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MONTHLY RECORD REPORT

IRRADIATION PROCESSING DEPARTMENT

JANUARY, 1959

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By Authority of CG-PR-2

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Compiled By
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IRRADIATION PROCESSING DEPARTMENT
MONTHLY RECORD REPORT
JANUARY, 1959

SUMMARY

RESEARCH AND ENGINEERING OPERATION

The B Reactor Self-Supported Fuel Element Test Facility was increased to 13 channels. Analysis of data to date finds the concept of self-supporting fuel elements to be feasible.

Three start-ups using "splines" were successfully carried out at KW; total gains were equivalent to more than a half day's production.

A record amount of turbidity for January occurred in the raw water necessitating sharp increases in chemical feed. No filming problems resulted, however.

Evaluation of the KER size rod-tube and tube-tube fuel elements received from Nuclear Metals on contract DDR-34 shows bonds, surfaces, interfaces and concentricity to be good quality.

Specifications for NPR process tubes were revised and will be issued as an HW Specification; requirements for on-site inspection and preparation of NPR tubes were also prepared.

The PWR fuel train proposed by WAPD for the KAPL-120-8 Test was rejected because of its high flow resistance which would result in its operating dangerously close to burnout.

PRODUCTION AND REACTOR OPERATIONS SUMMARY

Reactor input production for January was 1.5 percent below forecast; 9.0 percent below at the six old reactors and 9.3 percent above at the K Reactors. Production was below forecast due to low time operated efficiency at the six old reactors.

A new maximum power level (combined total for old reactors) was achieved, exceeding the previous record by 310 units. Individual reactor power level records were achieved at C, H and KE when the ACRS limits were discontinued late in the month. H and KE are piloting the program of planned level increases for the five old and the K's, respectively.

Overall time operated efficiency, 76.4 percent (80 percent forecast) was 9.4 percent below forecast at the six old reactors and 7.2 percent above at the K's. Low efficiency at the old reactors resulted largely from tube replacement and water leaks. Thirty-one reactor outages of which 18 were scrams occurred during January.

Six ruptures were removed from the reactors during January. Three of the January ruptures were I and E regular, one was solid regular and two were I and E depleted. Following the removal of the second I and E depleted rupture (the

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13th to date), the balance of this metal on the Pu-240 program was discharged except for eight tubes which remain charges for test purposes.

Significant items of equipment experience were:

1. Two hundred ninety-seven process tubes were installed.
2. Twenty water leaks, seven tube and 13 Van Stone, were corrected.
3. Conversion of the central zone to O-ring pigtails was accomplished at H Reactor with a mass replacement of 1300 rear connectors.
4. Malfunctioning of equipment necessitated removing the No. 5 high-lift motor at 190-KW from service which resulted in a reactor scram.

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

Processing and Power statistics for individual reactor areas are tabulated on pages Ch-1 through Ch-5 of this report.

FACILITIES ENGINEERING OPERATION

Work continued on the NPR program. Design of the reactor plant portion is seven percent complete. General Design Bases have been approved by project representatives. Reactor hydraulic characteristic data were supplied to the A-E so that design can proceed.

New Production Reactor zirconium tube-to-nozzle joints employing bell-ring and banana-ring metallic gaskets have been thermal cycled successfully 3,221 times.

The Expansion Design Council met once during the reporting period, January 29, 1959. The Design Basis, Part I, was approved.

Review and consultation were performed in support of scope and detail design for NPR.

Greater stress continued to be directed to early completion of the proposed rear-face fog spray system on Project CG-791.

The 100-K outfall study, performed under CG-704, has been completed with the conclusion that complete failure of the lines in the near future is not probable.

An air-powered tube inserter was used at F Reactor to insert seventeen tubes with a cycle time as low as three minutes.

Thirty-four splines were used during four start-ups at KW Reactor.

Work has been initiated on reactor front-face material handling equipment improvement.

A production test for 105-B rear face decontamination was issued.

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Downcomer inspections of B, C, H, and F downcomers indicate good condition and absence of the type of damage previously encountered at 105-DR. Minor modifications to 105-F downcomer were recommended to accommodate additional flow.

A design test for clay lining of the 107 basins is in the planning stage.

IPD loads were received in consideration of peak control planning for February and necessary interruptible power was requested.

Proposed specifications upgrading coal evaluation practice for HAPO coal contract negotiations were forwarded to Production Operation, based on an extended study of utility practices.

EMPLOYEE RELATIONS OPERATION

Exempt personnel activities continued at a high level during the month with eight experienced BS/MS technical employees interviewed for openings in IPD. Seven PhD candidates were interviewed resulting in three offers being extended by IPD with two acceptances.

Ten transfers were made into the Department: five from CPD, three from HLO, one from CEO and one from APED - San Jose. There were two transfers out of the Department: one to APED - Vallecitos Atomic Laboratory and one to HLO.

A revised Self-Development review form was completed and distributed to IPD operating components for CY 1959.

Plans are being made to establish a duplicating facility in 100-F Area.

New lithographic machinery was installed in 100-H duplicating office which will provide better and faster service on various types of work.

Mass communication activities included the publication of: eight Management News Bulletins, one Round Table Guide, one IPD News Letter, two OPG's, nine Advices plus 276 column inches in the GE News. Four Priority Messages were received and disseminated and one Management Information Meeting was held during the month.

Nine grievances were received during January which represents the lowest number received since September, 1956.

The HOO-AEC Labor Standards Board approved 14 jobs for assignment to plant forces making a total of 126 jobs which have been approved since the procedure for obtaining LSB approval was initiated in IPD.

The study of the non-exempt, non-unit salary plan progressed to the point of validation of the proposed evaluation plan and salary structure by describing jobs on the form developed to fit the proposed plan.

Fifty-five new IPD suggestions were received and 18 referred from other Departments. Forty-two IPD suggestions were adopted; four suggestions from other Departments were adopted and seven were rejected.

IPD achieved the Central Safety Award on January 18, 1959. Selection of gifts is

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being made by all IPD personnel at the present time.

100-B Area completed their 11th year in January 1959, without a disabling injury.

The two Safety and Fire Prevention Specialists have transferred to Operating Components.

The Central Safety office is scheduled to move to the 1760-H Building on February 6, 1959.

IPD's Fire Department responded to two alarms during January: (1) January 23, 1959 - 9:35 a.m., outer area - Army vehicle overturned spilling gasoline on the highway near M. P. No. 3, Rt. No. 2 South - No fire loss; (2) January 28, 1959, 11:37 a.m., 100-D Area - Near 1720-D Building - A tar pot became overheated and caught fire - Estimated loss = \$10.

FINANCIAL OPERATION

The Atomic Energy Commission was reimbursed \$915 for prepaid travel procured for IPD in connection with the Windscale accident investigation.

Consolidation and transmittal of IPD's budget for FY 1961 and revision of budget for FY 1960 applicable to Specialized Equipment was completed during the month.

Preliminary work was begun on preparation of the fiscal year 1960 and 1961 operation budgets. Forms were prepared and submitted to Level 3 Managers for their estimates of personnel, overtime hours, essential materials, and planned maintenance.

A study of coal consumption by area for Calendar Year 1958 indicates that post CG-558 requirements are below previous estimates and will tend to affect the amount included in the midyear review and future forecasts.

Salary rates for non-exempt, non-bargaining unit employees were increased by 2.5 percent of base salary rates effective January 15, 1959. At the same date isolation pay rates for all exempt employees and non-exempt, non-bargaining unit employees was increased by 2.5 percent of the base isolation rate.

The annual Income and Franchise Report, W-2 Forms, State and Federal Unemployment Tax Reports and the final Insurance Plan Assessment have been completed and forwarded to the proper authorities.

A report covering the audit of the Suggestion Plan for the twelve month period ended December 31, 1958, was issued.

Records supporting the Safety Council Award for which the Department qualified on January 9, 1959, were audited.

Detailed studies are underway of the basic code structures necessary for the planned integration and mechanization of clerical routines within IPD.

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IRRADIATION PROCESSING DEPARTMENT
MONTHLY REPORT OF INVENTIONS OR DISCOVERIES

JANUARY, 1959

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, notebooks, 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. J. Morris	Patent No. 2,863,817 was issued December 8, 1958, to W. J. Morris, and relates to a seal and to a "Poison Spline" control element movable through the seal into and out of a liquid-containing region of a reactor
E. Hollister	Tube Disposing Machine - January 14, 1959
C. E. Frantz and R. D. Schilling	A. C. Bridge, Null Input Photocell Amplifier - January 28, 1959

General Manager
IRRADIATION PROCESSING DEPARTMENT

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RESEARCH AND ENGINEERING OPERATION

JANUARY 1959

VISITORS AND BUSINESS TRIPS

W. A. Hepburn of U.S. Atomic Energy Commission, Washington, D.C., visited HAPO to discuss the DR Gas Loop, 1/9/59.

Dr. Robert Fehr, 1/20/59, and George Street, 1/19-20/59, of General Engineering Laboratory, Schenectady, N.Y., visited HAPO for discussions concerning the compressor contract for the DR Loop.

G. A. Moudry of Harvey Aluminum Co., Torrance, Calif., visited HAPO for discussions on BDF-Process Tubes, 1/30/59.

R. L. Dickeman attended a meeting of the General Advisory Committee, AEC, Washington, D.C., 1/3-7/59.

J. C. Peden visited Boeing Aircraft, Seattle, Wn., for consultations on analog computer equipment, 1/6-8/59.

W. K. Alexander visited Nuclear Metals, Inc., Concord, Mass., to confer on contracts and review fuel development program, 1/6-10/59.

R. W. Pitman visited Mouat Industries and Cascade Fire Equipment Corp., Billings, Mont., to discuss production and delivery of liquid sodium dichromate, 1/8-9/59.

R. W. Benoliel visited Phillips Petroleum, Idaho Falls, Idaho, for discussions on graphite irradiations in MTR, 1/12-14/59.

R. O. Brugge visited APED, San Jose, Calif. for an employment interview, 1/13-15/59.

D. H. Curtiss visited Chase Brass & Copper Co., Waterbury, Conn., Tube Reducing Corp., Wallington, N.J., Superior Tube Co., Norristown, Pa., Allegheny Ludlum, Watervliet, N.Y., and Mallory-Sharon Metals, Niles, O. to discuss tube fabrications, 1/17-24/59.

A. G. Dunbar visited the National Reactor Test Station, Idaho Falls, Idaho, for consultations on the fuel element rupture detection systems and nuclear instrumentation, 1/18-22/59.

R. E. Hall attended the Reactor Fuels Meeting at Sylvania-Corning Nuclear Corp., New York City, N.Y., 1/27-2/1/59.

P. C. Jerman attended a meeting of the Special Subcommittee on Radiation of the Joint Committee on Atomic Energy, Washington, D.C., 1/27-2/3/59.

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ORGANIZATION AND PERSONNEL

	<u>*Permanent</u>		<u>Rotational</u>	
	<u>Dec.</u>	<u>Jan.</u>	<u>Dec.</u>	<u>Jan.</u>
Management & Administration	5	5	-	-
Process & Reactor Development	42	42	4	3
Process Technology	37	35	1	2
Operational Physics	19	19	3	3
Irradiation Testing	21	21	1	1
Component Testing	17	18	1	0
Coolant Testing	26	26	0	0
	<u>167</u>	<u>166</u>	<u>10</u>	<u>9</u>

* Includes one engineer on loan

Process & Reactor Development: R. W. Benoliel, Engineer I, transferred from HLO, 1/1/59. Lenora M. Buel, Secretary, transferred to R&U, 1/5/59. K. W. Norwood, Engineer I, new hire, 1/7/59. H. E. Book, Engineer I, transferred to APED, San Jose, Calif., 1/9/59.

Process Technology: R. V. Bowersock, Engineer I, and R. L. Call, Engineer I, transferred to HLO, 1/1/59.

Component Testing: P. A. Crosetti, Engineer II, assigned from Rotational Training Program, 1/1/59.

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PROCESS AND REACTOR DEVELOPMENT OPERATION

Reactor Fuels

Present Reactor Fuels Technology

I & E Fuel Element Program

Projection Fuel Element Testing

The first column of I & E natural self-supported fuel elements was discharged from B Reactor at 185 MWD/T too late in the month to examine. Ten additional ribless process tubes were installed during the same outage and charged with I & E natural uranium self-supported fuel elements. This increases the size of the B Reactor Self-Supported Fuel Element Test Facility to 13 channels, which have been utilized to irradiate nine solid natural self-supported columns and one I & E natural self-supported column to goals ranging from 150 to 550 MWD/T. These channels now contain 13 charges of I & E natural material goaled at 400 - 800 MWD/T exposures. Analysis of the data to date indicates that the concept of self-supporting fuel elements is feasible and with appropriate equipment changes may be adaptable for general usage in conjunction with ribless process tubes. Further tests are required to demonstrate any improvement in either power or exposure potential.

Dingot Metal (I & E) Testing

Seven columns of low hydrogen dingot uranium, I & E fuel elements were discharged at approximately 800 MWD/T from C Reactor. Examination in the 105-C Metal Examination Facility has shown some "bumping" to be present. Observed bumps are in the range of 3 - 5 mils high. This again emphasizes the importance of grain size on reactor performance of fuel elements. Dingot uranium has been typically larger grained than ingot material.

Comparison of Bond Integrity With Hot Spot Incidence

Production Test IP-210-A, "Comparison of Bond Quality with Reactor Performance of Enriched I & E Fuel Elements," R. E. Hall, 10-20-58, was authorized and charging initiated. Thirty monitor columns were charged and the first of the lot charging performed. The goal of this test is to attempt to correlate bond-voids with hot-spot location. If such a correlation exists, more rigorous bond standards are in order; however, a negative result from this test may not be construed as proving that poor bonds are acceptable. Integral bonds are a necessary condition for good heat transfer properties and acceptance of less than perfect bonds is only a compromise with the process until integral bonds can be obtained.

High Concentration Pu-240 Plutonium Production

After a thirteenth rupture in the depleted uranium undergoing irradiation at 105-C, permission was obtained from the AEC to discharge the remainder of the test. This was accomplished with the exception of eight columns recently charged which will be carried under a separate testing program independent of the Pu-240 production effort.

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The status of fuel element development production tests is summarized in Table I.

NPR and Advanced Reactor Fuels Technology

Development Contracts - Nuclear Metals

Fabrication of the unenriched KER size elements under DDR-34, Modification 2, are estimated to be completed by January 30. These elements consist of the following:

- 1) 30 ft. natural uranium rod and tube.
- 2) 30 ft. 2% Zr-uranium alloy, rod and tube.
- 3) 25 ft. natural uranium tube-tube.
- 4) 25 ft. 2% Zr-uranium alloy tube-tube.

Evaluation of that part of the above material finished at this time indicates very good quality. Bonds appear good, surface and interfaces are satisfactory, and concentricity of the tube is the best produced so far. Billets for NPR size elements are in various stages of preparation. The first NPR sizes are scheduled for extrusion early in February at American Brass Company.

Zircaloy Clad Enriched I & E Slug Development

Composite billets for testing the four proposed methods for fabricating I & E² elements are in various stages of fabrication. The four methods to be tried are 1) conventional floating mandrel, which gave very encouraging results with CU-Ni dummy billets, 2) tipped mandrel, 3) oversized fixed mandrel with subsequent drawing to size, and 4) filled billet. Tools now being fabricated at Ajax Tool and Forge are scheduled for completion in February.

NPR Fuel Element Closure Study - Battelle Memorial Institute

A contract, DDR-58, is being negotiated with BMI for studying alternate methods for closure of coextruded elements, both rod and tube. This will be a four month effort with any future work depending on the results of this study.

KER Loop Modification

The final draft of the preliminary project proposal for modification of the 1706-KER facilities is being prepared following receipt of comments on the comment draft of the proposal and a rough draft of the scope. The project is to include conversion of two loops to NPR prototypic loops using the front-to-rear through-holes for the large process tubes, de-limiting of the two remaining loops, improved instrumentation, and additional supporting facilities to improve operability. The preliminary project proposal is for design, procurement, and management services.

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TAI I
PRODUCTION TESTS - FUEL DEVELOPMENT

Test Number	Type Metal	Tubes	Reactor	Goal Exposure	Current Exposure	Remarks
IP-50-A	Low Hydrogen Dingot U Elements	84	D, DR, F, C	Variable		Semi-production scale testing of low hydrogen dingot uranium fuel, solid and I & E
IP-81-A	BNTL Regular	298	D	Variable 500		Provide for quantity charging of BNTL elements. (Solid)
IP-84-A	Projection I & E Nat. Elements	13	B	400 & 600 800 MWD/T		Preliminary evaluation of self- supported fuel elements.
IP-93-A	Cast uranium I&E Natural	12	C	500 & 700 MWD/T	100 MWD/T	Preliminary evaluation of fuel elements fabricated with Cast Uranium cores to evaluate dimensional instability.
IP-95-A	Lead Dip, 1.445"	7	D	800 MWD/T		Provides for preliminary testing of I & E elements in D-Reactor.
IP-123-A	7-Rod S.S. jacketed 1.3% enriched clusters	1	KE	3500 MWD/T	3500 MWD/T	Charged 5-6-58 in KE front-to rear test hole. Fuel elements are instrumented to measure uranium temperatures.
IP-140-A	Co-extruded Zr-2 jacketed 7-rod clusters Nat. Ur.	1	KE			Discharged 15 Jan. '59 at goal
IP-168-A	1.460" O.D. Natural I & E	4	C	Variable 800		Long term corrosion monitoring & refinement of operating limits.
IP-171-A	Solid M-388 & 1245 Clad Elements	12	B, DR, F	Variable 500	350 MWD/T	Provide for evaluation of alternate aluminum component vendors. Control columns are only ones carried special. Rest are lot charged.
IP-178-A	1 474" O.D. I & E Nat.	6	KE, KW	Variable 800		Provides for irradiation testing of KIII elements, water mixers and long term tube corrosion monitoring.

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TABLE I (cont'd)

<u>Test Number</u>	<u>Type Metal</u>	<u>Tubes</u>	<u>Reactor</u>	<u>Goal Exposure</u>	<u>Current Exposure</u>	<u>Remarks</u>
IP-179-A	OIIN geometry, 45 sec. delay quenched nat. uranium.	16	C	Variable 800	300	Provides for testing to optimize heat treatment of I & E fuel elements.
IP-205-A	Zr-2 jacketed Rod-and-Tube elements.	1	KE	2500	650 MAD/T	Charged Nov. 18, 1958 in KER Loop 4.
IP-210-A	CIIE normal sorted as to Bond integrity	30	C	Normal		Evaluation of relationship between Bond integrity and Hot-Spots.
IP-214-A	Zircaloy jacketed 1.6% Enriched 7-Rod Cluster elements & a 3-foot, 3-rod, Zr-2 jacketed, 1.6% enriched integral end closed cluster element.	1	KE	3500	890	Charged in KER Loop 2 Dec. 9, 1958
IP-221-A	Zr-2 jacketed natural uranium 7-rod cluster elements	1	KE	2 weeks equilibrium operation	20 days equilibrium operation	Charged in KER Loop 3 on Dec. 29, 1958. Test is instrumented to measure flow channel temperatures in seven-rod cluster elements.
IP-226-A	Zr-2 jacketed, 1.6% Enriched 7-rod cluster elements.	1	KE	4500	175	Charged in KER Loop 1 on 15 Jan. '59.

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Fuel Element Rupture Test Loop

An in-reactor facility in which fuel elements may be deliberately failed is desired for two main purposes: 1) determination of fuel element failure characteristics under irradiation and, 2) development of instrumentation for early failure detection. It is currently believed that a non-recirculating installation or equivalent will be required for the rupture detection work in order to best simulate NPR conditions for the measurement of instantaneous fission product release rate. The possibility of installing such test facilities in the PRTR are being studied. Equipment space limitations have necessitated cursory studies on facility design.

KER Irradiation Results

Two natural uranium Zr-2 jacketed 7-rod cluster elements with 50 mil space between the rods were discharged January 15 at an exposure of 1000 MWD/T under PT IP-146-A. The tube was recharged with seven Zr-2 jacketed enriched 7-rod cluster elements under PT IP-226-A to be irradiated to a goal of 4500 MWD/T. The objective of the test is to compare the behavior of elements with 20 and 30 mil Zr-2 jackets which are alternated in the tube.

On December 29 the two and three foot long Zr-2 jacketed cluster elements being irradiated to a goal of 1200 MWD/T under PT IP-186-A to determine deformation of a long rod under its own weight were discharged. Loop 3 was recharged with a short-time term test, PT IP-221-A, which is intended to determine the amount of flow channel mixing occurring in the 7-rod cluster elements being measured at coolant temperature in the internal and external flow channels.

Reactor Physics

Present Reactor Physics Technology

Measurements Evaluation Program

A letter to the Atomic Energy Commission has been prepared which evaluates the possibility of utilizing reactor calculations as a means of determining the SSNM content in the non-production fuels to be processed at Hanford. Summarized in this letter are 1) reactor data necessary for carrying out the calculations, and 2) estimated accuracy of the calculations. This analysis was prepared at the request of the Chemical Processing Department.

Build-up of Kr-85 in E-Metal

The equations for Kr-85 buildup which are given in HW-32753 have been re-written in a more general form to permit the calculations to be made with a change in fuel geometry and/or fuel enrichment to 0.94%. The new expressions also include the corrected fission yield of Kr-85 from U-235 and Pu-239. The expression for Curies Kr-85/Ton Uranium proved to be fairly insensitive to changes in enrichment or geometry but the expression for Curies Kr-85/gm Pu is very sensitive to these changes.

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Additional Control Rods - K Reactor

A letter discussing the probable justification for adding four control rods to a K Reactor was prepared at the request of Facilities Engineering Operation. It was concluded that the only increased gain would be that associated with decreased spline throughput costs during start-ups. It is believed that the additional rods would not provide significant incremental production gains over those available with the poison spline and column displacement supplemental control systems.

Poison Column Control Facility

A supplemental technical basis was prepared to those appearing in HW-52400 RD Rev., "Bases for Process Standards - Charging and Discharging Process Tubes During Operation." This basis defines the probable tube power rise associated with a flush discharge of poison as a function of position relative to the poison charge and the amount of reactivity which could be flushed. The purpose of this basis was to establish limits permitting discharge by water displacement such that an inadvertent full flush would not cause tube temperature and power limits to be exceeded.

Reactor Instrumentation

Purchase orders were placed with the successful low bidders Victoreen and Anton Electronics on January 7, 1959 for the prototype in-core flux monitor assemblies. One prototype assembly consisting of five air ion chambers with lead cables will be provided by each vendor. Each of the assemblies will be installed in KW Reactor for in-pile evaluation.

Due to material procurement problems, the traveling wire flux monitor mechanical mechanism will be delayed approximately two weeks. Delivery to the Mechanical Development Laboratories is expected by February 15, 1959.

Vendors with acceptable technical proposals were Radiation Incorporated and Epsco, Incorporated. The system requirements are: 1) the system must operate 1000 consecutive hours at the vendor plant and successive 1000 hours at the purchaser's facility without discontinuity.

Palm-Olive Program

Palm is currently produced in the Hanford reactors at a rate of $\sim .003$ gm/MWD. The U-238 (n,2n) reaction accounts for the greater share of the production; the U-235 capture-chain being secondary. In order to account for the observed production it is necessary to know the effective n,2n cross section for U-238 in a Hanford reactor. Recent, n,2n cross section data have permitted an up-to-date calculation and the effective 2200 m/s value is 11.2 mF which compares to the old value of 5.2 mF. The new value gives predicted Palm yields which agree with Separations data.

Nuclear Safety - E-N Load

A study by W. R. DeHollander on the hazards of a full reactor E-N load from a chemical viewpoint (HW-58813) has been completed at our request. The conclusions he reached are that during a meltdown disaster, the behavior of the E-N load will essentially duplicate the behavior of tube 4669 in the K West incident.

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Category II and NPR

Control Rod Studies

A method for calculating individual and total control rod strengths has been developed for use in attempting to predict the total control strength of the NPR control system.

This method consists of three steps: 1) determination of the strength of a single rod placed in the center of the reactor, 2) determination of the buckling in one rod "lattice unit" from 1), and 3) determination of the effect of x number of this lattice units on the full pile.

To calculate the single rod strength a two-group calculation developed by Codd and Rennie is used. The rods are then transformed into a cylindrical lattice. The area of the cell is obtained from the spacing between the rods.

Two approaches to determine the buckling in this lattice have been tried. Method one consists of a perturbation calculation which is similar to the approach used previously by C. L. Miller. However, it was found that the perturbation in the flux in the central region is much too large to give correct answers. An alternate and more exact approach is to derive the critical equation for the particular configuration. Solution of the equations of this method accurately predict the K Reactor startup rod strength measurements.

One of the cases investigated for the NPR is the 0.664" cluster with the following results:

Single ball column strength in the "just critical pile" = 7.625 *MB*.

Single rod strength in the "just critical pile" = 7.707 *MB*.

The total ball strength was then calculated to be -89 *MB*. A migration area of 440 cm² corresponding to solid stack graphite of 1.5 gm/cm³ yields a conversion factor of ~ 20 ih/

$$\Delta k_{\text{Balls}} = 4.45\%$$

The effect of increasing the migration area to account for streaming and NPR 1.29 gm/cm³ density graphite was also investigated. Again for the 0.664" cluster in the NPR lattice and a corrected migration area of $M^2 = 821 \text{ cm}^2$, the ball strength in the "just critical reactor" was 7.2352 *MB*.

The total ball strength on the full pile was calculated to be -88 *MB*. The migration area of 821 cm² yields a conversion factor of ~ 37 ih/*MB*.

$$\Delta k_{\text{Balls}} = 8.14\%$$

It is felt that these values are good to $\pm 10\%$. It is also felt that these values quoted for rod strengths are if anything somewhat conservative.

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The single rod strengths measured in the "just critical" K-Reactor have been duplicated by this method for calculating single rod strengths.

<u>Rod Type</u>	<u>Calc.</u>	<u>Ex.</u>
VSR	127 ih	127 ih
Boron Steel Balls	171 ih	172 ih

NPR Fuel Element Rupture Detection System

A letter requesting the inclusion of proposed fuel element rupture facilities, decontamination facilities and controlled rupture tests was prepared and forwarded to HLO. The additional facilities for ETR 3" x 3" loop were scoped and presented to J. E. Minor, Fuels Development Operation, HLO. The following prototype rupture detection systems were scoped for inclusion in the 3" x 3" ETR loop:

- 1) Fission product monitor (gross gamma).
- 2) Fission product and coolant water activity monitor (gamma energy spectrum monitor).
- 3) Fission product monitor (delayed neutron monitor).
- 4) Fission product monitor (gaseous and associated by-products).

A visit was made to the ETR-MTR Arco Test Reactor site by A. G. Dunbar for visual inspection of the 3 x 3 and 6 x 9 GEH loops. Agreements were confirmed with the reactor operations personnel (Phillips Petroleum Company) for instrumentation floor space and space for the individual prototype rupture detection monitor cells.

Heat Generation - NPR Lattice

A calculation for Design Analysis Operation to determine the heat generation in the various components of the NPR stack is underway. Although no final results are yet complete it is worthwhile to list the total heat generation in the NPR per fission. All energy sources are considered in this total such as capture gammas, decay gammas as well as primary fission energies. The total sensible heat for three different fuel elements in the NPR are as follows:

<u>Fuel</u>	<u>Total Sensible Heat/fission</u>
.664" cluster	202.4 Mev
.733" cluster	203.0 Mev
25.5 lb/ft tube and rod	202.9 Mev

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Documents Issued

- HW-58784, "Calculations of Buildup of Plutonium Isotopes and Burnout of U-235 in 1.44% U-235 Enriched Uranium," W. E. Niemuth, Secret, December 1, 1958.
- HW-58817, "The Effective (n,2n) Cross Section for U-238," R. Nilson, Secret, January 9, 1959.
- HW-58304, "Calculations of Plutonium Buildup in Depleted U" W. E. Niemuth, Secret, December 1, 1958.
- HW-58678, "Correlation of Exponential and PCIR Measurements on Cluster Fuel Elements with Theory," G. D. Joanou, Confidential, December 31, 1958.
- HW-58672, "In-core Flux Monitor Justification," A. G. Dunbar, December 31, 1958, Unclassified.
- HW-58716, "Proposed Evaluation and Specification Changes for the Prototype In-core Flux Monitor System," A. G. Dunbar, January 2, 1959, Unclassified.

Reactor Engineering

Present Reactor Engineering Technology

Heat Transfer and Water Plant

In line with the objective of obtaining 95°C bulk outlet temperatures by July of 1959 a problem has come to light at H-Reactor during operation at 93.5°C bulk outlet temperature. There have been some indications that rear face piping thermal stress may be approaching limiting values.

A considerable decrease in the frequency and magnitude of bulk temperature surges can be effected by means of a rapid temperature monitor of 10-20 reactor outlet temperatures. Tests have been performed on a mock-up of an old reactor crossheader. These tests have shown no signs of cavitation erosion at test temperatures up to approximately 100°C.

A theoretical equation has been developed for the determination of reactor flow transients following BPA loss. The Production Test IP-85-A, "Water Shut-Off After Shutdown," has been approved and a mock-up charge of the actual test assembly performed. Test results were very satisfactory. An examination was made of both the DR - Near and Far downcomers. Weld damage to the near downcomer occurred in 33 days of operation at average values of 73,000 gpm and 80°C. Rather minor weld damage was discovered in the far downcomer, however this does indicate a need for frequent downcomer inspections.

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Nuclear Safety

A theoretical determination of the steady-state flow conditions before and after the loss of a single reactor pump revealed no problems at any of the production reactors under current operating conditions; however some reactor damage may result from the use of five pumps at K-Reactor or from the use of six pumps with the maximum flow available from zirconium tubes.

In connection with water hammer arising from the rapid closure of an initially stuck check valve in a D-Reactor crossheader, it was found that the hoop stress in the crossheader is not of sufficient magnitude to cause rupture.

An analysis was made of the KER rupture monitoring system which protects the KE-Reactor from the damage which would result if a tube failed as a consequence of a fuel element rupture. It was determined that rupture monitoring is required at all times during recirculation operation unless only non-swelling fuel elements such as UO_2 and Doe alloy elements are charged in the process tube. Even if loop temperatures and pressures are reduced to the minimum possible with continued recirculation, considerable stack damage could result or tube failure.

As part of the long term problems associated with reactor safety, studies are being initiated to evaluate the seismic vulnerability of the Hanford reactor systems. Initially this program will consist of three phases, i.e., 1) to define the earthquake potentials and magnitudes in the Hanford area as related to design requirements for structures and equipment, 2) to develop methods and procedures of analysis for determining behavior of reactor structures and equipment during a seismic disturbance, and 3) to evaluate areas of potential seismic damage in the existing reactor systems. It is anticipated services of the University of Washington and the Lockheed Aircraft Corporation will be engaged for these studies.

Thermic-Hydraulics

The problem of individual tube flow protection during low pressure operation of K-Reactor has been studied. Instability characteristics of the tube flow system may be affected by operation of K-Reactors with only five existing high lift process pumps if the reactor is loaded with KIII I & E fuel elements. This situation is not at present covered by specifications and standards.

Zirconium Tubes

Three proposals for the fabrication of ribbed Zircaloy-2 process tubes have been received from the following companies: Harvey Aluminum, Tube Reducing, and Superior Tube Company. Mallory Sharon Metals Company requested a two week delay in submitting their proposal.

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Category II and NPR

Zirconium Tubes

Process tube specification for NPR tubes has been revised and will be issued as an EWS. Requirements for on-site inspection and preparation of NPR tubes have been prepared and transmitted to the Project Expansion group.

Thermo-Hydraulics

To form the basis for pump characteristic specifications for NPR, the pressure loss of coolant flow past several of the proposed fuel designs has been computed.

Graphite

A design developed by the Hanford Laboratories for the use of a modified shim rod in the L-48 position in the MTR for controlled high temperature test irradiation of graphite was reviewed with Phillips Petroleum MTR engineering and operating personnel on January 13. The design was accepted as reasonable. A partial prototype of the modified rod is being built at Hanford. This will be shipped to the MTR site the early part of February for mock-up testing. Construction of two complete modified shim rods has been started. An "A" priority for installation and a "B" priority for operation of the test has been assigned by the Division of Reactor Development. Assuming approval of the test by the Phillips Safeguards Committee, it is planned that the first test in the modified rod will be charged in April.

Adapters to hold test capsules for high temperature, high flux graphite irradiation in the two corner filler spaces, E-5 and N-15 in the ETR (GEH-13) and a test capsule mock-up for use in determining the effect on reactivity of the test installation were shipped to Phillips the latter part of January. Assembly of two test capsules is nearly complete. At least one of these should be charged in February.

Sample bars of all of the graphites to be tested in the program for selection of the graphite for the NPR have now been received.

Comments on the design criteria for the NPR graphite moderator (HW-57009 RD Rev. 1) have been offered. These deal with 1) arrangement of the layout to forestall the development of gaps as have developed at the K Reactors, 2) provisions for monitoring for horizontal and vertical distortion, 3) arrangements for removing some graphite spacer blocks to permit monitoring irradiation effects, and 4) provision of a hot test hole and a water-cooled test hole for irradiation of various graphite samples.

Documents Issued

- 1) "B-C" Trip-Out Test," R. E. Trumble, S.S. Jones, J.F. Music.
- 2) "Radiographic Check of Process Piping," R. E. Trumble, S.S. Jones, C. E. Harkins.

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- 3) HW-58734, "Preliminary Program for Procurement & Installation of Zirconium Process Tubes," 1-5-59, D. H. Curtiss, Unclassified.
- 4) "Requirements for On-Site Preparation of NPR Process Tubes," 12-31-58, Letter D. H. Curtiss to C.E. Love.

Production Tests

- 1) PT IP-85-A, "Water Shut-Off During Shutdown at C Reactor, 4-24-58, S.S. Jones and D. L. Moore, Secret.
- 2) PT IP-130-A, "Trip-Out of KW-Reactors Pumps," January 15, 1959, S.S. Jones, Secret.

Radiological Engineering

Radiation Control Experience

The HAPO 1958 badge year was completed during this reporting period. One IPD employee of the Component Testing Operation, Research and Engineering Operation, exceeded the 3r annual limit with a recorded dose of 4190 mrad including 3210 mr for the year.

Fifteen Reports of Lapse of Radiation Control were issued during the month. There were six cases of spread of contamination to the skin or personal clothing of employees. One of these involved nasal contamination resulting from handling grossly contaminated equipment without respiratory protection. There was one case in which employees received uncontrolled exposure to radiation because of failure to notify the timekeeper when they entered a radiation zone at the start of a job.

There were also two lapses in which high dose rates existed outside radiation zone boundaries. One of these involved reclaimed poison pieces and highly contaminated trash stored near the edge of the work area, causing a high dose rate in the work area corridor. The other involved the backup of activated effluent water gases into the 105-C building from the 105-B effluent system because of inability to completely isolate the two effluent systems of 105-B and 105-C. Other lapses involved: 1) entry to a contaminated radiation zone without adequate protective clothing; 2) a highly radioactive speck in clean trash in a 105 building maintenance shop; 3) high level contamination on a chain hoist; 4) a contamination spread resulting from a gunbarrel falling out of a burial cart on the way to the burial ground; 5) a contaminated lunch tray found in clean trash in a load lugger outside a 105 building; and 6) a very high dose rate on a wash pad due to activated graphite stringer thermocouple wire in a bucket of reclaimed poison pieces.

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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	1	2	0	1	0	0	1	
Maintenance	1	0	1	0	0	2	0	0	
Supplemental Crews	1	0	0	0	0	0	0	0	
Research & Eng.	0	0	0	0	0	0	0	0	
Facilities Eng.	0	1	0	0	0	0	0	0	
Central Maint.	0	0	0	0	0	0	0	0	
Reactor Areas	0	1	0	0	1	0	0	0	
Assigned Totals	<u>4</u>	<u>3</u>	<u>3</u>	<u>0</u>	<u>2</u>	<u>2</u>	<u>0</u>	<u>1</u>	<u>15</u>
IPD General									0

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

These data are reported through the cooperation of the Radiation Protection Operation, HLO.

Columbia River and Sanitary Waters

100-F Area

	<u>Raw</u>				<u>Sanitary</u>			
	<u>Nov.*</u>	<u>Nov.</u>	<u>Dec.</u>	<u>12 month average</u>	<u>Nov.*</u>	<u>Nov.</u>	<u>Dec.</u>	<u>12 month average</u>
% MPE _{GI}	4.8	6.3	8.8	6.1	0.9	1.4	2.0	1.4
% HAPO Limit					9	14	20	14

Pasco

	<u>Raw</u>				<u>Sanitary</u>			
	<u>Nov.*</u>	<u>Nov.</u>	<u>Dec.</u>	<u>12 month average</u>	<u>Nov.*</u>	<u>Nov.</u>	<u>Dec.</u>	<u>12 month average</u>
% MPE _{GI}	1.3	2.2	1.9	1.7	0.3	0.4	0.4	0.4
% HAPO Limit	26	44	38	34	6	8	8	8

Kennewick

	<u>Sanitary</u>			
	<u>Nov.*</u>	<u>Nov.</u>	<u>Dec.</u>	<u>12 month average</u>
% MPE _{GI}		0.1	0.2	0.2
% HAPO Limit		2	4	4

* These data as previously reported. All other data revised to include correction for analytical error.

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Average Reactor Effluent Activity Output

	<u>January 1959</u>	<u>December 1958</u>	<u>January 1958</u>
107-B	26,000 μ c/sec	32,000 μ c/sec	21,000 μ c/sec
107-C	26,000 " "	28,000 " "	50,000 " "
107-KW	22,000 " "	19,000 " "	54,000 " "
107-KE	41,000 " "	55,000 " "	34,000 " "
107-D	29,000 " "	28,000 " "	28,000 " "
107-DR	19,000 " "	13,000 " "	20,000 " "
107-H	32,000 " "	34,000 " "	19,000 " "
107-F	36,000 " "	28,000 " "	22,000 " "

Radiological Training

The training of 21 radiation monitors and journeymen in the new radiation protection information program was started. Reports back from the reactor buildings indicate that the program is going well. Training materials for the second session have been issued to these monitors and journeymen and to the radiation analysts.

Radiation Protection topic #12, entitled, "Airborne Contamination" was issued.

Rough drafts of the proposed revision of the processing supervisors course on radiation protection have been prepared. These include revision of the original course, and preparation of a refresher for those who attended the original course. The second seminar in a series scheduled for personnel of the Processing Operations was presented on January 20. It was titled "Recent Trends and Developments in Recommendations of National and International Committees on Radiation Protection," and was presented by J. W. Healy of HLO. Interest in these seminars is high.

Instrumentation

Remote Area Monitoring

All but one Victoreen remote area monitoring channel out of 16 received to date have been returned to the vendor because they failed to meet specifications. Further tests of the one revealed that it does not meet our energy dependence requirements so it will also have to be returned. The vendor now promises completion of the order by the end of February.

Personnel Dose Alarms

The 15 personnel alarm dosimeters returned to the West Germany vendor for re-setting of alarm points arrived here on January 7, 1959. The alarm points on all but two were within ten percent of our calibrated values. The instruments are now being field tested.

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Liquid Waste Disposal

Reactor Effluent Water

Significant increases in "point of use" measurements of exposure from river and sanitary water were caused by refinements in chemical yield and counting corrections applied to the radioisotopic analysis procedures by the Radio-logical Chemical Analysis Laboratory, HLO. All exposure estimates based on river water or sanitary water analyses must be multiplied by 1.5 to 1.8 to be more nearly correct. The major discrepancy was in reported concentrations of As⁷⁶, a major contributor to gastrointestinal exposure in drinking water derived from the Columbia river, being barely within accuracy limits. Further work is planned which should greatly improve the reliability of these data.

Analytical Chemistry, Chemical Research Operation, HLO, has been conducting studies to determine ways to reduce the amount of radioactivity released to the river in reactor effluent water. One of these studies involved treatment of the effluent water by passing it through a bed of metal ribbons. The results of the first test indicate the activity densities of several radioisotopes can be reduced by about 50% in an eight foot bed of aluminum ribbons. Chemical Effluents Technology, HLO, will cooperate in further studies of this technique.

Reactor Decontamination

Decontamination of the discharge area piping at 105-D, 105-H, and 105-DR was carried out. Decontamination factors of 2.3, 2.4 and 2.1 and average post-decontamination dose rates of 43 mr/hr, 50 mr/hr and 46 mr/hr, respectively, were reported. Each decontamination preceded a maintenance outage and although the increase in maintenance efficiency was not evaluated, it was felt to be considerable. In at least one case part of the benefit was lost when the accumulation of material in the discharge chutes caused an increase in discharge area dose rates. Similar decontamination was previously carried out at 105-H in September 1957 and at 105-DR in July 1958. Although the reduction achieved at 105-DR was largely retained, it was felt that further reduction in discharge area dose rates would be beneficial.

Significant Reports Issued

"Production Test Authorization IP-207-A-3FP Evaluation of Effluent Contamination Problems Associated with Nickel-Coated Fuel Elements," HW-58179 A, dated November 14, 1958, authors R. E. Hall, R. B. Hall.

"Production Test Authorization IP-228-AE Reactor Rear Face Chemical Decontamination - 105-B," HW-58697, authors J.H. Hoage, N.R. Miller, R. B. Hall, dated December 31, 1958.

Personnel Activities

H. E. Book transferred to the Vallecitos Laboratory on January 9, 1959.

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PROCESS TECHNOLOGY OPERATION

REACTOR POWER LEVEL LIMITATIONS

Limits to reactor power levels at the end of the report period are as follows:

<u>Reactor</u>	<u>Basis</u>
B	ACRS power level limit
C	Stepwise increase from ACRS limit
D	ACRS power level limit
DR	ACRS power level limit
F	ACRS power level limit
H	Stepwise increase from ACRS limit
KE	Stepwise increase from ACRS limit
KW	ACRS power level limit

WATER TREATMENT

Plant Tests

The bauxite feeder at 183-B has had minor equipment difficulties.

The experimental sand-filter coal filter at 183-D has been producing good quality water with a material gain in head loss.

Raw Water

The raw water contained a record amount of turbidity for January. No serious consequences resulted. Chemical costs increased somewhat.

PROCESS STANDARDS

HW-46000 B, Process Standards - Reactor

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

Process Standard C-070 - "Horizontal Rod Withdrawal - Power Increase"

Two separate revisions of this Standard were issued. The first revision, Section 70.01, permits use of a more rapid horizontal rod withdrawal rate on secondary cold start-up by allowing correction for xenon build-up. This makes earlier

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resumption of operation possible. The second revision, Section 70.02, no longer requires a fixed operating period before use of hot start-up rod withdrawal rates is acceptable. Instead, use of these rates is determined by the reactivity status of the reactor at the time start-up is to be attempted. This provision should eliminate unnecessary use of restrictive start-up withdrawal rates, and result in more successful recoveries.

Process Standard F-011 - "Process Materials"

The revision lists the I & E slugs and water mixing spools that are acceptable for use at B and C Reactors. In contrast to solid slugs, I & E slugs are not freely interchangeable between reactors. Therefore, end cap data were provided to assist in I & E slug identification. Inadvertent use of slugs intended for another reactor could result in production losses through limiting tube temperatures.

HW-46000 D, Process Standards - Reactor

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

Process Standard C-070 - "Horizontal Rod Withdrawal - Power Increase"
Sections 70.01 and 70.02

The revisions were identical to those issued in HW-46000 B, above.

HW-46000 F, Process Standards - Reactor

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

Process Standard C-070 - "Horizontal Rod Withdrawal - Power Increase"
Sections 70.01 and 70.02

The revisions were identical to those issued in HW-46000 B, above.

HW-46000 H, Process Standards - Reactor

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

Process Standard A-040 - "Process Water Trip Settings"

The Standard specifies a lower #1 Safety Circuit process water trip setting to ensure automatic re-setting of the trip at the start-up water pressure. The revision also permits removing the LXX-LP trip from the #1 Safety Circuit provided certain compensating Safety Circuit modifications are made. Removal of the LXX-LP trip from the #1 Safety Circuit will not effect reactor safety because riser pressure is adequately monitored by a multitude of other water pressure trips.

HW-46000 K, Process Standards - Reactor

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

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

Because tube temperature sensing elements are located on the rear crossheader, the

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indicated tube outlet temperature is slightly less than the true temperature when tube temperatures are above rear crossheader saturation temperature. The revised Standard provides curves which allow determination of the corrected tube outlet temperature. As a result, tube outlet temperatures are no longer limited to a maximum of 5°C below rear header saturation temperature, thus eliminating this restriction on reactor power level.

Process Standard C-070 - "Horizontal Rod Withdrawal - Power Increase"

K Reactor start-up instrumentation sensitivity necessary to permit use of rapid rod withdrawal rates was reduced and the power rise rate was increased. Because of the greater size of the K Reactors, the new values are equivalent to those that apply at the older reactors. Also, the revision permits use of a more rapid HCR withdrawal rate during secondary cold start-up by allowing correction for xenon build-up. This should result in earlier resumption of operation for these start-ups.

PROCESS CHANGE AUTHORIZATIONS

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

PCA #8-125 - "Flux Monitor Low Trip Settings - KW Reactor"

Recently a "seismoscope-flux decay" coincidence trip was installed in the KW Reactor Ball 3X Safety Circuit. The flux decay trip is in parallel with the seismoscope so that receipt of two flux monitor low trips within five seconds after a seismoscope trip, showing that the VSR's have successfully entered the reactor, will by-pass the 3X system. Because of this change, the Standard requires that flux monitor low trips be set at two minor divisions or greater to prevent inadvertent ball drops. During hot start-up, the prescribed low trip setting significantly reduces the changes of recovery. While setting the trip lower eliminates this problem, it increases the chance of an inadvertent ball drop. Since the risk of ball drop is small, the latter course was chosen and a PCA was issued to permit a setting of zero or less during hot start-up.

PCA #8-126 - "#1 Safety Circuit Process Water Trips - B Reactor"

The PCA permitted lowering the #1 and #3 Safety Circuit process water trip settings from 70 to 100 psi below operating riser pressure. This was necessary because of the greater differential that exists between operating and start-up riser pressures when I & E slugs replace solid slugs. The lower setting will ensure automatic re-setting of the trips when water pressure is raised for start-up. The change will not cause any significant delay in the automatic ball drop required upon rapid decay of water pressure.

PCA #8-127 - "Water Leak - D Reactor"

On December 30, 1958, water collection rates at D Reactor slightly exceeded the rate permitted by Standards. To permit efficient outage scheduling, the PCA permitted an additional three days of operation under specified conditions.

PCA #8-128 - "Water Leak - KW Reactor"

Since the December 1, 1958, start-up, KW Reactor has been extensively leak tested

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and several leaks have been repaired. These leaks were caused by missing rear Van Stone gaskets which were probably lost during the RTD replacement program. Despite these repairs, the leak rate has remained high. The source is believed to be several small rear Van Stone leaks which can only be located by individual tube testing. Collection of extensive gas dew-point data was desirable to assist in defining the probable leak locations, thus reducing the amount of testing required. The PCA permitted two additional days of operation for data collection.

PCA #9-1 - "Water Leak - B Reactor"

After an unsuccessful leak test of B Reactor, the water collection rate remained slightly above that permitted by Standards. Rather than shut down immediately to locate a leak that would be very difficult to find, the PCA permitted an additional week of operation under specified conditions.

PCA #9-2 - "Temperature Monitoring During Start-Up and Reactor Operation - KE Reactor"

The PCA extended the provisions of expiring PCA #8-107. PCA #8-107 specified conditions under which KE Reactor could be started up and operated with a greater number of inoperable temperature sensing elements than permitted by Standards.

PCA #9-3 - "KER Loops - KE Reactor"

KE Reactor was shut down by a high trip on the KER Loop 4 Process Radiation Monitor, but the indicated rupture could not be confirmed. It is known that these instruments are very sensitive to power supply variations and have indicated several ruptures in the past that could not be confirmed. To prevent unnecessary outages of KE Reactor, the PCA permitted by-pass of these instruments for a short period until the cause of instrument instability was determined and corrected. Conditions under which by-passing would be permitted were specified.

PCA #9-4 - "Panellit Gauge 1269 - F Reactor"

To ensure rapid response to pressure changes, excessive throttling of Panellit sensing lines is not permitted by Standards. Panellit gauge 1269 F did not meet this requirement. It was not possible to correct the situation without risking a reactor outage because the throttling valve was known to leak badly when opened further, and use of a substitute gauge could have caused a Panellit trip by pressurizing other gauges in event any of the manifold toggle valves leaked. After extensive observation it was considered that gauge 1269 would monitor pressure changes, but that response time would probably be slower than normal. However, since the tube outlet temperature was 33°C below its TAI limit, a response time slower by a few cycles was not considered sufficient to jeopardize reactor safety. The PCA permitted continued operation under specified conditions. Repair of the gauge was required during the next outage.

PROCESS ASSISTANCE

The third loading of cast Al-Si-Cd test dummies was charged in tube 2685-DR on January 8. Tube 2185 was charged at the same time with four standard canned Pb-Cd dummies, to be used as a control tube. Non-equilibrium operation necessitated premature discharge of the two previous test loadings. The tendency of cadmium

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in the uncanned dummies to plate-out on rear face piping is one of the principal concerns.

Auditing

One engineer audited conformance to Process Standards on all Processing Operations shifts.

Graphics

Graphics services prepared 47 graphs, charts, and visual aids for various IPD and HLO components.

RUPTURE EXPERIENCE

<u>Failure Date</u>	<u>Tube No.</u>	<u>Lot No.</u>	<u>Type Metal</u>	<u>Exposure</u>	<u>Type Failure</u>
1/12/59	4081 C	KP-001-A	7" I&E Depl. (1)	688	Hole
1/14/59	4076 C	KP-001-A	7" I&E Depl. (1)	729	Hole
1/16/59	1770 F	KA-172-A	8" Regular	722	Unknown
1/19/59	0949 KW	CJ-073-A	8" I&E Natural	809	Hole
1/28/59	2089 KW	CK-039-B	*" I&E Natural	566	Hole
1/28/59	1071 KW	CK-802-D	8" I&E Natural	686	Unknown

(1) I & E depleted being irradiated under IP-132-AC.

Legend:

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

Unknown - Rupture piece was not examined, probably mixed with other metal.

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OPERATIONAL PHYSICS OPERATION

PILE PHYSICS ASSISTANCE

Maximum power was limited by the ACRS restriction at every pile this month. Operation in general has been smooth with essentially no tendency for flux distribution cycling. This is believed to be primarily the result of relatively low exposures at start-up at the K-piles and small improvements in control techniques at the older piles. The attempt to describe the degree of cycling with a number, discussed in last month's report, has been only partly successful. The values obtained at B and DR (see Table I) indicate a moderate-to-serious degree of cycling; however, the temperature distributions were never difficult to control. This anomaly is partly due to the fact that operation has been restricted by the ACRS limit, and specific power limits were enough less restrictive that tight control was not essential to maintaining the equilibrium power level.

The summation of ECT over all reactors was 13,965 which is only slightly below the all-time high of 13,995 reached in October, 1958. The I & E change-over programs are now essentially 100% complete. Evaluation of the associated reactivity coefficients is in progress but will take 2-3 months to complete. Progress has been hampered by the difficulty of running scram-transient tests without incurring Panellit scrams. A Production Test to permit bypassing the Panellit system under controlled and restricted conditions is being prepared.

TABLE I

SUMMARY OF OPERATING DATA OF PHYSICS INTEREST
FOR THE MONTH OF JANUARY, 1959

<u>Pile</u>	<u>B</u>	<u>C</u>	<u>D</u>	<u>DR</u>	<u>F</u>	<u>H</u>	<u>KE</u>	<u>KW</u>
ECT in Jan.*	1430	1640	1490	1540	1415	1615	2405	2430
12 Mo.Avg.ECT	1435	1600	1440	1490	1433	1580	2405	2420
Equil.Scram Time**	20-25	25-30	18-20	20-30	30-45	20-25	16-19	18-24
No.of Scrams and Recoveries #	2/2	1/1	0/0	0/0	0/0	0/0	3/1	1/0
No. of Non-Scram Outages ##	1/0	2/2	2/2	1/1	2/0	5/4	0/0	0/0
Report Period								
From	12/24	12/27	12/24	12/24	12/25	12/25	12/26	12/27
To	1/26	1/26	1/24	1/24	1/26	1/25	1/26	1/26
Cycle Factor ***	20-96	N	20	20-80		N	N	N

*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 number of brief outages from which hot start-ups would be made and the number of successful recoveries.

Footnotes continued on following page.

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Footnotes for Table I (Continued)

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

***The value or range reported is the sum of the maximum observed upward and downward changes in graphite temperature taken from one or two representative thermocouples, as reported on the Control Room Log Sheet. N refers to negligible.

B Pile (W. R. Smit)

The limit to pile power was the ACRS restriction; a nine-day outage for tube replacement work was the principal limit to production. Failure of instrument power on 1-1-59 removed power from the rod-position-indicating selsyns while the rods were being driven in on the scram by the hydraulic accumulators; no start-up could be attempted because of the lack of knowledge of rod positions.

On 1-11-59 a scram-transient test failed because of a Panellit trip; this has been a frequent cause of failure in these tests.

The attempt to express the degree of cycling in quantitative terms has not been as successful as expected. The values noted for B-pile in January (28 to 96) would indicate, by previous criteria, that cycling was a fairly serious problem this month. Although the degree of temperature change could have been kept smaller, other more pressing limits received the major attention because graphite temperatures were not really difficult to control within ACRS level restrictions.

C Pile (R. D. Carter)

Pile power level was limited by the ACRS restriction; three ruptures occurred in the depleted uranium charged for the high Pu-240 program. During the 1-15-59 outage, all depleted uranium, except that in eight low-exposure columns, was discharged.

The failure of the Flexowriter and the synchropulse monitor during the scram recovery on January 21 resulted in delay in finding a hot spot in the bottom-near. The large temperature distortion required a reduction in level and delayed raising power.

A successful scram transient test was performed on January 5; this was the first scheduled outage from equilibrium since May, 1958. The need for coefficient data is especially acute at C-pile at this time; prediction errors have been increasing, and the large discharge of D-metal which concluded the Pu-240 program will aggravate the problem.

D Pile (A. D. Vaughn)

The limit to pile power has been the ACRS restriction. After a successful recovery from a Panellit scram on 12-29-58, increased water collection caused a scheduled shutdown on 1-1-59. The shutdown time was utilized for tube replacement and graphite stringer installation.

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D Pile (Continued)

Forty-four splines were used for temporary poison and supplemental control during the start-up of 1-5-59. Following "turnaround" all of these splines were to have been removed. Out of the 44 splines, five had to be left in the pile; four of the five were stuck, and one broke off in the tube after approximately 12 feet were pulled. Operation was continued with these splines in the pile.

As the reactivity increased due to long-term-gains, poison splines were charged. Some mechanical difficulties were also encountered in charging these splines during operation.

The front-to-rear flux and temperature cycles which plagued D Reactor in October have been eliminated by the revised rod configuration. Two flux traverses, taken from dummies which were charged during the last operating period, show no peak and almost a perfect "chopped cosine" curve with a small number of splines (four) used for flattening. Three more traverses are being taken during this operating period when the use of splines will be more extensive.

The fission chamber was repaired during the last shutdown. Sensitivity tests show the chamber to be accurate so that it can now be used as a start-up instrument. The triple PC did not work properly on the last start-up. The sensitivity between chambers does not overlap so that, when switching from one chamber to another, there is a time delay until the flux reaches the sensitivity level of the second chamber.

DR Pile (D. I. Monnie)

The tube power limit has been 1025 KW, but the pile power has been limited an estimated seven per cent by the ACRS restriction.

The hot long-term-gains appeared to be about eight ih/day when the flux squared weighted exposure increased from 255 to 373 MWD/ton. Two attempts have been made to evaluate the metal coefficient of reactivity with conventional scram transient tests, one on 12-19-58 and the other on 1-23-59. Inconsistent results were obtained which can probably be explained by the unfavorable test conditions; the first test followed a scram from non-equilibrium status, and a flow decrease due to shut-off of one of the pumps occurred during the second test. The power level decay was not as smooth and rapid as desired in the first case.

The need for good data was indicated by a scram on 1-18-59 from which recovery was barely made. The predicted reactivity (based on coefficients for a solid metal load) at first indication was 130 ih high. This is a conservative or "safe" error, but such errors reduce the probability of a successful recovery.

F Pile (R. A. Chitwood)

Pile power was limited by the ACRS restriction. The operating period which began 11-26-58 ended on 1-16-59 with a ruptured solid slug. The I & E transition is essentially complete; only 80 tubes in the periphery are yet to be charged with I & E slugs.

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F Pile (Continued)

The Proportional Counter failed during the start-up of 1-21-59. The approach to critical was made conservatively, and the secondary start-up instrumentation was adequate. Two scram transient tests were attempted without success because of Panellit scrams during the shutting down period.

A great deal of information was collected during F Reactor's long operating period and some of it has been analyzed to obtain a better graphite coefficient. Hot reactivity gains appeared to be linear during equilibrium operation.

H Pile (G. R. Gallagher)

Maximum pile power has been limited by the ACRS restriction.

H pile was shut down on 1-4-59 for a scheduled discharge after an operating period of about 45 days. A scram transient test was attempted but failed. The reactor scrambled before one-half down. It will be virtually impossible to run such a test at H unless the Panellit board is bypassed, because there are so many different loadings that it is impossible to keep the board balanced.

Nine more old VSR's were replaced; this leaves four more to go.

The 45-day operating period provided data which is being analyzed to yield the graphite temperature coefficient of reactivity as a function of weighted uranium exposure. This coefficient has usually been evaluated from shutdown-start-up data. Long operating periods would make the former method impractical, and it is encouraging that this new approach shows very promising results.

KE Pile (F. C. Franklin)

The KE equilibrium power level was restricted by the ACRS limit during this report period. On the last day of the report period the ACRS limit was finally lifted, and a power level increase schedule was initiated which will permit increases of approximately two per cent per week until specific power limits are reached.

The residual exposure in the reactor at start-up on 1-8-59 was the lowest it had been since April, 1958. Front-to-rear graphite temperature cycling has not been a problem this month. The increase in the stability of the flux distribution at low residual was anticipated, and the rate-of-rise of the power level from turnaround to equilibrium was increased accordingly. Non-equilibrium losses have been reduced by the equivalent of nearly one-third day's production per start-up.

KW Pile (C. E. Bowers)

Equilibrium power level was limited by the ACRS restriction for 12 days during the report period; there was room for a three to five per cent increase within specific power limits. The reactivity change associated with dryer-room changes stopped as the pile dried out. Pile residual exposure is fairly low, and there is little tendency for cycling.

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KW File (Continued)

Spline usage continued on a test basis at KW; insertion and withdrawal of splines has been extremely successful. Ten splines were used on the start-up of 1-6-59 as an aid to control on the start-up after poison discharge. Normally, control problems are severe on these start-ups. Turnaround control problems were minor; non-equilibrium losses for the start-up were less than normal for this type start-up by the equivalent of one-fifth day's production.

Nine splines were inserted after first indication on the minimum outage of 1-20-59. Similar gains in start-up ease and efficiency were observed. Two splines currently used for equilibrium flattening preclude the necessity for at least one mint column.

PROCESS PHYSICS STUDIES

Pu-240 Program - PT-IP-132-C

The 42 remaining depleted uranium columns out of the 85 originally loaded were discharged on January 14 following occurrence of the 12th and 13th ruptures in this material within a day's operating time. A preliminary calculation for production from this program gives nine kg of plutonium containing 14% of the 240 isotope. At the request of the AEC the discharged columns are being held separately pending a decision on separations plans.

Control Capacity Studies

A background document is being prepared to show the sensitivity of total control requirements to various reactivity parameters and to indicate the relative magnitude of the uncertainties in assumptions and calculations. One conclusion made apparent by this study is that a minor re-arrangement in near-side enrichment will permit appreciable relief in total control limitations with only small losses in flattening efficiency.

Flattening and Reactivity Effectiveness of Enrichment

Results of the IBM 650 program for optimizing enrichment usage confirm the feeling that the C and K piles are operating on the high end of the feasible enrichment range. In other words, additional enrichment should be justified by reactivity demands rather than as a method of gaining ECT, and enrichment added for this purpose should be loaded uniformly.

A second study carried out with the same program appears to explain a large discrepancy in the reactivity accounting of loaded enrichment. The cold clean reactivities of the enriched C and K piles using the buckling concepts employed in this program are 200-250 inhours lower than those calculated by current flux-squared weighting methods. This apparent over-extension of the perturbation approximation largely explains the "loss" in cold, clean reactivity of 200-300 ih as the C and K piles went up in power level and enrichment requirements. Further studies will be carried out as a basis for modifying reactivity accounting procedures for the production reactors.

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Supplementary Control

Three spline start-ups were successfully carried out at the KW pile during the month. Nine to twelve splines were used on each of two minimum downtime start-ups and one extended outage start-up. Total gains for the three start-ups were equivalent to more than a half day's production. All KW spline start-ups were covered by Mechanical Development personnel.

D pile spline experience was not so optimistic during the month. Six of the splines inserted for start-up control on January 5 either stuck or broke off during removal, and difficulties were experienced in the charging of splines for equilibrium flattening later in the month. A task force coordinated by the D processing manager evaluated the present status of the spline program and its incentives. It was concluded that the economic incentives were sufficiently great and the system's control effectiveness sufficiently promising that greater emphasis on mechanical and operational improvements would be justified.

Reactivity measurements on displacement column facility components in the 305 Test Pile indicate that the combined effects of nickel plating and steel cable will be of the order of one-fourth inhour per displacement column. Mechanical Development has re-designed the system to overcome equipment troubles, and expects to order the six-column proto-type in time for installation by early summer.

Shielding Studies

The use of fringe poison in the F pile is being delayed pending results of trial helium introduction arrangements in the top shield. It is hoped that the helium used for pile gas make-up can be introduced in such a way as to provide a more effective heat removal path from the top biological to thermal shield.

An IBM 650 program for establishing flux and heat distribution through the reflector and shield is being used in support of NPR design in coordination with Process and Reactor Development core and reflector calculations.

Reactor Fundamentals Training

Current classes for the 32 non-operating reactor specialists will be completed in February; as of that date the entire group of 63 reactor specialists will have had the opportunity to complete a detailed class review of Chapter II, "Physical Principles of the Reactor Process." Schedules and discussion material are now being prepared for classes on the third chapter of the IPD Physics Primer which covers the pile structure and instrumentation. Question-and-answer sheets and glossaries explaining pile physics terminology are being circulated for shift training use in the areas.

Potential Gains Studies

Data for the calendar month of December, 1958, are reported in HW-58925. As might be expected from the production showing during December, no unusually high equilibrium or non-equilibrium losses were experienced during that month at any of the piles.

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IRRADIATION TESTING OPERATION

KAPL-120 LOOP

The empty in-pile tube was on process water cooling during this period.

The design of the triple flow tube instrumentation has been approved. The installation of the heat exchanger and its associated piping and instrumentation is estimated to be 70 per cent complete. The pump installation is estimated to be 50 per cent complete. The pre-fabrication of the flow tube instrumentation piping is under way.

Because of a high flow resistance, the PWR fuel train proposed for the KAPL-120-8 test would operate dangerously close to burn out; thus, this portion of the test has been rejected. The PWR train is one of three fuel assemblies which have been proposed for the test. The irradiation of the two remaining Naval Reactor Metallurgy (NRM) assemblies appears to be feasible. The enrichment of the fuel specimens in the NRM trains has been changed and some discrepancies between WAPD's and HAPO's thermohydraulic analysis of the new conditions are yet to be resolved. WAPD has not yet proposed a modified PWR fuel assembly.

DR GAS COOLED LOOP

The construction activity on the DR Gas-Cooled Loop was discontinued on December 26, 1958 to await delivery of the compressors. The first compressor is expected in mid-February. Two representatives from the General Engineering Laboratory visited Hanford in January to clarify the scope of the compressor contract and discuss the delivery schedule.

The Army Reactors Branch of the Division of Reactor Development has cancelled its test program for the DR Gas Loop. As a result, analysis of the Aerojet General proposed test has been stopped.

A representative of the Maritime Reactors Branch visited Hanford to discuss the reorientation and rescheduling of the Gas Loop program. Assuming that written notification of the change in project scope is received from the Maritime Reactors Branch by January 31, the loop can be ready for start-up with helium coolant (rather than nitrogen) by July 1, 1959. The change can be effected within the funds presently approved and available at Hanford although some transfer of funds from the operating budget to the construction budget will be necessary. Based upon a tentative decision by the Maritime Reactors Branch to start-up and operate with helium coolant, no further study has been made of the General Atomics proposal to use CO₂ coolant.

A study of the effect of inlet temperature upon compressor performance has shown a marked improvement in performance as the inlet temperature decreases. As a result, the by-pass coolers are being designed for maximum heat removal within the limits of the available space.

HAPO 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 is as follows:

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	<u>This Month</u>	<u>Last Month</u>	<u>Reactor</u>
Number of tubes monitored	8	8	C
	7	8	D
	1	0	KW
	3	3	KE
	3	0	B

Irradiation Testing Operation's development effort with regard to monitoring these temperatures has been completed and the responsibility for continuation of the routine monitoring program is being transferred.

The irradiation of four enriched 7-rod cluster fuel elements in test hole 3674KE (HAPO-195) continues. As of January 18, the fuel elements had reached 93 per cent of goal exposure.

The irradiation of one three-foot-long swaged UO₂ fuel element in test hole 3865KE (HAPO-215) continues. As of January 18, the fuel element had reached 24 per cent of goal exposure.

OTHER IRRADIATION TESTS AND SERVICES

1. A total of twelve 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 HAPO-184 samples in support of a Washington Designated Program assigned to HLO.
 - b. Three sets of effluent water residue samples (HAPO-172) in support of an HLO study of the radioisotopes in effluent water.
 - c. Two sets of natural uranium samples (HAPO-218) in support of an investigation of the release of fission products from uranium at high temperatures in oxidizing atmospheres.
2. A total of seven samples were irradiated or are undergoing irradiation in the Quickie Facility (E test hole) at F reactor. These samples are identified as follows:
 - a. One sample of UO₃ (HAPO-227) to provide a Np²³⁹ tracer in support of an HLO chemical separations study.
 - b. One sample of effluent water residue (HAPO-172) in support of an HLO study of the radioisotopes in effluent water.
 - c. Three samples of uranium oxide (HAPO-229) in support of an HLO study to determine if structural changes in uranium can be detected with an electron microscope.
 - d. Two samples of pure aluminum (HAPO-223) furnished by vendors as candidate materials for Pneumatic Facility rabbits. These samples were irradiated to determine if any long half-life radioactive impurities are present in the material.

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3. The following graphite sample irradiations are in support of an HLO study of irradiation damage to graphite:
 - a. Twenty-three graphite casings (HAPO-119) were charged into the magazine facility (2B test hole) at KE reactor.
 - b. One set of graphite samples was irradiated in the Snout facility (4C test hole) at KW reactor.
 - c. Eleven graphite sample boats were charged in the Hot Graphite Facility (Y test hole) at C reactor.
4. Three sets of samples were irradiated in the Pneumatic Facility (3D test hole) at KE reactor. These irradiations (the first in this facility) were done to establish the feasibility of using the facility with plastic rabbits in the application of activation analysis techniques for the quantitative detection of very short half-lived isotopes. The irradiations also further established the feasibility of using the Pneumatic Facility for future HAPO-184 irradiations.
5. One sample of Fe⁵⁵ (ORNL-186) was discharged and shipped to the Oak Ridge National Laboratory in support of the Radioisotopes Distribution Program.
6. The irradiation of two thermocouple leads, one with asbestos insulation, the other with quartz, continues in the 4B test hole at KW reactor (HAPO-199).
7. The irradiation of a thermocouple capsule, to determine to what extent the electrical output of thermocouples is affected by the gaseous atmosphere which surrounds the thermocouple bead, continues in the 2A test hole at KW reactor (HAPO-199).
8. Eighteen baskets began exposure and eighteen baskets completed exposure in the KE gamma facilities. The bulk of these irradiations are being sponsored by the Non-Metallic Materials Development Operation, HLO.

TEST FACILITIES

The construction of a hot-cell to be used in conjunction with the KE reactor Pneumatic facility is estimated to be 30 per cent complete.

Evaluation of the dose rate in the HAPO gamma facility by means of the ceric-sulfate dosimetry technique has been completed. The dose rate is 4.8×10^6 R/hr $\pm$ 5 per cent.

BORESCOPING ASSISTANCE

Tubes 0374 and 2874 in H reactor were borescoped to determine what type of obstruction was encountered when the tubes were traversed. A dark oval patch about 3/4 by 2 inches was noted on the top of tube 0374 at 18 feet in from the front. Tube 2874 had a similar oval patch at 14-1/2 feet in from the front. These anomalies are similar to the one noted in tube 2045KE on 9-10-58.

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Tubes 4373, 3785, 4768 and 4769 in KE reactor were borescoped to determine if any damage had occurred when the seating charges were left in during an operating period. The following was observed:

1. Tube 4373 showed no evidence of chattering.
2. Tube 3785 showed chattering damage from the two upstream pieces.
3. Tube 4768 showed no evidence of chattering.
4. Tube 4769 was worn half through by the chattering of the first upstream piece. Replacement of this tube was recommended.

Borescoping assistance was rendered to the Maintenance Operation at C reactor during the removal of broken, melted, process tubes from problem channels. A detailed account of this activity has been prepared.

The B test hole channel at C reactor was borescoped to determine if any side-to-side distortion had occurred. The channel was in good condition with the exception of several one inch separations at the block junctions. A detailed account of this activity has been published.

VERTICAL BOWING MEASUREMENTS

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

<u>Area</u>	<u>Tube</u>	<u>Date</u>	<u>To a Depth of</u>	<u>Results</u>
105-C	4659	1-13-59	38 ft.	down .05" at 10' since 12-31-57
				down .16" at 20' since 12-31-57
105-C	4688	1-13-59	36 ft.	down .04" at 10' since 12-31-57
				down .15" at 17' since 12-31-57
105-D	4674	1-4-59	38 ft.	down .09" at 10' since 9-14-58
				down .10" at 15' since 9-14-58
105-D	4375	1-4-59	6 ft.*	No previous data
105-H	4674	1-8-59	40 ft.	down .16" at 10' since 8-13-58
				down .20" at 23' since 8-13-58
105-H	0374	1-7-59	19 ft.*	No previous data
105-H	1574	1-7-59	40 ft.	No previous data
105-H	2874	1-7-59	16 ft.*	No previous data
105-H	4354	1-8-59	38 ft.	down .07" at 10' since 5-19-57
				down .30" at 22' since 5-19-57
105-H	4393	1-8-59	36 ft.	down .02" at 10' since 5-19-57
				down .33" at 22' since 5-19-57
105-H KAPL-120 Loop,	1-24-59	31 ft.		No previous data
105-KE	3565	12-28-58	41 ft.	No previous data
105-DR "C" test hole,	1-26-59	32 ft.		No previous data

* Traverse head would not pass an obstruction.

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COOLANT TESTING OPERATION

Coolant Testing; Operation Activities during January included the operation of the 1706-KE in-pile and out-of-pile facilities, operation of the KER loops, continuation of the organic program, planning and fabrication of additional facilities and planning of revisions and relocations of existing facilities.

1706-KE Single Pass Tubes (PT-IP-197-A)

The six central zone single pass tubes were discharged on January 14 and re-charged with revised charges of I & E fuel elements canned in X-8001 aluminum alloy. A mixing slug is also included in the charges. Operating conditions for the tubes are as follows:

4355	7.0 pH filtered water and 2 ppm dichromate
4456	7.0 pH filtered water and 1 ppm dichromate
4557	7.0 pH process water
4563	7.0 pH process water
4963 & 5063	6.5 pH process water

Preliminary examination of the discharged elements have not revealed any pitting or unusual corrosion. Detailed weighing and examination is presently in progress.

Tube 2943 continued to be operated with weighed, numbered dummies for corrosion tests on 1245 aluminum in preheated water at 90°C.

Mock-Up Tubes

The mock-up tubes remained shutdown during the month for completion of instrumentation revisions.

ELMO LOOPS

ELMO-1 - The loop was shutdown during the month.

ELMO-2 - The loop was shutdown during the month awaiting completion of revisions for decontamination tests.

ELMO-5 - The loop was operated during the month at 290°C and pH 10.0 for long-term corrosion tests on samples of A-212 carbon steel, sensitized and non-sensitized 304 stainless steel and Zircaloy-2. Also, stressed samples of 304 stainless steel and A-212 carbon steel which had been exposed to the Turco process are being corrosion tested.

The test of hydrazine as a corrosion inhibitor was discontinued during the month. Although the hydrazine very successfully scavenged excess oxygen, no change of corrosion rate could be observed from its use.

ELMO-6 - The loop was operated during the month for long-term corrosion testing of samples of M-388 aluminum, Zircaloy-2, and samples of sensitized and non-sensitized 304 stainless steel which had been exposed to the Turco 4501 process. The loop was run at 300°C and pH 4.5 using continuous clean-up through a phosphate-based resin bed.

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ELMO-7 - Elmo-7 was operated at 580°F. and pH 7.0 during the month.

New tests initiated during the month were (1) thermal cycling of revised NPR flared nozzle-to-tube connection, and (2) thermal cycling of revised Marmon-Conaseal NPR cap test.

Tests continuing all during the month were (1) test of an NPR cap with a Flexitalllic gasket seal, and (2) Bell-ring gasket cap test.

Tests completed during the month were (1) corrosion test of 316 stainless steel samples, (2) PRTR composite reactor connection test, (3) solid-state diffusion test of M-388 clad Alsi bonded slugs, (3) test of screwed NPR nozzle-to-tube connection (this connection was temperature cycled for 3200 cycles with no leakage), and (4) test on stainless steel thermocouples led into the core of a Pu-Al fuel element.

ELMO-8 - Elmo-8 is presently scheduled for delivery on site sometime in February.

ELMO-10 - Elmo-10 was shut down during the month awaiting installation of another Chempump.

Dowtherm Unit - Carbon Steel Heat Exchanger

Operation was resumed during the month at an increased pipe wall temperature of 345°F. The overall coefficient of heat transfer has decreased from 510 BTU/hr - ft²-°F. to 450 BTU/hr - ft²-°F.

CEP-1 (Corrosion Experiment Prototype)

CEP-1 has operated during the month at 300°C, pH 4.5 and 50 ppm dichromate for corrosion testing of samples of (1) A212 carbon steel, (2) Type 304 stainless steel, (3) M-388 aluminum, (4) Monel, (5) Hastaloy-C, (6) Nickel, and (7) Zircaloy-2. Examination of the coupons has revealed no significant effects as yet.

Organic Coolant Program

ORA-1 - The loop was operated with MIPB at 700°F for corrosion tests of a magnesium-beryllium alloy (magnox), zirconium coupons, and carbon steel coupons, with 20 ppm of water in the recirculating MIPB.

ORA-3 - The loop has been shut down during the month awaiting completion of the necessary equipment for a dry-seal thread test.

Carbon Steel Rupture Experiment

Design and fabrication of the loop were completed during January and installation is 30 percent complete.

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Induction Heating Facility

Installation of the induction heating apparatus was completed during January and is awaiting a reactor shutdown for final testing. This apparatus was formerly in 189-D and is for the purpose of producing high heat fluxes for corrosion testing.

KER FACILITY

Loop-1 - Operation of the loop at 270°C and a pH of 10.0 continued until January 14, when the loop was discharged and recharged with Zircaloy-2 clad 1.6 percent enriched 7-rod clusters. A 7-element thermocouple train and a variety of coupon holders were also charged.

The loop has operated at 225°C. outlet temperature and pH 10.0 during the balance of the month.

Loop-2 - Loop #2 continued operation at 205°C. and pH of 10.0 during the month. The present charge consists of one 38" 3-rod Zircaloy-2 clad enriched cluster element, two 18" Zircaloy-2 clad, wire-wrapped 7-rod UO₂ elements, and four 13" 7-rod Zircaloy-2 clad enriched cluster elements with triangular end supports. The above charge is authorized by PT-IP-214-A.

Loop-3 - Loop #3 continued operation at 200°C. outlet temperature until January 14, when loose electrical terminals in the depressurizing valve control circuit caused inadvertent loop depressurization with a resulting reactor scram. Normal operation at 200°C. was resumed following reactor startup and has continued for the balance of the month.

The present charge consists of eight Zircaloy-2 clad natural uranium 7-rod cluster elements and a thermocouple train.

Loop-4 - Shortly after reactor startup following the December 28, 1958 outage, a severe leak developed in the Loop #4 dump valve, causing the loop to be left on low temperature recirculation. On January 6, a spurious trip from the delayed neutron monitor scrambled the reactor and depressurized the loop. During this outage, the dump valve parts were replaced. However, pressure tests revealed that the repair was unsuccessful, which resulted in the loop being left on single pass operation following the outage.

On the January 14 outage, the dump valve was successfully repaired and operation has continued at normal operating conditions of 220°C. and pH 4.5 during the balance of the month.

The present charge consists of 2 rod-and-tube elements and one 18" 7-rod, Zircaloy-2 clad, UO₂ cluster element.

1706 KE-KER Performance and Improvements

A total of 21.6 hours of KE reactor outage time was charged to Coolant Testing Operation during the month. The charges are itemized as follows:

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PT-IP-146-A - Loop 1 Special Discharge	3.0 hours
PT-IP-226-A - Loop 1 - Charge thermocouple train and 7-rod Clusters	1.5 hours
PT-IP-214-A - Loop 2 - Installation of rear face stinger to allow Loop #4 dump valve work	0.6 hours
PT-IP-221-A - Loop 3 - Lost production time due to scram	6.7 hours
PT-IP-205-A - Loop 4 - Time lost in dump valve and rear face valve repair	4.2 hours
Production time lost due to faulty rupture indication	4.8 hours
PT-IP-197-A - Single pass Tubes - Charge-Discharge	<u>0.8 hours</u>
TOTAL	21.6 hours

Improved KER In-Reactor Tubes

Examination of the four zirconium tubes which were hoped to be candidates for 2200 psi, 300°C. operation has revealed surface cracks in two of the tubes and possible below-minimum wall thicknesses in a third tube. As yet, no defects have been found in the fourth tube which would make it unsuitable for design pressures and temperatures.

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COMPONENT TESTING OPERATION

IRRADIATED MATERIAL EXAMINATION

Examination of the fuel elements from the following fifty tubes was completed in the Metal Examination Facility during January. These tubes and their Production Test numbers are listed below:

<u>PT No.</u>	<u>Tube No.</u>	<u>PT No.</u>	<u>Tube No.</u>	<u>PT No.</u>	<u>Tube No.</u>
56A	2168-C	143A	2775-C	197A	4355-KE
	2170-C		2681-C		4456-KE
	2269-C	168A	2464-C		4557-KE
95A	0863-D		2564-C		4863-KE
	1689-D		2785-C		4963-KE
	2189-D		2788-C		5063-KE
	2461-D		3283-C	Stuck Chg.	3276-H
	4070-D		3792-C	Rupt.	3593-KE
132A	3988-C	178A	2875-KW		

24 tubes of Tru-line and
Regular Solid Mixed

Examination of tube 2168-C and tube 2269-C, irradiated under authority of PT-IP-56-A, Evaluation of Low Hydrogen Dingot Material, revealed five slugs from each tube which were slightly bumped. Low hydrogen dingot material tested earlier also revealed similar bumping. Twenty-four tubes of Tru-line and Regular Solid material were examined to determine the frequency of hot spots. The examination revealed 375 Tru-line pieces with 49 hot spots and 84 regular solid pieces with ten hot spots. Those pieces containing hot spots will be tested for bond quality at a later date.

PROCESS TUBE CORROSION MONITORING PROGRAM

In-pile measurements of 167 process tubes were made during the month. Listed below are the number of tubes measured per reactor and document number of the reports issued.

<u>File</u>	<u>No. of Tubes Probologged</u>	<u>Report No.</u>	<u>HW Number</u>
D	19	1	58735
B	34	2	58744
B	31	3	58878
C	5	4	58920
F	78	5	58947

Visual and metallurgical examinations were completed on five tubes from C Reactor, four tubes from D Reactor and four tubes from DR Reactor. Of the 13 tubes examined, two tubes, 3375-D and 2159-DR were leaker tubes. The leaks in these tubes were caused by internal corrosion. Tube 2079-D was removed from the reactor to investigate the corrosion rate of second generation tubes. This tube was installed in September, 1955. Actual measurements revealed that an average of 25 mils was removed from the top and nine mils from the bottom of the tube. This accelerated corrosion on the top half of the tube was found to occur between $8\frac{1}{2}$ and $11\frac{1}{2}$ feet from the rear Vanstone flange.

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PANELLIT PROGRAMS

Inspections were performed on 681 gauges which were processed in individual area instrument shops. Of those inspected, 168 gauges were rejected for non-conformance to standards.

In-Board Reliability Examinations were performed in D, C, H and K Areas. Examinations of 62 gauges revealed 301 defective gauges which required removal from service.

A total of 5,158 Panellit gauges received Bourdon tube leak examinations during the month. The examinations revealed 44 leaks, for a leak rate of 0.85%. To date, 69,620 gauges have received leak examinations and 250 have been removed and confirmed as leakers for an overall leak rate of 0.35%.

Failure analysis procedures were applied to 18 gauges during the month.

Instrumentation designed to provide accurate Panellit gauge response time readings was completed and tested during the month. Response time checking has been programmed, in conjunction with In-Board Reliability Examination activities, for approximately 600 gauges per month. Response time checks were performed on 25 gauges in KW and F Areas during initial tests of the response checking equipment.

Design Change No. 254, providing for installation of a scram delay of two minutes for the 100-F PCCF System, was approved during the month.

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 January 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

Manager, Research and Engineering
IRRADIATION PROCESSING DEPARTMENT

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PRODUCTION AND REACTOR OPERATIONS SUMMARY

JANUARY, 1959

Reactor input production for January was 1.5 percent below forecast; 9.0 percent below at the six old reactors and 9.3 percent above at the K's. Production was below forecast due to low time operated efficiency at the six old reactors.

A new maximum power level (combined total for old reactors) was achieved, exceeding the previous record by 310 units. Individual reactor power level records were achieved at C, H and KE when the ACRS limits were discontinued late in the month. H and KE are piloting the program of planned level increases for the five old and the K's, respectively.

Overall time operated efficiency, 76.4 percent (80 percent forecast) was 9.4 percent below forecast at the six old reactors and 7.2 percent above at the K's. Low efficiency at the old reactors resulted largely from tube replacement and water leaks. Thirty-one reactor outages of which 18 were scrams occurred during January.

Six ruptures were removed from the reactors during January. Three of the January ruptures were I & E regular, one was solid regular and two were I & E depleted. Following the removal of the second I & E depleted rupture (the 13th to date) the balance of this metal on the Pu-240 program was discharged except for eight tubes which remain charges for test purposes.

Significant items of equipment experience were:

1. Two hundred ninety-seven process tubes were installed.
2. Twenty water leaks, 7 tube and 13 van Stone, were corrected.
3. Conversion of the central zone to O-ring pigtails was accomplished at H Reactor with a mass replacement of 1300 rear connectors.
4. Malfunctioning of equipment necessitated removing the no. 5 high-lift motor at 190-KW from service which resulted in a reactor scram.

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

Processing and Power statistics for individual reactor areas are tabulated on pages Ch-1 through Ch-5 of this report.

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B-C REACTOR OPERATION
JANUARY, 1959

I. ORGANIZATION AND FUNCTIONS - An additional exempt position (Analyst, Reactor Operation) was created and staffed, effective January 15, within the organization of C Processing Operation to provide integration and coordination of testing and development activities at C Reactor. The number of positions, Specialist, Reactor Operation, C Processing Operation was reduced by one in conjunction with the above change.

II. PERSONNEL

A. Force Summary

	<u>December 31</u>			<u>January 31</u>			<u>Net Change Of Total</u>
	<u>E</u>	<u>NE</u>	<u>Total</u>	<u>E</u>	<u>NE</u>	<u>Total</u>	
General	3	3	6	3	3	6	0
B Processing Operation	16	39	55	16	39	55	0
C Processing Operation	16	34	50	16	33	49	-1
Power Operation	15	97	112	15	96	111	-1
Maintenance Operation	22	103	125	22	103	125	0
TOTAL	72	276	348	72	274	346	-2

B. Movement of People - Exempt changes included internal (B-C) movements only. Nonexempt movements included one transfer to A.P.E.D. and one deactivation for prolonged absence due to personal illness. Effective January 15, L.V. Barker, Supervisor, 100 Operations I, was promoted to Analyst, Reactor Operations, and D.G. Winston, Specialist, Reactor Operations, was promoted to Supervisor, 100 Operations I; both changes being confined within the organization of C Processing Operation.

III. PERSONNEL ACTIVITIES - The Pacific Northwest Utilities Conference Committee (28 people) was conducted on a tour of the area January 28th. J.B. Violette, from Vallecitos (General Electric Co.), was conducted on a tour of C Reactor and the general area layout on January 30th. C.E. Harkins attended a demonstration by the TelAutograph Company on January 14 at the Desert Inn.

IV. SAFETY AND SECURITY - 12 medical treatment injuries were reported during the month; no disabling injuries, serious accidents, or security violations were reported.

V. NON-ROUTINE REPORTS - None

VI. INVENTIONS AND DISCOVERIES - All persons engaged in work that might reasonably be expected to result in inventions and discoveries advised 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.

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VII. COMPONENT ACTIVITIES

GENERAL

- A. Administrative Activities - Greater responsibilities and increased duties were accepted for present and future administration of established programs dealing with Exempt Personnel Self Development, Nonexempt Personnel Development, Pre-retirement Orientation of Employees, and the scheduling of exempt employees attendance at the General Manager's Information Meetings.

A forecast of requirements for Specialized Equipment was submitted to the General Accounting Operation, January 26, for inclusion in the FY1960 and FY1961 budget of Equipment Not Included in Construction Projects.

A program was started for writing Job Descriptions and analyses on all nonexempt non-bargaining unit jobs.

- B. Personnel Development - Three exempt employees completed a 17-session Basic Economics course and seven others completed the 4th series of PBM-I course; three employees attended one IPD Training Program class and eight nonexempt people participated in In-Plant Training activities; one Technical Graduate continued a Rotational Program assignment with C Processing Operation.
- C. Cost Control Activities - All components began preparation of forecasts of FY1960 and 1961 budget requirements; forecasts of requirements for Specialized Equipment were submitted January 26 to the General Accounting Operation.
- D. Landlord Activities - On January 1, high winds blew five cement slabs from the northwest corner of the 190-B Tank Room roof. One slab fell inside the building, with the remaining four slabs being blown toward the center of the roof. Steps were initiated to make repairs. Since aquisition of another serviceman at B-C, the floor sealing program has been expanded to include concrete office floors and other concrete floors that need sealing.
- E. Suggestions - Under study at the start of the month, 100; received for study during the month, 11; completed during the month, 71; under study at the end of the month, 40.

B PROCESSING OPERATION

- A. Production - Input production (Pu) was 67.5 percent of forecast. Power level was limited by administrative limits. The TOE was 53.3 percent.

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- B. Operating Experience - There were four unscheduled and one scheduled outages:

<u>Day</u>	<u>Outage Hours</u>	
1	38.7	No. 1 Safety Circuit scram caused by improper switching in 105-B Electrical equipment room.
2	0.7	Panellit scram - cause undetermined.
2	0.3	Panellit scram - high trip on Panellit gage No. 2776 during level increase.
11	220.2	Scheduled outage.
28	87.6	Excessive condensate collection. Down at month end.

During the January 1 outage, time was utilized for charge-discharge and leak testing, as condensate and exit drip leg collections had increased during the last operating period; no indication of a water leak was found using the helium leak detector.

During the January 11 outage, time was utilized for probologging (31 tubes), installation of 70 tubes (includes retubing 7 air channels and installing ten ribless tubes), charge-discharge, and leak testing. A rear Van Stone 3879 was found leaking. A thorough inspection of the rear face was made and it was discovered that approximately 26 neoprene boot bellows were damaged. 22 of the leaking bellows were filled with plastic foam, but later leak testing indicated that eight still had leaks. After completion of tube installation, the reactor was leak tested again. No. 8-1/2 header gave positive indication and all tubes on this header were stinger tested twice; both attempts failed to disclose a leak. All tubes on rows one through 12 were stinger leak tested with negative results. During the stinger leak testing, the inlet drip leg indicated an increase in water collection. Investigation of this revealed that Tube 0874 had a leak at the front Van Stone, due to the front gunbarrel flange setting out too far to allow a seal on the gasket between the nozzle and Van Stone.

The reactor was shut down at 8:50 a.m., January 28, due to excessive condensate collection from the exit drip legs and dryer rooms. Outage time was utilized for charge-discharge, probologging (43 tubes), maintenance work, and leak testing. The probologging results revealed severe external corrosion at the front of the rear gunbarrel on Tube 1292. The tube was stinger tested and a leak was confirmed. The reactor was leak tested; using the helium leak detector, with negative results. The exit drip leg collection rate continued to indicate a water leak and stinger leak testing was initiated. Approximately 920 tubes were stinger tested. Ten faulty rear nozzle gaskets were found, repaired, and checked. Tube 1996 had a cracked rear Van Stone, and Tube 0775 had a hole in the rear Van Stone. Both tubes were removed and blanked off as air channels. The exit drip leg collection rate dropped to zero after Tube 0775 was removed from the water system.

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- C. Equipment Experience - The reactor was leak tested four times, using the helium leak detector. 1362 tubes were stinger leak tested; three tubes were verified to be leakers using this method. All crossheaders were pressurized in an attempt to obtain a leak indication by increasing the drip leg collection rate. Results were negative on the first test; however, indications on two headers were verified as leakers on the second attempt.

Nineteen tubes were probed; all successfully passed a ten-inch probe. 108 tubes were probologged; four tubes were charged with solid aluminum due to thin walls and excessive external corrosion at the front of the rear gunbarrels. One tube was removed due to a leak which indicated severe external corrosion. A total of 332 tubes were processed, including 280 I&E and 7 I&E² charges.

All HCR's were pressure tested; no leaks were found. All pressure indicating lines for the HCR's were found plugged in the elbows at the orifice outlet; all the elbows were cleaned and replaced prior to startup. The D Elevator slack cable limit switches were replaced. A functional check on seven of the Ball 3X hoppers was satisfactory. The downcomer and crossover line were inspected and found in satisfactory condition. The first "J" pigtails installed on the rear of replacement tubes were too short; fifty-seven of the pigtails were replaced with correct length "J" pigtails.

Inboard inspection of the Panellit board revealed four suspected leaking gages, which were replaced; three other gages were replaced due to mechanical defects. No scrams resulted from defective Panellit gages. 185 10-90 trip Panellit gages were installed. A flow check of Panellit lines on rows one through 18 revealed two plugged lines; the lines were blown out and returned to service. The damaged sphincter seals on Nos. 34 and 35 VSR's were replaced. The number four dryer tachometer drive shaft was replaced.

- D. Improvement Experience - PT-IP-84A, "Evaluation of slugs having projections for use in Ribless Tubes" - Ten new ribless tubes were installed and 11 tubes charged with ribbed I&E pieces. PT-IP-522, "Process Tube Corrosion Program" - Six tubes were saved for inspection. PT-105-11MR, "Scram Transient Test" - remained active. PT-IP-39A, "Routine Corrosion Monitoring" was activated; eleven tubes of I&E numbered slugs were charged. PT-IP-14AC, Supplement A, "Use of E Metal in Shield Protection" - one charge removed due to a leaking process tube.

Project CG-740, "Replacement of Central Viewers" was completed with the exception of cleanup work. Project CG-780, "Improvement to 105-B Ventilation System" was initiated; electrical controls have been installed. Project CG-706, "Installation of Improved Reactor Gas Instrumentation" was initiated, new lines have been run to the control room. Project CG-707, "Improvements to Reactor Nuclear Instrumentation, All Reactors" - Work on the control room console and X Levels was continued, and the four new miniature Beckman recorders were placed in service.

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Project CG-666, "Zone Temperature Monitoring" was rewired into the safety circuit, but will remain bypassed until new RT's are installed. MJA No. 2, "Rehabilitate Pile Gas Moisture Monitor System" was completed and placed in service.

- E. Radiation Monitoring Experiences - There were six instances of personnel contamination with a maximum activity of 30,000 c/m noted; all were readily decontaminated and none constituted an exposure contribution. Maximum personnel exposure rates for various jobs were as follows: Inspection and condensate sampling of the 115 dryer rooms - 500 mr/hr; Dryer room valving - 750 mr/hr; Discharge operations - 170 mr/hr; Poison charging - 40 mr/hr; Dummy recovery - 40 mr/hr; Downcomer inspection - 250 mrad/hr; Dripleg sampling in the exhaust air tunnel - 350 mr/hr. 91 air samples were taken and none indicated activity densities greater than the permissible limits for respiratory protection worn. Of the 79 vehicles surveyed, none were found contaminated. Contamination levels noted during reactor tube probologging were: 3 rads/hr. on cable and 30 rads/hr. on swabs. Activity to 17.5 rads/hr, including 80 mr/hr. gamma, was noted on No. 8 HCR. Smears of the floor and piping in the exhaust air tunnel indicated 3000 c/m.
- F. Events Influencing Costs - 174.8 nonexempt and 16 exempt overtime man-hours were utilized, including 78.9 R.M. man-hours. No helium start-ups were made. Total helium used was 220,300 cubic feet, compared to 149,000 in December. Total gas used was 323,029 cubic feet, compared to 663,700 in December. Twenty leaking rear face bellows were filled with plastic foam to reduce gas loss. A blown gasket on the high pressure CO₂ Liquid Storage Tank was replaced.

C PROCESSING OPERATION

- A. Production - Input production was 83.2 percent of forecast. Power level was limited by the administrative limit. The TOE was 69.2 percent.
- B. Operating Experience - The following (five unscheduled and one scheduled) outages were experienced:

<u>Day</u>	<u>Outage Hours</u>	<u>Cause</u>
4	105.2	Scheduled outage - problem tubes removal
8	0.4	Scram - Panellit row 20.
12	32.9	Rupture - Tube 4081 (depleted slug)
14	49.4	Rupture - Tube 4076 (depleted slug)
21	0.3	Scram - OCD low pressure trip.
26	40.8	Water leak - Tube 1869
	<u>229.0</u>	

The two ruptures experienced during the month were depleted uranium slugs charged under the Pu-240 Program. One of the ruptures was stuck and required removal of the process tube

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- C. Equipment Experience - The reactor was shut down on January 26 to investigate a water leak. Tube 1868, a ball valve tube containing a solid aluminum dummy charge, was found to be leaking. The tube was removed and replaced. During the operating period prior to the removal of the tube, an undetermined amount of water was drained from the outlet drip leg, Ball 3X exit valves and the main gas lines, in addition to 81 gallons from dryer regeneration.

Eight process tubes were removed during the month; tubes 1165, 2472, 2482, 2488, and 3573 (problem tubes), tube 1586 (stuck D charge) 4076 (ruptured slug), and tube 1868 (water leak). Three new process tubes (ribs reduced 13 mils) were installed in channels 1586, 1868, and 4076.

- D. Improvement Experience - PT-IP-132-AC "Production of High Pu-240 Plutonium at C Reactor" - During the January 4 outage, tube 1586 (containing depleted metal) would not backseat and required the use of the hydraulic jack to discharge the metal. A hydrostatic test of the tube indicated the tube to be leaking, and it was replaced. Two depleted metal ruptures were experienced, for a total of 13 to date. On the basis of rupture frequency rate, 39 additional tubes loaded with depleted material and 97 enriched metal columns supporting the program, were discharged. Eight tubes containing depleted metal remain in the reactor. The majority of the depleted metal columns discharged reluctantly and four of the tubes required the use of a hydraulic jack to loosen the charge. PT-IP-162-E - "Routine Uranium Charging During Reactor Operation" - On January 21, a scram occurred when the "machine stop" button was pushed to assist in clearing a jammed perforated dummy in the pressurized magazine charging machine charge head, during a charging operation on tube 2369. The cause of the scram, a faulty circuit, was found and corrected. On January 26, an outage of 40.8 hours was incurred as a result of a water leak in ball valve tube 1868. A study of the tube revealed that chattering of the aluminum dummy column had perforated the tube at four locations. The tube had been charged with the solid aluminum dummies on January 21, when the development of a faulty thermocouple prevented recharging the tube with I&E regular metal as planned. During the month, tubes in the ball valve pattern were processed 26 times utilizing the OCD equipment. The 26 charge-discharge operations consisted of 13 solid aluminum and 13 uranium metal column discharges, and 16 solid aluminum and 10 uranium metal column recharges. PT-IP-203-AE - "105-C Reactor Test Internal Chemical Decontamination" - Eight process tubes were decontaminated using Turco 4306-B, 4506-1A, and 4506-1B. PT-210-A-1-FP - "Comparison of Bond Quality with Reactor Performance of Enriched I&E Fuel Elements" - Thirty tubes were charged to initiate this test. PT-105-1 - "Exposure of Samples of Special Request Irradiations - HAP0-119" - Seven graphite (sample) boats were charged into the Y-test hole. PT-IP-47-D - "Measurement of Fluxes and Temperatures in the C Pile Shield Plug Test Facility" - Four inserts were removed and new inserts installed in the 36" test facility.

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Renovation of the Ball 3X System 105-C - CG-741 - The following work was completed: Storage hopper removed from the Ball 3X tunnel; all Grinnell Ball 3X System exit valves installed and leak tested; installation of the pressure lines to the system exit valves; washer-dryer set in place in the Ball 3X room; the new trough installed and connected to the ball exit valves. Improvement to Reactor Nuclear Instrumentation - CG-707 - probed G-hole and checked the looseness of the H-hole shield plugs.

- E. Radiation Monitoring Experience - The 105-C Building was contaminated in the corridors as a result of effluent vapors escaping from the near downcomer room; the vapor originated at 105-B, which was operating at the time of the occurrence. During the burial of a gunbarrel, it fell from the burial cart and contaminated a small ground area, inside of the exclusion area. A contaminated lunch tray was found in the trash loadluggers; it was not determined what the tray had been used for. A Construction Engineering Operation employee encountered skin contamination while working in the Ball 3X tunnel; there was no problem of exposure and contamination was readily removed.

External Exposure Experience

<u>Location</u>	<u>Type of Work</u>	<u>Personnel Dose Rates</u>	
		<u>Max. mrem/hr</u>	<u>Avg.</u>
Discharge Area	Problem tube removal	4,000	200
Charge Face	Problem tube removal	3,000	100
Work area	Tube burial	5,000	300
Near Downcomer	Inspection	600	300
Ball 3X Tunnel	Clear plugged channel	5,000	800
Ball 3X Tunnel	Valve removal	800	100

Fifty-two vehicle surveys were performed and one was found contaminated; the contamination was easily removed. There were fourteen cases of skin contamination and all were easily decontaminated. There were four instances of personal clothing contamination; all items were decontaminated and released. 134 air samples were taken; none indicated activity densities greater than the permissible limits for respiratory protection worn.

- F. Events Influencing Costs - 637.8 nonexempt, and 4 exempt overtime manhours were required. Removal of five problem tubes, two ruptured slugs, and a process tube water leak, were the major factors contributing to the 229.0 hours total downtime incurred.

POWER OPERATION

- A. Operating Experience - During the January 1 storm, the 184 Area emergency feeder breaker relayed out because of a temporary short circuit caused by lines slapping together. The 183-B/C Filter rebuilding program was completed on January 22 with the addition of 126 tons of Anthrafilt to the 183-B filters and 8 tons to No. 4 filter at 183-C. Process water flow through the R Reactor was increased approximately 1,000 GPM by

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loading additional tubes with I&E fuel elements. The range of the raw water flow meters was increased from 0-60,000 GPM to 0-90,000 GPM to allow capacity for increased flows through the 183-C Filter Plant to supply diverted flow to B through the new 30 inch cross-tie.

- B. Equipment Experience - At 181-B, the No. 8-B unit was returned to service with the No. 12-C unit being taken down for vibration correction. At 183-B, the No. 3 south backwash valve was replaced. At 190-B, the first two-year Class A inspection on an Annex motor was completed on No. 5-A. The curtain seal was removed from No. 1 storage tank and the annual internal inspection of this tank was completed. At 190-C, the governor valves on Number 1, 8, and 10 units were reworked and the tube bundle in the heat exchanger on No. 8 fluid drive was replaced.
- C. Improvement Experience - CG-558 - Modified impellers were installed in Numbers 4-A, 5-A, and 8-A units. Radiographic checks of the bypass piping and of several critical points on the process piping were made on No. 3-A and 4-A unit discharge lines to confirm the December sonic testing and to provide a basis for future checkreading comparisons. CG-600 - Representatives from Byron-Jackson Pump Company inspected Numbers 5 and 10 unit pump impellers for cavitation damage on January 8. No. 3 and No. 12 impellers were also inspected during the month by GE engineers. 58-IP-47 - "3500 HP Induction Motor Power Loss Relays - 190-C" - The final tie-in to the 105-C safety circuit has not been made; at present, the system is being operationally tested for a period of time to determine correct usage and prove circuit reliability. Project A-89053 (Process Water Cross-Tie) - Remaining to be done is the delivery and installation of a flow recorder in the 183-B Pump Room; gravity flows of 5,000 GPM have been transferred from 183-C to 183-B since January 20. 58-IP - "Aluminum Oxide - Sulfuric Acid Feeders - 183-B" - Various modifications were made to the No. 3 Prototype Bauxite feeder and information is being compiled for final design.
- Project CA-696 - "Coal Car Shakers - 184-B" - Complete except for placing the car shakers in position. CA-751 - "Steam Pole Replacement - Phase III" - Accepted without exception on January 13.
- D. Events Influencing Costs - The January 12 rise in turbidity necessitated the increase of alum feeds and the use of Separan, increasing the water treatment costs for January. Maintenance costs remained high due to the replacement of No. 3 backwash valve, the river pump work on No. 8-B and 12-C units, the Class A on No. 5-A motor at 190-B, the reworking of the governor valves at 190-C, and the replacement of the heat exchanger tube bundle on No. 8 unit at 190-C.

MAINTENANCE OPERATION

- A. Equipment Experience - Five of the seven problem tubes at C were removed during the outage of January 4.

During the tube replacement outage at B (started January 11), 63 tubes were removed and 70 were installed, including 10 ribless tubes; removal time averaged 0.82 hours per tube.

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The Dewcell portion of the 105-B Moisture Monitoring System, which has been extensively modified recently, was reactivated for the January 11 outage and assisted satisfactorily in locating leaks. No cells have failed since the modifications were made.

- B. Maintenance Engineering - The No. 5 190-B Annex 4500 HP motor was opened and inspected for suspected insulation damage and corona discharge. Some insulation damage was found and was corrected on a test basis. Findings have been forwarded to the manufacturer and further inspection is planned within about two months.

Engineering plans were made and the equipment was installed for Turco decontamination of the inside of B Reactor tubes and rear face piping; however, it was not done in January because of the continued presence of tube leaks.

The B downcomer and the C near downcomer were inspected and were found to be in good condition.

Twenty-two rear face bellows were foamed at B, of which 16 were successfully sealed. Failure of the other 8 to seal probably was due to the extremely poor condition of the bellows.

C. Planning and Scheduling

Productive Maintenance - During January, 3,341 man hours of work were scheduled. This included 2,917 man hours scheduled for January and 424 man hours carried over from previous months. The total included 72 Class A overhauls, 300 Class B overhauls, 40 Class C overhauls, and 10 lubrications. Of this total, 1,821 man hours, or 55 percent, were completed. Reasons for non-completion were: Jobs in progress - 4 percent, insufficient manpower - 27 percent; shutdown items - 5 percent, and equipment not available - 9 percent; total 45 percent. During this period, equipment condition dictated changing 4 Class A overhauls to Class B, 5 Class B to Class A, and 1 Class C to Class B.

A. R. Maguire

Manager
B-C REACTOR OPERATION

AR Maguire-ILH:mbc

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D-DR REACTOR OPERATION
JANUARY, 1959

I. ORGANIZATION AND FUNCTIONS

Responsibilities for control and administration of the Exempt Self Development Plan, and for pre-retirement counseling were assigned to the group as part of the Employee Relations reorganization program.

II. PERSONNEL

	<u>Dec. 31, 1958</u>			<u>Jan. 31, 1959</u>			<u>Net</u>
A. <u>Force Summary</u>	<u>NE</u>	<u>E</u>	<u>Total</u>	<u>NE</u>	<u>E</u>	<u>Total</u>	<u>Change</u>
General	3	3	6	3	4	7	+1
D Processing	38	16	54	39	16	55	+1
DR Processing	35	16	51	35	16	51	0
Power	102	15	117	102	15	117	0
Maintenance	<u>124</u>	<u>22</u>	<u>146</u>	<u>124</u>	<u>22</u>	<u>146</u>	<u>0</u>
Total	302	72	374	303	73	376	+2

B. Movement of People

Effective January 1, 1959, J. D. Ryan, Contact Engineer, Redox Operation, Chemical Processing Department, transferred to Specialist, Administrative Programs, (Measurements and Costs), D-DR Reactor Operation, to fill a vacancy.

Effective January 1, 1959, John Fatur, Supervisor, Mechanical Maintenance, was reassigned within D-DR Maintenance Operation as Supervisor, Development Laboratory Maintenance. This is a new position to provide additional supervisory coverage in Building 139-D, Development Laboratory.

Nonexempt personnel movement during January included one transfer in, one reactivation, and one transfer out.

III. PERSONNEL ACTIVITIES

Several exempt and non-exempt employees attended the seminar on "Contamination in the Columbia River". Six exempt and five non-exempt employees attended the seminar on "Recent Trends and Developments in Recommendations of the National and International Committees on Radiation Protection and Measurements". Both seminars were sponsored by the IPD Radiological Engineering Operation.

IV. SAFETY AND SECURITY

There were 14 medical treatment injuries reported during January. No security violations were incurred.

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SAFETY AND SECURITY (Con't.)

A near serious accident occurred on 1-17-59 when an employee driving a pick-up truck left the road between F and D area, during conditions of darkness and fog. The incident was formally investigated and reported in Serious Accident No. 59-2.

A D-DR Reactor Operation Safety Program was introduced during the month, designed to present opportunity for individual participation and for more managerial activity in such programs. The Area Council selected a Working Group for February and March to publicize the program.

V. NON-ROUTINE REPORTS

None were issued.

VI. INVENTIONS AND DISCOVERIES

R. F. Warnick, Supervisor I, DR Reactor Operation, was informed that a patent has been obtained for a device he developed while assigned to Mechanical Development A as a Rotational Trainee.

VII. COMPONENT ACTIVITIES

GENERAL

A. Administration Activities

Exempt appraisals, salary action, and self development review were programmed for D-DR Reactor Operation for the calendar year 1959. Schedules and related information were presented to Level IV Managers.

A Position Guide covering the position of safety engineer assigned to D-DR and other reactor operations was developed during the month in preparation for establishing such a position in D-DR Reactor Operation..

Revised procedures for suggestion evaluation within D-DR Reactor Operation were completed and placed into effect during January. Suggestion statistics for the month of January were:

Suggestions by D-DR Reactor Employees:

In process at beginning of month	37
Submitted	11
Reopened	6
Completed	0
In process at end of month	54

B. Personnel Development

A. G. Elasewitz, Manager, Irradiation Testing Operation, discussed the Geneva Conference at a meeting of exempt D-DR Reactor Operation employees on January 21.

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Personnel Development (Con't.)

One rotational Technical Graduate, V. V. Johnson, began an assignment in D-DR Reactor Operation during the month, making a total of one on assignment to the operation at month end.

C. Cost Control Activities

Preparation of the FY-1961 and review of the FY-1960 budgets for D-DR Reactor Operation was in progress during the month. The portions of the Operating Expense Budget, consisting of personnel requirements and overtime hours that were due in January, were submitted to the Financial Operation on schedule.

A cost meeting was held on January 23 for approximately 15 exempt D-DR Reactor employees. C. E. Reed, Manager, Product Cost and Budget Operation, outlined the application of the profitability concept to HAPO.

D. Landlord Activities

A detail plan for scheduling and follow-up of janitor work in 100-D Area was placed in effect during the month.

The 18 evacuation and regular bus hotstart plugs in 100-D Area were modified during the month to minimize an electrical shock hazard.

High winds on January 1 and 2 caused minor damage to Building 1720-D roof, Building 136-D roof flashing, and three exterior doors in the Area.

D PROCESSING OPERATION

A. Production

Input production was 109.5 per cent of official forecast. Maximum operating levels were limited when the maximum power level allowed by the Reactor Safeguards Committee was reached.

Time operated efficiency for January was 86.5 per cent, which was 105.1% of forecast.

B. Operating Experience

1. Operating Continuity

There were two outages during the month. An extended outage on 1-1-59 resulted from a water leak and scheduled shutdown work. One Panellit scram was the result of a valving error.

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Operating Continuity (Cont.)

<u>Date</u>	<u>Hours</u>	
1-1-59	100.4	Water leak, charge-discharge, tube replacement.
1-7-59	0.2	Scram - Panellit - Error in gauge testing.
Total	100.6	

2. Equipment Experience

a. Tube Replacement

There were 19 tubes replaced during the 1-1-59 outage. Of the 19, 14 were below row 6 and were replaced due to external corrosion.

b. Vertical Safety Rods

No. 13 VSR has remained out of service the entire month due to an obstruction in the channel.

c. Horizontal Control Rods

The scram valves were closed on #2 and #8 rods to prevent their entering the reactor on a scram. These valves were closed as a safety measure since under certain conditions, insertion of these half rods can cause an increase in reactivity.

d. Splines

During the 1-1-59 outage, 41 splines were inserted for turnaround control. After turnaround, 36 were removed to maintain reactivity. Four splines could not be removed and have remained in the reactor. One other was left in the reactor for permanent flattening. Spline statistics for the month are as follows:

Total Splines inserted	49
Total Splines removed	36
Balance in Reactor	13
Reluctant Splines	4

During the month, 20 insertions failed because the splines could not be inserted through the cap or the splines became stuck before they had been inserted the desired distance. This problem has been more acute this month than in the past, indicating the need for closer inspection of the spline caps and for more careful installation of the caps on the nozzles.

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e. Process Tube Water Leak

Exit dew points began increasing on 12-29-58, and by 12-31-58 the condensate collection rate had increased to 102 gallons per day. The reactor was shutdown on 1-1-59 and tube 3375-D was isolated as the leaking tube. The helium detector was used to locate the header and the tube was located using "stingers".

Tube 3375-D was probologged in October, 1957, and was calculated to have a 35 mil wall thickness when last charged. A pin-hole leak was found in the downstream portion of the tube in an area where there was evidence of dummy chattering. This tube had previously been used as a PCCF tube.

f. Material Handling

Dummy decontamination has been performed at the 105-D Wash Pad in preference to sending the dummies to the 200 Areas. By weaseling the material under water, and using an extended C.P. probe, radiation exposure has been held to a minimum.

The metal storage facility in the #10 fan cell has been completed and is now in use.

g. Graphite Stringers

The graphite stringer from channel 1266 was removed and replaced. Efforts to remove stringers from 2182 and 2662 were unsuccessful as the stringers are stuck and cannot be moved in the normal manner.

C. Improvement Experience

1. Production and Process Tests

a. IP-95-A-79-MT - "Irradiation of Lead Dipped Canned I & E Slugs In D Reactor"

Three tubes were charged with this material and thermocouple stringers were installed in the downstream portion of the tubes.

b. IP-170-I - "Decontamination of Internal Surfaces of Rear Face Fittings at D and DR Reactors"

Rear face piping was decontaminated under this test during the 1-1-59 shutdown. See HW-59091, "Interim Report on Rear Face Decontamination," by J. D. Agar and the Radiation Monitoring section of this report for details.

c. IP-38-A - Suppl. B - "Exposure of Aluminum Canned Slugs in a Zircaloy-2 Process Tube"

This supplement authorizes continuation of the use of the ZR-2 tube for two additional operating periods while improved marking devices are developed for identification of the tube pieces as it is removed. The test also authorizes use of downstream thermocouples if required for determination of limits.

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2. Projects

CG-740 - "Replacement of Central Viewers"

The broken lead glass was removed from the viewer. The frame was sent off-site for installation of a new piece of glass.

D. Radiation Monitoring Experience

1. Radiation Occurrences

Four lapses of radiation control occurred during the month. One case involved the finding of 175 mrad/hr, including 2 mr/hr at 2" on the lower part of a storage area hoist. A second concerned contamination of an employee's personal clothing after carrying contaminated broaches from the work area to the cushion corridor. The third resulted from handling a shipment of used tube splitters in the 103-D Building, a Radiation Monitor and a Processing Operator receiving nasal contamination while unwrapping the equipment. Bioassay samples were collected from both men. The fourth lapse of radiation control involved a box of reclaimed poison in the wash pad annex, giving a dose rate of 30 r/hr through side of bucket. The source of the intense radiation was a small piece of irradiated thermocouple wire. It is assumed that no uncontrolled exposure resulted because of the regulated storage location.

2. External Exposure Control

Rear face piping was decontaminated internally and externally during a reactor shutdown, using a heated solution of Turco 4306-B. A 55.5% reduction of dose rates was measured at 40 selected tubes. An average exposure of 23 mr/spline was received in spline removal, using special film badges.

3. Contamination Experience

A direct surface reading of 32 mrad/hr was found over a floor crack in the S.E. corner of the lunchroom heating supply room. This activity was due to effluent vapors from an unknown source. The floor crack was taped and excavation is planned to determine the source.

E. Events Influencing Costs

No unusual variations in controllable costs are expected for January.

DR PROCESSING OPERATION

A. Production

Input production was 100.8% of the official forecast. Maximum operating levels were limited when the maximum power level allowed by the Reactor Safeguards Committee was reached.

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A. Production (Con't)

Time operated efficiency was 78.9% which was 97.0% of forecast.

B. Operating Experience

1. Operating Continuity

Operation was interrupted by one scram and one unscheduled outage. Details follow:

<u>Date</u>	<u>Hours</u>	<u>Cause</u>
1-18-59	0.3	The reactor scrambled when the Pressure Monitor sensing line to tube 2167-DR ruptured. This tube is part of the Poison Column Control Facility.
1-23-59	157.0	Water leak, charge-discharge, tube replacement, rear face decontamination.

2. Equipment Experience

Process Tube Leaks

An internal leak in 0878-DR and a rear Van Stone leak on 0833-DR caused abnormal water collection rates in the 115-D drier rooms. These tubes were replaced, as well as 138 additional tubes, as part of the planned program to avoid tube leaks caused by corrosion.

Building Sewers

The 3" line under the north end of the building was found to be free of leaks. Condensate from the steam lines in the rear stairwell was routed to the storage basin.

Stuck Charges

Four charges, 3 of I & E and one of solid metal, of concentrations ranging from 543 to 352 were stuck during C and D operations. After backseating with forces of 1500# to 4500# all were discharged with the charging machine. Three warped slugs were sent to the Component Testing Operation for inspection.

C. Improvement Experience

1. Production and Process Tests

<u>Test No.</u>	<u>Description</u>	<u>No. Tubes Charged</u>	<u>No. Tubes Discharged</u>	<u>Total No. Tubes in Reactor</u>	<u>No. Tubes in 31</u>
PTA IP-4-I	Use of I & E E-Metal At B, D, DR, F, and H	10	14		

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<u>Test No.</u>	<u>Description</u>	<u>No. Tubes Charged</u>	<u>No. Tubes Discharged</u>	<u>Total No. Tubes in Reactor Jan. 31</u>
PITA IP-6-I	Central Zone Loading of I & E into DR Reactor	343	188	1321
PT-IP-170-I	"Decontamination of Internal Surfaces of Rear Face Fittings at D and DR Reactors". This decontamination effort was made, reducing dose rates by 55.6%.			

2. Projects

AEC-160 Recirculating Gas Loop

Construction was suspended throughout the month because the gas compressors had not arrived on plant.

3. Other

Crossheader Pressure Differential Monitor

The problems reported last month have been corrected and the system now functions satisfactorily.

Gas Moisture Monitor

The compressor for the refrigerator is out of service. Problems of synchronizing the indicating lights in the control with the dew cell being monitored still exist.

Dummy Decontamination Facility

The hoist was repaired and mechanical modifications were made to the sorter. The equipment now performs satisfactorily and was turned over to this Operation by Equipment Development Operation.

D. Radiation Monitoring Experience

1. Radiation Occurrences

No lapse of radiation control was experienced during the month.

2. External Exposure Control

The highest dose rate to personnel during the month was 4 r/hr, to extremities only, experienced while boroscoping an experimental hole. On two occasions, dose rates were found existing outside of radiation zones. In one case, the pickup truck was found loaded with boxed contaminated waste reading 40 mrad/hr. In the other case, a dose rate of 22 mr/hr was found at the work area rope from storage of poison.

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3. Contamination Experience

Nine cases of skin and hand contamination were experienced, of which 5 cases resulted from radioactive effluent vapor. The remaining 4 cases resulted from tube replacement work on the front face and involved a maximum level of 5,000 c/m.

Eleven cases of personal clothing contamination were experienced, of which 3 instances resulted from effluent vapor. In the remaining 3 cases, the maximum contamination level was 3,000 c/m.

E. Events Influencing Costs

Maintenance costs were high due to the cost of replacing 140 tubes. The unit cost of production is lower than December because of increased production in January. DR Processing overtime usage rate was 0.2%.

D-DR POWER OPERATION

A. Operating Experience

The export pumping load was supplied by 100-D Area during January. Surges on the export system occurred on January 1 and 2 due to electrical trouble in 100-D/DR Area caused by high winds. It was necessary for 100-B Area to assist 100-D to maintain pressure on system on January 23, 29, 30 due to numbers 1 and 5 pumps being out for repairs.

B. Equipment Experience

100-D Building

Mufflers were installed on the Numbers 2 and 3 export pump motors for noise control on January 6.

Number 1 export pump unit was removed from standby service on January 23 to replace the turbine and reduction gear bearing. The pump unit was returned to normal service on January 31. The thrust bearing on the Number 5 export pump was replaced on January 30.

100-D Building

The primary impeller and wear rings were replaced in Number 6 pump unit on January 3.

Inspection and repairs were started on Number 5 process pump motor on January 19. It was found that the end coils between the bracing rings and bull rings at each end of the motor had to be re-tied and the glass tape on each bracing ring replaced. Repairs were completed on January 21. The primary impeller was replaced in the pump on January 20.

100-DR Building

The primary impeller and wear rings were replaced in the Number 3 pump unit on January 14. The motor exciter was removed from the unit on

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190-DR Building (Con't.)

inspection and the commutator was found to be .005 out of round. New brushes (G.E. F-533) and new constant tension brush holders were installed for a test run.

Number 6 process pump unit was removed from service on January 26 due to vibration. The top casing was removed for inspection of the wear rings and impeller. Condition of the pump was found to be good. The pump was then turned over to the Project Engineering Operation to install new design impellers, wear rings, and a larger shaft.

C. Status of Approved Projects

Project CA-696 - Coal Car Shakeout - 184-D Building

Project completed except for hanging the car shaker and painting of equipment.

D. Events Influencing Costs

No unusual costs are anticipated for the month.

D-DR MAINTENANCE OPERATION

A. Equipment Experience

1. Instruments

(a) Pressure Monitor System

105-D - On January 6 a broken spline on tube 1233-D made it advisable to install a second Panellit on this tube and put the gauge in the safety circuit. This was installed without scrambling the unit.

(b) Pile Control Instrumentation

105-DR - Safety Circuit Instrumentation

(1) A General Electric Mark II Chamber was installed in one of the octant monitor holes for use with numbers one and two galvanometers. Preliminary tests indicate this location may prove to be a satisfactory substitute for "A" Test Hole which must be released for the new fission start-up equipment. The chamber previously installed under number eight riser proved to be too insensitive for this service.

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105-DR - Safety Circuit Controllers (Con't.)

(2) The recently installed H.A.P.O. built safety circuit controllers have been giving spurious trips. Checks with other areas indicate they are having similar trouble. The spare unit is being substituted, relay contacts burnished and all potentiometers cleaned. Some time will be required to determine if this will prove effective.

2. Electrical

115-D - Sub-station E4S4 was damaged during a high wind storm on 1-1-59. Sub-station Maintenance Operation repaired the damage promptly.

134-D - A fuse at sub-station C4S4 was blown during the same storm causing single phase condition on emergency line E4L33 in 134-D Building. The incoming line undervoltage relay did not drop the breaker due to a feed back. Service was restored by manually opening the breaker and starting the emergency alternator. During the same high winds, on 2-2-59, breaker E4X3 opened and left the 1700-D buildings without lights or power. The shift electricians attempted to reclose the breaker, but due to a mechanical failure, it did not reclose. The Sub-station Maintenance Operation restored this service.

3. Mechanical

105-D - During the month, 19 process tubes were replaced at a rate of 43.54 minutes per tube. Channels 2132 and 2662 contain graphite stringers at this time, and tools will be fabricated for removal on future outages.

105-DR - During the month one tube outage was scheduled and 140 tubes were replaced at a rate of 26.53 minutes per tube. Thermocouples were installed at a rate of 2 minutes each, while Processing was using the front elevator for production type work.

During an outage late in the month, water was diverted from the far downcomer for an inspection. Several worn and torn spots were noted in the side walls and one length of vent pipe was loose. This length of pipe was removed from the downcomer, but repair time was not available.

Repair work is under way in the near downcomer, and at the end of the month all vent pipes had been removed.

B. Shift Maintenance Activities

No significant report.

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C. Maintenance Engineering

1. Instrument Engineering

Instrument Training Block Diagram

Preparation of block diagram of safety circuits as related to control instrumentation has started. These diagrams will be used for training instrument personnel.

Pile Period Simulator

An oscillator was designed and built for use in training of Processing personnel in P.C. instrumentation. Under stringent calibration this oscillator can cover a ratio range of 2000 plus (3 to 17,000 cycles), and it will consistently perform with a range ratio in excess of 1000. Training sessions for D Processing personnel have started. Instrument Development expressed interest and was provided with a design to use for testing purposes.

Cross Header Pressure Differential Gauges

Defective parts have been replaced completing this job.

Automatic Temperature Logger

The Giannini encoder to be used as a replacement for the existing Fisher-Porter encoder was received. Modifications to allow its use with the Fisher-Porter chassis were started.

Thermal Shield Power Compensation

Assisted by a Foxboro Company representative, a circuit modification to allow for thermal shield flow compensation to the power calculation equipment, was designed.

Reactor Safety Circuit Trip Identification System

A detailed design for the subject identification system using static switching components has been started by the Electrical Development Operation. An appropriation request was prepared and circulated for final approval.

Dummy Sorter

Installation of two switches received this month complete the electrical system for the subject equipment. This work concludes current D-DR Maintenance Engineering responsibility for initial installation of the dummy sorter.

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2. Electrical Engineering

Removal of Process Water Low Pressure Trip Relays from #1 Safety Circuit

Design Change #262 D-DR "Removal of Process Water Low Pressure Trip Relays from #1 Safety Circuit" has been prepared and is out for approval.

1-4-D Emergency Generator

Failure of the emergency generator to respond was investigated and circuit revisions to improve its response were recommended. (See page 10-11)

3. Mechanical Engineering

DR Downcomer

Both DR downcomers were entered and inspected. The temporary repairs completed at the far downcomer during October, 1950 were still in sound condition. However, progressive damage from continued operation is still in evidence. The near downcomer with approximately two months operating experience since last examination showed more acute damage than was expected. Operation is being continued in the far downcomer while permanent reinforcement modifications to the near downcomer were expedited.

Compressed Air Supply

Installation of the 665 cubic foot compressor and supply headers to D and DR Reactors is approximately 95% completed.

110 Gas Storage Modifications

Fabrication and installation of high pressure piping continues. The services of the engineering inspection group have been requested to assure code compliance on the work.

Backup Chute Viewers

Initial bids by prospective vendors were received with recommendations for design change to economize the improve the viewers. Revised specifications were being prepared and sent out to the vendors.

Crossheader Valve Operator

A front face valve operator and torque mountings were fabricated, installed, and tested satisfactorily at DR Reactor. Fabrication of similar equipment for the D Reactor has been started.

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4. Planning and Scheduling

During the month the following P.M. work was accomplished:

Inspections and Overhauls - 14 Class A
17 Class B
63 Class C

D. Events Influencing Costs

During the month it was necessary to use overtime as follows:

Nonexempt - 1,054 manhours
Exempt - 416 manhours

Manager
D & DR REACTOR OPERATION

JHBrown:JDR:ab

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F REACTOR OPERATION
JANUARY - 1959

I. ORGANIZATION AND FUNCTIONS

No change in assigned responsibilities.

II. PERSONNEL

A. Force Report

	<u>December 31</u>			<u>January 31</u>			<u>Net Change of Total</u>
	<u>E</u>	<u>NE</u>	<u>Total</u>	<u>E</u>	<u>NE</u>	<u>Total</u>	
General	3	2	5	2	1	3	-2
Processing	15	38	53	15	38	53	0
Power	7	52	59	7	51	58	-1
Maintenance	13	71	84	14	73	87	+3
Total	38	163	201	38	163	201	0

B. Movement of People

R. C. Christianson, Analyst - Reactor Operations, resigned from F Processing Operation to accept a position with APED.

E. W. Wilson, Specialist - Manufacturing Administration, transferred to FEO - Expansion Operation.

G. P. Coryell, Assignment Supervisor, transferred to F Processing Operation from Purex Processing Operation.

J. G. Herdan, Assignment Engineer, transferred to F Maintenance Operation from CEO Off-Site Inspection.

Nonexempt personnel moves consisted of two transfers in, one of which was a reactivate, and two transfers out (one deactivate and one leave of absence).

There are no Technical Graduates presently assigned to F Reactor Operation.

III. PERSONNEL ACTIVITIES

E. J. O'Black attended the tenth National Plant Maintenance and Engineering Conference in Cleveland, Ohio, and visited Nela Park and apparatus service shops.

R. K. Gange, C. A. Simsen, C. J. Crane, C. E. Trondson and S. A. Wilson attended training sessions sponsored by Radiation Counter Laboratories Incorporated, which were conducted in 300 Area on January 7, 8, and 9.

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R. R. Palmer, C. R. Ronk, and H. L. Gagnebin completed PBM-1 series during the month. E. C. Merryman attended the initial meeting of PBM-1 series.

S. L. Nelson, L. B. Ufkes, R. R. Palmer, C. R. Ronk, K. J. Parchen and S. F. Allen attended A. B. Greninger's General Information Meeting of January 27.

S. F. Ginther attended a seminar on Radioactive Contamination of the Columbia River conducted in 100-H Area on January 6.

IV. SAFETY AND SECURITY

There were eleven medical treatment injuries during the month of January. No disabling injuries and no security violations 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. L. B. Ufkes attended a meeting at B Area with the Specialists, Administrative Programs, from all plants, to co-ordinate writing the Nonexempt Non-Unit Job Descriptions. Job descriptions were written in F Area for the Maintenance Secretary, Power Clerk and Maintenance Service Manual Writer.

B. Cost Control Activities

Started preparation of the Budget for Fiscal Year 1961 and revision of the 1960 Budget.

Information on specialized equipment budgets was prepared and forwarded to Financial Operation during the month of January.

C. Landlord Activities

Phase I of the rearrangement of the Maintenance Shops in 1717-F Building was completed during the month of January. Phase II of the work was started upon completion of Phase I.

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Scheduled work for January under the cycle painting program was completed during the month.

D. Suggestion Plan Activities

To be evaluated - start of month	33
Received for evaluation	20
Evaluated and returned	18
Unanswered - end of month	35

F PROCESSING OPERATION

A. Production

F Reactor production was 103.1 per cent of forecast during January. The reactor operated on ACRS limits throughout the month with a time operated efficiency of 76.0 per cent.

B. Operating Experience

1. Operating Continuity

<u>Outage Date</u>	<u>Hours</u>	<u>Reason</u>
1/16/59	126.3	Rupture in 1770 - charge-discharge, tube replacement and water leaks.
1/26/59	52.2	Water leak.
1/28/59	0.3	Panelit scram on row 18 - high trip, cause unknown.

2. Equipment Experience

- a. Water Leaks - Collection rate was constant at 30 to 35 gallons per day during the first half of month. Water collection increased after the tube replacement outage to 125 gallons per day. The following leaks were found:

0873 - Rear Van Stone	1576 - Rear Van Stone
1065 - Rear Van Stone	1569 - Tube Leak
1089 - Front Van Stone	1671 - Tube Leak
1191 - Tube Leak	1984 - Rear Van Stone
1468 - Rear Van Stone	2684 - Rear Van Stone

All Van Stone leaks were repaired with new nozzle gaskets and leak tested.

- b. Tube Replacement - A total of 39 tubes were replaced during the month of the 79 probologged for external corrosion. Included was air channel 0163.

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- c. Rupture (1770) - One solid metal rupture occurred during the month. It was discharged with charging machine after backseating at 3500 pounds.
- d. I & E Loading - At month's end, loading was 95 per cent complete.

C. Improvement Experience

1. Projects

Project CG-666 - "Zone Temperature Monitor" - Approximately 95 per cent complete.

2. Other Improvements

- a. Panellit - Continued installation of 10-90 trip gages. Approximately 60 per cent of central zone completed.
- b. Flushing Console - A flushing console was used to flush tubes for probologging. This decreased the probolog time by 33 per cent.

D. Radiation Monitoring Activities

1. Radiation Occurrences

No radiation incidents and two lapses of radiation control were incurred by F Reactor Operation this month.

2. External Exposure Control

External exposure control experience was favorable.

3. Contamination Control Experience

A three-fold reduction in the contamination levels of the 183-F filter beds to 20,000 c/m was characteristic of general reduction in contamination levels previously noted in water plant equipment.

F POWER OPERATION

A. Operating Activities

- 1. An increase in raw water turbidity was experienced from January 10 through January 17 with a maximum of 490 ppm on January 15. Due to this sudden change in raw water quality, the impurities in process water exceeded standards for a period of seven hours on January 13.

B. Equipment Experience

- 1. The No. 1 process water storage tank in 190 Building was inspected internally on January 19. No change since last inspection was detected and the general condition was judged to be satisfactory.

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2. The discharge cone valves and bypass valves for Nos. 7A and 8A process water pumps in 190-A Building were inspected. There was no cavitation evident and no adjustments were required.
3. Inspection of filter beds for six filters at the 183 Building was made for determining depth of sand and anthrafil. Evidence of anthrafil penetration into sand was noted in all filters inspected.
4. Repair work and assembly of No. 13 pump at 181 Building was completed and unit returned to service on January 27. The work of disassembling No. 10 pump for repairs was started on January 28.

C. Improvement Experience

1. Project CG-558 - 190-A Building

A repaired first stage impeller type PW-1417-I and second stage impeller type PW-1416-I with shrink fit wheel rings were installed on No. 7A process water pump. The inboard side shaft sleeve was also replaced. Unit was placed in service on January 29 and No. 8A pump removed from service for inspection and repairs.

2. Project CA-696 - Coal Car Shake Outs

All work in connection with this project is complete except for hanging the shaker.

D. Events Influencing Costs

Items which will increase costs are:

1. Repair work on No. 13 and No. 10 raw water pumps at 181 Building.
2. 183 Building pumps and equipment protective painting.
3. Replace stoker turbine in 184 Building.
4. The unscheduled reactor outage resulted in scheduled overtime for Power maintenance work on Sunday, January 18.
5. The unit cost of steam generation increased approximately 5.9 per cent over previous month due to the use of a high percentage of low heat value storage pit coal. Chemical unit cost increased approximately 17 per cent because of the abnormally poor raw water quality.

F MAINTENANCE OPERATION

A. Equipment Experience

1. Instrument

The Helium Leak Detector facilities were used during two outages this month to assist in locating water leaks in process tubes. On both occasions, the performance was satisfactory.

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The "Nash" high vacuum pump installed to pull water from the pile gas moisture sampling lines in conjunction with the Dewcell operation has been successful in the evacuation of water from the sampling lines as well as indicating general areas of water leaks (confirmed by leaks located during the outage). Inasmuch as this is a wet pump, the gas pumped through the samples line is not returned to the system. Bids on a dry vacuum pump of equal capacity have been requested.

Thirty-one thermocouples were repaired during the two outages.

Two hundred fifty-eight Panellit gages were replaced with gages of 10-90 trip and new Bourdon tubes. Sixteen leaking gages and two with bent drive arms were replaced. Two thousand nine hundred ninety-three (2993) adjustments to Panellit gages were made during this period. These adjustments were primarily necessary because of I & E metal charges resulting in a decrease in operating water pressure.

2. Electrical

The inspection of No. 7 process pump motor in 190 Annex was completed. The stator windings were found in very good condition. The retainer rings were tied and sprayed with No. 457 varnish.

All exciter brushes on the eight process pump motors in the 190 Annex were replaced with T-583 brushes as recommended.

A new style constant pressure slip ring brush holder was installed on the No. 4 process pump motor. Grade "D" slip ring brushes are now installed on Nos. 2, 4 and 7 process pump motors.

3. Mechanical

Thirty-nine process tubes were replaced at a rate of .72 hours/tube. The tube inserter provided by Mechanical Development Operation was used to install 17 tubes after which time a mechanical breakdown prevented further use.

No. 37 VSR channel was inspected. This rod remained out approximately 4' on a scram and approximately 8' when entered under power. The inspection revealed a broken section of graphite liner in the bottom of the channel. This VSR was removed from service.

The newly developed bellows boot expander was used for the replacement of one rubber bellows boot. Although the replacement was in a difficult location, the installation was completed in 46 minutes, which is much faster than by previous methods.

Holes were cut in the top baffle of the downcomer to improve flow characteristics. Repairs were made to the stainless seal at the downcomer cover where a crack in the metal had developed.

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A helium leak survey of 105-F Helium System was completed by Radiographic Testing Operation. A total of 40 tests were made. Two major leaks were detected and have been repaired.

An inspection was completed on the Horizontal Rod Water Supply Screen and Guard Valve. The screen was found dirty. The guard valve was found to be in good condition.

The Class "A" overhaul of the No. 13 river pump at 181-F was completed. Because of excessive wear in the shaft bearing retainers (spiders), a bushing was installed in the retainers to maintain the original bearing clearances. All pump and bowl shafts were checked for straightness and corrected as necessary. New rubber bearings were installed. This pump was overhauled because of excessive vibration. This pump was reconditioned and a new bowl installed by Construction Forces as part of the CG-558 project.

Because of increased vibration in No. 7 process pump at 190 Annex, an inspection was made during the outage of January 16. The wheel wear ring on the outboard end of the first stage impeller had come loose, resulting in excessive vibration. A replacement impeller was installed.

The installation of the liquid dichromate pumping and storage system in the 190 Tank Room is approximately 95 per cent complete.

B. Maintenance Engineering

1. 183-F Raw Water Cone Valve

Faulty operation of the east cone valve necessitated examination of the valve. Inspection of the inside of the valve revealed several cracks in the body and plug which caused the valve to bind. Examination of these seats showed considerable erosion.

2. 107-F Radiation Monitor Instruments

A study is being conducted to determine better location and mountings for the effluent water monitor instruments. The present units are affected by winds and moisture.

3. Process Water Pressure Low Trip (PWP and PWPA Relay) Safety Circuit Deletion

The installation of Design Change No. 246-F to remove the low water pressure trip from the No. 1 Safety Circuit has been completed and acceptance tests made.

4. No. 1 Safety Device Bypass Annunciation

The new annunciator circuit for indication of pressure monitor, seismoscope, or power failure trip bypass has been incorporated per Design Change No. 251-F. The installation and acceptance tests have been completed.

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5. 105 Building Transfer Area Crane Revision

Design Change No. 191-F for revisions to the control of transfer area crane has been approved.

6. 105 Building Work Area Lighting

A study was completed for the improvement of the F Reactor work area lighting. Recommendations included the painting of the work area walls and replacement of the high boy lamps with a reflector unit.

7. Charge Seater - 105-F

The prototype charge seater was successfully used during charge operation at 105-F. However, some inadequacies in equipment are being corrected in the final design prepared by Reactor, Plant Engineering Operation. Further investigation is being made for use of a ram chain instead of the pole with the gear rack as actual seating means.

8. Tube Testing Stingers

A modification of the rubber gaskets on the tube testing stingers was made to improve reliability.

C. Planning and Scheduling

1. Property Control

The quarterly inventory of Catalogue Movable Property as charged to F Reactor Operation was completed with all items accounted for. Six meetings were held to familiarize and indoctrinate F Plant personnel in accounting, use and care of government property.

2. Productive Maintenance

Approximately 25 per cent of available manpower was assigned to Productive Maintenance work including the completion of 10 Class "A" overhauls and 307 Class "B" inspections.

D. Events Influencing Costs

The January costs will reflect an expenditure of approximately \$11,000 due to the withdrawal of 183 additional Panellit gages. Overtime usage was higher than normal.

MANAGER, F REACTOR

CN Gross:EWV:det

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H REACTOR OPERATION

January, 1959

I. ORGANIZATION AND FUNCTIONS

No change.

II. PERSONNEL

A. Force Summary

	<u>December 31</u>			<u>January 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	3	2	5	3	2	5	0
Processing Oper.	16	39	55	15	39	54	-1
Power Oper.	9	50	59	9	51	60	+1
Maintenance Oper.	13	62	75	14	62	76	+1
Central Maint. Oper.	16	99	115	16	99	115	0
Total	57	252	309	57	253	310	+ 1

B. Movement of People

J. E. Lee, Foreman Maintenance I, Chemical Processing Department, was transferred to H Reactor Operation as Supervisor, Shift Maintenance effective January 1, 1959.

R. B. Hamilton, Analyst, Reactor Operations, terminated January 30, 1959 to transfer to APED at San Jose, California.

Nonexempt personnel movements in January included one transfer in, one transfer out, one deactivation, one reactivation and one rehire.

III. PERSONNEL ACTIVITIES

None of outstanding significance.

IV. SAFETY AND SECURITY

There were no disabling injuries, radiation incidents or security violations during the month. A total of 17 medical treatment injuries were reported. One near-serious incident occurred. This involved a truck driver who slipped and accidentally engaged the clutch operating the truck's hydraulic lift while his leg was between the lift and the truck bed. The clutch was disengaged before his leg was injured.

During January, the H Reactor Operation Safety and Security Council, consisting of a total of ten exempt and nonexempt members, was organized to guide the safety program for the Operation during 1959.

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V. NONROUTINE 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

General

- A. Administration Activities - Routine during January.
- B. Personnel Development - Five exempt employees were enrolled in the fifth presentation of Professional Business Management I. Two sessions of the Maintenance Operation electrical training course were presented. Four employees attended the IPD Radiation Protection Program course. One Technical Graduate was on rotational assignment at month end.
- C. Cost Control Activities - Prepared and submitted the budget on specialized equipment. A meeting between the Operation manager and level four managers and specialists was held to review costs for the first six months of the fiscal year, and to discuss areas of possible cost reduction during the balance of the year.
- D. Landlord Activities - Scheduled several tenant moves to utilize space vacated by Facilities Engineering Cost group in Building 1761-H. Programmed painting program for first six months of 1959, and issued necessary work orders.
- E. Suggestions - At start of month, 33; received for evaluation, 13; evaluated and returned, 11; balance at month end, 35.

H Processing Operation

A. Production

Input production was 83.7 per cent of forecast. Three outage days for rear pigtail replacement plus two days for stuck charge removal were the major factors involved in failing to meet forecast. Equilibrium power levels were governed by the ACRS limit until it was lifted on January 26. By month end, a new level had been reached.

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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>
4	180.9	Scheduled outage for charge-discharge, replacement of 1300 rear pigtails, and replacement of 25 tubes.
12	6.5	Scrammed because of leaking rear cap. Also corrected a serious gas leak on an air channel.
13	0.2	Unexplained Panellit trip on row 43.
13	0.3	Unexplained Panellit trip on row 27.
14	0.3	Unexplained Panellit trip on row 27.
23	0.2	Unexplained Panellit trip on row 07.
24	30.2	Scrammed by Panellit gauge 0762 because of a faulty mercury switch. Insufficient reactivity prevented recovery. Performed charge-discharge.

2. Equipment Experience

- a. Rear Pigtails - Conversion of the central zone to O-ring pigtails was accomplished on the January 4 outage with a mass replacement of 1300 rear connectors. Only one leak from an O-ring failure had occurred at month end. It did not effect operating continuity.
- b. VSR's - Nine additional modified rods were installed. Four old rods remain to be replaced.
- c. Downcomers - All vent pipes were removed from the far downcomer. Higher flows had torn one section of pipe completely loose, while many of the others had serious weld breaks.
- d. Stuck I & E Charges - Five I & E charges failed to discharge with normal charging machine forces. Two of these required a total of 40 hours to remove.

C. Improvement Experience

1. HCR Seals - A modified seal was installed on No. 1 HCR which has a history of serious gas leakage. This seal has been satisfactory, and similar seals will be installed on the remaining horizontal rods.

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D. Radiation Experience

Radiation levels in the discharge area were reduced approximately 60 per cent by Turco decontamination of process piping. Four Radiation Occurrences resulted in two Lapses of Control.

1. External Exposure - Two monitors were above the 3R curve on the first badge pull. All other personnel were below the curve.
2. Contamination Control - One case of skin contamination and two cases of clothing contamination were experienced.

E. Events Influencing Costs

Overtime requirements for the month consisted of 6.5 hours for operators and 1.5 hours for monitors. Dummy decontamination is again being done locally which results in a savings of 10 to 20 cents a dummy as compared to CPD charges.

H Power Operation

A. Operating Experience

The average steam generating rate was 53,199 lbs/hr with evaporation rate of 7.35 pounds of steam per pound of coal.

Raw water turbidity varied considerable throughout the month from 3 ppm to 484 ppm with an average of 60 ppm. The variance was attributed to local heavy rains. Coagulant feed rates averaged 8.7 ppm with a maximum of 19.2 ppm. Separan feed was started on January 12.

In collaboration with Process Design Operation a system test of the process water pumping facility in 183 pump room was made on January 6.

Minor arcing was observed January 29 at the brushes on the outboard slip ring of No. 3 annex unit. The power factor was reduced to unity to alleviate the condition until repairs can be made.

B. Equipment Experience

Building 181-H - No. 8 river pump operated abnormally during a start on January 12, and was removed from service.

Building 182-H - The 13.8 KV electrical feed lines L10 and 11 were removed from service to facilitate pole hardware repairs and permit connection of a line to supply White Bluffs.

Building 183-H - On January 27, a coil in the undervoltage relay for No. 6 process water pump motor failed. The unit was returned to normal service following repairs.

Building 184-H - A comprehensive inspection was made of the emergency generator on January 6 and 7. The unit was found to be in very good condition.

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Building 190-H - Work continued on revisions to the Turco feed system, with installation of the four-inch supply line in the east tunnel being completed. To reduce maintenance costs, the flow meters and major portion of the pressure gauges have been removed from service on the pump room "M" panels. Repairs were completed on No. 7 annex unit running assembly and No. 4 unit was out for repairs at month end. No. 7 motor was inspected and found to be in good condition, while No. 4 motor required some re-tying of the insulator strip to the bull ring.

C. Improvement Experience

Project CA-696 - Coal Car Shake-Out - The car shaker and hoisting equipment were received during the month. Work had not begun on the installation of electrical facilities.

H Maintenance Operation

A. Mechanical Maintenance

The KAPL-120 modification completion date has been rescheduled to April 1. The heat exchanger is complete except for insulation which will be done during reactor operation. The instrument piping is being fabricated and will be ready for installation during the next outage. The miscellaneous lines to the heat exchanger and loop header installations are about 75 per cent complete.

B. Instrument Maintenance

Thirty-five faulty Panellit gauges were replaced during outages due to leaks and defective mercury switches. The copper tubing to gamma monitor sample turrets is slowly deteriorating. Five sections of tubing were replaced to correct leaks. In other sections of the lines, the tubing wall thickness is very thin. Six control room Beckmans were converted for new controllers previously installed.

C. Electrical Maintenance

The reactor rear face interlock limit switches were repaired and replaced as necessary due to water damage. The power supply to the Building 190-H maintenance shop was transferred from the emergency supply to the normal source to eliminate possible overload of emergency feeder lines.

D. Maintenance Engineering

1. Horizontal Control Rods - Visual inspection of horizontal control rods Nos. 1, 2 and 3 revealed a white deposit very much like salt towards the end of each rod, with No. 1 being the most severe. Leak testing of rod seals indicated that Nos. 1 and 4 were the most severe. A lantern ring type of back-pressure attachment was installed on No. 1 seal and back-pressured with CO₂ reducing leakage considerably. Seals for all rods are being fabricated.

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2. Radiation Monitoring Equipment for Reactor Storage Area - Beckman monitoring panels for the dummy elevator, water weasel, and wash pad instrumentation have been received and will be installed when work loads permit.
3. Panellit Coordinate Lighting Systems - Building 105-H - The four types of Panellit coordinate lighting systems installed or being developed for the 100 Areas were reviewed and analyzed for application at H Reactor. The two systems favored are the 24-volt system and the static switching system due to their reliability and negligible maintenance. Final selection will depend upon cost, space and possible future expansion or revision.
4. Rear Face Cap and Tool Decontamination Facilities - Building 105-H - Check prints for the proposed equipment arrangement were completed. A study of revisions required to make the facilities suitable for all decontamination solutions which might be used is in progress.

Central Maintenance Operation

A. Engineering

As-built drawings of Building 1717-H light and power systems were up-dated to cover proposed installation of the heat treating equipment. Provided recommendations to Transportation Operation for making the hydraulic lift mechanisms on trucks safer as a result of a near-serious incident. Provided engineering assistance for experiments on the rear face fog spray system. Presented the revised proposal for handling and charging of the tube tool program to the IPD Maintenance Managers with favorable results.

B. Hot Shop

Reworked tools for tube removal programs including 300 splitters, and 70 broaches. Rebores 24 venturis. Reworked VSR's for H Reactor. Converted 120 front face nozzles to rear face nozzles.

C. Electronic Shop

Harness fabrication continued for Project CG-666. The portable TV unit was installed in inner rod room of B Reactor for experimental purposes.

D. Machine Shop

Fabricated tube remover and cutter. Reconditioned six bearing spiders for 100-F Area river pumps. Modified venturi assemblies for Building 1706-KER. Completed machining on six hydraulic charging machine heads.

E. Fabrication Shop

Fabricated and installed ducts in Buildings 1760-H and 190-H.

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Fabricated special cask for Building 1706-KE. Fabricated new style quickie funnel for 100-K Area.

F. Paint Shop

1. The regularly scheduled period for painting was completed in 100-K and F Areas.

G. Special Maintenance

1. Project Work - Projects active this month included: CG-666, CG-706 and CG-707. Projects assigned this month, but inactive due to design or procurement, included: CG-708, CG-817 and MJA-8.
2. Miscellaneous Activities - Installation of the high frequency generator at Building 1706-KE was completed.

Manager
H REACTOR OPERATION

RT Jessen:HCS:met

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KE-KW REACTOR OPERATION
JANUARY, 1959

I. ORGANIZATION AND FUNCTIONS

There were no changes of assigned responsibilities during the month.

II. PERSONNEL

A. Force Summary

	<u>December 31</u>			<u>January 31</u>			<u>Net Change</u> <u>of</u> <u>Total</u>
	<u>E</u>	<u>NE</u>	<u>Total</u>	<u>E</u>	<u>NE</u>	<u>Total</u>	
General	4	2	6	4	2	6	0
KE Processing Oper.	14	41	55	16	41	57	+ 2
KW Processing Oper.	15	40	55	16	40	56	+ 1
Power Oper.	13	72	85	13	72	85	0
Maintenance Oper.	23	122	145	23	123	146	+ 1
Supp. Crews Oper.	10	56	66	10	56	66	0
TOTALS	79	333	412	82	334	416	+ 4

B. Movement of People

W. A. Crossman, Supervisor, Product Recovery, CPD, was transferred to KE Processing as Assignment Supervisor, 100 Operations, effective January 1, 1959.

J. E. Rice, Supervisor, Processing, Redox Operation, CPD, was transferred to KW Processing as Assignment Supervisor, 100 Operations, effective January 1, 1959.

R. L. Gridley, Junior Engineer Maintenance Operation, was transferred to KE Processing as Reactor Specialist, effective January 1, 1959.

L. P. Reinig, Supervisor, K Maintenance Operation, returned to work on January 13 following convalescence from automobile accident injuries.

Changes for the month included two transfers in, and two reactivates.

III. PERSONNEL ACTIVITIES

F. M. Stratton, acting as K Area representative to Project CGI-200 (Passive Scanning), met with representatives from Epsco, Inc. and Radiation, Inc. to discuss final details of their proposals prior to issuance of an invitation for formal bids. The meeting was scheduled by the Plant and Industrial Engineering Operation.

W. R. Moon and P. E. Lindstrom attended a meeting on use of Gypak (Westinghouse statis switching) conducted by a Westinghouse representative.

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IV. SAFETY AND SECURITY

Fifteen medical treatment injuries were experienced for a frequency rate of 2.16.

At the January meeting, the K Plant Safety Council adopted the theme "As ye sow, so shall ye reap" as the K Plant Safety Theme for 1959. The safety program activity for January was to encourage employees to make a self-analysis of their safety attitude and performance.

The IPD Health, Safety and Housekeeping meeting was held at K Plant on January 13. Following the meeting, an inspection tour of the area was made.

No security violations were incurred.

V. NON-ROUTINE REPORTS

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 advised, 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. FUNCTIONAL ACTIVITIES

GENERAL

A. Administrative

Suggestion Plan statistics for the month were as follows:

Suggestions at start of month --	99
Received for evaluation -----	16
Replies submitted -----	29
On hand at end of month -----	86

Anticipated requirements for the 1959 summer hire program and technical personnel needs for FY 1960-61 were submitted to the IPD Personnel Placement Specialist.

Priority listing of exempt personnel for PBM-I enrollments was submitted to the IPD Personnel Development Operation.

Results of the KE-KW Reactor Operation opinion survey were analyzed and made available to Management for information and guidance purposes.

Assistance was given to Manager, Supplemental Crews in placing into effect the Pile Operator Selection Procedure. Arrangements were made for qualified Utility Operators to take required tests.

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B. Personnel Development

The first two meetings of the Economic Discussion Series, set-up to accommodate "A" and Day shift personnel, were held during the month. The meetings were scheduled for employee "off work" hours.

A film "Atomic Power at Shippingport" was shown to nine groups of Plant personnel. A total of 130 people viewed the film which presented a review of electrical power and experimental facilities of the Shippingport Reactor.

C. Cost and Measurements

The Automotive and Specialized Equipment needs for FY 60 and 61 were consolidated and submitted to the Financial Operation.

Following a general review at the Monthly Cost and Planning meeting, preparation of Budget Reason Sheets was initiated for Planned Maintenance, and Equipment Not Included in Construction items for FY 60 and 61.

Production and unit costs data for Calendar Year 1958 were compiled.

Assistance was given to Industrial Engineering personnel in compiling maintenance cost data and history on specific Maintenance items and in arriving at forecasted maintenance costs.

D. Landlord Activities

The fiscal year to date experience of rentals received to costs billed was reviewed and adjustments were made in rental rates as dictated by past experience and future planned programs.

A work order to install six air traps in the glycol heating system was issued to improve heat distribution control.

Arrangements were made to include 1713 KE, KW and KER on the Plant listing of Landlord properties. Rental rates were established for these warehouses.

KE PROCESSING OPERATION

A. Production

Input production for the month was 113.4 % of the forecast. The ACRS limitation on power level was relaxed on January 26 and a planned power level increase above the previous limit was initiated on that date. The maximum level attained was 60 units above the previous high.

B. Operating Experience

1. Operating Continuity

Reactor outages totaled 69.6 hours for the month. Operating continuity was affected by the following events:

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<u>Day</u>	<u>Hours</u>	<u>Remarks</u>
6	32.0	Scram caused by high process activity on KER Loop Number 4. Outage time was used for processing 301 tubes.
14	36.3	Scram caused by a loose terminal in the depressurization valve circuit on KER Loop Number 3. Outage time was used for miscellaneous maintenance and metal processing.
16	1.3	Panellit scram during level reduction at turnaround.

2. Equipment Experience

- a. Instrument and Circuitry - The dual master relay feature was installed in the panellit system in accordance with Design Change 155. Wiring faults resulting from the work delayed the reactor start-up 1.6 hours. Seventeen Resistance Temperature Detectors were replaced on rear tube nozzles in a continuing effort to keep the number of faulty temperature monitor circuits at a minimum.

The spectrometer failure alarm circuit of the gamma monitor system was revised to provide fail-safe type circuitry. The sample lines to turret 5-R in the gamma monitor room were revised to improve flow regulation.

- b. Process Water System - Process tube 4769, which had shown wear from dummy movement under water pressure, was replaced and returned to service.

Flow adjustments in cooling systems of the thermal and biological shield temperatures were made. All temperatures were brought within recommended ranges. The temperature of the bottom membrane, as indicated by thermocouple B-7, is lower than optimum, but is as high as bottom shield temperature limits will permit.

- c. KER Facilities - The reactor was scrambled on January 6 by the high process activity trip on KER Loop 4, indicating a possible fuel element failure. Since loop water sample analysis, and dummy swab checks did not confirm the rupture, the loop was not discharged. The process activity monitor for Loop 4 was exchanged for that in Loop 3 as a means of checking the system in service. Loop 4 was started-up on single pass flow due to leakage through the dump valve. The dump valve was repaired, and the loop returned to recirculation during the January 14 outage.

Inspection indicated that a loose terminal in the depressurization valve circuitry on KER Loop 3 caused the reactor scram on January 14. The connections of all similar circuits were examined for tightness.

C. Improvement Experience

1. Production and Process Tests

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- a. PT-1P-15-D, Supp'l A - Irradiation Service Request HAPO - 184 - The first sample was irradiated in the pneumatic operated 'rabbit' facility on January 16. Sample irradiations continued on a planned basis throughout the month without incident.
- b. PT-105-1 - Irradiation of G Sample - Twenty graphite samples were charged into 2-B test hole on January 15.

D. Radiation Experience

1. Radiation Occurrences

No radiation occurrences were experienced during the month.

2. External Exposure Control

The average dose rates to personnel for discharge operations and miscellaneous work on the rear face were 100 to 150 mr/hr.

No radiation exposure was involved in initial tests and operations of the pneumatic test facility on X-0 level.

The newly installed continuous air sampler for the discharge area was used during the month's outages. Operation of the equipment was satisfactory.

KW PROCESSING OPERATION

A. Production

Input production was 105.1 per cent of forecast. Maximum power level was at the high permitted by the ACRS limit.

B. Operating Experience

1. Operating Continuity

Reactor outages totaled 106.2 hours. Operating continuity was affected by the following events:

<u>Day</u>	<u>Hours</u>	<u>Remarks</u>
4	46.5	Panellit scram that occurred during an attempt to cut back from six pump to five pump flow during operation.
19	29.5	Rupture in tube 0949.
28	30.2	Rupture in tube 2039.

2. Equipment Experience

- a. Instruments and Circuitry - A Panellit trip on tube 1586 occurred and resulted in a scram while total board Panellit range changes

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were being made. Change from six pump to five pump flow was attempted following operational difficulties with Number 5 highlift pump motor.

The resistance temperature detector of tube 1363 was blown out of its adapter at the "Y" fitting during operation. Twenty-four RTD circuits were defective at month end despite correction of 12 circuits during the month.

- b. Ruptures - Two ruptures caused outages during the month. During one of these outages a third rupture was detected and discharged. All ruptures were I&E metal with exposure from 566 to 802 and had operated at tube powers from 892 to 1265.
- c. Gas System - Normal gas usage rates were attained by month end as a result of the following corrective measures:
 - 1) Elimination of drier room changes for water collection during operation.
 - 2) Reduction of reactor gas pressure to the minimum amount.
 - 3) Correction of current VSR gas seal leaks.
- d. Water Leaks - A program of tightening of rear face nozzles and replacing of defective gaskets during the January 4 outage corrected the majority of water leaks. A total of 313 gallons of water was collected in January. Although several dew cell points continued to show slight indications of moisture in the reactor, only normal amounts of water were collected after each drier regeneration.

C. Improvement Experience

1. Production and Process Tests

- a. PT-1P-128-CE, Supplement B, "Poison Spline Flexible Control System Tests at 105-K" - Twelve splines were used for start-up control following the three outages experienced this month. A production gain of about 500 MWD's was achieved for each start-up. More extensive use of splines is not permissible without approval of a production test or a revision of Process Standards, authorizing unlimited use of splines.
- b. DT-1P-86-H, "Heat Transfer Study in KW Biological and Thermal Shields" - Temperature data for low inlet water temperatures was taken during the January 19 outage. This data, along with that previously obtained during a period of high inlet water temperatures, completed the study requirements.

D. Radiation Experience

1. Lapses of Radiation Control

One Lapse of Radiation Control was experienced involving contamination of an employee's shoe.

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2. External Radiation Control

Discharge area dose rates have increased to levels almost equal to those experienced before the November internal decontamination by use of Turco. The average dose rate during the January 28 outage six hours after shutdown was 100 mr/hr. Twenty-two hours after shutdown, the average dose rate of 80 mr/hr. The maximum personnel dose rate encountered was 5 r/hr at process tube 0972, which contained a ruptured slug.

Poison splines were inserted in process tubes during reactor operation at an average dose rate of 5 mrem/hr. The average personnel dose rate for their removal was 10 mr/hr at 45 feet. The maximum dose rate encountered was 2.5 r/hr from a spline piece in the cutter. The maximum dose rate measured on the exit hose was 1 r/hr.

Entry was made to the Ball 3X tunnel to make an inspection for vibration damage. A dose rate greater than 5 r/hr was noted near the end of the through. Personnel dose rates were limited to 2 r/hr.

KE-KW POWER OPERATION

A. Operating Experience

1. Number 5 Hi-Lift Motor Brush Failure

On January 3, severe arcing occurred on the brushes of the pump motor. In an effort to maintain continuity of reactor operation, the pump output was reduced gradually to allow time for panellit gage adjustments in 105-KW to compensate for lower pressure and flow. These efforts were not successful and the reactor scrambled at 12:08 p.m. on January 4. Investigation revealed overheating of the brushes, brush boxes and pig-tails. No permanent damage resulted and repairs were made.

2. Generator Difficulties

- a. Number 3 Generator, 165-KW - On January 6, the generator failed to pick up the load during a routine acceleration test. Examination revealed a ground in the pilot exciter. Repairs to the exciter and a thorough examination of the entire generator control system were completed. The unit was returned to normal service on January 14.
- b. Number 1 Generator 165-KE - During a routine acceleration test, a greater than normal voltage drop was noted as the generator took the load. When the unit was subsequently removed from service, a malfunctioning relay in the voltage regulator was found. The generator unit was given a complete class B overhaul before its return to normal service on January 29.
- c. Number 1 Generator 165-KW - On January 19, the generator tripped-off due to loss of excitation. Inspection revealed that the armature and brush rigging were grounded. Repairs to the pilot excitor plus inspections and maintenance of the main exciter and voltage regulator were completed. The unit was returned to normal service on January 23.

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3. Electrical Peak Control Efforts

Peak control efforts were required for 93.5 hours during periods of peak IPD operation to limit the Bonneville Power Authority interruptible demand at approximately 25 megawatts. The control efforts reached a maximum of 5 megawatts on January 22.

B. Equipment Experience

1. KE Filters - Sand and Anthrafilt Addition

Four carloads of sand and four and one-half carloads of anthrafilt were added to the 183 KE filters completing the current filter bed maintenance program.

2. KE Brine Pit

The leak that developed in the 165-KE brine pit during the latter part of December was repaired. The pit was refilled and the system was returned to normal service.

3. Number 3 River Pump 181-KW

On January 19, during a routine check of the 181-KW pumps, water was observed dripping out of a breather pipe at the bottom of the pump motor air cooler housing. Following hydrostatic testing, the coils were removed and the leaking tube was replaced. The pump was returned to service on January 20.

C. Events Influencing Costs

1. Water Treatment

Due to unseasonal rains and quick run-off of surface water, the river turbidity rose rapidly on two occasions during the month. Both increases were of several days duration and the maximum turbidity reached was in excess of 500 PPM. Increased use of coagulant and Separan was necessary, causing a unit treatment cost increase of 24 per cent over the previous month's experience.

KE-KW MAINTENANCE OPERATION

A. Equipment Experience

1. Instruments

- a. Panellits - Range changes and checks were made to 3709 gages, with 75 per cent being completed during outages.
- b. Temperature Monitor System - Twelve resistance elements and eleven connectors were replaced in the temperature monitor systems. In addition, five controller boxes were repaired.
- c. Carbon Dioxide System - 115-KW - A vaporizer limit switch was replaced on the vapor pressurizer tank.

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2. Electrical

- a. Communications Systems - Installation of the instrument tunnel to the rear face system was completed in both 105 buildings.
- b. High Lift Pumps - New solid polypropylene cells were installed in the liquid rheostat of Number 3 pump unit in 190-KE.

Brush assemblies on all motors in 190-KW and on Number 2 and 4 units in 190-KE were examined and corrections made as required.

All rheostat electrodes were checked in 190-KW and tightened where necessary.

3. Mechanical

- a. Vertical Safety Rods - Twenty-one gas seals were installed in 105-KW. Six of these were in special clamps designed to improve seal performance. Four other seals were repaired in 105-KW and four seals were replaced in 105-KE.
- b. Leak Testing - Eight horizontal control rods and six test holes were hydrostatically tested.
- c. Mock-up - 105-KE - Three crossheaders were fabricated and installed on the 36-tube mock-up to simulate a rear face section. The mock-up was fabricated for demonstration and training purposes in preparation for the coming extended outage.

B. Engineering and Planning and Scheduling

1. Instrument Engineering

- a. Temperature Monitor System - All resistance temperature detectors in Lot 8 which were not installed in 105-KW and which failed one of the qualification tests were returned to Lewis Engineering Company for re-working.
- b. Design Change 258, Temperature Monitor Resistor Bypass Switch - A design was completed which covers the installation of a switch to permit lowering the trip-point range on fifty selected monitoring points. Final approvals are pending.

2. Electrical Engineering

- a. Generators, 5000 KVA - 165-KE and KW - Improved inspection procedures and test data sheets were prepared. The frequency of class "A" overhauls and detailed inspections was increased.
- b. High Lift Pumps - 190-KW - Sample brushes were removed from the Number 5 pump for further evaluation by Mr. Gunnoe to the G.E. Large Motor and Generator Department. The study was initiated to determine the causes and the corrective action necessary to eliminate the pig-tail-to-brush failures and to obtain brush temperature and tension data.

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3. Mechanical Engineering

- a. Horizontal Control Rods - A water hose was removed and inspected by Materials Development Operation. The plies and rubber covering were in good condition with no evidence of cracking.
- b. Fuel Oil Temperature Control Valve - 166-KE-KW - Wire drawing of the valve seats resulted in inadequate control and excessive maintenance. The condition resulted from the small steam demand when a 250 psi pressure differential exists across the valve. Recommendations were made to reduce the pressure on the valve to 40 psi by installation of a pressure reducing valve in the main steam header.
- c. Process Gas Driers - 115-KW - An estimate was made and submitted to KW Processing Operation for conversion of the blower room, not normally in use, into a third drier room.

4. Planning and Scheduling

- a. Class "A" overhauls were completed on 147 items of equipment and class "B" overhauls on 179 items. The class "A" overhauls included two 5000 KVA generators and exciters in 165-KW and one in 165-KE. The class "B" overhauls included three 500KVA generators, two boilers, and a low lift pump in 190-KE.

SUPPLEMENTAL CREWS OPERATION

A. Events Influencing Costs

1. Supplemental Crews' Time Distribution

The non-exempt time distribution was as follows:

<u>Area</u>	<u>Per Cent</u>	<u>Area</u>	<u>Per Cent</u>
100-B	29	100-F	12
100-C	18	100-H	14
100-D	8	100-KE	7
100-DR	10	100-KW	2

2. Overtime Usage

Overtime worked by Supplemental Crews personnel totaled 500 hours.

R. S. Bell
Manager
KE-KW REACTOR OPERATION

RSB:CEG: ljs

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PRODUCTION OPERATION

JANUARY, 1959

I. ORGANIZATION AND FUNCTIONS

No change.

II. PERSONNEL

A. Force Report

	<u>December 31</u>			<u>January 31</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	2	1	3	2	1	3	0
Prod'n Reports & Statistic	1	2	3	1	2	3	0
Prod'n Forecast'g & Sched'g	5	4	9	5	4	9	0
Prod'n Computing	3	3	6	3	3	6	0
Essential Materials	1	1	2	1	1	2	0
Total	12	11	23	12	11	23	0

III. PERSONNEL ACTIVITIES

W. S. Slippern finished a 10-session course in FMS&L.

R. M. Micklich submitted a paper to the IBM Department of Education. The article, titled "Horizontal Listing", describes a scheme of panel board wiring for printing from punch cards an array of numbers, such as a temperature map, with an IBM accounting machine.

IV. SAFETY AND SECURITY

There were no injuries or security violations. Safety and Security Meetings were attended as scheduled.

The Production Computing Operation was addressed by T. A. Wickes, Psychologist, on the subject of personality traits and safety performance. A round-table discussion of general interest followed the lecture.

V. NON-ROUTINE REPORTS

<u>Doc. No.</u>	<u>Title</u>	<u>Author</u>	<u>Date</u>	<u>Classif.</u>
CLVI-593	Revised Key for the Daily Production Report	DL DeNeal	1/20/59	T.S.

This document provides information essential to the interpretation of the Daily Production Report.

HW-58012	Key for the Daily Operations Report	DL DeNeal	1/28/59	Secret
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This document sets forth the basic information required for understanding the Daily Operations Report.

IV. 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. FUNCTIONAL ACTIVITIES

A. Production Forecasting, Scheduling and Analysis

1. Production Forecasting

The five-year production forecast, TS Document No. CLVI-595, was issued during January. Pertinent information from the document was directed to FPD and CPD to aid in preparation of their respective forecasts and to be combined by CPD into an overall HAPO production forecast.

2. Production Scheduling

a. Discharge Concentrations

Discharge of the High Pu-240 program from C Reactor has removed a major source of uncertainty in determining the extent to which goal reductions in enriched I & E material could be made. As a result, the exposure of material discharged has been further reduced for the third consecutive month and is expected during February to reach the level recommended by R & E.

The goal reduction for regular I & E slugs at the K Reactors which was initiated in December based on an R & E recommendation was discontinued due to a later R & E recommendation to raise this goal. Action on the December recommendation had resulted in a reduction to about 750 MWD/Ton which approximates the latest figure.

Goals for other materials were not changed during January. However, for the sake of uniformity, all goal plans were reduced to the form expressed by the following equation:

$$G = I - Mf$$

where G = discharge goal exposure, MWD/Ton
I = constant (variable goal intercept)
M = constant (variable goal slope)
f = tube factor (relative tube power)

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The table below summarizes the current goal plan.

Variable Goal Discharge Plan - January 1959

<u>Material</u>	<u>Reactor(s)</u>	<u>*G Max.</u>	<u>**Usual Dischg. Exposure</u>
Solid Regular	B, D, DR, F, H, KE, KW		700
Solid Regular	C		650
I & E Regular	B, C, D, DR, F, H		780
I & E Regular	KE, KW	900	750
Solid Enriched	B, DR, H	1000	850
I & E Enriched	B, D, DR, F, H		950
I & E Enriched	C		700
I & E Enriched	KE, KW		600

* Where low tube factors would result in discharging well above the economic upper limit, a maximum goal has been specified.

** The exposures of individual batches can vary widely from those listed because of the timing of the outage and the powers of the tubes discharged.

Listed below are those instances where the established goals were not used:

Below Goal Discharging - January 1959

<u>Reactor</u>	<u>Tons Dischg.</u>	<u>Tons Excess Usage</u>	<u>Mat'l Type</u>	<u>Reason</u>
B	1.3	0.3	E	Solid E charges discharged to lighten fringe poison compensation enrichment.
B	0.3	0.1	E	Process tube replacement.
B	1.4	0.7	Reg.	Process tube replacement.
C	0.3	0.1	Reg.	Tubes used for temporary poison.
C	8.6	4.0	E	Discharge of High Pu-240 supporting enrichment.
D	0.8	0.3	Reg.	Process tube replacement.
DR	19.5	7.4	Reg.	Large scale process tube replacement.
F	0.7	0.3	Reg.	High powered solid charges in the central flow zone.
F	0.6	0.2	Reg.	Certain central zone I & E charges having abnormally high tube powers.

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Below Goal Discharging - January 1959 (Cont'd.)

<u>Reactor</u>	<u>Tons Dischg.</u>	<u>Tons Excess Usage</u>	<u>Mat'l. Type</u>	<u>Reason</u>
H	0.3	0.2	Reg.	Material discharged to permit tube bowing traverse.
H	1.0	0.2	Reg.	Arbitrary discharge of all solid charges from the central flow zone.
KW	0.8	0.3	Reg.	Tubes used for temporary poison.
KW	3.7	0.9	Reg.	Rupture prone lot CK-039-B.
	<hr/> 29.1	<hr/> 10.6	Totals for regular uranium	

Comparison of January Discharge Exposures
MWD/Ton with those of Previous two Months

<u>Month</u>	<u>Regular U</u>		<u>Enriched U</u>	
	<u>Solid</u>	<u>I & E</u>	<u>Solid</u>	<u>I & E</u>
November	531	736	765	781
December	583	733	735	773
January	670	713	840	713

b. Process Tube Replacement

A number of tube outages were scheduled for January, some of which had been deferred past the end of the year because of a shortage of personnel exposure and to improve over-all scheduling. Because the ACRS limit was controlling during the latter part of 1958, little if any loss was incurred by having thin-wall tubes out of service during this period. A number of these tubes were utilized for polonium production. Following is a table of January tube replacements:

<u>Reactor</u>	<u>Tubes Replaced in January</u>
B	70
C	3
D	19
DR	140
F	39
H	25
KE	1
Total	<hr/> 297

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c. Off-Plant Shipments

Eight casks of polonium were shipped to Mound Laboratory.

3. Operations Analysis

Work continued on a study directed toward up-dating process tube replacement forecasts. Use of zirconium tubes is also being investigated with the above.

Review of HW-50300, HAP0 Source and Special Nuclear Material Accountability Reference, was continued in conjunction with the various reactors. Comments and several suggested revisions were forwarded to the SS Accountability Operation.

A member of the group represented the Production Operation on the Task Force investigating Slug Quality Certification and attended a meeting on Data Processing.

B. Production Computing

Tube-by-tube source data were processed to establish the current production and corrosion status for each tube in all reactors. Routine and emergency reports were issued to implement the scheduling, forecasting, and accountability functions of the Production Operation. Charge-discharge and tube replacement information for each reactor operation was provided in accordance with production schedules. Production data were supplied to each Pile Physicist for reactivity evaluations, and to Process Technology for EDFM processing.

Individual tube source data were supplied to the SS Accountability Operation for calculating weights of SS material in discharges and month's end inreactor inventories.

Input and output data were processed for use by the Specialist, Production Forecasting, in the preparation of the official 5-year production forecast.

Machine programs were developed and tested for the processing of tube corrosion data which will provide a basis for the forthcoming plant-wide tube replacement forecast. Correlations of relative corrosion (R.C.) values with other reactor variables were investigated by machine methods. As a result of the investigation a new equation was applied to tube wall thickness calculations for B Reactor. The new formula makes use of the direct dependence of relative corrosion on tube location; i.e. a tube located in a fringe area will have a corrosion rate significantly lower than a central tube at the same operating temperature.

A prototype deck of "Loading Record" cards was set up for F Reactor. It is being maintained on a trial basis in an effort to evaluate a recommendation that a "Loading Record" file be established for all reactors.

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C. Production Reports and Statistics

1. Daily Reporting

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

The Daily Operations Report form and associated secret key were revised and issued to appropriate individuals. The information on this report was expanded to provide up-to-date information on both individual and combined reactor performance.

2. Monthly Reporting

The combined report of Production and Reactor Operations for December was assembled and issued.

The December production summary was prepared for management.

Special monthly report information was assembled for personnel of the AEC-HOO (Process Engineering and Manufacturing Division) summarizing plant operation and related statistics for December.

The data, necessary for preparing the December report on Production Losses Due to Special Irradiations, was tabulated for issuing to the AEC-HOO and within IPD.

3. Special Reporting

The IPD contributions for the 1958 Annual Report were received and edited into draft form for inclusion in the HAPO report.

4. Production Statistics

Production statistics work performed during January included the following:

- 1.) A chart book showing reactor outage time, ruptures and scrams was maintained for department management.
- 2.) The Product Cost and Budget Operation was furnished production data, operating efficiencies, outage hours and tube replacement information.
- 3.) The Radiation Protection and Analytical Laboratories Operations, HLO, were given weekly reports showing process water flows and related reactor data.
- 4.) The Plant and Industrial Engineering, Component Testing and Supplemental Crews Operations were supplied information each morning showing which reactors were operating.

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- 5.) The Processing Engineering Operation, Fuels Preparation Department, was given power level, water flow and tube replacement data.
- 6.) Time operated efficiency, tube replacement and reactor scram data from FY 1954 to date were tabulated for IPD management.
- 7.) Reactor outage time breakdown data from CY-1953 to date were developed for the Expansion Operation, FEO.
- 8.) Production data, as percent of a base, were given to Process and Reactor Development Operation and Plant and Industrial Engineering Operation from CY-1954 to date.

D. Essential Materials

Rail and truck shipments received in January were as follows:

Carload shipments for IPD	245
Carload shipments for other Depts.	211
Truck shipments for IPD	<u>162</u>
Total shipments received	618

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

1. Prepared and submitted to purchasing, requisitions for test quantities of stainless steel-boron splines, magnesium-aluminum-cadmium poison dummies and a different grade of hydrated alumina.
2. Increased the liquid sodium dichromate storage in 100-H and the K Areas to a full three months supply. This material was obtained from the Cascade Fire Equipment Co. of Yakima and was manufactured in Japan.
3. Received word from the Bureau of Mines that the Helium supply for February was expected to be about the same as it was in January.
4. Furnished purchasing with HAP0's requirements of steam coal and burner fuel oil for fiscal year 1960. These figures will be used for new contract negotiations.

E. Miscellaneous Services

Formal job knowledge testing of Utility Operator candidates for up-grade was initiated in accord with the new Pile Operator Selection Procedure. Close liaison was maintained with the Employee Relations Operation, which administered the written examinations, and with the plants in connection with both test design and test grading.

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Security classification matters continued to be handled for the department. Problems involved in the processing of internal documents (e.g., plant procedures manuals) for off-site release were resolved, with referral to the Technical Information Operation where necessary.

Mr. W. A. Hepburn, of the Maritime Commission (and the AEC's Division of Reactor Development), visited the Production Operation on Jan. 8 to discuss possible Hanford assistance with the reactor operational training of the officers and crew of the N. S. Savannah. A copy of IPD's Reactor Operator Training Program manual subsequently was supplied the AEC-HOO for forwarding to Mr. Hepburn.

Manager
Production Operation

CA Priode:DLD:bam

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REACTOR OPERATIONS STATISTICS - PROCESSING																	
MONTH January 1959																	
INPUT PROD.-Pu (% OF FORECAST)		67.5		83.2		109.5		100.8		103.1		83.7		113.4			
TIME OPER. EFF. (% OVERALL)		53.3		69.2		86.5		78.9		76.0		70.6		90.6			
NO. OF REACTOR OUTAGES & HOURS		NO.		HRS.		NO.		HRS.		NO.		HRS.		NO.		HRS.	
SCHEDULED		1	165.7	1	156.9	0	72.2	0	136.8	0	130.6	1	160.2	0	44.8	0	79.9
UNSCHEDULED - SCRAMS		3	5.2	2	0.7	1	0.2	1	0.3	1	0.3	6	12.3	3	12.8	1	8.4
- OTHER		1	176.6	3	71.4	1	28.2	1	29.2	2	47.9	0	46.1	0	12.0	2	17.9
TOTAL		5	347.5	6	229.0	2	100.6	2	157.3	3	178.8	7	218.6	3	69.6	3	106.2
BREAKDOWN OF REACTOR OTGE HRS.																TOTAL HRS. TIME	
PLANNED																	
CHARGE-DISCHARGE		51.3		28.4		20.7		38.5		25.6		41.4		23.4		66.5	
TUBE REPLACEMENT		92.6		52.4		25.6		86.5		51.3		22.5				330.9	
PROJECT WORK										29.1						29.1	
PRODUCTION TEST		5.8		31.6		14.4								1.1		1.5	
MAINTENANCE		16.0		44.5		11.5		11.8		24.6		96.3		20.3		11.9	
MISCELLANEOUS																236.9	
SUB - TOTAL		165.7		156.9		72.2		136.8		130.6		160.2		44.8		79.9	
UNPLANNED																	
CHARGE - DISCHARGE				69.8(1)		1.1				2.2		44.6 (3)				2.8	
PRODUCTION TEST						4.3								20.5(2)		94.6	
RUPTURE REMOVAL										3.2						15.2	
WATER LEAK		158.6				11.9		13.6		40.2		0.2				224.5	
MAINTENANCE		16.6		1.9		10.9		6.6		2.3		4.8		3.0		11.5	
INSTRUMENTATION																57.6	
PANELKIT		1.0		0.4		0.2		0.3		0.3		8.8		1.3		12.3	
MISCELLANEOUS		5.6														5.6	
SUB - TOTAL		181.8		72.1		28.4		20.5		48.2		58.4		24.8		26.3	
TOTAL		347.5		229.0		100.6		157.3		178.8		218.6		69.6		106.2	
NO. SLUG RUPT. (ALL TYPES)		0		2		0		0		1		0		0		3	
NO. NEW TUBES INSTALLED		70		3		19		140		39		25		1		0	
TYPE OF WATER LEAK - TUBE		1		1		1		1		3		0		0		0	
VAN STONE		4		0		0		1		8		0		0		0	

- (1) Includes 33.5 hrs. for rupture removal on PT IP-132-AC, also 24.0 hrs. for water leaks caused by PT IP-162-E (OCD).
- (2) Includes 11.5 hrs. for trips caused by 1706-KER.
- (3) Removal of an I & E reg. metal stuck charge.

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MONTH		REACTOR OPERATIONS STATISTICS - POWER										SHEET 1	
January 1959		100-B	100-C	100-D	100-DR	100-F	100-H	100-KE	100-KW	TOTAL			
RIVER WATER (BLDG.181)													
TO RESERVOIR (BLDG.182)		3046		16441		3043	2235			24765			
TO FILTER PLANT (BLDG.183)		56000		79710		67190	62300	163600	155200	584002			
TO FILTER PLANT (C&DR)		79300		60296						139596			
TO R & E (KER) & FEO				203				763		966			
TOTAL		138346		156650		70235	64535	164363	155200	749329			
TOTAL		6175.7		6992.9		3135.3	2880.8	7337.2	6928.1	33450.0			
RESERVOIR WATER (BLDG.182)													
TO POWER HOUSE (BLDG.184)		46		77		26	26			175			
TO COND-SYSTEM(BLDG.190)		3000		1652		3015	2209			9876			
TO COND-SYSTEM (190DR & 183F)				2325		2				2327			
TO EXPORT SYSTEM				12387						12387			
TOTAL		135.9		733.9		135.8	99.8			1105.4			
FILTER WATER (BLDG. 183)													
TO POWER HOUSE (BLDG.184)		196		200		134	149			679			
TO PROCESS (BLDG. 190)		53700	72661	71716	64500	64482	58960	160521	152222	693762			
TO 108		915	3600	144		1187	840			6686			
TO 108DR				145						145			
TO FILTER PLANT (BLDG. 183DR) & R		1869		(5671)						1869			
TO F & S SYSTEM		1130		199			108		50	627			
TO R & E (KER) & FEO				153				14		167			
BACKWASH		1059	1170	1482	1467	1247	2243	3065	2928	14661			
TOTAL		2583.3	3456.5	3305.1	2944.8	2999.4	2781.1	7303.1	6928.1	32301.4			
PROCESS WATER (BLDG. 190)													
TO REACTOR		53300	72261	71316	64100	64082	58460	158200	149800	691519			
TO REACTOR		77000	94500	79200	78300	79000	79500	172100	170700	830300			
POWER HOUSE (K AREA)								30	14	44			
108 (KE - KW)								1784	2008	3792			
TO R & E (KER)								107		107			
BUILDING USAGE		400	400	400	400	400	500	400	400	3300			
TOTAL		2397.2	3243.6	3201.4	2879.3	2878.4	2632.0	7165.7	6795.2	31202.8			
RIVER DATA													
ELEVATION (MSL.F.T.)		390.2		381.9		368.3	374.0		384.6				
		386.8		378.4		364.8	371.0		380.5				
		389.0		380.7		367.1	372.8		383.0				
TEMPERATURE		42.4		43.0		44.6	43.3		41.6				

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REACTOR OPERATIONS STATISTICS - POWER										SHEET 2
MONTH	100-B	100-C	100-D	100-DR	100-F	100-H	100-KE	100-KW	TOTAL	
January 1959										
WATER TREATMENT DATA										
AT BLDG. 182			190.0		135.8				325.8	
BLDG. 183	2499.8	3540.0	3558.3	2691.6	2999.4	2781.1	7303.1	6928.1	32301.4	
CHEMICAL CONSUMPTION										
CHLORINE (ELDG. 182)										
LBS.										
LBS	8077	14529	13240	7280	11329	12145	25800	26800	119200	
AVG PPM	.4	.5	.4	.3	.5	.5	.4	.5	.4	
Bauxite - - - - LBS	5749								5749	
	.3								.3	
ALUM	107108	164523	235280	169820	193811	200430	350600	326100	1747672	
LBS	5.1	5.6	7.9	7.6	7.8	8.7	5.8	5.7	6.5	
AVG PPM										
SEPARAN	50	125	540	110	350	150	440	560	2325	
LBS	.002	.004	.018	.005	.014	.006	.007	.001	.086	
AVG PPM										
SULPHURIC ACID	170998	246069	165166	133664	220366	177891	365200	461500	1940854	
(AS 100%)	8.2	8.3	5.6	5.9	8.8	7.7	6.0	8.0	7.2	
AVG PPM										
DICHROMATE	35500	48200	48320	43880	39233	8623	106700	100500	460956	
LBS										
PURGE MATERIAL CONSUMPTION										
SOLIDS										
LBS										

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MONTH

January 1959

SHEET 3

REACTOR OPERATIONS STATISTICS - POWER

ANALYTICAL DATA

RAW WATER

PH AVG
PPM AVG

7.9	7.8	8.17	8.17	8.03	8.03	7.88	7.91
38.0	41.0	62.0	62.0	58.2	60.0	59.0	60.4

FINISHED WATER

PH
TURBIDITY
CL₂ RESIDUAL
DICHROMATE

7.00	7.00	7.11	7.06	7.00	7.06	7.08	7.03
.004	.004	.003	.003	.006	.006	.006	.004
.05	.05	TRACE	TRACE	.05	.06	.05	.05
1.8	1.8	1.8	1.8	1.6	1.9	1.8	1.8

STEAM DATA

GENERATED (MAX)
(NOR)
(AVG)

TOTAL

TO PLANT

COAL RECEIVED
CONSUMED
IN STORAGE

GEN. STEAM/LB. OF COAL

167000	158000	111000	100000	536000	58000	57000	115000
102800	99000	70000	51315	323115			
103000	106061	69591	53199	331851	36766	33058	69824
76522	78910	51775	39580	246787	27354	24595	51949
64890	66915	45562	33564	210931	24619	22136	46755
4009	3150	4417	2914	14490			
4394	4238	3667	2693	14992			
35411	45282	32582	30817	144092			
8.71	9.31	7.06	7.35	8.20			

OIL RECEIVED
CONSUMED
IN STORAGE

GEN. STEAM/GAL. OF OIL

					0	503765	503765
					259266	217451	476717
					1126272	1162854	228912.6
					105.5	113.1	109.0

ELECTRICAL DATA

TOTAL GENERATED KW HRS.

1663200	1691200	3354400
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FACILITIES ENGINEERING OPERATION MONTHLY RECORD REPORT

JANUARY, 1959

I. ORGANIZATION AND PERSONNEL

A. Responsibility

There were no changes of assigned responsibilities during the month.

B. Personnel Statistics

	<u>December 31,</u> <u>1958</u>	<u>January 31,</u> <u>1959</u>	<u>Net</u> <u>Change</u>
Employees on Permanent Payroll	205	211	+6
Technical Graduates (Rotational)	4	3	-1
Technical Trainees	2	2	0

	<u>FEO</u>	<u>Technical Graduates</u> <u>Rotational</u>
Transferred into Operation	7	0
Transferred out of Operation	0	1
Payroll Removals	1	0

C. Personnel Changes

R. E. Hubbard, Equipment Development, was removed from the rolls due to illness on January 14, 1959.

H. L. McDonald, Technical Graduate, was placed on the rolls with Project Engineering; January 1, 1959.

E. M. Kratz, Principal Engineer, transferred from APED to Process Design on January 2, 1959.

J. V. Henry, Draftsman, was placed on the rolls with Plant and Industrial Engineering on January 5, 1959.

C. H. Nord, Design Draftsman, was placed on the rolls with Plant and Industrial Engineering on January 5, 1959.

W. J. Love, Consulting Engineer, was placed on the rolls on January 30, 1959.

R. J. Joy, Design Draftsman, was placed on the rolls January 5, 1959, and terminated January 16, 1959.

W. J. Gartin and E. W. Wilson transferred effective January 1, 1959, to Expansion Operation.

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D. Personnel Development

<u>Title of Course</u>	<u>Personnel Attending</u>
Radiation Protection	8
Principles and Methods of Supervision	3

E. Safety and Security Experience

Two medical treatment injuries were reported.

No security violations were reported.

II. MONTHLY REPORT OF INVENTIONS OR 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 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. J. Morris	Patent No. 2,863,817 was issued December 8, 1958, to W. J. Morris, and relates to a seal and to a "Poison Spline" control element movable through the seal into and out of a liquid-containing region of a reactor.
E. Hollister	Tube Disposing Machine - January 14, 1959
C. E. Frantz and R. D. Schilling	A. C. Bridge, Null Input Photocell Amplifier - January 28, 1959

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III. ACHIEVEMENT

A. Process Design

1. Research and Development

a. Category I - Existing Reactor Support

An interim report on the study of future expansions of existing water plant capacity has been completed and is ready to be issued. This report contains system characteristic curves for each part of the water plant, from the river to the reactor for all areas being studied.

Data collection on various water plant components continued during the month. The 183-H to 190-H system friction test was completed during a scheduled outage. Pump performance data compared favorably with ATP results on file but the measured friction drop at higher flow rates was greater than had been calculated.

Study of the adequacy of 190 Building steam back-up facilities with projected flow increases and resulting higher tube powers has been initiated. Preliminary results indicate present installations will be adequate at B, D, DR, F and H; C Area studies are still in progress.

b. Category II - New Reactor Studies

Items in this category are of general applicability to the longer range improved production reactor program and thus are reported here, even though their immediate application may be to the NPR work, reported under CA-816.

The IBM-702 lattice physics survey code is being utilized in the analysis of NPR operating characteristics through dual-purpose and power only phases. In addition, data points were assembled for use in checking the improved code which has been developed for the IBM-709 computer. Debugging of this new program was completed during the month through use of 709 facilities at the Western Data Processing Center, Los Angeles, California.

A draft of a request for performance of two-phase critical flow tests was prepared. Current methods of calculation of the critical velocity of a two-phase mixture from, for example, a primary loop pipe rupture treat the mixture as a pseudo gas with correction factors based on experimental data taken at relatively low pressure and temperature. Test equipment being assembled for NPR support can be utilized to obtain data more directly comparable to conditions which will exist in water cooled reactors capable of electric power production.

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It has been concluded that machining of graphite for the high pressure process tube rupture test installation could be done more quickly and at lower cost if performed by the vendor rather than here at Hanford since quantities are not great and, also, nuclear purity and cleanliness requirements need not apply.

2. Design Projects

a. CG-704 - 100-K Outfall Study

The final report of engineering work done under this project has been completed and is ready for publication. It is concluded that complete failure of the outfall lines in the near future is not probable. It is recommended that, at a minimum, a concrete anchor be installed over both lines, immediately off-shore from the KE break repair and encompassing the KW break to prevent any further pipe separation.

b. CG-709 - Improved VSR's - All Areas

The summary report covering the design and development work performed under this project has been completed.

c. CG-775 - 100-K Area Water Plant Expansion

Piping drawings for the proposed test installation at 190-KE, unit number one, on which performance testing of the prototype process pumping unit will be done, have been approved and issued to the field. Key plan, electrical and instrument drawings also have been completed and a draft of the production test prepared.

Potential difficulty by the vendor in delivering parts for the prototype pumping unit on schedule have been recognized. Expediting efforts are being made and, in addition, possible delay in the April KE extended outage with which the installation is to be coordinated is being explored.

Model testing of the high lift pump suction piping at Oregon State College has been completed and the final report is in preparation. Construction of the model for testing of the low lift suction wells at the same site has been completed and the pumps have been procured.

d. CG-791 - Reactor Confinement

Project effort during the month was directed toward obtaining the earliest possible installation of the fog spray system. Detail design of this Phase I is now 50 per cent complete. Revision to the project proposal asking for total design and for Phase I construction funds was transmitted to the AEC.

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e. CA-816 - New Production Reactor

The general Design Bases document was approved by both Project Representatives groups and was reviewed by the Expansion Design Council preparatory to approval. A detail design schedule was prepared and issued for the reactor, building and components. Scope work continued on all components of the reactor, instrumentation, electrical and on the architectural, structural and mechanical portions of the building. Three more criteria were issued for comment. Detail design was started on several of the reactor components and on the reactor building. Weighted progress of the reactor design program at month's end was seven percent complete.

Data on reactor hydraulic characteristics were supplied to the A-E to permit design of primary loop components to proceed.

At the request of the AEC, study was made of the estimated cost and schedule of a second production reactor, assumed to be authorized prior to the completion of the present NPR program. Combinations of concepts considered included Convertible - Pu-only, Pu-only - Pu-only, Pu-only - Convertible, and Pu-only - Dual Purpose. A report was issued summarizing the results.

Analytical and design development work in support of NPR continued at a high level during the month.

3. Visitors

Mr. C. Y. Blom, Chief Engineer of Byron Jackson Pumps, Inc., Los Angeles, California, visited HAPO January 8-9 to inspect cavitation damage in the 190-C process pumps.

E. Bradshaw, Manager - Industrial Engineering, and J. Hackett, Manager - Cost and Production Control of Speer Carbon Company, were conducted on a tour of the 2101 Building in order to allow them to evaluate our machining facilities. The inspection will enable them to indicate their interest in leasing the facility for machining the moderator, should they be low bidder on the material. This visit was made January 21.

4. Trips

E. L. Etheridge visited the Oak Ridge National Laboratory on January 22-23 to discuss the irradiated uranium burning tests being performed at ORNL.

N. F. Fifer visited Oregon State College, Corvallis, Oregon, December 7-8 to review the progress of the various model testing programs.

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C. A. Mansius visited UCLA Test Center, Los Angeles, California, for the purpose of setting up physics problem on 709 computer, from January 3 to 23.

C. A. Pursel visited Oak Ridge National Laboratory from January 21-25 to meet with George Parker and discuss uranium burning tests.

M. H. Russ visited Burns and Roe, Inc., New York City, from January 12 to 16 for the purpose of appraising the progress of the heat dissipation system design and for the purpose of re-solving certain specific questions relative to the generation of steam in the secondary system following scram.

During the week of January 25, A. B. Carson visited E. J. Bloch in Washington, D. C., and Burns and Roe, Inc., in New York City, to discuss the NPR program.

5. Significant Reports Issued

HW-57009 RD Rev. 1 - "Project CAI-816 - 105-N Design Criteria Graphite Moderator," D. Marinos, January 19, 1959.

HW-57014 RD - "Ball Safety System Criteria," J. F. Nesbitt, January 5, 1959.

HW 57043 RD 3 and RD 4 - "Design Bases - Part I - General," E. R. Astley and G. L. Locke, January 19 and 27, 1959.

HW-57955 RD - "CA-816 Heat Conversion Plant Representatives Meeting No. 8 - January 9, 1959," M. H. Russ, January 20, 1959.

HW-57956 RD - "CA-816 Heat Conversion Plant Representatives Meeting No. 9 - January 26, 1959," M. H. Russ, January 27, 1959.

HW-58091 - "Proposed Criteria for NPR Rupture Detection System," D. E. Sebade, January 5, 1959.

HW-58183 - "Project CG-791 - Representatives Meeting No. 2 - October 31, 1958," R. C. Walker, November 11, 1958.

HW-58419 RD 2 - "Project CG-791 - Representatives Meeting No. 3 - November 21, 1958," R. C. Walker, December 4, 1958.

HW-58890 - "Meeting No. 4 - Reactor Plant Project Representatives - January 13, 1959," J. R. Carrell, January 16, 1959.

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- HW-58927 - "Selection of Primary Coolant Temperatures and Flow Rates for the 100-N Reactor and Corresponding Primary Loop System Head Curves," D. L. Condotta and H. G. Johnson, January 19, 1959.
- HW-58928 - "Primary Loop System Head Curves for the 100-N Reactor," H. G. Johnson, January 31, 1959.
- HW-58934 - "Project CG-791 - Representatives Meeting No. 4 - December 12, 1958," R. C. Walker, January 9, 1959.
- HW-58945 - "Project CG-791 - Representatives Meeting No. 5 - January 16, 1959," R. C. Walker, January 17, 1959.
- HW-58975 - "Additional Reactor Capacity Study," A. B. Carson, January 26, 1959.

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B. Equipment Development

For the New Production Reactor, installation of the Prototype Concept Evaluation Loop in 189-D Building is estimated to be 55% complete and construction has been scheduled for completion in March. In joint development, joints can be classed as (a) tube-to-nozzle, (b) nozzle-closure, and (c) connector-to-nozzle; a test section of a tube-to-nozzle joint, using bell-ring and banana-ring metallic gaskets and held together with fittings that have been threaded on the zirconium tube, has been thermal cycled 3,221 times successfully and has been removed for inspection; thermal cycling of a test section employing flared zirconium tube joints was initiated wherein the dummy mating nozzles contain machined serrations to localize forces; additional flared tubing test sections have been ordered from Leonard Precision Products Company which contain new materials in the fittings so that forces applied during initial assembly can be retained during thermal cycling; HYGE Corporation of Convair reports initial success in flaring annealed KER-Loop-size zirconium tubing using an impact extrusion procedure at a speed of 50 feet per second; acceptable thermal cycling is being obtained on the nozzle-closure design using bell-ring and flexitallic gaskets and on the connector-to-nozzle coupling employing the metal Marmon Conoseal.

Representatives of Mechanical Development A traveled to Seattle on January 8, 1959, to inspect progress on the fabrication of an advanced design rear-face, ball-valve actuator (Snellman) for use in charge-discharge-while-operating projects. A sample of a machined, one-piece aluminum casting was carried to HAP0 to demonstrate and test the engagement, alignment, and sealing features with existing reactor nozzles. Significance of the valve lies in its low cost, unitized construction and low installation cost since the new valve would hang on an existing rear-face nozzle after the cap is removed. Other significant component designs include (a) self-aligning features, (b) a compression gasket with provision for easy tightening, (c) simplified removal with a tool that can be operated from a distance, (d) readily accessible hydraulic connections, and (e) a rigidly fastened slug deflection guide.

In tube removal, the air-powered tube insertor was used at F Reactor on January 18, 1959, to insert 17 tubes. Best performance time was three minutes from "set-up" on one channel to the next. A new impact wrench, with exceptionally high output forces, was used successfully at B Reactor on January 15, 1959, to release rusted nozzle nuts and flange studs quickly.

The principle of a charge-seating device utilizing an articulated rack with a pinion drive was tested and proven feasible. Procurement was started for full-scale prototype components. Vendor contacts were established with the Teleflex Corporation and a proposal is being evaluated for their charge-seating device utilizing a helical-wound positive cable drive.

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Use of poison splines for operational control moved to KW Reactor when 3 splines were inserted on December 31, 1958, 12 splines on January 5, 1959, 9 splines on January 20, 1959, and 10 splines on January 29, 1959. Use of splines in the latter three instances aided materially during the startups. Plans have been made to expand the use of splines at KW Reactor. Use of splines at D Reactor for startup and equilibrium control continued but with troubles such that a study team is looking at the incentives, the hazards, and the mechanical and operating problems. Mechanical development personnel have been directed to follow the techniques and procedures at D Reactor in an attempt to resolve the mechanical and operating problems.

The hot slug monitor of the dummy decontamination facility on the DR Reactor wash pad has been modified to include shielding in front of the storage bin to minimize the effect of occasional irradiated dummies in the system. The results indicate that the monitor will work satisfactorily on all dummies and that project scoping and proposal preparation can take place without additional development work. A large hoist-trailer combination for lifting and carrying baskets of slugs has been installed and all components are in operation.

Acceptable technical proposals for high-speed (passive) scanners (Project CGI-802) have been received from EPSCO and Radiations, Inc. and requests for bids have been solicited. Beckman Systems took exception to the specified 1,000-hour acceptance test but indicated they could meet all other technical requirements.

Three samples of silicone-coated thermocouple wire for C Reactor have failed the moisture absorption and migration test in the 189-D Laboratory. Dow Corning 916, General Electric 97-J and Union Carbide XK-1235 were the silicones tested. Contacts were established with Minneapolis-Honeywell, the prime vendor, to determine engineering reasons for the failure.

An improved electric connector for use between borescope sections has been designed and a sample fabricated for the rupture removal task forces. The connector will make easier the maintenance and operation of the Lenox borescope and can be adapted to new borescopes as well.

Budget Study reports were prepared for Remote Maintenance Equipment, In-Core Flux Monitoring, and Flow Monitoring for a Lead Reactor.

The D Reactor prototype subcritical neutron monitor which utilizes a fission chamber was restored to service on January 5, 1959, after approximately duplicate CG-707 in-reactor position parts were received from Victoreen. The automatic withdrawal (recorder controlled) feature, a part of Project CG-707 design, was used by the prototype for the first time on this startup and performed satisfactorily.

Ten immersion-type resistance temperature detectors machined from bar-stock were received from T. A. Edison Company and have passed initial qualification tests. Vibration and response time (1.04 to 1.4 seconds) tests on unirradiated samples were satisfactory.

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Visitors

Bruce Benton of Boeing Airplane Company visited Electrical Equipment Development on January 22, 1959, for consultation on the usage of a General Electric silicon-controlled rectifier in the improved seismoscope amplifier.

T. D. Daniels of General Electric Silicone Products Department visited Materials Development on January 15-16, 1959, to discuss silicone products and their application at HAPO.

On January 12-13, 1959, G. L. Messa, Field Engineer for Teleflex Corporation, North Wales, Pa., and West Coast representatives A. A. Harris and J. L. Barnes of Transdynamics Corporation visited Instrument Development to discuss the application of the Teleflex servo-mechanism to the positioning of chambers within the reactor; and visited Mechanical Development B to discuss: 1) a design proposal for a charge-seating device in connection with improved charging equipment, and 2) the traveling wire flux monitor system.

The following off-site personnel met with R. Sherrard of Instrument Development to discuss details concerning the technical proposals submitted by their respective companies for Project CGI-802; "High-Speed Scanning Type Nuclear Process Monitoring System": on December 16, 1958, M. C. Burns, D. W. Bender, and D. P. Dietz of Radiations Incorporated; on December 17, 1958, B. H. Smith, Manager of Advance Systems Development, EPSCO, and Northwest representative I. R. Compton; on December 18, 1958, J. G. Neuland of Beckman Systems.

R. E. Rogers, Regional Manager, San Francisco Area Office, and Mel Parr, Regional Engineer, of Foxboro Instrument Company, met with J. D. McCullough, Instrument Development Operation, and Roger Rohrbacher, Systems Design Operation, on January 14, 1959, to discuss NPR instrumentation.

Trips

C. W. Botsford, J. E. Robb, and R. D. Schilling, on January 7-8, 1959, traveled to Seattle, Washington, to inspect progress at D. L. Snellman Company on fabrication of an advanced design rear-face, ball-valve actuator for use in charge-discharge-while-operating projects, to discuss vendor's products with local representatives concerning development of relays and synchros, and to discuss the crane modification development contract with Ederer Engineering.

A. N. Iverson traveled to Oakland, California, on January 11-14, 1959, to confer with Shell Development Company representatives on the process tube integrity checker prototype probes.

R. L. Loundagin attended the "Photostress" lecture at the University of Washington in Seattle, Washington, given by Dr. F. Zandman of Tatnall Measuring Systems Company January 13-14, 1959.

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Significant Reports Issued

- Undocumented - "Status Report - NPR Fitting Development Activity," J. H. Fastabend, January 13, 1959
- Undocumented - "HWS-6500 - Resistance Temperature Detectors for NPR," R. Sherrard, December 11, 1958
- HW-58509 - "Meeting with Pyro-Electric Company About Mineral-Insulated Sheathed Cables," D. B. Lovett, December 11, 1958
- HW-58537 - "Comments for Consideration in Preparing NPR Instrument Design Criteria," R. Sherrard, December 12, 1958
- HW-58629 - "Application of RTD's to NPR," R. Sherrard, December 23, 1958
- HW-58724 - "Results of Production Test IP-206-CE, In-Pile Tests of Boron Stainless Steel Splines," P. B. McCarthy, January 16, 1959
- HW-58872 - "Final Report - Design Test 1019 - Comparison of Shield Cooling Methods as Applied to One-Inch Thick Steel Plates," J. P. Cooke, January 14, 1959
- HW-58879 - "Final Report - Design Test 1031 - Graphite Tube Deflection," J. P. Cooke, January 14, 1959

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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 As-Builts	175
Drawings and BPFs Added, Refiled or Retired	641
Blueprint File Customers Serviced	249
Catalogs Added to File or Refiled	87
Catalog Customers Serviced	31
Film Prints Produced	84
Check Prints Made	587

2. Industrial Engineering

105 Work Area Metal Handling, All Old Areas

Design criteria for 300-100 slug transport pallets and charge boxes have been prepared in conjunction with FPD and IPD Processing Operations personnel. Concepts of 105 Building work area and "C" elevator material handling equipment arrangements have been proposed and are being analyzed. Cost estimate has been completed by CEO Estimating Operation for installation of one of the proposed material handling systems. Vendors are being visited to obtain detailed information about standard items of material handling equipment for use in systems for 105 Buildings.

Portable Powered Operator for Cross Header Valves

All material and equipment has arrived from vendors for the prototype to be installed at 105-KW. Modification of the equipment and the fabrication of the drive adapter and the tool mounting bracket has been completed. The "C" elevator lights have been moved to accommodate the overhead suspension rail. Actual installation has been delayed by the January KW outage.

Industrial Engineering Service to F Reactor Operation

Principal activity has been to prepare analyses of alternative material (slug) handling systems in preparation for making changes which will increase the potential sustained charging rate. An analysis of 105-F office requirements was completed.

3. Reactor, Plant Engineering

Reactor Atmosphere Moisture Monitor Sampling

Excessive amounts of condensate in the sampling lines have been found to be one of the major obstacles to efficient operation of this system. On pile tests with a 20 CFM pump have been successful in drying the lines to a usable condition with dewpoints up to 70°F.

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Reactor Atmosphere Moisture Monitor Sampling (continued)

Purchase specifications have been prepared for an engineering review of commercially available pumps. On completion of this review, a recommendation for gas pump revisions in the six older areas will be prepared for improvement of moisture monitoring systems.

Effluent Water Temperature Logger

A preliminary listing of field changes that must be considered prior to installing the new Analog Digital Converter was prepared. Prototype fabrication of an improved null balance for test purposes was requested and authorized. Concurrence of Maintenance Engineering Operation on changes necessary to adapt existing monitoring system to the new Analog Digital Converter is presently being obtained.

Vibration Studies

Vibration pickups on the rear face of 105-H were relocated during a recent outage to give additional on-pile vibration data covering central and lower crossheaders and the new "J" type connector.

K Area Charging Machine

The first machine has been modified for improved magazine handling and is being tested. No serious problems have been seen to date.

Material Handling System for 105-KE, KW and Downstream Dummy Charging

The conveyors have arrived on plant, but were damaged during shipment. Efforts are being made to fix the damage responsibility; however, no serious delay should result from this damage. Downstream dummy charging equipment is being used in both areas on a routine basis.

Rear Face Decontamination

The Production Test Authorization IP-228-AE, HW-58697, for the decontamination of the rear face only at 105-B was prepared and issued. A detailed procedure and check sheets were also issued (HW-58747). Engineering coverage was supplied to 105-B for their rear face decontamination; however, process tube leaks forced the cancellation of the decontamination effort.

Closed Circuit TV Systems - All Reactor Buildings

Gathering of information for justification, budget study and development requirements, prior to scope preparation, was started for the proposed installation of closed-circuit TV systems for all reactors. Each system is to include equipment for television monitoring of front and rear face, top of unit and inner rod room. Additional provisions will be made for monitoring the Ball 3X tunnel areas in C and K Reactors.

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105-K VSR Latching System

A demonstration for representatives of 100-K Maintenance Engineering was held to show operation of the prototype model of the modified solenoid plunger and new locking block design. An additional test was proposed and run for dropping of rods weighing approximately half of the present rods. The prototype model successfully released rods weighing 1/10 of the present rods. A development test is being written for an actual operating on reactor test of this modified latching system.

4. Water Plant and Utilities Engineering

Additional Pumping at 181-C

The recommended electrical modifications supporting proposed addition of two river pumps at 181-C consist of interchanging the two 2500 KVA transformers at 181-B with two 3000/4000 KVA transformers at 182-B, adding fans to obtain the 4000 KVA rating, adding fans to the two 4500 KVA transformers to obtain a 5175 KVA rating, replacing the existing Rowan switchgear with nine units of surplus G.E. switchgear, and adding a third 13.8 KV line to the 181 transformers. These changes will provide the necessary power facilities for the new load, add reliability to the 13.8 KV overhead line power source to the building, and improve the existing operating facilities in the 181 building by eliminating the necessity of paralleling all three buses in case one transformer is out of service. The increased production from the added filtered water at 105-B will pay off the project in about one year.

Downcomer Engineering

The 105-B, 105-C (near), 105-H (far), and 105-F downcomers have been inspected during the past month. Except for a broken sample line in the 105-C downcomer, both the 105-B and 105-C downcomers appear to be in very good shape. The 105-H downcomer had several loose breather pipes, one of which had fallen to the bottom and had been carried away by the effluent water. The loose breather pipes had started wearing away the side liner but fortunately the trouble was detected before a hole in the liner developed. WP&UEO concurred in the removal of all of the breather pipes in the far downcomer. This was accomplished during the outage.

In the 105-F downcomer there were several possible causes of the present leakage of effluent water down the stairwell. These include leakage around the hatch cover, condensate leakage from the vent line, and a crack in the bellows seal at the top of the downcomer. All of the most likely leaks with the exception of the vent line have been corrected during the past outage.

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Downcomer Engineering (continued)

At F Reactor, an increase in the perforated area of the top downcomer tray was recommended to reduce the possibility of flooding with the added possibility of reducing water elevation on the top tray and surge pressures on the lid. Other recommendations included reduced speed in changing flow rates and monitoring of surge pressures on the lid by means of a transducer installation.

Inspections of the 105-DR downcomers indicate continuation of damage in un-modified sections. The near downcomer is scheduled for a series of modifications to increase its capacity and reduce stress concentrations possibly emphasized by type of steel used in construction. The far downcomer shows some minor recurring damage to repaired areas, but in the region where extensive bracing and tray perforation was accomplished, the damage was confined to one crack in the tray beam clip angle.

107 Basin Modification Program

A testing program for clay lining has been agreed to with Materials Development Operation with test facilities in 1706-KE. An estimate of the cost of the installation is not yet available, nor has the problem of funding it been solved.

Engineering in Support of Power Forecasting

IPD loads were reviewed in consideration of peak control planning for February 1959 and necessary interruptible power was ordered through R&UO. The reduced interruptible power in February reflects the significant increase in firm power as provided for in the forecast document HW-55294, Revised.

Coal Utilization Standards

Proposed specifications upgrading coal evaluation practice for IPD and HAPO coal contract negotiations were forwarded to Production Operation. These include improved methods of accounting for heat loss from moisture, revision of ash penalty to a lower more realistic basis, and recommendation that on-site sampling be used as a means for determining conformity to specifications. The recommendations were prepared from material obtained during a two-year study of coal buying practices of large utilities and manufacturing plants.

5. Standards Engineering Spare Parts

Stock Adjustment Requests processed	51
Maximum Authorized dollar value of new items added by SARs	\$ 19,170
Maximum Authorized dollar value of spare parts requested by letter to Project Engineering	1,508

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Spare Parts (continued)

Maximum Authorized dollar value of spare parts requested for Projects by SARs	\$ 16,322	
Number of Engineered spare parts items reviewed		39
Number of Drawings revised		0
Actual Dollar value of items deleted from spare parts stock	1,223	
Maximum Authorized dollar value of items deleted from spare parts stock	12,111	

During the month of January, a total of 51 Stock Adjustment Requests were processed for an increase of \$19,171. Approximately \$15,000 of this figure applies to charge-discharge machine at 105-C.

Craft Training

IPD Instrument Supervisors held a meeting in the Instrument Warehouse at White Bluffs for the purpose of developing the Instrument craft training program for calendar year 1959.

Personnel training for tube replacement was continued with 18 men attending classes.

6. Visits

Mel Parr of Foxboro Company visited White Bluffs on 1/15/59 and participated in a discussion pertaining to formulating a training program on the Foxboro Power Calculator Systems.

7. Significant Reports

HW-58684 (Sec.) "Increased Pumping Capacity at 181-C - Scope and Justification", LB Brinkman and VG Blanchette, 1/7/59.

Letter, Conf. Undoc. "105-DR Far Downcomer Tests", ET Hubbard from LB Brinkman, 1/6/59.

HW-58697 (Uncl.), Production Test Authorization IP-228-AE Reactor Rear Face Chemical Decontamination - 105-B, Total Rear Face Including Pigtaills and Nozzles, 12/31/58, JH Hoage.

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D. Project Engineering

1. Projects

<u>Number of Jobs</u>	<u>Activity</u>	<u>Financial Responsibility</u>
14	Engineering Studies, Scoping, and Project Proposal Preparation	\$ 128,950
6	Projects in Design Phase	889,000
14	Projects in Construction Phase	4,872,333
7	Projects in Close-out Phase or Accrued Work on Closed Projects	40,151,011
3	Field Management of Non-project Work and MJA's	648,000
<u>44</u>		<u>\$46,689,294</u>

AEC-160 - Recirculating Gas-Cooled Test Loop

No work has been done at the 105-DR Building this month. The work was stopped and construction work release closed as of January 2, 1959. This was necessary due to delayed delivery of the compressors.

The first compressor unit has now been completed and satisfactorily tested and work is underway on the remaining three units.

CG-558 - Reactor Plant Modifications for Increased Production

The drawings and specifications for the pump test facility are undergoing final correction.

Procurement for this facility is continuing. Twenty orders have been placed to date. Agreement on the method of work to be used in constructing the pump test was reached in a meeting with members of the AEC on Friday, January 23.

The first of the new rotating assemblies for the 190 DeLaval pumps has been received on the plant. Two more repaired 183 pump impellers have been received.

CG-663 - Steam-Driven Auxiliaries - Buildings 165-KE and 165-KW

A total of \$65,703 has been accrued for purposes of startup, as-builts, and the removal of deficiencies from certain pieces of operating equipment which has been installed under this project. One of the principal problems in this installation had been the correct operation of the fireye. This device was installed to

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insure relighting of the boiler fire in the event of fire failure. The equipment was not operating in a dependable manner, and finally placed in dependable operation by the vendor's field engineer. Acceptance tests on this equipment are now in process.

During the start-up of an auxiliary boiler feed pump on #3 boiler, 165-KE, a crack developed in the lower pump casing. We have been in contact with the vendor and his representative has visited the plant and examined the pump. This cracked pump casing is repairable, and as soon as the legal aspects of the problem are resolved repair will be initiated.

CG-666 - Zone Temperature Monitoring - 100-B, C, D, DR, F, and H

Installation of new wire and RTD's have been completed at 105-F. However, approximately 75 RTD's were of the type supplied by Lewis Engineering Company and recently installed in 105-KW. The vendor supplying RTD's for CG-666 has had a delay which caused us to be 75 elements short. We plan to install replacement RTD's as outage time becomes available later.

CG-674 - Water Plant Component Test Loop - Building 1706-KE

The work at Alco Products on the repair of the test loop has progressed to the point that the loop is being hydrostatically tested.

CA-696 - Coal Car Shakeouts - 100-B, D, F, H, and 200-W

All car shaker equipment arrived on plant January 19. The contractor started installation immediately at 100-B Area and will move on to each other area promptly.

CG-708 - Installation of Additional VSR's - KE and KW

Revision 2 to the project proposal requesting an extension of the project completion date from February 15, 1959 to February 15, 1960, was sent to Contract Accounting Operation on January 19, 1959.

CG-741 - Renovation of the Ball 3-X System - 105-C

The Ball 3-X room has now been decontaminated and very low readings are experienced by the construction forces. All new ball exit valves have now been installed. Associated tubing for valve operation and wiring for the valve signal system have been installed and checked out. The ball washer and drier are partially installed and the construction forces are now installing the new ball trough which will connect the new exit valves with the ball washer.

CG-780 - Improved Ventilation, Buildings 105- and 115-B, D, and F

The principal design has now been completed except for exhaust fan modifications. Requisitions for the engineered equipment have been

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processed and a construction cost estimate based on design drawings has been prepared. A work release has been issued to Construction Operation, and actual work started at 105-B on January 19.

CG-781 - Service Building Additions - 1706-KER

The contract was awarded to R. J. Britton at \$68,320 on January 9, 1959.

CG-786 - Flux Monitor Dual Trip System, 105-B, C, D, DR, and H

Installation of the flux monitor system was made at 105-H and completed on January 9. All work on this project is now complete and close-out papers are being prepared.

CG-793 - Filtered Water Cross-Tie - 183-B and 183-C

The filtered water cross-tie was tied in to B Area on January 15. The line has now been turned over to Operations and although it is available for their use, flow metering equipment has yet to be installed. This equipment is scheduled for delivery during early February at which time the project will be completed.

CGI-807 - Modifications to 1713-D Building

The design completion date was January 8, 1959.

MJA-4 - Test and Repair Sewers - 105-DR

Rerouting of steam condensate lines formerly emptying to the 8" and 12" sewers was completed on January 21, 1959. The 8" sewer to 1608 was tested on January 9, 1959 and found satisfactory.

R-20700 and A-82943 - Waste Disposal Cask and Modifications to Semi Trailer

Pacific Steel Products Company of Seattle is fabricating the cask. The expected shipping date is moved back from January 30, 1959 to February 15, 1959 due to delays in the vendor's material delivery.

2. Project Proposals

Projects Returned Unapproved

CGI-815 Increased Water Capacity, B-C, D-DR, F, and H

Project Proposals Approved

AEC-160 Recirculating Gas-Cooled Test Loop (Revision 5)
CGI-791 Reactor Confinement (Modification No. 1, Directive HW-469, increased funds of \$30,000 to a new total of \$125,000 to permit continuance of the work while Revision 1 is being acted upon.)

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Project Proposals Awaiting AEC Approval

CGI-791 Reactor Confinement (Revision 1)
CGI-824 Remotely Operated Cap Removers, KE and KW Reactor Dis-
charge Areas
CAI-831 Fence and Badge House Relocation, 100-F Area

Project Proposals Submitted

CGI-791 Reactor Confinement (Revision 1 submitted January 14, 1959)
CAI-831 Fence and Badge House Relocation, 100-F Area (Submitted
January 26, 1959)

3. Visitors

Mr. George Street and Dr. R. O. Fehr of the General Engineering Laboratory, Schenectady, visited Hanford on January 19 and 20 to discuss the status and future plans for the gas lubricated compressors program. As a result of these discussions, work is now proceeding at Schenectady on all the remaining compressor units.

Mr. Ed Budde from DeLaval Steam Turbine Company is on plant site for the purpose of supervising the modifications to the 190 Building pumps. His clearance was requested for a 30-day period beginning January 27.

4. Trips

R. G. Knirck visited Barton Instrument Company, Los Angeles, California January 19 through 21 to discuss production of differential pressure gauges for Project CGI-817, Crossheader Pressure Differential Indicators, Hanford Reactors.

M. G. Patrick visited Seattle January 8 and 9 to consult with the fabricator building the casks for AEC-160 and to consult with Johns-Mansville's representative regarding special gaskets for the in-pile tube on AEC-160.

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E. EXPANSION OPERATION

1. Activities

Construction Planning

A decision was reached to obtain temporary power for NPR construction from the 100-D Area. In collaboration with IPD Finance a cost code system has been developed with about seven hundred codes. This system is much simpler than that used for the "K" program.

Graphite Planning

Continuing investigation of the graphite requirements for the NPR shows that it may be possible to contract for the graphite in accordance with the original project schedules. This might be done by specifying alternate cokes for the purified graphite in the bid proposal with the stipulation that the specific coke would be selected at a later date. Indications are that all cokes are usually considered by vendors to be the same price for bid purposes. This method would allow the successful bidder to start restoration of purification furnace facilities, which takes approximately seven months, while the graphite testing program is in process and before the final coke selection is made.

Research and Engineering has been requested to study this proposal to determine if it is technically feasible. They are presently investigating the requirements for the reflector grade material since radiation damage is probably not a problem in the reflector.

Zirconium Planning

The specification for the zirconium process tubes has been submitted for comments. The outside diameter tolerance has still not been decided upon; however, this was discussed with various vendors on the last trip by D. H. Curtiss and J. W. Riches to the tube fabricators and it appears an .015" maximum variation tolerance can be met.

A request has been issued to Union Relations to determine if it is permissible for plant forces to perform preparatory work on zirconium tubes prior to installation. This must be determined before considering use of Hanford Laboratory facilities for this work.

Control Planning

The first issue of the GE-NPR drawing schedule was issued during this reporting period. A revised Expansion Operation procedure manual was issued.

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Design Review and Consultation

Reviews were completed and comments were offered on the following scope design items:

1. HW-57009 Graphite Moderator
2. HW-57039 Electrical Systems
3. HW-57043 Design Basis - Part I - General
4. 105-N Building Layout Drawings
SK-1-26716, SK-1-26717, SK-1-26718,
SK-1-26719, SK-1-26720
5. HW-57014 Ball 3-X Safety System
6. SK-1-26729, SK-1-26730, SK-1-26731 - Basic Reactor Block
Plan
7. River Pump House drawings
8. Administration Building drawings.

The Design Basis - Part I - General was approved.

Consultation on elevators, charging equipment, safety circuits, horizontal rods, process piping, instrumentation, tools for the top of the unit Ball Safety System and for graphite cooling tube maintenance and a list of installations for front and rear elevators was given to Process Design Operation. A further check of present installations is being made to attempt to provide design guides to the betterment of the present installations.

Operational Planning

Discussions on operational organization and manpower requirements continued during the month. An organization chart was developed by the Power Engineer, the Reactor Engineer, and the Maintenance Engineer. This chart utilizes a different employee classification system than that presently used in IPD. It is believed to be much more appropriate for an integrated plant such as NPR.

Maintenance Planning

Copies of the mathematical model "Spare Parts for NPR" were received from Operations Research and Synthesis and distribution was made for review and comment.

Some sample equipment data sheets, as used at Dresden Nuclear Power Station, are being analyzed and changes made so they can be utilized at 100-N.

Block diagrams of equipment are utilized in conjunction with the data sheets to make it easy to locate technical data and references.

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2. Visitors

Elmo F. Bradshaw, Director of Engineering, and John Hackett, Director of Costs and Production Planning, Speer Carbon Company, visited the plant January 21 and 22, 1959, to view the 2101 Facilities and to discuss the NPR graphite program.

3. Significant Reports Issued

HW-56944 - Rev. 1 CAI-816 - NPR - Project Responsibility and Procedures.

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F. Principal Engineers

Principal Engineer

1. Trips

Meetings were attended with Burns and Roe representatives on January 27, and with members of the Division of Production, AEC, on January 28, to discuss NPR plant design and answer specific questions raised by Mr. E. J. Bloch and members of his staff.

2. Significant Reports

HW-58573 - "Data for Economics of Replacement With Dual-Purpose Reactor"

J. S. M. Mahon
MANAGER
FACILITIES ENGINEERING

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EMPLOYEE RELATIONS OPERATION
JANUARY 1959

PERSONNEL DEVELOPMENT & PLACEMENT

The fourth series of PBM-I conducted in the department was concluded during the month. This was the first series in which shift supervision was included.

The Pile Operator Job Knowledge Test was administered to several employees by Employee Relations. No problems or adverse comments were encountered with the participants. Four test batteries were administered and interpreted for the Supervisory Selection Program and one personnel assessment was conducted.

The possibility of introducing the Manufacturing Studies course in the Department was reviewed with the Supervisor, Industrial Engineering. The matter was also discussed in a meeting with Mr. F. T. Lewis of Manufacturing Services during his visit the week of January 26.

Continued attention was devoted to the orderly transfer to other components of those personnel development and placement activities to be discontinued as a service provided by Employee Relations under the revised organization.

Eight experienced technical employees were interviewed by the Department and other HAPO components during January which will result in two employment offers by the Department. All of the candidates were interviewed for positions in our two Engineering Operations. The increase in experienced recruitment activity is basically the result of returns from campus recruiting activity.

There were seven PhD candidates interviewed in January, with three offers extended by the Department. Two PhD employees were added to the rolls this month resulting from previous offers. One was a former HAPO employee.

There were ten transfers into the Department during January. Five of these transfers were from CPD to Reactor Processing, three were from HLO of which two were from the Technical Graduate Program, one was from CEO, and one transfer was an experienced reactor power engineer from APED - San Jose. There were two transfers out of the Department, one to HLO and one to APED - Vallecitos Atomic Laboratory. There were no other exempt losses.

A revised Self-Development review form was completed and distributed to the Department's operations for use during CY 1959. One Climate Review was conducted during January and one talk was given in H Area on the psychological factors in accidents.

Twenty-six additions to payroll and sixteen removals were made during the month. Six requisitions were filled with thirty remaining open at month-end.

MAIL AND DUPLICATION

A survey of 100-F Area duplicating requirements indicates a need for duplicating facilities at this location. Plans have been made to obtain office space, and transfer of needed personnel and equipment from 100-H Area. No additional salary expense will be incurred as a result of this action.

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New lithographic machinery was installed in the 100-H duplicating office to provide faster, better quality service on varied kinds of work handled by this facility.

COMMUNICATION

Mass communication activities included publication of eight Management NEWS Bulletins, one Round Table Guide, one IPD NEWS Letter, OPGs A 7 and 1.4, and Advices 1.1.5, 1.1.6, 1.3.1, 1.5.2, 1.10.11, 4.1.2, 5.2.6, 6.2.6 and 8.1.1; plus 276 column inches in the GE NEWS (25% of available space). Four Priority Messages were received and disseminated and one Management Information Meeting was held.

UNION RELATIONS

The HAMTC sent notice of their desire to arbitrate a grievance filed by Painters regarding the practice of dipping nozzle caps in a protective solution.

The "You and Labor Law" training program was presented to 17 supervisors.

The nine grievances received during January represent the lowest number received since September, 1956.

An index to "Union Relations Information" bulletins issued during 1958 has been prepared and distributed to all IPD exempt employees.

The HOO-AEC Labor Standards Board approved fourteen jobs for assignment to plant forces which are estimated to cost \$142,640.16. Since the procedure for obtaining LSB approval was initiated in IPD, 126 jobs have been approved representing a total cost of \$3,934,725.66.

EMPLOYEE COMPENSATION

Major attention was directed to a review of salary action planned for calendar year 1959, based upon forecast furnished by each third level component.

The study of the nonexempt, non-unit salary plan progressed to the point of validation of the proposed evaluation plan and salary structure by describing jobs using a format developed to fit the proposed plan.

Administrative work, consultation and guidance has been particularly heavy during the month due to the transition activities involved and the reduction of personnel in the Compensation function and the integration of salary review activities which are being handled to a greater extent by line management.

Fifty-five new IPD Suggestions were received and 18 referred from other Departments. Forty-two suggestions were adopted and received awards totaling \$1157.50; forty-two IPD suggestions were rejected; and four suggestions from other Departments were adopted and seven were rejected.

HEALTH & SAFETY

IPD achieved the Central Safety Award on January 18, 1959. All of the necessary details to complete this operation have been concluded with the selection of the gifts being made at this time.

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The 100-B Area completed their 11th year without a disabling injury in January, 1959.

The two Specialists, Safety & Fire Prevention have been transferred to operating components and the transition was orderly and appears complete. Certain changes in statistical reporting will result in less "bookkeeping" by these Specialists as well as the Central Safety office. The Central Safety office is scheduled to move to 1760-H Bldg., Friday, February 6, 1959.

FIRE PROTECTION

IPD Fire Protection responded to two alarms during January: January 23, 1959, 9:35 AM - Outer Area - Army vehicle overturned spilling gasoline on the highway near M.P. #3 on Route #2 South. No Fire Loss; January 28, 1959, 11:37 AM - 100-D Area - near 1720-D Bldg., tar pot became overheated and caught on fire. Estimated Loss: \$10.

E. J. Fitzmaurice
Manager - Employee Relations
Operation

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FINANCIAL OPERATION
MONTHLY RECORD REPORT
JANUARY, 1959

General Accounting

The Atomic Energy Commission was reimbursed \$915 for prepaid travel procured for IPD in connection with the Windscale accident investigation.

Consolidation and transmittal of IPD's budget for FY 1961 and revision of budget for FY 1960 applicable to Specialized Equipment was completed during the month.

An equipment expenditure pattern was issued in January. Total expenditures for FY 1959 are estimated at \$1,036,000 plus an indicated level of commitments at 6/30/59 of \$620,000. IPD's allocation from HAPO was \$1,060,000 and \$610,000 respectively.

The Semi-Annual Machine Tool Report was transmitted to Property Management (R&U). The report listed 113 items with an estimated replacement value of \$828,000.

Facilities Engineering Cost Operation and the Specialist - Engineering Cost were moved from 1761-H Building to 722-A Building in order to consolidate General Accounting Operation in one location.

Product Cost and Budgets

Preliminary work was begun on preparation of the fiscal year 1960 and 1961 operation budgets. Forms were prepared and submitted to level 3 managers for their estimates of personnel, overtime hours, essential materials, and planned maintenance.

The form of the monthly operation report was revised to present cost controllable at level 3.

The essential material consumption report was revised to include the information previously furnished on two other reports.

Standard billing rates for Intra-Area power were reviewed and revised.

A study of coal consumption by area for calendar year 1958 indicates that post CG 558 requirements are below previous estimates and will tend to affect the amount included in the midyear review and future forecasts.

Personnel Accounting

Salary rates for nonexempt, non-bargaining unit employees were increased by 2.5% of base salary rates effective January 15, 1959. At the same date isolation pay rates for all exempt employees and nonexempt, non-bargaining unit employees was increased by 2.5% of the base isolation rate.

The Annual Income and Franchise Report, W-2 Forms, State and Federal Unemployment Tax Reports and the final Insurance Plan Assessment have been completed and forwarded to the proper authorities.

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Several additional functions, formerly the responsibility of Employee Relations Operation, have been assumed by this operation. All of these items deal with employee personnel matters.

The last bond purchase for employees electing to participate in the Savings & Security Plan was made. These bonds have been purchased and the Custody Receipts delivered to employees. Individual balances remaining in the accounts of the Stock Bonus Plan have been refunded.

Auditing

A report covering the audit of the Suggestion Plan for the twelve month period ended December 31, 1958, was issued. A certification that IPD awards for CY 1958 were in accordance with the company plan or with any modifications negotiated with the Commission was prepared for the General Manager's signature.

Records supporting the Safety Council Award for which the Department qualified on January 9, 1959, were audited.

A payoff of IPD employees whose pay envelopes are normally delivered to department representatives in the 100-F Area was made on January 29 and 30, 1959. Of 266 envelopes selected for the test, 241 were delivered to the employees. Employees not contacted personally during the payoff will be contacted later by the auditors.

Procedures

Progress was made in the study of full integration and mechanization of clerical accounting routines within the Operation. Basic outlines were prepared of the objectives of the study as well as plans for its completion. A study team was formed to implement completion of our objectives.

Detailed studies are underway of the basic code structures necessary for the planned integration of the entire system. In addition to all organizational and financial accounting codes, the revised structure will provide for other management data such as type and identification of maintenance work.

General

No inventions or discoveries were made during the month by Financial personnel.

DR MacNaughton
 Manager - Finance
 IRRADIATION PROCESSING DEPARTMENT

DR MacNaughton:apa

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**DATE
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8/21/92