repaired by replacement of upper half of valve body and installation of flange in the line.

Replaced 12 process tubes during the March 10 outage at a rate of 1.31 hours per tube. Later in the outage, two tubes, 4164-H and 1183-H, were found to have faulty van stones and were replaced.

Of the four ruptures during the month, one, 3489-H, required maintenance assistance. The downstream tube ribs were removed to free rupture and allow removal with the pushing machine. The tube was replaced.

D. H Maintenance Engineering

1. Instrument Engineering

Authorization has been given for installing a graphite thermocouple stringer in channel 2577-H. The design of this stringer is complete and incorporates many of the improvements resulting from the experience of stringer installations in other reactors. The new stringer thermocouples will be monitored by the existing graphite temperature instrumentation in the Control Room.

2. Manual Writing Activities

During March, the electrical Manual Writer prepared write-ups and sketches for (1) commutator and brush maintenance; (2) instructions on adjusting D and C elevator solenoid brakes; (3) testing of protective relays; and (4) one-line diagrams of 181-H Building 2400 volt

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ground indicating circuit.

As-built data was collected for D elevator and for conduit risers in near-side stairwell at 105-H Building. In addition, a design change sketch was prepared for the rotor removal bridge at 190-H Annex.

3. Drafting

Electrical - Electrical drafting activities for March included field checks on D elevator for as-built information and modification of Sheets 8, 9 and 10 of BPF No. 649 to reflect changes found. In addition, drawings P-1748 and P-1749 were completely as-built for 1717-H Building.

Mechanical - Three weeks of March were spent in drawing the newly designed overhead charging machine.

Central Maintenance Operation

A. Hot Shop

1. Major accomplishments consisted of reworking tools for the tube program including:

131 splitters; 63 broaches; 18 broach spirals; 14 splitter starters; 56 splitter blades, as well as a variety of other tools in quantities under 10 per item.

2. VSR work for H & DR Reactors consisted of stripping and installing new components in four hot VSR's, and machining 15 sleeves.
3. Machined 244 rear face cap inserts for D Reactor.
4. Reamed 119 nozzles for K and 169 for B, F and H Reactors.

B. Machine Shop

Major accomplishments consisted of modifying 350 TC wells for B Reactor, metalizing two shafts for 100-K Area river pumps, machining three TC stringers, and fabricating three charging heads and mounting yokes for D Reactor charging machines.

C. Metal Fabrication Shop

Major accomplishments were fabricating and installing a S/S hood at K Reactor, seven hoods and duct work in 108-F Building, and fabricating 40 gunbarrels for spare parts.

D. Special Maintenance

1. <u>Work Order Data</u>	<u>February</u>	<u>March</u>
a. Active work orders	56	57
b. Mandays loaned to other components	78	93
c. Unexpended labor dollars	\$ 471,379	539,984

The increase in unexpended labor dollars can be primarily attributed to Panellit gauge work orders for D Reactor, a project work order for work on project CG-706, and additional funds for work on the Charge-Discharge program.

2. Project Activities

a. CG-558 - Water Expansion Program - B, D, F and H Reactors

Toggle valve stem work was completed in F Reactor. All committed items have now been completed.

b. CG-666 - Zone Temperature Monitoring - All Areas

Electrical work continued at B, D and DR Reactors. Fabrication of RTD's was started.

c. CG-707 - Improvements to Nuclear Instrumentation - All Reactors

All conduit runs were completed, however, no wire was pulled in D or F Reactors. Temporary neutron monitoring installations were completed in C, DR, B, F and H Reactors. Modifications are being made to recorders. Piping installations are continuing in D, KW and KE Reactors.

d. CG-708 - Additional VSR's - KE/KW Reactors

Nine VSR step plugs and housing assemblies were completed and partially moved to the job site, to be ready for installation during the next outage. All VSR channels were inspected and found to be clear. All floor plate work in KE Reactor was completed.

E. Special Services and Engineering

Simultaneous tests were conducted on old and new style broaches, during an H Reactor outage. The superiority of the new style broaches was definite. These broaches were fabricated of solid carbide, after a pattern designed by G. E.'s Carbology Department.

F. Events Influencing Costs

At the present time, the liquidation rate has been set for the entire component, at 125 per cent.

Manager
H Reactor Operation

RT Jessen:HCS:met

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KE-KW REACTOR OPERATION MARCH, 1958

I. ORGANIZATION AND FUNCTIONS

The responsibilities and functions of the KE-KW Radiation Monitoring Operation were transferred to the KE and KW Processing Operations. Coincident with the transfer of functions was the reassignment of Radiation Monitoring personnel.

II. PERSONNEL

A. Force Summary

	<u>February 28</u>			<u>March 31</u>			<u>Net Change</u>
	<u>E</u>	<u>NE</u>	<u>Total</u>	<u>E</u>	<u>NE</u>	<u>Total</u>	<u>of</u> <u>Total</u>
General	1	1	2	1	1	2	0
Plant Admin. Oper.	3	1	4	3	1	4	0
KE Processing Oper.	16	30	46	18	40	58	+12
KW Processing Oper.	14	31	45	17	39	56	+11
Power Oper.	13	72	85	13	72	85	0
Rad. Mon. Oper.	4	19	23	--	--	--	-23
Maintenance Oper.	24	127	151	23	127	150	- 1
Supp. Crews Oper.	<u>11</u>	<u>62</u>	<u>73</u>	<u>11</u>	<u>61</u>	<u>72</u>	<u>- 1</u>
	<u>86</u>	<u>343</u>	<u>429</u>	<u>86</u>	<u>341</u>	<u>427</u>	<u>- 2</u>

B. Movement of People

J. G. Myers, Manager, KE-KW Radiation Monitoring Operation, assumed the duties of Analyst, Radiation Monitoring, KE Processing Operation.

R. M. Nelson, Analyst, KE-KW Radiation Monitoring Operation, assumed the duties of Analyst, Radiation Monitoring, KW Processing Operation.

S. H. Hulett, Supervisor, Radiation Monitoring, KE-KW Radiation Monitoring Operation, assumed the duties of Supervisor, Radiation Monitoring, KE Processing Operation.

L. M. Ostby, Supervisor, Radiation Monitoring, KE-KW Radiation Monitoring Operation, assumed the duties of Supervisor, Radiation Monitoring, KW Processing Operation.

B. J. McMurray, Supervisor, Radiation Monitoring, H Radiation Monitoring Operation, was transferred to KE-KW Radiation Monitoring Operation in the same capacity, and subsequently transferred to KE Processing Operation as Supervisor, Radiation Monitoring.

Changes for the month included 50 transfers in, 47 transfers out, one reactivation, two deactivations, one retirement, and three terminations.

III. PERSONNEL ACTIVITIES

J. C. McLaughlin visited the Detroit-Edison Company in Detroit, Michigan, on March 25, and attended the American Power Conference in Chicago, Illinois, on March 26, 27 and 28.

R. J. Bursey participated in the first meeting of the task force, formulated to evaluate IPD training needs and to develop a revised training program.

B. H. Johnson visited the Hammel-Dahl plant in Providence, Rhode Island, concerning problems on dump valves supplied by this vendor and used in 1706-KER.

L. P. Reinig visited the Lewis Engineering Company in Naugatuck, Connecticut, and their subcontractors in New Britain, Connecticut, and the Rockbestos Products Corporation in New Haven, Connecticut. The trip was in connection with specifications and delivery dates of lead wire bundles and resistance temperature detectors.

K. A. Jones, Traveler's Insurance Company, completed a third-party inspection on Number 1 boiler in 165-KE.

E. E. Weyerts, E. H. Kolts and R. L. Olsen attended a meeting with W. E. Saman, of the ASME, relative to pressure vessel problems.

IV. SAFETY AND SECURITY

No disabling injuries or security violations were experienced during the month.

Eighteen medical treatment injuries were incurred for a frequency rate of 2.46.

The IPD Central Health, Safety and Security Council meeting was conducted in 100-K by the General Manager on March 11.

V. NON-ROUTINE REPORTS

None.

VI. INVENTIONS AND DISCOVERIES

All persons engaged in work that might reasonably be expected to result in inventions or discoveries advise that, to the best of their knowledge and belief, no inventions or discoveries were made in the course of their work during the period covered by this report. Such persons further advise that, for the period therein covered by this report, notebook records, if any, kept in the course of their work have been examined for possible inventions or discoveries.

VII. COMPONENT ACTIVITIES

KE-KW PLANT ADMINISTRATION OPERATION

A. Administrative Activities

In addition to routine duties assigned to the Operation, the following were the major administrative activities of the month:

A study of the limiting factors of KE-KW Reactor Operation facilities was initiated as an aid to long-range planning.

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Arrangements were made for a meeting between the Personnel Manager of the Detroit-Edison Company and J. C. McLaughlin. The purpose of the meeting was to obtain information relative to the personnel hiring and training practices of the Detroit-Edison Company.

A series of meetings with exempt personnel was conducted by R. J. Bursey, using "brainstorming" techniques to obtain their ideas on methods to increase productivity. The ideas obtained are in the process of evaluation for possible application.

Arrangements were made to conduct a promotional program for increased participation in the G.E. Stock Bonus Plan.

Forty-three suggestions were received during the month for evaluation. During this period, evaluations were completed on twenty-one suggestions and recommendations were submitted to the Suggestion Board. A follow-up meeting was held with the plant suggestion evaluators to review the present ground rules in the interests of increased efficiency. G. V. R. Smith, IPD Suggestion Plan Administrator, also attended.

The names of candidates were submitted for enrollment in the Supervisory Selection Program.

B. Personnel Development

Dr. R. F. Foster of the aquatic Biology Operation was guest speaker at the monthly exempt information meeting. Sixteen K Plant exempt people attended. Dr. Foster discussed the purpose of the fishpond facilities and the results of recent tests conducted by the Operation.

R. J. Bursey conducted a series of dictation training sessions for exempt personnel.

Attendance to IPD Training Courses was as follows:

Effective Business Writing:	JT Baker, PE Lindstrom
Financial Operation Orientation:	LB Brown, GE Greger, TM Hall, CE Jones, GF Thomas, EC Wood, AP Vinther
Communications Course:	RC Theil, HC Crose, RJ Bursey
First Aid:	KW Murray, CD Kelly
PMS & Leadership:	RL Olsen
Understanding People:	AP Vinther, LB Brown
TS Workshop Training:	RS Bell, RJ Bursey, JT Baker, JHM Miller, RG Francis

C. Cost Control Activities

The monthly cost meeting was held on March 12. A report indicating savings achieved was submitted to the Cost Reduction Program group.

Budgets were prepared for the Landlord and Radiation Monitoring budgets for FY 1959 and 1960 in cooperation with the Estimating and Budgeting Operation.

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Special Equipment Requests were submitted to the Transportation Operation, Relations and Utilities, as justification for the purchase of equipment from FY 1958 budgeted funds. The equipment is to be assigned to K Plant on a rental basis.

D. Landlord

Changes of office occupancy were coordinated between Radiation Monitoring, Maintenance and Reactor Physics Operation personnel.

Arrangements were made for emergency repairs to a broken fire hydrant line.

Three Excavation Permits were processed during the month.

KE PROCESSING OPERATION

A. Production

Input production was 95.3 percent of the forecast. The reactor power level was limited to the high previously established by KW in accordance with the recommendation of the Advisory Committee on Reactor Safeguards.

B. Operating Experience

1. Operating Continuity

Reactor outages totaled 240.2 hours for the month. Operating continuity was affected by the following events:

<u>Day</u>	<u>Hours</u>	<u>Remarks</u>
1	45.1	Rupture removal outage (tube 3748) continued from February. Operation was resumed on March 2.
3	0.9	Manual scram due to lack of reactivity at turnaround.
12	77.1	Ruptured slug in tube 4967. Following rupture removal, outage time was used for metal processing.
21	38.9	Ruptured slug in tube 5088. Following rupture removal, outage time was used for metal processing.
23	0.4	Panellit scram during startup.
28	76.3	Ruptured slug in tube 2976. Following rupture removal, outage time was used for metal processing.
31	1.5	Scram during startup caused by a short circuit in temperature monitor of tube 5177. (The reactor was down at month end for a poison discharge. Outage time is included in the outage total of March 28.)

2. Equipment Experience

- a. Ruptured Slugs - Three slug ruptures occurred during the month. The charges from tubes 4967 and 5088 were removed with the charging

machine using normal discharge pressures. The charge in tube 2576 was stuck, and removal was made using the stuck slug removal procedure. A new tube was installed, pressure tested and recharged.

Fifty-one tubes of I & E² charges were discharged as rupture-prone material during the outages of March 21 and 28. The tubes had tube factors above the point at which corrosion rates are rapidly accelerated. The replacement charges were shortened to aid in keeping the tube temperatures below this limit.

- b. Process Water System - Twenty-one tubes scheduled for discharge, which had previously contained Doe charges, were borescoped to check for rib damage caused by Doe slug "chattering". Four of the tubes had evidence of rib damage and were replaced during the March 28 outage.

All front face cap inserts were removed from tubes containing I & E² charges. In addition, the inserts were removed from all tubes charged during the month to eliminate the possibility of cap inserts coming loose and stopping water flow through the interior of the I & E metal charges.

- c. Instruments and Circuitry - The installation of new type Panellit gages was completed. The coordinate light-indicating system was completed and placed in service on all panels.
- d. KER Facility - The dump valve on Loop Number 4 failed on March 6 and the loop was placed on single pass operation until March 13, when it was repaired and returned to recirculation status.

During a routine pressure test of Loop Number 1, the front thermocouple blew out at 2500 psi. A new thermocouple was installed and the loop tested satisfactorily at 3300 psi. The boiling point suppression instrument failed on Loop Number 1 on March 24 and the loop was operated on temperature and pressure trips until the March 28 outage.

C. Improvement Experience

1. Production and Process Tests

- a. PT-IP-70-A-80-MT - Irradiation of Lead Dip Canned I & E Slugs in K Reactor - The I & E loadings total 1387 in KE Reactor. To date, no metal loadings have been discharged. An I & E metal charge with a mixing slug in the charge train, and a thermocouple probe at the downstream end, was charged into tube 3450 on March 12. Tubes 1080, 2475, 3653, and 4387 were probologged on March 21, and charged with I & E material for the Production Test. A mixing slug was included in the charge for tube 3653.
- b. PT-IP-64-CE - Poison Column Displacement During Reactor Operation - The ball valve assembly was installed on the rear of tube 3287 on March 21, completing the installation of the equipment. Operation of the displacement column was satisfactory.

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- c. PT-IP-39-A - Measurement of Slug Corrosion Rates - Three tubes were charged with material for this Production Test on March 12.
- d. PT-IP-150-E - Reactor Test of Flow Adaptors for K Reactor Rear Nozzle Internal Decontamination - Eight adaptors have been installed to date. Plans were made for installation of 100 adaptors during April.

D. Radiation Monitoring Experience

1. Radiation Occurrences

Seven Radiation Occurrence Reports were processed during the month. One was classified as a Lapse of Control and concerned a radioactive particle (350 mrad/hr) on the shoe heel of an operator. No exposure to the employee was involved.

2. External Exposure Control

Discharge setups were conducted at dose rates from 50 to 200 mr/hr. Rupture removal work was accomplished at average dose rates of 500 to 1000 mr/hr. The maximum dose rate to personnel was 3 rads/hr during the rupture removal work on process tube 2576 on March 28.

Following shutdown work on the RT-3D test facility on the X-1 level, a routine startup survey indicated 36.0 mrem/hr neutrons, and 10 mr/hr gamma. Additional shielding was added.

3. Contamination Control

Contamination up to 1.4 rads/hr was spread to the grating of the charge elevator and 400 mrad/hr to the tops of the charging machines during rupture removal work. Decontamination efforts reduced the levels to approximately 25 mrad/hr at surface.

KW PROCESSING OPERATION

A. Production

Input production was 82.9 percent of forecast. The maximum level achieved in March was equal to the high achieved during July, 1957, the limit established by the AEC.

B. Operating Experience

1. Operating Continuity

Reactor outages totaled 220.4 hours. Operating continuity was affected by the following events.

<u>Day</u>	<u>Hours</u>	<u>Remarks</u>
1	30.0	Rupture removal outage (tube 4858) continued from February.
2	4.5	Panellit trip believed due to gage 4568.

<u>Day</u>	<u>Hours</u>	<u>Remarks</u> (cont'd)
3	0.4	Panellit trip on row 40.
4	29.2	Panellit trip on row 47. No specific gage was found at fault. Outage time was utilized for metal processing and maintenance work.
6	6.7	Reactor manually shut down shortly after startup because of 190-KW high lift pump difficulties.
8	26.2	Ruptured slug in tube 1552. Following rupture removal, outage time was used for metal processing and maintenance.
11	29.8	Panellit trip on row 16. Recovery attempt was unsuccessful due to a trip on the LLFP system during startup.
13	1.0	Reactor was manually scrammed to keep tube outlet temperatures within specified limits during turnaround period.
14	22.8	Ruptured slug in tube 2553. Other rupture-prone metal columns were discharged.
20	33.2	Ruptured slug in tube 3892, requiring removal of metal and tube.
22	0.9	Reactor was manually scrammed to keep tube outlet temperature within specified limits during turnaround period.
29	35.3	Ruptured slug in tube 5158. A suspect rupture in tube 5156 was discharged. Following rupture removal, outage time was used for metal processing.

2. Equipment Experience

- a. Ruptures - Four ruptures and a rupture suspect were experienced. The suspect was not confirmed by month end. Two of the ruptures and the rupture suspect contained I & E² metal. Of the ruptures, all but the rupture suspect column were stuck in the tube.

The front cap insert was found missing from rupture tube 2553 and an insert was later discovered in the pickup chutes. The decision was made to remove all front face inserts in view of the water flow restriction that might develop if an insert washed down in a tube loaded with I & E type metal. All front face cap inserts were removed from rows one through 54 and the rest will be removed as outage time is available. No measurable increase in front face radiation exposure was experienced since the removal of the inserts.

- b. Instruments and Circuitry - Four Panellit trips were experienced. Two trips were believed due to faulty Panellit gages, but only one trip was so confirmed. The two other trips were of a spurious nature and the exact cause was not established. A thorough check of the Panellit board was made during the March 11 outage.

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Two temperature monitor trips were experienced. The first trip was believed due to a rear face circuit short for tube 3658. A reactor scram resulted. The second trip occurred March 24 on tube 1456 and the exact cause is unknown.

The number of startup thermobulb circuit failures has stabilized at about 150 for each metal processing outage.

- c. Gas Usage - The gas usage was 27 percent lower than the record high experienced in February during the moisture removal period following the water leak in a reactor process tube. The March experience represents the second highest usage rate since startup.

C. Improvement Experience

1. Production and Process Tests

- a. PT-IP-70-A-80-MT, Supplement B - Irradiation of Lead Dip Canned I & E Slugs in K Reactor - The I & E metal loadings total 1369 in KW Reactor. To date, 54 I & E metal loadings have been discharged. In support of the program, the front face nozzle reaming was completed. The entire venturi zone, with the exception of special tube loadings, was equipped with the reamed front face nozzle.
- b. PT-IP-23-A - Pile Graphite Sampling - At the request of the AEC, four cores of graphite were removed from two process channels under the procedures authorized by the Production Test.
- c. PT-IP-150-E - Reactor Test of Flow Adaptor for K Reactor Rear Nozzle Internal Decontamination - Flow inserts were placed in the rear of 100 process tubes in order to evaluate their ability to reduce rear face radiation readings. A purge just before a scheduled shutdown will be necessary to evaluate the effectiveness of the insert.

D. Radiation Experience

1. Radiation Occurrences

Seven Radiation Occurrences were processed during the month. Five were classified as Lapses of Radiation Control. The responsibility for one of the lapses could not be specifically assigned and it was classified as "IPD, Unassigned". None of the lapses warranted formal investigation.

2. External Exposure Control

Discharge operations were conducted at dose rates of 50 to 150 mr/hr. The maximum personnel dose rate for rupture removal work was 1 r/hr. The maximum dose rate measured on the pigtail of a rupture tube was 100 rads/hr.

The three graphite thermocouple stringers stored in the rod storage cave were removed to the burial ground at a maximum dose rate of 1.3

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r/hr. The maximum dose rate broadside from the stringers was 500 mr/hr at 30 feet.

3. Contamination Control

The exhaust air tunnel and the exhaust air ductwork became contaminated during removal of ruptured I & E² slugs on March 30. The maximum dose rate through the exhaust fan expansion joints was 500 mrads/hr including 50 mr/hr. There was no evidence of contamination emission from the building stack.

KE-KW POWER OPERATION

A. Operating Experience

1. Number 6 High Lift Unit - 190-KW

Operation of the Number 6 unit during the month was complicated by the development of excessive and unusual bumping noises in the speed increaser gears on three different occasions. Reactor operation was effected in one instance when it was necessary to shut down the reactor since the spare unit (Number 4) was undergoing a Class "A" overhaul. The unit was removed from service for a complete inspection.

2. Atomizing Steam Controller Malfunction - 165-KW

At the completion of a routine generator acceleration test on the Number 3 generator in 165-KW on March 5, the main fires on the Number 1 boiler supplying this generator were lost apparently due to faulty operation of the atomizing steam controller when the load was being reduced to normal. The Number 3 generator was removed from service for 25 minutes to prevent undue pressure drop on the boiler. The boiler-generator combination was subsequently returned to normal operation and no delay in reactor startup resulted. The faulty controller was subsequently removed and replaced with the similar unit from the spare boiler until inspection and repairs could be completed.

B. Equipment Experience

1. Motor Control Center Number 2 - 165-KW

A 480 V breaker was installed in the spare cubicle of Motor Control Center Number 2 at 165-KW to supply service to the newly installed equipment of Project CG-743. Busses supplying all cubicles in this panel were grounded out during the installation. The Number 2 4160V/480V transformer supplying this center relayed out twice during attempts to re-energize the control center. Subsequent investigation revealed failure of the coils of this transformer. Reactor operation was not effected and repairs of the transformer were under way at month end.

2. Class "A" Overhaul Program - High Lift Units

The completion of the Number 4 unit in 190-KW on March 17 completed the scheduled preventive maintenance program on the units for this

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period of five-pump operation. Four units in each area received a Class "A" overhaul.

3. Class "A" Overhaul Program - River Dumps

The overhaul of Number 2 river pump at 181-KE was completed. Completion of the Number 5 unit was delayed due to the necessity of replacing the upper stage impeller, which was found to be cracked.

C. Improvement Experience

1. Projects

- a. CG-743 - Ventilation Improvements - 165 and 190-KE-KW Buildings -
All contract work was complete at month end including a one-hour performance test of the eight supply and four exhaust units in each area. Plans were made for completion of over-all efficiency Acceptance Test Procedures by the Chemical Processing Department air balance group in April. A final test at a period of higher outside temperatures was tentatively scheduled for June or July.

2. Others

- a. Sand Addition to Filters - The fourth and final car of sand for the 183-KE filters was unloaded on March 14 completing the program of adding approximately two inches of sand to each filter. The similar program at 183-KW was previously completed in December, 1957.

KE-KW MAINTENANCE OPERATION

A. Equipment Experience

1. Instruments

- a. Panellits - Adjustments were made to 3956 gages, with 80.7 percent of these being completed during outages.

There were 147 new type gages installed in 105-KE and 460 in 105-KW. Installed new type gages total 2578 in 105-KW. Installation is complete in 105-KE.

- b. Temperature Monitoring System - Maintenance experience of the system was as follows:

	<u>105-KE</u>	<u>105-KW</u>
Connectors replaced	9	12
Resistance elements replaced	8	--
Controller boxes repaired	12	31

Ninety-seven faulty thermohms were satisfactorily returned to service in 105-KE during reactor operation by applying a low voltage across the lead wires.

- c. Gamma Monitor System - A number of the flow regulator diaphragms of the 105-KE gamma monitor failed. Two regulators were connected as in-line and appear to be operating satisfactorily. New diaphragm materials, expected to withstand the operating temperatures as well as radiation, are under evaluation by Project Engineering. High voltage transformers failed in three units in 105-KW and were replaced.

2. Electrical

- a. Design Change 112 - Air Supply Interlock - 105-KE-KW - This design change, which prevents the operation of both supply fans simultaneously, was completed in 105-KW. The work is now complete in both 105 Buildings.
- b. Design Change 152 - Instrument Power Supply Dual Feed - The change was completed in 105-KW.
- c. Transformer Number 2 - 165-KW - The primary windings of the Number 2 transformer failed following a control center bus short circuit during installation of a feeder breaker in motor control center Number 2.

3. Mechanical

- a. Process Tubes - Twenty-one tubes in 105-KE were isolated from the water for borescoping to determine tube condition. Four of these tubes were replaced. One tube was removed for graphite mining in 105-KW and replaced.

Nozzles reamed to I & E measurements in 105-KE totaled 368. The reaming program was completed in 105-KW.

Tubes leak tested in 105-KE totaled 195. Loop 4 of the KER system was pressure tested.

- b. 1706-KE-KER - The new Chem-Pump in Elmo Loop Number 2 failed and was replaced with a spare. The parts that failed are being returned to the factory. Elmo Loop Number 7 was taken out of service for major modifications. The work includes installation of new pump to obtain KER flows for out-of-pile fuel element and corrosion tests, fabrication and installation of heat exchangers to permit thermal cycling and manifold testing, installation of additional copper constantan thermocouples and relocation of the heater element adapter to the main loop flow piping. Two new KER type tubes were replaced in the mockup.

B. Maintenance Engineering, and Planning and Scheduling

1. Instrument Engineering

- a. Temperature Monitor System - Tests completed by the Materials Development Operation have demonstrated that the lead wire insulated with Dow Corning Silastic 916 silicone successfully meets

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resistance requirements. A request was made through the AEC to the Rockbestos Products Corporation to proceed with the balance of the wire order on a delivery schedule as originally quoted by the vendor.

In preparation for the temperature monitor replacement outages, the Lewis Engineering Company has demonstrated their ability to fabricate the lead wire bundles at a rate which could utilize 100,000 feet of wire per week.

Satisfactory deliveries were made by the vendors supplying the first 1000 pieces of each of the connector components needed for the molded connector assembly. The Electro Mechanics Company has completed molds and established a manufacturing process which will permit this Company to mold connectors at a rate consistent with bundle fabrication.

On the basis of the Lewis Engineering Company's schedules of resistance temperature detector fabrication, 1000 detectors per week can be delivered beginning April 14.

2. Electrical Engineering

- a. Thermohm Lead Wire Detector - All parts of the wire detector were received and tested. This device is to be used for identifying individual conductors in a multi-conductor cable.
- b. Liquid Rheostats - Repairs to epoxy cells and slip regulators were discontinued upon recommendation by the vendor. Thirty-six new cells fabricated of Dynell epoxy resin will be supplied by the vendor.
- c. Design Change 196 - Cross-Tie Valve Control Revisions - The change providing for elimination of cross-tie pilot control valve deficiencies was approved.

3. Mechanical Engineering

- a. Process Tubes - Purchase orders were placed for rear gunbarrel bellow seals, "O" rings, retaining rings and bellows clamps. Flow adaptors were ordered for installation in one reactor. Spare parts stock for crossheader adaptors was increased.

Tools were developed by Mechanical Development "A" Operation for loosening the retaining ring and the nozzle flange, removing the nozzle flange and the old seal, and for clipping the seal clamps. Development work was begun on tools to replace new clamps, clean retainer ring grooves and loosen connector nuts.

- b. Crossheader Expansion Joint - An improved expansion joint has been designed through the combined efforts of the Process Design Operation and the Zallea Company. The design is expected to withstand higher flow rates and pressures than the bellows presently in use.

4. Planning and Scheduling

Class "A" overhauls were completed on 152 items of equipment and Class "B" overhauls on 160 items.

C. Events Influencing Costs1. Overtime Usage

A total of 452 hours was worked in KE-KW Reactor Operation as compared to 235 hours last month.

Hours worked in KE-KW Reactor Operation by K Plant personnel	344
Hours worked in KE-KW Reactor Operation by other personnel	108
KE-KW Reactor Operation requirements	452

Hours worked in 1706 Buildings by K Personnel	111
Hours worked in 1706 Buildings by other personnel	44

2. Spare Parts

Thirty stock adjustment requests were processed for 1706-KER, setting up \$157.90 worth of new items and deleting \$18,989 worth of obsolete items. Store orders were written for spare parts in the value of \$10,057, including a 181 Building traveling screen gear drive and a 181 Building pump impeller.

SUPPLEMENTAL CREWS OPERATIONA. Events Influencing Costs1. Supplemental Crews' Time Distribution

The non-exempt time distribution was as follows:

<u>Area</u>	<u>Percent</u>	<u>Area</u>	<u>Percent</u>
100-B	16	100-F	12
100-C	10	100-H	13
100-D	14	100-KE	15
100-DR	12	100-KW	8

R. S. Bell
Manager
KE-KW Reactor Operation

RS Bell:GEG:prb

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DECLASSIFIEDPRODUCTION OPERATIONMARCH, 1958I. ORGANIZATION AND FUNCTIONS

No change.

II. PERSONNELForce Summary

	<u>As of 2/28/58</u>			<u>As of 3/31/58</u>			<u>Net</u>
	<u>Ex.</u>	<u>N.E.</u>	<u>Total</u>	<u>Ex.</u>	<u>N.E.</u>	<u>Total</u>	<u>Change</u>
General	1	1	2	1	1	2	0
Prod'n Forecast'g & Sched'g	6	4	10	6	4	10	0
Reports & Statistics	2	2	4	2	2	4	0
Production Computing	3	3	6	3	3	6	0
Essential Materials	1	1	2	1	1	2	0
Total	13	11	24	13	11	24	0

III. PERSONNEL ACTIVITIES

T. Prudich began the Creative Approach training course.

M. R. Lipke (Essential Materials) essentially completed part-time training in the Reports & Statistics office to provide back-up clerical assistance for that function.

IV. SAFETY & SECURITY

All personnel attended regular safety and security meetings during the month.

Those concerned with Top Secret information also attended the Top Secret Workshops conducted by AEC-GE Security. There were no security violations. One medical treatment injury was sustained.

V. NON-ROUTINE REPORTS

<u>Doc. No.</u>	<u>Title</u>	<u>Date</u>	<u>Author</u>	<u>Class.</u>
HW-55375	Production Computing Source Flow and Temperature Data	3/18/58	DE Crouter	OUO

This document specifies the minimum required frequency of recording tube-by-tube source flow and temperature data for each reactor process tube.

VI. INVENTIONS AND DISCOVERIES

All persons engaged in work that might reasonably be expected to result in inventions or discoveries advise that, to the best of their knowledge and belief no inventions or discoveries were made in the course of their work during the period covered by this report. Such persons further advise that, for the period therein covered by this report, notebook records, if any, kept in the course of their work have been examined for possible inventions or discoveries.

The following Report of Invention was issued jointly with the Research & Engineering Operation:

"Continuous Process for Making Dilute Aluminum Sulphate Solution", by E. Bailey and R. Pitman.

VII. FUNCTIONAL ACTIVITIES

A. Production Forecasting, Scheduling and Analysis

1. Production Forecasting

Assumptions for the eighteen-month production forecast were discussed with various interested IPD personnel. Work continued on forecast preparation.

2. Production Scheduling

a. Discharge Concentrations

Discharge goal plans remained unchanged during March with one exception: The goal for cored slugs canned in Tru-Line M-388 alloy components was reduced 100 units to 400 MWD/ton as a result of recent slug rupture experience.

An increase in the amount of metal discharged below normal goals was experienced as noted below:

<u>Reactor</u>	<u>Tons Discharged Regular Uranium</u>	<u>Net Tons Excess Usage</u>	<u>Reason</u>
B	2.9	1.3	Metal displaced during charging of fringe poison.
B	7.6	2.4	Rupture-prone metal (2 ruptures in each of two lots)
C	7.6	0.6	Metal displaced during charging of the E-D load for production of high Pu-240. Losses were minimized by planned over-exposure of some metal.

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<u>Reactor</u>	<u>Tons Discharged Regular Uranium</u>	<u>Net Tons Excess Usage</u>	<u>Reason</u>
D	1.3	0.6	Metal discharged to replace corroded tubes (internal corrosion).
F	3.6	1.4	Metal discharged to replace leak-prone tubes (external corrosion).
KE	12.6	1.6	Cored slug goal reduction.
KE	14.5	5.9	Discharge of all remaining cored slugs.
KE	1.7	1.0	Tubes used for charging enrichment and temporary poison.
Totals	<u>51.8</u>	<u>14.8</u>	
<u>Enriched Uranium</u>			
KE	3.5	0.9	Top of annulus temperature calculated to exceed the critical corrosion temperature
KW	1.2	0.6	Tubes used for charging enrichment and temporary poison.
Totals	<u>4.7</u>	<u>1.5</u>	

March discharge concentrations (in MWD/T) compared with those of previous months as follows:

	<u>Regular Uranium</u>		<u>Enriched Uranium</u>	
	<u>Solid and Cored</u>	<u>I & E</u>	<u>Solid and Cored</u>	<u>I & E</u>
January	534	779	654	-
February	515	767	772	1055
March	513	740	663	893

b. Process Tube Replacement

Analysis of tube leak and out-of-pile tube inspection data of DR Reactor tubes has resulted in a decision to replace about 50 extra tubes during March and April. These tubes are in a localized area which exhibits a peculiar type of external corrosion. This decision has the effect of replacing these tubes a few months earlier than if based on internal corrosion.

c. Off-Plant Shipments

One cask of various isotopes was shipped to ORNL during March.

3. Operations Analysis

A document outlining the detailed calculation methods used in arriving at production test losses due to special irradiation work is in preparation.

Information on various phases of the zirconium process tube installation program was accumulated and detailed in a document which is being reviewed at month-end.

External corrosion of process tubes in the B and DR reactors was analyzed from the standpoint of leak-prone areas and overall replacement. The results, with suggested courses of action, were submitted as letters of recommendation to the respective Processing Operations.

Review of design "comment" prints of the NPR was continued and comments were forwarded through the H Processing Operation.

B. Production Computing

Tube-by-tube source data were processed to establish the current production and corrosion status for each tube for all reactors. Routine and emergency production data reports were issued to implement the scheduling, forecasting, and S. S. 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 Reactor Physicist for reactivity evaluations and to the Process Technology Operation for EDPM processing.

Additional tube-by-tube source data were provided for the S. S. Accountability Operation feasibility study of calculating weight quantities of S. S. materials in individual process tubes. Data for reactor discharges during January, February and March, and for February and March month-end in-reactor inventories have been provided.

The Quarterly Input and Output Production Forecast data reports were prepared. Procedures and machine programs were revised to provide the necessary detail for forecasting I & E fuel element through-put.

C. Reports, Statistics & S. S. Accountability

1. Reports & Statistics

a. Daily Reporting

Routine processing of the Daily Production Report and the Daily Operations Report in both summary and complete forms was continued.

A "Manual of Standard Practices" detailing Reports & Statistics procedures was issued.

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b. Monthly Reporting

The Combined Report of Production and Reactor Operations for February was assembled and issued. Included were the production summary and six pages of statistics prepared by this office.

A Production Summary for February, with explanation for variance from forecast, was prepared for management.

Special monthly report information was assembled for personnel of the AEC-HOO (Operations Division) summarizing plant operation and related statistics for February.

c. Production Statistics

A chart book showing reactor outage time, ruptures and scrams was maintained for the IPD General Manager.

Other production statistics work performed during March included the following:

- (1) Production data, operating efficiencies, outage hours and tube replacement information were furnished the Product Cost & Budgets Operation.
- (2) Weekly reports showing process water flow and related reactor data were supplied to the Radiation Protection and Analytical Laboratories Operations of the Hanford Laboratories Operation.
- (3) Information was supplied the Plant & Industrial Engineering Operation, the Component Testing Operation, and the Supplemental Crews Operation each morning showing which reactors were operating.
- (4) Power level, water flow and tube replacement data were given to the Process Engineering Operation, Fuels Preparation Department.
- (5) Statistics on tubes replaced at DR, F and H from October, 1956 to date, and on 3X system ball drops, 1952 to date, were supplied the Plant & Industrial Engineering Operation. These ball drop data were given also to the Project Engineering Operation.

2. S. S. Accountability

Contact was maintained with the Contract Administration Operation in Relations & Utilities regarding the progress of arrangements for the transfer of the 100 Areas S. S. Accountability Unit to the Production Operation of the Irradiation Processing Department.

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3. Miscellaneous Services

Work continued on the integration of IPD activities in connection with the Hanford Classification Guides, present and proposed. Supplementary information regarding IPD compliance problem areas with the present Guide (HW-37965) was assembled and was forwarded to the AEC-HOO in a letter dated March 27. Discussions were held with AEC visitors B. C. Feldman (Division of Classification, Washington, D.C.) and E. F. Greenleaf (Division of Production, Washington, D.C.) regarding (1) IPD's interpretation problems with the present Guide, and (2) the irradiation processing portions of the proposed new Guide (HW-55000). Some of the examples cited in (1) were confirmed in a letter to the AEC-HOO dated March 27.

Steps were taken to implement IPD's review of vital records for micro-filming, as requested by the Relations & Utilities Operation.

Administrative functions performed for the Production Operation included: (1) consolidation and issuance of the February 1958 record report, and (2) processing of OPG's and Advices.

D. Essential Materials

Rail and truck shipments received in March were as follows:

Carload shipments for IP Dept.	412
Carload shipments for other Depts.	317
Truck shipments for IP Dept.	<u>37</u>
Total shipments received	766

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

1. The liquid carbon dioxide unloadings and the storage levels in the various areas were arranged so as to allow the Gas Ice Corp. to withdraw their truck from this service for a twenty-four hour period. This was done twice during the month, giving the vendor an opportunity to make deliveries of this material to air fields in the vicinity of Spokane.
2. IPD's requirements on coal sizing and suitability characteristics were reviewed in order to clarify these items which will be included in Purchasing's steam coal invitations to bid and also in the resulting contracts.
3. 8,334 lbs. of surplus aluminum rod were obtained from FPD and shipped off-plant to the United Power Control Corp. at Tacoma for fabrication into 6,204 solid aluminum dummies.

C. A. Priode, Manager
Production Operation

MARCH 1958

Input Prod.-Pu (% of Forecast)		B	C	D	DR	F	H	KE	KW	TOTAL
Time Oper. Eff. (% Overall)		102.3	125.9	105.6	113.4	112.6	101.7	95.3	82.9	101.2
		71.7	80.6	79.5	78.3	76.7	80.7	67.7	70.4	75.7
No. of Reactor Outages & Hrs.										
Scheduled	No.	Hrs	No.	Hrs	No.	Hrs	No.	Hrs	No.	Hrs
Unscheduled	(1)	102.9	0	0	1	124.6	1	103.7	1	75.4
									0	406.6
Scrams	7	2.2	4	75.0	2	26.0	1	0.8	1	0.4
Other	3	105.7	2	69.0	1	2.2	4	161.	2	69.3
									3	237.4
									4	154.2
Total	10	210.8	6	144.0	4	52.8	5	161.8	4	173.4
									7	66.2
									3	2.8
									6	240.2
									12	220.4
									54	1447.0
Breakdown of Reactor Otge Hrs.										
Planned										Total Hrs.
Charge-Discharge	51.0	39.7	51.7	43.2	34.3	41.0	103.0	62.8	426.7	7.2
Tube Replacement	37.0	0	63.3	54.9	48.5	20.8	8.8	0	233.3	3.9
Project Work	0	0.6	2.6	0	0	0	0	0	3.2	0.1
Production Test	12.0	26.1	0	10.0	11.5	0	17.8	4.0	61.4	1.3
Maintenance	36.4	48.3	23.3	0	42.1	4.0	34.2	58.2	246.5	4.1
Miscellaneous	0	0	0	0	0	0	2.0	0	2.0	0.1
Sub-Total	136.4	114.7	140.9	108.1	136.4	65.8	165.8	125.0	993.1	16.7
Unplanned										
Rupture Removal	67.2	0	0	14.4	0	50.3	57.9	58.0	247.8	4.1
Leak Testing	5.0	0	1.9	14.4	33.4	20.0	9.5	0	84.2	1.4
Maintenance	0	11.7	2.8	24.1	0	7.1	4.2	8.6	58.5	1.0
Instru. & Circuitry	2.2	1.9	6.5	0.8	0.4	0.4	0.4	19.8	32.4	0.6
Miscellaneous	0	15.7	0.7	0	3.2	0	2.4	9.0	31.0	0.5
Sub-Total	74.4	29.3	11.9	53.7	37.0	77.8	74.4	95.4	453.9	7.6
TOTAL	210.8	144.0	152.8	161.8	173.4	143.6	240.2	220.4	1447.0	24.3
No. Slug Rupt.- All Types	4	0	0	2	0	5	3	4	18	
Tubes Installed-Repl. Progr.	19	1	48	60	37	15	5	2	187	
Type of Water Leaks										
Tube	0	0	0	2	2	0	0	0	4	
Van Stone	1	0	0	0	1	2	0	0	4	

	D	C	I	L
(1) Scheduled Tube replacement following Panellit trip				
(2) February outage continued for 15.4 hrs during March				
(3) " " " " 45.1 " " "				
(4) " " " " 30.0 " " "				

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REACTOR OPERATIONS STATISTICS - SLUG RUPTURES
MARCH 1958

[illegible]

OFFICIALS

SHEET 1

REACTOR OPERATIONS STATISTICS - POWER

MARCH 1958

WATER FLOW DATA		100-B	100-C	100-D	100-DR	100-F	100-H	100-KE	100-KW	TOTAL
<u>RIVER WATER (BLDG. 181)</u>										
TO RESERVOIR	GPM AVG	69100		91206		67357	67387			295050
TO FILTER PLANT	GPM AVG	80300		53861				123300	134500	391961
(C - DR - K)										
TOTAL	GPM AVG	149400		145067		67357	67387	123300	134500	687011
TOTAL	MM GALS	6669.2		6475.8		3006.8	3008.2	5504.1	6004.1	30668.2
<u>RESERVOIR WATER (BLDG. 182)</u>										
TO FILTER PLANT	GPM AVG	65500		74703		64124	65350			
TO COND SYSTEM	GPM AVG	3600		4454		3233	2037			
TO EXPORT SYSTEM	GPM AVG	0		12049		0	0			
TO EXPORT SYSTEM	GPM NOR	0		12049		0	0			
TO EXPORT SYSTEM	MM GALS	0		537.9		0	0			537.9
<u>FILTERED WATER (BLDG. 183)</u>										
TO POWER HOUSE	GPM AVG	162		173		105	88	48	21	
TO PROCESS	GPM AVG	55800	73600	64158	58770	61517	61730	115200	124400	
TO DR	GPM AVG			5397						
TO F & S SYSTEM	GPM AVG	103		267		170	58		50	
<u>PROCESS WATER (BLDG. 190)</u>										
TO REACTOR	GPM AVG	55400	73200	63758	58370	61117	61330	114800	124000	611975
	GPM NOR	71000	85000	70600	70000	71990	70890	154400	153600	747480
TOTAL	MM GALS	2473.0	3267.6	2846.2	2605.6	2728.3	2737.8	5124.7	5535.4	27318.6
<u>RIVER DATA</u>										
ELEVATION(MSL.FT.)	(MAX)	390.8		382.2		368.8	374.5		384.9	
	(MIN)	387.1		378.8		365.2	371.2		380.7	
	(AVG)	389.3		381.2		367.0	373.4		383.7	
TEMPERATURE	AVG °F	41.0		43.0		44.8	44.1		42.3	

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REACTOR OPERATIONS STATISTICS - POWER
MARCH, 1958

	100-B	100-C	100-D	100-DR	100-F	100-H	100-KE	100-KW	TOTAL
	-								
	2923.9	3584.6	3334.7	2404.4	2862.5	2917.2	5504.1	6004.1	29535.5
	-								
	12353	12762	14500	8600	10878	8100	20600	2500	90293
	0.5	0.4	0.5	0.4	0.5	0.3	0.4	0.1	0.4
	15175	0	0	0	0	0			15175
	0.6	0	0	0	0	0			0.6
	90633	136608	204080	160000	123170	143568	291500	306900	1,456,459
	3.7	4.6	7.3	8.0	5.2	5.9	6.4	6.1	5.9
	500	300	0	0	361	300	700	950	3111
	.021	.010	0	0	.015	.012	.015	.019	.013
	313594	415693	312889	175286	298151	246901	526900	545100	2,834,514
	12.9	13.9	11.3	8.8	12.5	10.2	11.5	10.9	11.5
	37900	49600	142000	37000	40706	42580	80100	87000	416886
	0	400	0	0	0	0	0	1000	1400

WATER TREATMENT DATA

AT BLDG. 182 MM GALS
BLDG. 183 MM GALS

CHEMICAL CONSUMPTION

CHLORINE (BLDG. 182) LBS
(BLDG. 183) LBS
AVG PPM

Hydrated Alumina LBS
AVG PPM

ALUM LBS
AVG PPM

SEPARAN LBS
AVG PPM

SULPHURIC ACID LBS
(AS 100%) AVG PPM

DICHROMATE LBS

PURGE MATERIAL CONSUMPTION

SOLIDS LBS

DELETED

REACTOR OPERATIONS STATISTICS - POWER

SHEET 3

ANALYTICAL DATA

RAW WATER

	100-B	100-C	100-D	100-DR	100-F	100-H	100-KE	100-KW
PH	8.10	8.15	8.08	8.12	8.21	8.11	7.89	8.10

TURBIDITY

PPM AVG

	26.0	24.0	23.0	23.0	28.0	24.0	26.0	27.0
--	------	------	------	------	------	------	------	------

FINISHED WATER

PH

PH AVG

	6.90	7.00	7.06	7.07	7.00	7.06	7.03	7.05
--	------	------	------	------	------	------	------	------

TURBIDITY

PPM AVG

	.006	.007	.003	.004	.006	.007	.008	.007
--	------	------	------	------	------	------	------	------

Cl₂ RESIDUAL

PPM AVG

	.05	.05			.05	.05	.06	
--	-----	-----	--	--	-----	-----	-----	--

DICHROMATE

PPM AVG

	1.80	1.80	1.80	1.80	1.79	1.84	1.90	1.90
--	------	------	------	------	------	------	------	------

STEAM DATA

GENERATED(MAX)

LBS/HR

	100,000	141,000	100,000	78,000	419,000	66,000	55,000	121,000
--	---------	---------	---------	--------	---------	--------	--------	---------

(NOR)

LBS/HR

	85,000	87,000	50,000	45,000	267,000	-	-	-
--	--------	--------	--------	--------	---------	---	---	---

(AVG)

LBS/HR

	81,000	91,643	51,837	42,179	266,659	44,774	33,411	78,185
--	--------	--------	--------	--------	---------	--------	--------	--------

TOTAL

M LBS

	60,435	68,183	38,567	31,381	198,566	33,312	24,858	58,170
--	--------	--------	--------	--------	---------	--------	--------	--------

TO PLANT

M LBS

	51,248	57,819	33,939	26,611	169,617	29,981	22,372	52,353
--	--------	--------	--------	--------	---------	--------	--------	--------

COAL RECEIVED

TONS

	5909	8118	3886	3396	21,309	-	-	-
--	------	------	------	------	--------	---	---	---

CONSUMED

TONS

	4380	4410	2327	2349	13,466	-	-	-
--	------	------	------	------	--------	---	---	---

IN STORAGE

TONS

	31,167	38,784	31,467	31,147	132,565	-	-	-
--	--------	--------	--------	--------	---------	---	---	---

GEN. STEAM/LB. OF COAL

	6.90	7.73	8.29	6.68	7.37	-	-	-
--	------	------	------	------	------	---	---	---

OIL RECEIVED

GALLONS

						308227	199411	507638
--	--	--	--	--	--	--------	--------	--------

CONSUMED

GALLONS

						300919	241117	542036
--	--	--	--	--	--	--------	--------	--------

IN STORAGE

GALLONS

						888048	- 733320	1,621,368
--	--	--	--	--	--	--------	----------	-----------

GEN. STEAM/GAL. OF OIL

						110.7	103.1	107.3
--	--	--	--	--	--	-------	-------	-------

ELECTRICAL DATA

TOTAL GENERATED KW HRS.

1,568,000	1,545,600	3,113,600
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RECEIVED

REACTOR OPERATIONS STATISTICS RADIATION MONITORING

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	B	C	D	DR	F	H	KE	KW	LPD Total
Special Work Permits Issued	46	43	18	9	16	49	20	14	215
Routine and Special Surveys	585	520	495	550	355	489	448	255	3697
Air Samples Taken	82	38	29	73	31	67	44	34	409
Hand Contamination Cases	0	1	1	1	0	2	0	0	5
Skin Contamination Cases	7	2	7	3	2	3	0	1	25
Contaminated Injuries	0	0	0	0	0	0	0	0	0
Vehicles Contaminated	2	0	0	1	0	0	1	1	5
No. of Cases of Personal Clothing Contamination	6	2	2	4	0	4	1	8	27
No. of Cases Contamination Spread Outside of Radiation Zones	4	7	3	6	0	3	1	5	29
No. of Employees for whom Dose Rates ≥ 6 Rads/hr. Were Established	0	4	0	0	0	1	2	0	7
Lapses of Control (Reactor Operation)	5	0	1	2	0	5	1	5	19
No. of Hours Training Others	4	43	30	10	16	246	0	0	349
Attendance at Mtgs for Training Others	19	37	60	35	6	121	0	0	278
REACTOR EFFLUENT DATA									
No. of Effluent Calculations	31	31	93	109	69	90	65	69	
Ave. Beta Dose Rate (mrads/hr.)	7.9	14.4	10.7	14.1	16.8	17.1	16.3	17.3	
Ave. Gamma Dose Rate (mrads/hr.)	8.5	20.1	18.4	21.7	27.7	22.7	23.3	30.5	
Ave. Total Dose Rate (mrads/hr.)	16.4	34.5	29.1	35.8	44.5	890.7	39.6	47.8	
Ave. Integrated Dose in 24 hrs.	404	828.0	698.4	859.0	1068.0	39.8	950.4	1033	
Max. Integrated Dose in 24 Hrs in 1958	826	1930	1242.4	1394.0	1605.6	516.8	1294.6	2405	

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FACILITIES ENGINEERING OPERATION
MONTHLY RECORD REPORT

MARCH, 1958

I. ORGANIZATION AND PERSONNEL

A. Responsibility

There were no changes of assigned responsibilities during the month.

B. Personnel Statistics

	<u>Feb. 28,</u> <u>1958</u>	<u>March 31,</u> <u>1958</u>	<u>Net</u> <u>Change</u>
Employees on Payroll	196	193	-3
Technical Graduates (Rotational)	8	9	+1
Technician Trainees	1	0	-1

	<u>FEO</u>	<u>Tech. Grad.</u> <u>(Rot.)</u>	<u>Technician</u> <u>Trainees</u>
Transferred Into Operation	1	1	0
Transferred Out Of Operation	2	0	0
Payroll Removal	1	0	0

C. Personnel Changes

G. R. Bauer was transferred to HLO effective March 1, 1958.

D. C. Keck transferred from H Operation to Expansion Operation on March 1, 1958.

J. P. Warren, secretary, was granted a leave of absence on March 21, 1958.

C. A. Simsen was transferred to F Operation on March 1, 1958.

K. J. Wright, Technician Trainee, transferred to Pile Physics on March 28, 1958.

D. Personnel Development

<u>Title of Course</u>	<u>Personnel Attending</u>
Professional Business Management	11
Principals and Methods of Supervision and Leadership	3
Reactor Processing Fundamentals	5

<u>Title of Course</u>	<u>Personnel Attending</u>
Top Secret Workshop	52
Understanding People	6
Effective Business Writing	2
Process Orientation	6
G.E. Salary Plan	6
Financial Operation Orientation	<u>1</u>
Total	92

E. Safety and Security Experience

One medical treatment injury and one security violation was reported.

F. Radiation Experience

One radiation incident was reported in Project Engineering (See III,D,5 of this report).

II. MONTHLY REPORT OF INVENTIONS OR DISCOVERIES

The following ten inventions were reported:

<u>Title and Date</u>	<u>Author</u>
1. Combination Nozzle Flow Adaptor and Van Stone Flange Seal, 3-21-58	W. E. Cawley H. F. Jensen
2. Configuration of a Three-Conductor Electric Instrument Cable, 3-26-58	R. L. Loundagin
3. Method for Continuously Removing Fission Gases from Fuel Elements in a Heterogeneous Reactor, 2-25-58	W. E. Cawley
4. Nitrogen Addition to the Atmosphere of a Graphite-Moderated Reactor as a Means of Providing Supplemental Start-up Control, 3-21-58	W. E. Cawley
5. Method for Reducing the Energy Required for Metal Forming Operation, 3-26-58	W. E. Cawley C. E. Frantz R. Willing
6. Method for Obtaining Maximum Bulk Outlet Temperature from a Pressure Tube Power Reactor, 3-19-58	W. E. Cawley
7. A Method for Reducing Absorption of Neutrons and Changing Moderation Effect of a Reactor Coolant, 3-19-58	W. E. Cawley
8. Method for Controlling Heat Cycles in a Heterogeneous Reactor, 3-7-58	W. E. Cawley

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<u>Title and Date</u>	<u>Author</u>
9. Reactor Control Rods with Variable Poison Strength, 3-7-58	W. E. Cawley
10. Method of Controlling a Heterogeneous Reactor by Symmetrically Displacing Fuel Elements During Operation, 3-11-58	W. E. Cawley

III. ACHIEVEMENT

A. Process Design

1. Research and Development

Category I - Existing Reactors

A program for the study of the need for and the feasibility of providing containment for existing reactor plants was formulated during the month. An estimate was made of the cost of performing the work as outlined so that request could be made for the necessary funds.

Category II (and NPR) - New Reactor Studies

The scheduled date for transmittal of the NPR report to the AEC was met. As their consideration of the report got under way, supplementary information was supplied as requested. Specific points covered included the effect on calculated NPR unit product cost of including distribution of fixed charges and the effect of alternate sites and financing methods on both capital and unit product costs. In addition, economic data on a 1000 MW reactor concept which previously had been given brief attention as a dual purpose plant was updated and transmitted to the AEC, at their request.

Engineering study continued on NPR design development problems. Principal attention was given to programming of activity for the remainder of the fiscal year. Work within this operation has been organized and the A-E has been directed to concentrate attention on problems of system design and operating pressure brought to light in the course of the previous work and on developing additional information on a 4000 MW plant of maximum feasible primary loop pressure capability and a range of electric power recovery levels.

Thermal cycling tests were performed on candidate nozzle closure and nozzle to process tube coupling designs at a pressure of 1500 to 1600 psi through the temperature range of 300°F to 550°F with no detectable leakage.

Thermal expansion studies on the reference header to nozzle connector design have been completed with the conclusion that the calculated stresses are in compliance with applicable

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codes. Preparations have been made to obtain experimental verification of the results by use of stress coating and strain gages.

Category III - Gas Cooled Reactor Studies

Formal report was received of the tests on samples of impervious graphite performed at the University of Washington under DDR-33.

Indication has not yet been received from the AEC regarding the work they would like to have undertaken now that the interim report on the parametric studies which have been performed to date has been completed and transmitted to the AEC. A letter was written to the AEC during the month recommending that this operation proceed with general studies of the design features and process conditions that should be considered for an advanced developmental, gas cooled reactor.

2. Design Projects

CG-642 - Continuous Charge-Discharge Equipment, 105-C

The orderly close-out of this project is being completed as the result of deferment of the on-pile installation of this equipment until FY-1960 or later. A new project can be established when this work is reactivated.

CG-704 - Design of 100-K Outfall Study

It was not possible to complete the inspection of the interior of the KE line during the month but diver inspection of the exterior of both lines was performed at the location of the existing breaks in an attempt to detect progressive damage since the last such inspection. Further cracking of the concrete cover on the KE line was indicated by this inspection. The KW line is completely covered by fill material but the effluent stream from the previously detected break was apparent to the diver.

CG-775 - 100-K Water Plant Modification, 100-KE and KW

Authorization to proceed with the design work called for under this project was received during the month. An initial allocation of \$250,000 is provided for preliminary design and for prototype pump development activities.

Revisions to the draft of process pump design development specification have been completed, clarifying the test requirements for the prototype pump. Work Orders have been issued to CEO to prepare the scope basis for the electrical portion of this project and to Plant Engineering to investigate possible vibration problems in the water plant and reactor piping systems.

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3. Visitors

George Lewis and Henry Gitterman of Burns and Roe, Inc., participated in discussions on NPR problems and programming during the interval March 3 to March 11.

4. Trips

M. H. Schack visited the Hydraulics Research Laboratory at Washington State College, Pullman, Washington, on March 17, to discuss model testing of the 105-F downcomer.

H. W. Heacock and E. R. Astley visited the Division of Reactor Development, AEC, Washington, D.C., on March 7 and 8, to participate in a review of the Gas Cooled Reactor development program.

G. L. Locke attended meetings held March 5 through 7 at the AEC offices in Washington, D.C., during which the NPR Hazards Report was discussed with the ACRS.

A. B. Carson visited the Division of Production, AEC, Washington, D.C., March 17 through 19 to provide assistance and consultation regarding the NPR work performed at Hanford. Discussions were also held with the Division of Reactor Development regarding their Gas Cooled Reactor studies as well as their work on review of dual purpose and convertible reactor concepts.

L. G. Henke visited vendors in Grand Haven, Michigan, in Wilmington, Delaware, and in York, Pennsylvania during the week of March 17 to discuss a variety of reactor plant design problems.

H. S. Davis, G. L. Locke and M. H. Russ attended the 1958 Nuclear Congress in Chicago, Illinois the week of March 17. Dr. Davis presented a paper there and, in addition, visited a number of vendors and ANL in connection with reactor plant design activities.

G. L. Locke stopped in Denver, Colorado, enroute to the Nuclear Congress, to meet with W. J. Love and discuss the consulting work being performed for this operation by Dr. Love.

5. Significant Reports Issued

HW-54664 - "An Engineering Study of a New Production Reactor", Staff of Process Design Operation, March 1, 1958.

HW-55231 - "NPR Bulk Fuel Element Temperature", D. E. Sebade, February 5, 1958.

HW-55312 - "Supplementary Information Summary - New Production Reactor Study, A. B. Carson, March 12, 1958.

- HW-55320 - "Visit to Burns and Roe, Inc., to Review Process Procedures for the NPR Primary Loop", D. L. Con-dotta and D. B. Lovett, March 12, 1958.
- HW-55340 - "Alternate Sites and Financing - Small Size Dual Purpose Reactor", A. B. Carson, W. J. Dowis, H. L. Pringle, March 13, 1958.
- HW-55348 - "Alternate Sites and Financing - NPR Reference Case" A. B. Carson, W. J. Dowis, H. L. Pringle, March 14, 1958.
- HW-55355 - "Gamma Activity in a Helium Gas Cooled Reactor", C. A. Mansius, March 14, 1958.
- HW-55405 - "Trip Report - Visit to Hydraulics Research Labor-atory, Washington State College - 100-F Downcomer", M. H. Schack, March 17, 1958.
- HW-55413 - "Comparison of NPR II-A Costs using Stainless and Zirconium Tubes", R. F. Corlett, March 18, 1958.
- HW-55422 - "100-K Raw Water System Characteristic Curves", N. F. Fifer, March 21, 1958.
- Undocumented - "Trip Report - Visit to AEC Division of Reactor Development, Washington D.C., March 7 and 8, 1958", H. W. Heacock, March 12, 1958.

B. Equipment Development

1. Activities

"Stop-gap" subcritical neutron monitors have been installed at all old reactors on schedule. These installations consist of level and period meter electronics attached to existing under-pile proportional counter tubes. Installation dates were as follows:

B Reactor	-	February 28, 1958
C Reactor	-	March 5, 1958
F Reactor	-	March 7, 1958
DR Reactor	-	March 10, 1958
H Reactor	-	March 11, 1958
D Reactor*		

*D Reactor is outfitted with both the fission counter and the proportional counter prototypes.

Drawings and specifications have been issued for required electronic components and tube positioners for the final in-stallation of fission counter-subcritical neutron monitors.

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Working with representatives of the Metallurgical Products Department, a graphite broach made of Carboloy has been developed, designed, procured, and used at B and H Reactors. For the first time on March 11, 1958, five channels in the hard graphite of H Area were sized, each with one pass of the broach. The time cycle was reduced from nine to three minutes. As an air tugger pulled the broach through, a new process tube followed behind. Central Maintenance is initiating procurement of parts for additional broaches.

The poison spline system continued in use at D Reactor for routine flattening (operated by D Process personnel). Two additional tests using splines for startup were undertaken on March 1 and March 3, 1958. A limited number of PCCF poison column charges were used in each case to support the splines. Radiation exposure received during these two start-up tests was reduced from that experienced January 25, 1958, by revised procedures and additional shielding.

The tools and techniques for Van Stoning zircaloy process tubes were re-evaluated in the 189-D Laboratory and successful flanges produced on samples from the zircaloy-3 tubes to be installed at C Reactor. Flanging of the specific tubes to be installed in C Reactor was initiated. This effort supports a Production Test being circulated for test evaluation of zirconium tubes.

Scope drawings were completed for the NPR Prototype Concept Evaluation Loop. Detailed design has been authorized. An order was placed with Byron-Jackson for the circulation pump for this loop. Requisitions were issued and bids are being evaluated for a pressurizer and heater. Pipe and fittings have been ordered through Minor Construction.

Initial thermal cycling of NPR cono-seal test fittings for header-to-nozzle and nozzle-closure joints has been completed at the ELMO #7 Loop. Both assemblies functioned satisfactorily during the thermal cycling tests. Additional testing at 2,000 psi and 590°F for three weeks is scheduled.

A prototypic installation of 100 flow adaptors was made at KW Reactor on March 15, 1958, to determine the feasibility of flushing radioactive materials from the dead space in the rear nozzles and caps. Insufficient time has elapsed to detect a difference in radiation levels.

Testing of a fiberglass-sheathed, silicone-coated resistance temperature detector cable is under way in the 189-D Laboratory.

2. Visitors

A. E. Wiles, Manager - Equipment Operation, General Electric Company, Schenectady, New York, visited Equipment Development on March 11, 1958, to discuss potential Manufacturing Equipment Laboratory consultation on NPR equipment and improved charging equipment.

Phillip Hodel of Huntington Rubber Company, Portland, Oregon, visited Materials Development on March 7 to discuss the inspection procedures associated with the vertical and horizontal rod gas seals.

R. W. Scholler of G-E Silicone Products Department, Downey, California, visited Materials Development on March 12 to discuss the compounding of silicone sponges to meet the needs of IPD in the use of this material.

3. Trips

J. D. Maguire on February 22 through 26, witnessed final testing of equipment for Design Test 1021 (NPR horizontal control rod) at Rucker Manufacturing Company in Oakland, California, and consulted with Huntington Rubber Company in Portland, Oregon, on poison spline seal production.

A. N. Iverson visited the Shell Development Company in Emeryville, California on March 11 through March 13 to discuss process tube integrity checker probe development and to determine the additional work and cost required to complete this contract.

R. L. Loundagin visited Rockbestos Corporation in New Haven, Connecticut on March 1 through 4 to discuss establishment of methods for inspection of RTD cable being manufactured under HWS-6244, Revision I.

J. W. Green, on March 11 through 20, visited the Shell Development Company in Emeryville, California, to discuss work on process tube integrity checker probes; to discuss and consult on fuel rupture monitoring and low-level neutron monitoring (CG-707) with Tracer Lab Inc. and Beckman Berkeley Systems Division in Richmond, California, Daystrom Systems Division in La Jolla, California, and Hycon Inc. and Fairchild Camera and Instrument Company in Los Angeles, California; to discuss and consult on various instrument cable problems with Sequoia Wire Inc. in Redwood City, California; to consult with Barton Instrument Company in Los Angeles, California, on crossheader pressure differential measurement (R-84343); and to discuss various reactor instrumentation problems with Atomics International Inc. in Los Angeles, California.

T. D. Dow visited Western Light Metals in Spokane, Washington, on March 12 through 14, to consult on flow adaptors for K Reactor rear nozzle internal decontamination.

H. F. Jensen visited Western Light Metals in Spokane, Washington on March 5, to discuss casting of aluminum flow adaptors. On March 18 through 21 he visited Rubber Craft Company, Torrance, California, to discuss the engineering aspects of the materials specification for the gunbarrel gas seals; while in Los Angeles, California, he attended a symposium conducted by the G-E Silicone Products Department on the sealing of passageways.

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C. H. Gydesen visited Lewis Engineering Company in Naugatuck, Connecticut, March 6 through 14 to discuss the engineering and inspection aspects of the bundling and materials problems associated with resistance temperature detectors and adaptors. On March 18 through 19 he visited Pacific Scientific Company in Portland, Oregon, to discuss engineering and problems associated with the manufacture of silicone rubber-lined RTD adaptor bushings.

4. Significant Reports Issued

HW-53956	- "A Static Switching Interlock Between Radiation and Pressure Monitoring Instruments", A. A. Maupin, Jr., March 4, 1958.
None	"Study of Underwater Lights for DR Storage Basin", W. Dalos, February 27, 1958.
None	R&D Accomplishments - FY-1958, W. M. Harty, March 12, 1958
None	"Problems Relating to Power Level Increases", W. M. Harty, March 20, 1958.
None	"K Area Cap Remover Program Report", R. B. Willson, March 26, 1958.
None	"Interim Report - RMU Instrumentation - Radiation Exposure Integrator, R-84334", C. A. Simsen, February 24, 1958.
None	"Interim Report - SWP Radio, R-84333", C. A. Simsen, February 26, 1958.
None	"Status Report - Hot Dummy Sorter Instrumentation", C. A. Simsen, February 20, 1958.
None	"B Reactor - Nozzle Alignment", D. H. White, March 20, 1958.
None	"Supplemental Test of 61-S Alloy - I & E Mixing Slugs", M. P. Black, March 6, 1958.
None	"Crushing Strength and Deformation of Modified 2-S I & E Mixing Slugs", M. P. Black, March 3, 1958.
None	"Interim Report - Moisture Monitoring - Royson Segmental Recorder Modification, R-84344", C. A. Simsen, February 26, 1958.

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C. Plant and Industrial Engineering

1. Drafting Operation

Summary of Drafting Operation services provided is:

Revised or New Drawings, Graphs and Charts	122
Drawings and BPFs Added, Refiled or Retired	668
Blueprint File Customers Serviced	173
Catalogs Added to File or Refiled	62
Catalog Customers Serviced	24

2. Plant Engineering Operation

Pile Gas Moisture Recorder - Controllers

A work order has been issued to Central Maintenance for modifications to recorder-controllers now in six older areas. This work follows recommendations of Instrument Development Operation to increase service life and reliability.

Vibration Studies

Frequency, amplitude, and acceleration were calculated from vibration data of rear face components at 105-B. This has been sent to the General Engineering Laboratory, Schenectady, New York for evaluation.

A problem of abnormal floor vibration was investigated in 190 KE. The vibration was confined to a section of the operating floor in front of #6 low lift pump. Investigation indicates that present pump operation at high flow may be exciting this particular section of floor. Since the abnormal floor vibration has been stopped by installing a floor jack, it has been suggested that the situation be kept under observation until individual pump flows are reduced.

Vibration pickups were installed on two rear face crossheaders at 105-KE as a part of a vibration study requested by the Process Design Operation.

Noise Studies

The project proposal for Noise Abatement, 100 Areas was returned without approval by the AEC. Permission was granted however to proceed with part of the proposed work on a maintenance program.

110-115-B Gas Storage Piping Simplification

Scope recommendations of Plant Engineering Operation for the simplification of 110-115-B Building gas storage piping have been accepted and detailed design has been requested.

105-C Ventilation System Recommendations

Recommendations to provide optimum benefits from the present ventilation equipment with a minimum of added expense were issued to the "C" Processing Operation in a report of March 7. Some of these recommendations have already been accepted and work has started to obtain necessary funds.

E Metal Handling

The detailed shop sketches necessary for the modification of present units to produce the prototypes of proposed irradiated enriched fuel element handling equipment have been prepared and fabrication orders issued by both Irradiation Processing Department and Chemical Processing Department.

Electric Power Load Study - 105-B

The field survey work has been completed on the electric power and lighting circuits in B reactor. Calculations of the various loads and voltage drops were made for the normal and emergency lighting circuits. New electrical one-line diagrams are being prepared for both the lighting and power circuits.

Control Room Lighting - 105-B

B Processing Operation has approved the recommendations for changes to the B Reactor Control Room lighting. Requests for similar work have been received from D and DR Reactor Operations.

3. Standards Engineering Operation

Productive Maintenance

Assistance was given in collecting backlog figures for the millwright and pipefitter crafts and projecting these figures through 1958. The Maintenance Operations cooperated in this effort which was necessary to provide IPD management with the best available forecast of work load.

Mr. K. A. Jones of the Travelers Indemnity Company made scheduled inspection of boilers and unfired pressure vessels on March 18 and 19.

Spare Parts

Stock Adjustment Requests processed	44
Maximum authorized dollar value of new spare parts added by SARs.	\$ 6,000
Maximum authorized dollar value spare parts requested by letter to Project Engineering	-0-
Maximum Authorized dollar value of spare parts requested for projects by SARs	1,680

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Number of Engineered spare parts items reviewed	42
Actual dollar value of items deleted from spare parts stock	\$18,900
Maximum Authorized dollar value of items deleted from spare parts stock	30,000

The recent order for boron steel balls has been received at HAPO from the Bethlehem Steel Plant and is awaiting tests.

Craft Training

A training film entitled "Principles and Methods of Grinding" prepared by the Carborundum Company was shown to approximately 30 craftsmen, supervisors and engineers of the Central Maintenance Operation on March 12, 1958.

4. Utilities Engineering Operation

Engineering in Support of Power Forecasting

A rough draft of the electrical power forecast for FY-1959 was assembled and comments were obtained from all area managers. Arrangements were made with BPA through Relations and Utilities Operation for interruptible power to cover our summer pumping requirements.

105-H Transfer Area Settlement

Engineering investigation of the drain lines and soil conditions immediately beneath the slabs in the 105-H Transfer Area revealed that at least two of the drain lines are leaking and that the cause of settlement of the slabs is most likely due to the water from leaking sewers. Whether or not the storage basin is contributing to this settlement will be evaluated when the north drain system is excavated for replacing or repairing.

A plan for raising the railroad track slab, repairing and revising the drain system, and filling the voids under the Transfer Area floor slab has been issued to the customer operation.

Precast Concrete Roof Slab Inspection

The detailed inspections of the precast roof slabs in the 190-D Tank Room and the 185-B Building and 190-B Pump Room revealed that the roof slabs in general were in good shape. A hi-spot check of the roof slabs in the remaining buildings in the 100-D Area indicated that, with the exception of several slabs in the 105-DR Building, the D Area roof slabs are in good shape.

Utilities Engineering Operation has issued recommendations to replace several slabs in the 105-DR building prior to re-roofing but that the other slabs need not be replaced at this time.

5. Visitors

Walter Samans, Consultant on pressure vessels, and F. S. G. Williams of the ASME Main Committee on pressure vessels were here during the week of March 10, 1958 for discussions with the Standards Engineering Operation.

6. Trips

J. P. Corley attended the annual meeting of the National Association of Corrosion Engineers in San Francisco, California, March 17 through 21, 1958.

J. P. Corley presented a talk, "Radiative Waste Disposal at Hanford Works", to the AIChE student chapter at Kansas State University, Manhattan, Kansas on March 13, 1958.

7. Significant Reports Issued

HW-55294 - (Secret) "Electrical Power Forecast - Fiscal Year 1959 for IPD", V. G. Blanchette, March 11, 1958.

HW-53955 - (Unclassified) "Voltage Survey Test Report 230 KV and 13.8 KV HAPD Electrical System", H. C. Ellsworth, February 17, 1958.

None - "Scope of Repair Work for Settlement of Slabs in 105-H Transfer Area", L. B. Brinkman, March 14, 1958.

None - "Proposed HAPD Employment Specifications for Maintenance Crafts", issued for comments, N. V. Hobbs, March 6, 1958.

None - "Manual on Leak Detection", issued in connection with training program which started February 3, 1958. N. V. Hobbs.

D. Project Engineering

1. Financial Responsibility

Services were performed during the past month on the following work:

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<u>Number</u>	<u>Activity</u>	<u>Financial Responsibility</u>
6	Engineering Studies, Scoping, and Project Proposal Preparation	\$ 15 230
4	Projects in Design Phase	241 410
16	Projects in Construction Phase	4 569 400
2	Projects in Close-out Phase or Accrued Work on Closed Projects	39 550 000
4	Field Management of Non-project Work and MJA's.	102 700
<u>32</u>		<u>\$44 478 740</u>

2. Projects

CG-558 - Reactor Plant Modifications for Increased Production

To date, 39 of the first stage impellers have been repaired and installed with ESCO rings on the first stage. Also, 27 sets of bushings have been modified per instructions of DeLaval. We have had four failures of the threaded outer shrouds and impellers to date.

An examination of the failed second stage impeller on No. 6-B showed that the fracture started at a weld repair made by DeLaval in the course of fabrication of the impeller.

Messrs. H. H. Hubble and C. F. Quackenbush were at the DeLaval plant during the month to witness tests on modifications made to the No. 5 DR pump which had been sent to them for test purposes. This pump is being returned to us for reinstallation and test of newly designed rings and several minor case modifications in its original spot in 190-DR.

Specifications were sent to Ingersoll-Rand, Allis-Chalmers, Worthington, Byron-Jackson, and Bingham Pump Company, asking for proposals to provide prototype and replacement pumps for the 190 Buildings. The invitation requests that their proposals be at Hanford on April 9.

The installation of these relays in the other areas is proceeding. A second examination of the speed increaser No. 2 at 190-B has been made. The galling that was witnessed in the first examination has progressed toward the outside edge of the teeth approximately three-quarters of an inch. The pattern of the galling is similar to that forecast by Mr. Ed Heater of the General Electric Lynn Gear Works. Pictures and latex impression of the teeth were given to Mr. H. C. Anderson by H. H. Hubble on his recent visit to the East.

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A consultant agreement was put into effect during the month with Dr. J. W. Daily of MIT to assist in the 190 Building process pumps cavitation problems, including review of the testing program currently being carried on at the vendor's plant.

The contract with Oregon State College for model testing of the 190 process pump suction piping configurations was approved during the month.

CG-600 - Modifications for Increased Production - 100-C

Pump No. 1 was turned over to Power Operation on March 18, 1958. This is the sixth pump replaced in this program. Work is now underway on the replacement of Pump No. 9.

CA-512-1952 Hanford Expansion - 100-K

Dielectric tests on new and old epoxy cells of the 10,000 hp slip regulators for the K plants were completed and forwarded to General Electric engineers at Roanoke. They have advised they have no confidence in epoxy cell repairs regardless of by whom made because electrolyte can be entrapped in the structure of the repaired cell. General Electric will now make definite replacement of all cells with Dynel fiber instead of glass, well covered with epoxy, on a f.o.b. Richland basis, regardless of the fact that the warranty has expired. They have explained the matter to the AEC who have agreed to this adjustment but without reimbursement of repair costs or installation costs.

CG-666 - Zone Temperature Monitoring, 105-B, C, D, DR, F, & H

At 105-B, although Panellit equipment has all been installed and is operating on test, there has been a little difficulty with operation of the Weston relays. 105-B now has beneficial use of 160 zones to indicate pile conditions.

At 105-D all equipment has been installed and the resistance temperature detectors tied into the Panellit controllers.

At 105-DR the Panellit control cabinet has been installed. The project proposal, Rev. 2, requesting approval to install new lead wires and RTD's in all areas was approved by the Commission.

CG-707 - Improvements to Reactor Nuclear Instrumentation

At 105-F all electrical work has been completed. At 105-KW piping work is 95% complete and ready for installation to the Panellit panel. At 105-KE installation of piping on the O' experimental level has started. Invitations to bid on all required electronic equipment are in the hands of various

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suppliers. Installation of stop gap equipment is now complete and is in service performing as intended.

CG-708 - Installation of Additional VSR's, KE and KW

All VSR channels which will be used on this project have been inspected and found acceptable. The support plates for VSR cylinders have been installed at 105-KE and the VSR housings and step plugs are being aligned and assembled in the shop.

The problem still exists at the vendor's plant to produce acceptable VSR sections. The vendor has to date been unable to produce routinely acceptable nitriding.

CG-740 - Replacement of Fly's Eye Viewer - 105-D and F

Fabrication of the metal window frames for D and F is 90% complete and being accomplished in Construction Operation shop. Preparation of the viewing window space at 105-F was completed during the week ending March 16. Four pieces of lead glass which had been received and inspected at HAP0 were returned to the vendor on March 17 because of sufficient deviation from our specifications. A revised progress schedule was submitted to the Commission on March 21.

AEC-160 - Recirculating Gas Cooled Test Loop

Work by the fixed-price contractor has been greatly accelerated. The cask handling structure has been erected, the existing vent duct relocated, and the burial pit excavated and "gunited." The emergency gas storage vessels have been accepted and installed and the remaining valves have been delivered.

The hot-gas filters have been tested and shipped.

Work on the gas compressors is proceeding with particular attention currently directed toward obtaining pre-quench converters, switch gear, and diaphragm compressors. Assembly of the first compressor unit is expected to begin early in June.

3. Project Proposals

Project Proposals Authorized

CG-666, Rev. 3	Zone Temperature Monitoring
CA-696, Rev. 1	Coal Car Shake-Outs
CG-740, Rev. 1	Replacement of Central Viewers
CG-775	100-K Water Plant Expansion
CG-741, Rev. 1	Ball 3X, 105-C (letter approval for expense portion only)

Project Proposals Returned Unapproved

CG-782	Noise Abatement
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CG-706 Gas Instrumentation
CG-780 Ventilation Improvements (returned for
second time because of confinement
study)

Project Proposals Held For Further Study

CA-788 Fire Protection
CG-781, Rev. 1 Service Building Additions, 1706-KE
IR-237 190-H Maintenance Shop and Office Space

Project Proposals Submitted

CG-666, Rev. 3 Zone Temperature Monitoring
CG-741, Rev. 1 Ball 3X, 105-C
CG-791 Confinement of Radioactive Particulate Mat-
ter in 105 Exhaust Air

4. Budget Preparation

Meetings for management review of the budget were held Feb-
ruary 26 and March 13. Expenditure patterns and narrative
backup sheets for the budget submission were prepared.

5. Radiation Experience

Two contractor's men (Royal, Inc.) working on the 105-B roof
on the top of the 70' level received radiation occurrence
reports dated March 13, because of failure to keep their shoe
covers on until leaving the radiation zone. Although their
shoes were contaminated, these were cleaned up and there were
no serious consequences. Reorientation was held to avoid
reoccurrence.

6. Trips

H. H. Hubble was at DeLaval's plant in Trenton, New Jersey from
March 12 through March 17, witnessing tests on No. 5 Pump from
DR Area which had been returned to them for test purposes.

During the week of March 17, M. G. Patrick visited GEL, Schenec-
tady, Turbine Equipment Company, Mountainside, New Jersey, and
Stearns-Rogers, Denver, Colorado.

E. Principal Engineers

The Principal Metallurgical Engineer, J. M. Fox, Jr., has been
notified by G. H. Harnden of Schenectady of appointment to ASTM
Committee B2 and membership on Subcommittee VIII. This latter
subcommittee is the newly organized committee on zirconium within
the framework of general nuclear materials.

Manager
Facilities Engineering

EMPLOYEE RELATIONS OPERATION

March 1958

PERSONNEL DEVELOPMENT & PLACEMENT OPERATION

Organization and Personnel

No change in organization structure nor assigned responsibilities of the Operation occurred during the month. The number of people on roll at the beginning of the month and at month end was as follows:

	<u>Beginning of Month</u>	<u>End of Month</u>
Exempt	6	6
Nonexempt	<u>17</u>	<u>17</u>
Total	23	23

One medical treatment injury and no security violations occurred. Forty-eight hours overtime were worked in the duplicating facilities. One information meeting was held with nonexempt people in the Operation.

Personnel Development

An IPD Exempt Position Register was completed with the assistance of a Technical Graduate on rotation with Employee Relations. The register is to be used to extend departmental manpower planning by aiding in the location of positions for individuals. Two internal position vacancies were processed through the IPD Exempt Manpower Register. Also this register was used to initiate a review of all exempt employees with less than five years experience. This review will be used to assist management in manpower planning activities.

The first of sixteen sessions of the "Creative Approach Seminar" was held. The class is made up of future instructors for other Seminars and for the "Applied Creativity" Course. Since this is the first Seminar of its kind at HAPO participants from Hanford Laboratories Operation and Fuels Preparation Department are enrolled.

As a result of several recent requests, a task force, consisting of a representative from each Irradiation Processing Department's Level #3 Operations, has been formed to study the types of training courses needed by the first line supervisor. No action has been taken as yet.

Activity in the Exempt Self-Development Program continues at a satisfactory level. To date 32 self-development record sheets have been completed, discussed and returned to Personnel Development and Placement for assessment and filing.

Nominees to the revised Supervisor Selection Program are beginning to come in. To date 15 new nominations have been received. Certain basic information was already available concerning these nominees, thus, if the trend holds up, the program may become completely operative sooner than anticipated. In connection with this program new norms have been derived for the current supervisor selection test battery. These norms are based on approximately 200 cases and make it now possible to compare individual scores to other IPD employee's scores on the tests.

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In the counseling area, seven contacts were made this month involving four people. Total number of individuals seen to date is seven. Contact problems range from inconsequential, involving no more than one hour of counseling, to marked, involving several hours of counseling. One referral was made to Industrial-Medical for further diagnosis and treatment.

The following information reflects the attendance in the various training classes presented in the department:

	<u>This Month</u>	<u>Last Month</u>	<u>Year to Date</u>
Data Processing	0	7	10
Effective Business Writing	0	14	14
Financial Operation Orientation	10	0	10
First Aid	2	6	13
G.E. Employee Benefit Plans	0	11	11
G.E. Salary Plan & Its Admin. in IPD	8	0	8
G.E. Wage Plan & Its Admin. in IPD	0	0	12
IPD Radiation Protection Program	0	0	8
Labor-Management Relations	0	12	12
Management Orientation	11	0	11
P.M.S & L	10	0	10
Process Orientation	14	0	14
Reactor Processing Fundamentals-I	50	0	103
Supervisor's Industrial Safety	7	0	7
Top Secret Workshop	156	0	156
Understanding Human Nature (People)	0	9	9

Progress of Self-Development discussions with nonexempt people within the department is indicated in the following tabulation:

	<u>This Month</u>	<u>Last Month</u>	<u>Year to Date</u>
Number of Forms Distributed	117	129	246
Number of Forms Returned	134	176	310

Technical Personnel Placement

Experienced BS-MS Recruitment

This recruitment activity remained curtailed due to current and pending IPD and HAPO force reduction.

PhD Recruitment

Five PhD candidates were interviewed by IPD representatives, resulting in one job offer.

Transfers and Terminations

	<u>March</u>	<u>February</u>
Interviews for Transfer Purposes	*27	18
Transfers-Other Departments to IPD	0	2
Transfers-IPD to Other Departments	**2	2
Transfers Within IPD	27	17
Other Removals	***3	4
New Hires	0	0

- * The majority of these interviews were with APED representatives, and will result in 4 IPD exempt employee offers. These transfers will help relieve our RQF problem.
- ** An employee on RQF status transferred to Hanford Laboratories Operation on nonexempt rolls. One Level #3 Manager transferred to APED, San Jose.
- *** Two employees were removed on RQF status, one from Financial, the other from F Reactor. The other employee resigned to accept a position with the Atomic Energy Commission in Washington, D.C.

Technical Graduate Program

<u>Assignment</u>	<u>No. of Transf.</u>		<u>No. Present at end of Mo.</u>	<u>No. Off-Program Assignments to IPD</u>	
	<u>Out</u>	<u>In</u>		<u>This Mo.</u>	<u>Since 1/1/58</u>
Research & Engrg.	3	2	12	0	4
Facilities Engrg.	1	1	10	0	0
B-C Reactor	1	1	1	0	0
D-DR Reactor	0	0	3	0	1
F-Reacto	1	0	0	0	0
H-Reacto	0	0	0	0	0
K-Reacto	0	0	3	0	0
Employee Relations	<u>1</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
	7	4	29	0	5

Employment

Twenty-four service pins were awarded and twenty-five employees received attendance recognition. As of 3-31-58 twenty-one transfer requests were active (12 non-unit and 9 unit). Eight additions to payroll and 48 removals were made. Two requisitions were on hold status at the end of the report period. Three contact notices, one warning notice, and no discharge notices were received. Commencing with this report each monthly record report will be written on a calendar month basis.

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5 years
10 years
15 years

<u>Number of Awards</u>	
<u>This Month</u>	<u>FY to Date</u>
5	87
19	224
0	1

Attendance Recognition PlanYears of Perfect Attendance

1
2
3
4
5
6
7
8

<u>Number of Awards</u>	
<u>This Month</u>	<u>FY to Date</u>
2	43
5	43
5	37
4	46
6	34
1	19
2	12
<u>0</u>	<u>5</u>
25	239

Request for Transfer

	<u>Nonunit</u>	<u>Unit</u>	<u>Total</u>
On Hand 2-15-58	12	10	22
New Requests Received	1	1	2
Transfers Completed	0	1	1
Requests Cancelled	1	1	2
Interviews Conducted	0	0	0
Requests on Hand 3-31-58	12	9	21

Personnel Changes - 2-15-58 through 3-31-58Additions to Payroll

		<u>FY to Date</u>
New Hires	0	5
Re-engaged	0	0
Reactivates	5	31
Transfers	3	120
Re-hires	<u>0</u>	<u>0</u>
	8	156

Removals from Payroll

		<u>FY to Date</u>
Deaths	2	7
Retirements	1	7
*Terminations	15	75
Deactivates	7	48
Transfers	15	112
**Lack of Work	8	86
Discharged	<u>0</u>	<u>2</u>
	48	337

* Four employees on lack of work resigned by mail

** One employee on lack of work was employed at Vallecitos.

Requisitions

Number of Openings as of 2-15-58	2
Additional Openings 2-15-58 to 3-31-58	0
Openings Cancelled	0
Number of Openings Filled	0
*Number of Openings as of 3-31-58	2
*Both on hold status	

Disciplinary Action

	<u>March</u>	<u>FY to Date</u>
Employee Contacts Received	3	30
Warning Notices Received	1	8
Discharge Notices Received	<u>0</u>	<u>2</u>
	4	40

Military Service

	<u>March</u>	<u>FY to Date</u>
Number of letters written to SS Boards requesting deferments or reclassifications:		
Deferment in S.S. Draft	2	23
Standby Reserves	0	2
Number of interviews conducted for employees entering Military Service	0	0
No. of employees returned from Military Serv.	0	4
No. of deferments granted	0	25
No. of deferments denied	0	4
No. of deferments appealed to State Board	0	4

Mail and Duplicating

Mail and Addressograph

Security screens and locks were installed on one sedan delivery vehicle recently obtained from Transportation and Maintenance. The additional vehicle will assist in providing uninterrupted mail service throughout the department.

MAIL STATISTICS

	<u>March</u>	<u>February</u>
Pieces of registered delivery mail	1,844	2,096
Pieces of Postal mail	919	893
Pieces of regular mail	923,654	897,909
Number of addressograph orders handled	36	36
Number of addressograph impressions	36,838	16,582
Number of plates made	31	59

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Duplicating

Announcement was made in the March 15 News Bulletin of the availability of Plastic Back-Up Sheets for use in preparing paper offset masters. These sheets are a typing aid which reduce master embossing, and thereby provide sharper copy and improved erasures.

<u>Off-Set</u>	<u>March</u>				<u>February</u>
	<u>100-H</u>	<u>100-D</u>	<u>100-K</u>	<u>Total</u>	<u>Total</u>
Orders Received	683	242	311	1,233	1,395
Orders Completed	683	234	311	1,228	1,425
Orders on Hand	0	8	0	8	15
Xerox Masters Made	554	148	169	871	809
Total Masters Handled	2,571	809	1,301	4,681	5,064
No. Copies Duplicated	169,943	33,694	50,426	254,068	287,747

Verifax

Orders Received	21	40
Orders Completed	21	40
Orders on Hand	0	0
Total Masters Handled	198	739
No. Copies Duplicated	571	3,543

COMMUNICATIONS

Mass communication activities for the month of March included the publication of five Management News Bulletins, one "Memo from the General Manager" and three Union Relations Information bulletins. Four issues of "Management Information for Foremen and Supervisors" were distributed during the month, as was the health bulletin and the "Monogram." The March-April issue of the "GE Review" was also distributed to those individuals in the Department on the distribution list.

The March Round Table Guide was prepared and distributed. Approximately 175 supervisors are now on the distribution list for this monthly publication.

Two priority messages were initiated during the month. The first concerned an accident in 105-F Building and the second concerned an accident in the 100-H area and was only disseminated in that area.

Communication activities in response to the "white collar" organizing campaign included the following: 1) a written discussion of the conduct of our supervisors during organizing campaigns sent to all IPD exempt people; 2) a letter from the General Manager to all IPD exempt people; 3) a letter to all secretarial and clerical people from the General Manager; 4) a summary of questions and answers about the OEU drive with a cover letter signed by the Manager-Employee Relations sent to all exempt people; 5) a refutation of the claims made by the union on their "authorization cards" with a cover letter from the Manager-Employee Relations sent to all IPD exempt people.

The first three sessions of the ten-session Communication Training Course for First-Line Supervisors was held during the month. Fifteen supervisors from the Reactor Operations are attending the course.

Miscellaneous communication activities included the preparation of two letters for the General Manager's signature (the first concerned IPD objectives; the second the Signed Article Program) and a letter signed by the Manager-Union Relations which was attached to a summary of compulsory unionism and distributed to all IPD exempt people.

One paper was processed for presentation at Kansas State University:

"Radioactive Waste Disposal Facilities for a Nuclear Reactor" - J. P. Corley

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UNION RELATIONS

A revised overtime distribution procedure for Maintenance employees was placed into effect on March 17. The scheduling of overtime assignments for Maintenance, Processing and Radiation Monitoring personnel are now handled centrally by clerical personnel in 100-H Maintenance Operation.

An issue has been raised by the Chemical Workers' union and the Council regarding the status of certain working arrangements which were established in the past as a result of discussions between Operating Management and union representatives. Our position is that these understandings are not commitments which require negotiation and Council concurrence and that they can be changed whenever they conflict with the efficient operation of our plants.

Arbitration notices were received for two grievances during the month. Both grievances were filed in connection with the working arrangement proposed by the Company for Panellit Board work.

The Union Relations' Manager presented a speech entitled "Union Relations Aspects of Craft Training" to all HAPO Maintenance Managers on February 24 in the 300 area.

The Labor-Management Relations Program was presented to 12 supervisors on February 24.

The HOO-AEC Labor Standards Board approved three jobs for assignment to plant forces which are estimated to cost \$38,933. Since the procedure for obtaining LSB approval was started in IPD, seventy-six jobs have been approved, representing an estimated total cost of \$2,614,457.

The following statistics summarize Work Review Approvals during the month:

<u>Work Review No.</u>	<u>Estimated Cost</u>	<u>Description of Job</u>
IP-58-68	\$ 386	Office door location change - 105-DR.
IP-58-69	2,072	Circuit modification and relay calibration of 190 Motor Control Panels.
IP-58-70	36,475	Thermocouple replacement - 105-DR.

BARGAINING UNIT CHECK-OFF STATISTICS

	<u>Last Month</u>	<u>This Month</u>
Cancellations	9	11
Additions	12	11
Total Participating	965	965
Total in Unit	1378	1366
% Participating	70.0	70.6

IPD GRIEVANCE STATISTICS
2-16-58 through 3-15-58

A total of 15 grievances was received and three Step II grievance meetings were held. Following is a breakdown of the status of these grievances:

	<u>Unit</u>	<u>Non-Unit</u>
Received this month	15	0
Received this year	49	0
<u>Step I</u>		
Answer satisfactory	1	0
Answer unsatisfactory	13	0
Pending time limit	12	0
Settled this month	5	0
<u>Step II</u>		
Discussed this month	5	0
Pending time limit	4	0
Settled this month	5	0
<u>*Arbitration Pending</u>	23	0
Active	8	0
Inactive	15	0
Total Settled This Month	10	0

*In reporting grievance statistics in the past, our practice was to show arbitration cases as settled at Step II if no further action was taken within three months after receipt of the arbitration request. In the future, all arbitration cases will continue to be carried as such and will either be shown as active or inactive. Inactive status means that there has been a lapse of three months without further action in the case.

<u>Unit</u>	<u>Subject of March Grievances</u>						<u>Emp.</u>	<u>Fac.</u>	<u>Res.&</u>
	<u>B-C</u>	<u>KE-KW</u>	<u>D-DR</u>	<u>H</u>	<u>F</u>	<u>Fin.</u>	<u>Rel.</u>	<u>Prod.</u>	<u>Eng.</u>
Jurisdiction		3	2	3	1				
Overtime		1							
Supervisor's Attitude			1						
Work Assignment		1							
Vacation	1								
R.O.F.			1						
SWP Timekeeping	—	—	—	—	1	—	—	—	—
TOTAL	1	5	4	3	2	0	0	0	0
<u>Non-Unit</u>	0	0	0	0	0	0	0	0	0

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EMPLOYEE COMPENSATION OPERATION

Salary Administration

Considerable time was spent in the evaluation, revision and establishment of exempt positions in connection with organizational modifications in the Engineering and Reactor Operations.

A detailed review was made of fourth level manager and equivalent individual contributor positions in the Engineering Operations with a view toward evaluating the effects of hiring-in rates for PhD's, revaluation of similar jobs in the Hanford Laboratories Operation, and in recognizing the impact of the NPR program on these positions.

CHANGES OF STATUS OF PERSONNEL

Transfers into Dept.	0
Transfers Out	<u>4</u>
Location Changes	<u>0</u>
Suffix Changes	<u>27</u>
FLSA Changes	<u>8</u>
Reassignments	<u>15</u>
Total	<u><u>54</u></u>

CHANGES IN SALARY OF PERSONNEL

Promotional Increases	8
Salary Review Increases	<u>63</u>
Interim Merit Increases	<u>0</u>
Salary Adjustments	<u>0</u>
Total	<u><u>71</u></u>

Wage Administration

CHANGES OF STATUS OF PERSONNEL

Transfers between Depts.	24
Transfers within Dept.	<u>90</u>
Location Changes	<u>0</u>
Reclassifications	<u>16</u>
Total	<u><u>130</u></u>

CHANGES IN SALARY OF PERSONNEL

Automatic Increases	78
Reclassifications	<u>34</u>
Merit Increases	<u>2</u>
Total	<u><u>114</u></u>

Employee Benefits

The program for establishing the revised Suggestion System Administration is progressing effectively; however, the backlog of suggestions continues to grow as was expected at the outset. An interim budget allocation of \$25,000 for HAPO suggestion awards was received from the Commission enabling us to proceed with awards.

Action has been undertaken to outline the necessary changes to our present Vacation Plan and to predict and make preparation for the integration of HAPO-wide practices which will accommodate the new vacation policy and have the effect of allowing greater latitude to make payments in lieu of vacation and to allow deferment of vacation so as to accumulate up to five weeks of vacation.

	Current Month <u>March</u>	7/1/57 to date
<u>Employee Purchases</u>		
Special purchases handled by this office	2	15
Complaints by employees investigated and resolved	4	13
Letters written to obtain special G.E. goods	2	9
<u>Retirement Program</u>		
Retired	3	11
Pre-retirement contacts	5	112
<u>Deceased Employees</u>		
	1	6

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HEALTH & SAFETY

Personnel

Employees: Exempt - 4. Non-exempt - 1.

Accident Statistics

	<u>March 1958</u>	<u>February</u>	<u>Year to Date</u> <u>No.</u>
Disabling Injuries	0	0	0
Frequency	0	0	0
Severity	0	0	0
Medical Treatment Injuries	86	101	302
Frequency	2.17	2.55	2.54
Accumulated hours of exposure since last Disabling Injury (9-3-57)		2,742,430	

Fire Statistics

Fires	2	0	4
Loss	\$20.00		\$40.00

Security Violations

Research & Engineering	3	2	8
Facilities Engineering	1	0	1
Finance	0	1	1
Total	4	3	10

An effective Welding & Cutting Procedure was completed. It is extended to require compliance by all outside contractors and was enthusiastically endorsed by the Commission Safety Operations.

Twenty-five Safety Suggestions were processed during March.

IPD will become eligible for the General Manager's Safety Award on or about April 28, 1958

Seventeen safety meetings were conducted by Specialists - Health & Safety. An average of 20 employees attended each meeting.

Fire Protection

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Organization and Personnel

	<u>Exempt</u>	<u>Non-Exempt</u>
Employees - Beginning of the month	11	41
Fireman terminated voluntarily		1
Fireman reactivated		1
Fireman transferred to F.P.D.		1
Employees - End of the month	11	40

Fire Responses

Apparatus responded to one alarm during the month of March.

Description of Fire

I.P.D. - 100-D Burial Ground - 2:41 P.M. March 26, 1958 - Material ignited, possibly from spontaneous combustion. A control detail of men and equipment was required for 24 continuous hours before the fire was completely extinguished. Estimated Government loss - \$10.00.

Drills held during March

Outside drills	51
Inside drills	41
Feet of ladders used on drills	250
Feet of hose used on drills	11,975

Meetings

<u>Type of meeting</u>	<u>Number of meetings</u>	<u>Number attending</u>
Round Table	5	52
Information	4	39
Safety	4	48
Security	4	49

General

Chief and Day Captain attended an instructional class on Fire Alarm System Maintenance.

Submitted two articles for publication in "Fire Engineering" a national publication.

Assisted 105-B with a pumper for an operational problem.

Controlled burning at several locations in White Bluffs.
Non-Exempt Force reduced by extending Fire Extinguisher maintenance and eliminating one Serviceman.

A First Aid class given to 8 I.P.D. Members by Day Captain.

Serviceman's Activities

Fire Extinguishers: Inspected	525	Fire Extinguishers: Installed	3
Changed Location	3	Seals Broken	19
Serviced	95	Weighted	95
Gas Masks inspected	10	Hose Boxes Inspected	10

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E. J. Fitzmaurice

FINANCIAL OPERATION
MONTHLY RECORD REPORT
MARCH, 1958

Administrative Planning

The Advice 4.3.1, "Compensation, Gifts or Gratuities From Vendors or Subcontractors," was cancelled and re-issued as OPG 1.16, to insure compliance. Several review meetings were held on the subject of revision of OPG 3.1, "Authorization and Performance of Work."

The regular meeting of the IPD OPG Council was held on March 25, for discussion and search for needed OPGs in the field of Employee Relations.

General Accounting

The equipment budget for FY 1960 and Revision of FY 1959 was completed and transmitted to Contract Accounting. We requested \$1.7 M for FY 1959 and \$1.5 M for FY 1960.

Details of the plant acquisition and construction budget for FY 1960 and Revision of FY 1959 were presented informally to Contract Accounting on March 14, 1958. Formalization of the budget information was accomplished by the end of the month.

Our forecast of Spare Parts Inventory levels at the end of fiscal years 1958, 1959 and 1960 are \$1,800,000; \$1,860,000 and \$1,930,000, respectively.

The operating budgets for FY 1960 and Revision of FY 1959 for which General Accounting has responsibility, were completed.

The semiannual inventory of Special Materials and Precious Metals disclosed a shortage valued at only \$.14.

Estimated depreciation expense for fiscal years 1958, 1959 and 1960 is \$22.1 M, \$22.3 M and \$22.7 M, respectively.

Product Cost and Budgets

The month's major effort was directed toward completion of the FY 1960 and Revision of FY 1959 budgets by the April 1 deadline.

Responsibility for issuance of the overtime report by level 3 customer was transferred to Personnel Accounting beginning with February reports.

A physical inventory of essential materials in 100-K Area was taken as of February 28, 1958 and a report issued.

Account 2872 Current Account - Non-product Shipments Billed has been established to record costs of Special Irradiations billed offsite.

RECEIVED
MAR 28 1958
FBI - NEW YORK

Auditing

Production for all reactors for the month of January, 1958 was calculated from recorded power levels and compared with reported data. Procedures for the recording of power levels and the calculation of production were reviewed.

Manager-Finance
IRRADIATION PROCESSING DEPARTMENT

PD Lee:kd

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END

**DATE
FILMED**

12 / 7 / 92