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FUELS PREPARATION
DEPARTMENT

MONTHLY REPORT
SEPTEMBER
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HANFORD ATOMIC PRODUCTS
OPERATION

[REDACTED]

GENERAL ELECTRIC

MASTER

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**HANFORD ATOMIC PRODUCTS OPERATION
RICHLAND, WASHINGTON**

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FUELS PREPARATION DEPARTMENT

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MONTHLY REPORT - SEPTEMBER 1961

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By Authority of DR-24

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Compiled by Fuels Preparation Department

By TL Phillips 8-11-92

October 7, 1961 - Richland, Washington

PM Eck 8-12-92

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PRODUCTION

High manufacturing yields and operating efficiency, coupled with a re-scheduling of bumper fuel and water mix fuel production, resulted in an output which was 105 per cent of forecast.

A new record high yield of 92.9 per cent for six-inch fuels was established during the month, while the yields for eight-inch fuels remained at a relatively high level of 88.7 per cent.

Finished fuel element inventories at the end of September reflected a 1.8 month supply based upon projected reactor usage.

The inventory of bare uranium cores reflected a 1.9 month supply.

ENGINEERING

Present Reactor Fuels

Fuel performance continues to be adversely affected by fuel quality oriented ruptures and an upward trend in "side hot spot" failures. One (1) natural and eight (8) enriched fuel element ruptures occurred during September. Two of these, however, were caused by mechanical charging damage and a third was attributed to a buckled process tube which restricted coolant flow in the area of the failed fuel element. Total ruptures this month were three (3) more than last month. Severity of service is about twice that of a year ago.

Radiometallurgy examination of a second dingot fuel element transverse split rupture has not revealed the exact mechanism although several transverse cracks in the I.D. core apparently existed prior to the failure. Heat treating of uranium in the hollow blank form followed by quenching in 130 F oil is being evaluated as a means to alleviate stresses which may cause cracking.

Approximately 76 tons of large grain uranium dingot cores, segregated by the UT-2 testers, were being irradiated and 116 tons have been discharged. Preliminary quality certification data shows a tendency toward surface bumping. Complete data, however, is not yet available for analysis.

Approximately 302 tons of additive dingot uranium were being irradiated and 752 tons had been discharged by mid-September. Thirteen (13) dingot ruptures have occurred to date as compared to nine (9) ingot control failures.

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The irradiation of overbore fuel elements continues without incident. Overbore fuels are on hand for the 21 additional tube charges planned for the C-Reactor test facility.

Three UT-2 surface testers, to detect and reject quench cracked cores, were in operation this month and a fourth was installed in mid-September. Thus far two (2) quench cracked ingot cores have been rejected by these testers. Chemical analyses confirmed a high iron content (375 to 443 PPM) similar to quench cracked ingot cores found in shipments received the latter part of last year.

The UT-4 prototype for testing AlSi fuel element closures has been completed and is undergoing laboratory check-out.

The performance of bumper fuels continues to confirm that this type of fuel will minimize gross fuel misalignment and associated "side hot spot" ruptures. Approximately 26,800 bumper fuel elements have been made on the ultrasonic welders. Yield through the inspection station was 93.3 per cent in September in comparison to 81.9 per cent for August.

During the past quarter nine (9) ingot uranium cores sampled from incoming lots have exceeded the maximum specified limits for nitrogen and carbon. The producer site has been requested to take the necessary action to maintain these cores within specifications.

Seventy (70) tubes of externally nickel-plated normal uranium fuel elements were charged in 105-DR Reactor on September 5 for irradiation to twice normal goal exposure. About thirteen hundred (1300) nickel-plated, enriched fuel elements were prepared for a 100 tube test which is planned for K Reactor.

Evaluation of 500 fuel elements canned in internally nickel-plated aluminum components showed a 20 per cent incidence of non-wet caps. A program to improve wetting is under way in an effort to eliminate this quality deficiency.

Recent developments in the deposition of corrosion-resistant chromic acid films on X-3001 aluminum have yielded encouraging results. Very corrosion resistant films were produced on samples initially autoclaved in 170 C water followed by autoclaving in 1.0 wt. % chromic acid at 170 C.

The Sylcor Division of Sylvania Electric Products Company completed a contract to assemble 1000 HAPO CV size, diffusion bonded fuel elements by their hot-press process and 500 acceptable pieces were shipped to HAPO for inspection and testing.

Bond testing of fuel elements assembled in the HAPO hot-press facility show a bond reject rate of about 9 per cent. Studies are under way to determine the cause of the high reject rate.

During May 1961, one hundred and sixty (160) fuel assemblies were shipped to Savannah River Laboratory to optimize parameters for fluid pressure bonding and the work was completed September 11. The average fuel element bond strength reported by Savannah River Laboratory was 8500 psi for those fuels made under maximum process conditions. Bonds were observed to be weak between the nickel and uranium interface. A complete evaluation will be made upon receipt of these fuel elements by FPD.

N Reactor Fuels Development

KER Loop #1 was discharged because of neutron monitor malfunction. Five N inner tube, 0.95 % enriched fuel elements (NIE-1) had reached an exposure of 1800 MWD/T and two NIE-1 had been exposed to 800 MWD/T at the time of discharge. The loop was recharged with prototypic NIE-1 fuel elements. Five NIE-1 fuel elements were also charged into KER Loop #2 after completion of loop coolant tests in mid-September.

The six tubes of K size I&E coextruded fuel elements charged during August are operating satisfactorily and have reached an exposure of 350 MWD/T. Four hundred (400) similar fuel elements are now in process in the 306 Pilot Plant.

A suspected NIE-1 rupture charged in April is being examined in Radiometallurgy to determine whether abnormal appearance in the area of one of the supports indicates a rupture has occurred.

NPR fuel locking slip designs have now been completed. Tooling and proof testing of the fuel element supports and steel shoes is virtually complete.

Current methods for the fabrication of thin wall copper extrusion sleeves requires the rolling and welding of copper sheet to produce the tube. A development order has been let to provide both an alternate source and improved fabrication methods by using direct extrusion. Initial tooling difficulties have been solved and the satisfactory production of 6" size sleeves is expected in the near future.

National Lead Company of Ohio is continuing experiments to outgas uranium billets which exceed HAPO hydrogen specifications with apparently satisfactory results. None have been evaluated as yet at Hanford, however.

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Difficulty has been experienced with inner-tube mandrel failures during coextrusion. This problem has been alleviated by eliminating mandrel preheating. This results in improved retention of lubrication on the mandrel and a reduced failure rate.

A batch of N inner tube enriched extrusions warped badly during cooling. Reduction of billet extrusion temperatures to 1155 F appears to have rectified the situation. Preliminary data show a considerable reduction in rejects, after beta heat treating, when the material extruded at the lower billet temperature was used.

Installation of the Vacu-blast unit in the 306 Pilot Plant has been completed and testing of various nozzle types is under way.

Development work to date on the cathodically etched (650 C at 10,000 psi) end closure process shows that high strength uranium:zirconium bonds are made. The Zircaloy:Zircaloy bond between the cap and clad is not as good and usually shows some porosity. Seven test specimens, having pressure bonded end closures (not welded), were autoclaved at 400 C and 1500 psi. All failed after 16 hours exposure. Examination revealed porous regions in the cap-clad (Zircaloy:Zircaloy) bond as the likely entry path of steam.

N fuel cladding testers have shown satisfactory operation to date. Testing efficiency is expected to increase as operators gain experience.

Tests designed to better define the capabilities of the N fuel surface contamination tester reveal that a standard element containing a surface smear of 100 micrograms of uranium responds with a background count five times background. Eighteen fuel elements produced in the Pilot Plant were tested at this sensitivity and revealed no evidence of contamination. This work is being carried out to insure a means of detecting contaminated fuel elements which might adversely effect the operation of the NPR rupture monitoring system.

Nondestructive testing equipment designs for post irradiation testing facilities have been completed and equipment orders will be made in October.

GENERAL

Operating efficiency of the AlSi Shop was 95.3 per cent compared to the 91.0 per cent forecasted.

No failures of fuel elements occurred in the autoclaves during the month. Total failures for the year remain at ten.

Production of bumper fuels was discontinued in the Pilot Plant when the ultrasonic welders in the 313 Building were placed in full operation.

PERSONNEL STATISTICS

Number of employees as of August 31, 1961 908
 Number of employees as of Sept. 30, 1961 920

	<u>Exempt</u>	<u>Nonexempt</u>	<u>Total</u>
General	2	1	3
Manufacturing	90	383	473
Engineering	47	28	75
Financial	13	7	20
Plant Facilities	48	295	343
Relations Practices	4	2	6
 TOTAL	 204	 716	 920

STAFF

General Manager, Fuels Preparation Department	R. L. Dickeman
Manager, Manufacturing Operation	W. N. Mobley
Manager, Engineering Operation	L. H. McEwen
Manager, Financial Operation	W. S. Roe
Manager, Plant Facilities Operation	E. Hilgeman
Acting Manager, Relations Practices Operation	G. D. Barr
Special Studies Assignment	J. W. Talbott

PATENT SUMMARY - SEPTEMBER 1961

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 September except as listed below. Such persons further advise that for the period therein covered by this report, note book records, if any, kept in the course of their work have been examined for possible inventions or discoveries.

"A Method for Improved Arc Starting for Tungsten-Inert-Gas Welding."
 G. R. Hanson

R L Dickeman
 General Manager
 Fuels Preparation Department

RL Dickeman:mkm

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MANUFACTURING OPERATIONSEPTEMBER, 1961CURRENT OPERATIONSProductionStatistics

	NORMAL					ENRICHED				
	8"	O				O				Total
	Solid	C	K	Reg.	Bumper	C	K	Reg.	Bumper	
<u>Current Month's Production</u>										
Acceptable Fuel Elements Produced (Tons)	-	88.3	280.3	105.6	127.7	20.3	37.2	-	-	659.4
As % of Forecast Production	-	156	113	66	162	113	85	-	0	105
Cum. % of Forecast for Current Quarter	-	137	97	89	129	107	92	125	97	101
As % of Past 3 Month's Average Production	-	140	119	55	387	226	81	0	0	102
of Past 12 Month's Average Production	-	158	119	51	473	145	87	0	0	103
% of Forecast Achieved Last Fiscal Quarter	-	116	114	116	115	49	111	108	88	111
% of Forecast Achieved Last 4 Fiscal Quarters	-	101	106	110	84	81	101	86	90	102

Operating Efficiency

Current Month (%)	95.3
Forecast (%)	91.0
Previous Month (%)	94.6

Manufacturing Yield

Current Month (%)	-	90	88	91	85	93	93	-	-
Forecast (%)	-	86	86	86	82	86	86	86	82
Previous Month (%)	-	91	90	88	82	87	88	93	86

Bare Uranium Available for Processing (Tons)	1050
Finished Products in Storage (Tons)	1224
Special Products Finished (pieces) Boll	155
Uranium Utilization	98.3

Plant Operation - AlSi

Above forecast production of fuel elements during September is attributed to higher than forecasted yields and operating efficiency and a re-scheduling of OIIIE bumper fuels and water mix elements. Ten (10) canning line shifts were operated per day for a total of 200 lines shifts worked for the month.

The September yield for six-inch fuel elements reflects a new high yield for this model which slightly exceeded the previous high of 91.2 percent which was attained in June, 1961. Improved control in the production of this model was obtained by reducing the severity of the problem of AlSi penetration into the sleeve-can annulus (AlSi slopover) due to undesirable sleeve-can mating tolerances. This was attained by sampling the cans just prior to component cleaning and holding the undesirable material for rework. This improvement, combined with a slight reduction in the severity and frequency of fractured or "brittle" bond incidents, accounted for the improved yield. Eight-inch fuel element yields remained at the relatively high level experienced during August.

Early in the month, use of the prototype ultrasonic welder for projection welding was discontinued and the two 313 Building machines were utilized for production. One welder was operated on each of the two shifts to produce 128 tons of OIIIN bumper fuels. At the end of the month, the welders were converted for six-inch production and welding of rails on "O" size water mixing elements began. The transition of bumper welding activities from the 306 Pilot Plant to the AlSi Shop was made with a normal amount of associated problems. Modification of the soaping, cleaning and de-soaping facilities was completed early in the month, and transfer of rails and fuel elements to the 306 Building for processing is no longer required.

The fuel element reclamation operation was transferred to the 306 Pilot Plant during September. A total of 4,682 elements were machined and re-welded during the month with a yield of 85 percent.

There were no autoclave failures of AlSi Process Fuels during September. Total for the year remains at 10.

Finished fuel element inventories at the end of September reflected a 1.8 month supply based upon projected reactor usage. This inventory is still higher than forecast because of the high Manufacturing yields and efficiencies and below-forecast charging in the reactors during the past four months.

The month-end inventory of bare cores reflected a 1.9 month supply based upon projected reactor usage. In view of the contract negotiations being conducted at the Fernald plant, the receipts and bare inventories are being followed and inventory position of this plant is being analyzed on a continuing basis.

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The following pieces were processed through the Fuel Recovery facilities during September:

8" I & E	27,904
6" Water Mix	335
Total	28,239

One scrap shipment containing 541 grams of Li-Al was made during the month.

Plant Operation - Coextrusion

The practice material which was started through the process during the early part of August, is nearly out of the stream. This material will be retained and utilized by both engineering and operating personnel for special tests and machine set-up.

The first three weeks were devoted to production of inner tubes. Outer tubes were extruded during the last week of the month.

Following is a total throughput for each work station during the month of September:

	<u>Inners</u>	<u>Outers</u>
Billet Assembly	24	18
Extrusion	24	18
Cut Up	507 pcs.	13 pcs.
Chemical Milling	463 "	0
Braze	482 "	0
Beta Heat Treat	402 "	0
Machining	159 "	0
Vacu-Blast	122 "	0
Welding	191 "	0
N.D. Testers	137 "	0
Support Welding	17 "	0
Autoclave	0 "	0

The B unit of the braze facility was put into operation early in the month. Modifications to the heat treating equipment were completed to permit the charging of the baths the first week of the month.

Facilities Engineering

Design and Projects

CAF-847 New Fuel Cladding Facility

	<u>Scheduled</u>	<u>Actual</u>
Design	100	100
Construction	94	94

Design criteria for autoradiograph have been approved by the AEC.

Beta heat treat equipment has been started up, and is functioning well.

The two stainless steel storage tanks were received by the chemical contractor and installed.

CGF-903 Projection Fuel Element Modifications

	<u>Scheduled</u>	<u>Actual</u>
Design	100	100
Construction	96	96

Both welders are performing satisfactorily.

CGF-915 Increased Warehouse Space - 303 Area

	<u>Scheduled</u>	<u>Actual</u>
Design	100	100
Construction	55	48

All but one section of the warehouse floor has been poured. Steel and siding have been erected.

CGF-934 UT-4 Testers - 313 Building

	<u>Scheduled</u>	<u>Actual</u>
Design	78	78
Construction	3	3

Preliminary conveyor modifications have been completed.

Drafting and Files

Drafting work was performed on the following facilities:

306 Building	AlSi Fuel Closure Tester UT-4 End Bonding Press Assembly
313 Building	Tool Set-up Fixtures Manual Line Identification Stamper
333 Building	Baskets Abrasive Cutoff Saw Elevator Inner Tube Shear Tester Outer Tube Shear Tester
Miscellaneous:	Water Line As-Builts

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The following drafting work was completed:

New Drawings	61
Revised Drawings	75
Small Charts	4
Large Charts	1
Miscellaneous	20

PLANT CONDITIONS, INCIDENTS, AND IMPROVEMENTS

ALSi Shop

General

The operating efficiency was 95.3 percent for September, the highest level attained since November, 1960. Significant improvements were reported this month in operational areas as information and safety meetings were changed from weekly to a semi-weekly basis. Also, some production time was gained as a result of a reduction in time allowance for workers to change clothes at the end of the shift. Outages for operational reasons were reduced to 20 percent of the total, and the remaining 80 percent was for equipment failures. The major contributors to equipment time losses were problems associated with the quench machines, a furnace coil failure, and furnace controls.

The vendor evaluation program is progressing in a satisfactory manner with all of the material from vendor B and three-fourths of vendor H's components having been canned.

After experiencing considerable difficulty with component quality and delivery problems, vendor H has performed satisfactorily on the last 100,000 parts delivered. Vendor B, once initial quality and delivery difficulties were overcome, fulfilled their contract promptly and without incident.

Based upon recent rupture data there appears to be no significant difference in the rupture rates of the test and control fuel elements. Approximately fifty (50) percent of the vendor B and forty (40) percent of the vendor H material have been irradiated and discharged to date.

Even though a large number of fuel elements (200,000 each) are authorized for charging under this program, only gross differences in reactor performance will likely be detected since most quality defects are immediately detected in the receiving and fuel fabrication processes. It is felt that the purposes for the test have already been satisfied and approval of these vendors appears desirable ahead of full test completion.

Receipt of universal-size water mixing spools which would not meet HAPO specifications caused some delay in spool attachment and 100 percent inspection of all material processed recently. The male contour of the mixing spool was found to be higher than specified in some cases, and the male contour diameter was found to be above the specified limit. A waiver was issued for acceptance of the high male contours, but 1,210 of the large diameter contours were returned to the vendor for rework or replacement.

The pressure quench machines continued to be a major source of down-time. Alignment difficulties and AlSi sticking to the cap seating washers have been the most consistent problems. The alignment problems which are being encountered have been aggravated by excessive wear to the resin impregnated bushings which support the quench baskets. Replacements are being made with nylon impregnated fiber bushings. The cap seating washers are being redesigned to reduce their tendency to collect AlSi and to freeze to the spire chimneys.

Samples from five production lots of uranium metal analyzed above the upper specification limit for nitrogen. Some of this material was also outside specification limits for carbon and density. Portions of these samples were returned to NLO and their analysis agreed with the results obtained at HAPO. Therefore, the problem appears to be a function of the sampling system used by NLO to determine the quality of an ingot.

Quench crack tests were installed in all UT-2 bare core test stations by mid-month. Since this time, the reject rate has been approximately 1.5 percent, predominantly striations. Visual inspection of the rejects has revealed two pieces containing quench cracks.

Routine recording of bare core tester data was made a part of the Quality Certification Program early in the month. A procedure was established which would maintain individual fuel identity on Certification samples from receiving inspection through reactor processing. The system has been designed with sufficient flexibility to permit the use of any new measurement which might be desired and to determine the effects of variations anywhere in the stream from feed metal processing through reactor processing. Plans are to sample by ingot starting in October.

Test results disclosed that the existing external bond tester could not be used to measure reproducibly the degree of fractured (brittle) bonding in a fuel element. The variation of total count within and among testers, on pieces containing no defect but fractured bonding, was as much as ± 100 percent of the average value for the particular fuel element. Efforts are being made to develop a tester capable of providing the desired information.

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306 Pilot Plant

The 306 Pilot Plant crew completed six development tests in support of production. These tests included use of nickel plated components, Turco-etched pieces for welded studies, material canned for physics testing in IPD, six-inch canning cycle optimization, CIVN fuel elements, and assembly of fuel elements using integral spire-can components.

305 Test Reactor

The 305 Test Reactor backlog has been reduced to approximately eight working days during September. An approximate 15 day backlog was created last month while the console was replaced and instruments rewired. In addition, approximately 20 percent of the available reactor time was utilized for special testing of poison splines, nickel plated fuel elements and Li-Al target elements.

Coextrusion Shop

Materials

Difficulty has been experienced in supplying sufficient quantities of essential materials to the Coextrusion Shop to achieve a sustained production rate. Few, if any, of the copper components from research and development efforts were suitable for use in the production processes.

Materials personnel have been expediting work in local shops. By late October, receipts are expected to be forthcoming on these orders that will assure continuity of operations.

Supplies of zirconium sleeves on hand are adequate to meet production needs through October. Only one vendor (H) has delivered the full quantity of pieces, 75 of each of the four sizes, required for qualification as a supplier. Vendor B has produced a few pieces of each size but apparently have not achieved sustained production capabilities as yet to meet delivery dates. Another vendor (WC) has demonstrated their ability to produce outer claddings but have no experience with the smaller cores. A purchase order has been started for a sizeable number of Zr-2 sleeves (800 outer and 600 inner).

Zirconium end caps and support deliveries are being delayed and supplies at the present time are low. However, it has been assured that deliveries will begin soon on a sizeable basis. Supports and locking clips will be expected by the end of October or early November.

Word was received this month that the unit price of helium will be increased from \$15.50 to \$37.50 on November 1, 1961. This will increase fabrication costs by approximately \$5,000 per year at the present consumption rate. The possibility of obtaining this gas at reduced rates in tank car shipments is being investigated. Also, the possibility of

using 100 percent argon, instead of the present argon-helium mix, for welding should be evaluated.

Cutoff Saw

Alignment of the saw and trough has made a considerable improvement in the squareness of the cut. However, it is still necessary to use a facing operation to meet specifications. The machining lathe is being tooled up to face after zirconium strip.

Chemical Milling

Pitting difficulties at chemical milling were experienced on several occasions. Initial evaluation of the problem indicates it was probably due to solution control problems.

Chemical milling is still being accomplished one end at a time in the vertical position. Work is continuing on developing a horizontal chemical milling unit.

Vacu-Blast

It is necessary to reprocess roughly 10% of the inner tubes because the inside tube is not being adequately cleaned by the inner nozzle. Work continues on modification of the inner nozzle.

Braze

The B unit was put into operation early in the month. Minor mechanical difficulties still plague both the A and B units, but performance, in general, has been satisfactory. Work on C unit is expected to be completed in October.

Beta Heat Treat

The furnaces were charged early in the month and material processed on a limited basis. Operation of the conveyor requires the use of special baskets to restrict the swinging of the elements between stations. Without the baskets, processing is limited to one piece at a time. A high reject rate was experienced on the inner elements from the first twelve tubes extruded and heat treated due to excessive warp. Later extrusions were greatly improved, although reject rates on some types remained relatively high. Study of this problem is under way.

End Cap Welders

One end cap welder is being utilized for both inners and outers. The second unit has not been released for operation.

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Support Welders

Tooling for the support welders is not yet complete.

All measuring and testing equipment necessary for the startup of the Co-extrusion Shop has been obtained and the procedures necessary for control have been prepared or are being prepared in advance of processing. Process capability measurements are being obtained at each stage of the process. In some cases the capability for meeting the specifications has not been obtained and adjustments are being made in equipment, procedures, or specifications as appropriate.

Sufficient work was completed this month on testers and test standards to assure that all material could be tested according to specifications. The tests and physical standards are, in most cases, not optimum but are considered to be adequate pending evaluation under operating conditions.

Several air and smear samples for beryllium contamination were taken at various locations in the 3rd Building. No beryllium was detected with the exception of the inside of the welder gas shield and the surface of the fuel element which had blown out during welding. The minimum detectable level is 0.1 microgram per cubic meter. The Industrial Safety limit is 2.0 micrograms per cubic meter average exposure over an eight-hour period.

OPERATING PLANS

A review of fuel element production and reactor requirements for future months was completed early this month for comparison with the Official Production Forecast. This review was required in order to assess the effects of the high Manufacturing yields and efficiencies and below forecast time-operated efficiencies in the reactors being experienced at the present time. Finished inventories has risen substantially during August, but were approximately 100 tons lower at the end of September.

Projected production and usage rates, however, show that, while Manufacturing activities remain at a ten canning line per day level, a peak inventory of approximately 1,500 tons might be reached by the end of November, 1961.

It was decided that continuity of operation at the ten (10) canning line per day level will provide the best operating plan, using the present operating assumptions. Pallets for storage of the finished fuel elements are limited and storage space is scarce. However, these problems are being overcome and anticipated usage rates in future months will leave the finished inventories at desirable levels.

SIGNIFICANT REPORTS ISSUED

HW 70916	Monthly Report, Quality Control Operation, Fuels Preparation Department, August 1961	9/1/61	A.G. Blasewitz
HW 70965RD	Uranium Delivery Schedule	9/6/61	H.E. Berg
HW 71038RD	Uranium Delivery Schedule	9/13/61	H.E. Berg
HW 71048	Uranium Quality Control Analytical Results	9/14/61	G.B. Hansen
HW 71095	Production Evaluation of Pressurized Quench	9/18/61	B.K. Boyd
HW 71128	Report of Uranium Isotopic Analysis	9/21/61	G.B. Hansen

EMPLOYEE RELATIONSFPD Health and Safety

	<u>September</u>	<u>August</u>
Disabling Injuries	0	0
Serious Accidents	0	0
Medical Treatment Injuries	49	61
Medical Treatment Frequency	3.07	4.35

Medical Treatment Frequency Rate year to date is 3.82.

Members of the Manufacturing Operation sustained 26 medical treatment injuries during September, a frequency of 3.18.

The hand injury prevention program sponsored by the Health and Safety Program Council has been well accepted. Department members who belong to Toastmasters have presented the prepared talk to more than 500 employees to date, and are scheduled to cover approximately 200 more.

Plans are complete for Fire Prevention Month activities. The final planning meeting was held by Chairman O. N. Dodson on September 28. Posters have been put up in all FPD facilities, inspections are scheduled for all buildings during the week of October 9, literature for distribution to employees has been obtained, a central display will be set up on October 3, and the slogan contest is nearing completion.

Inspections were made by Central Council teams during the month. Two teams covered Department shops, production facilities, burial grounds, and plant parking areas.

On September 29, the General Manager made the first of a series of personal inspections that will cover all Department facilities and all employee work locations, during the period September 29 through October 5. Each section manager is participating in the specific areas of his responsibility. The Specialist, Health and Safety will be engaged in the total inspection.

Security

There were no security violations in the Manufacturing Operation during September.

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Radiation Experience

During the four week badge period ending August 11, 1961, the total exposure for Manufacturing personnel was 6,499 mrad compared to an average exposure of 7,360 for four week reporting periods over the past year. There have been no individual exposures in excess of 300 mrad for any four week period since March 24, 1961.

Training

A total of eight classroom sessions were conducted for instrument craftsmen during September on the following subjects: grain size, surface test, surface chassis, readout boards, readout panel and bond and pen circuit analysis.

Reports of Invention

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 September.

W. N. Mobley
for W. N. Mobley
Manager - Manufacturing

WNM:HFT:mrh

UNCLASSIFIED FUELS ATTRIBUTE DATA

1961

8" NORMAL

8" BUMPER

6" NORMAL

6" BUMPER

UNCLASSIFIED FUELS ATTRIBUTE DATA

W 1121

8"

6"

DECLASSIFIED
ENGINEERING OPERATION

September, 1961

VISITORS

<u>Name</u>	<u>Company</u>	<u>Contact</u>	<u>Date</u>	<u>Reason</u>
Dr. D. Gy Rene Jean-Pierrie	French AEC Saclay, France	D.C. Worlton	9/7/61	Discuss nondestructive testing.
W. K. Johnson R. Dobbery	Montek, Inc. Salt Lake City, Utah	G.L. Waldkoetter	9/8/61	Discuss nondestructive testing.
J.F. MacMacNeill S. Marshall	National Lead Co. Cincinnati, Ohio	J.T. Stringer	9/12- 9/15/61	Attend FEDC Working Committee Meeting.
R. F. Hartmann N. F. Neumann	Mallinckrodt Chem. Works St. Louis, Mo.	"	"	" "
T.C. Evans V.I. Montenyohl	E.I. duPont, SRP Aiken, S.C.	"	"	"
V.I. Montenyohl	"	A.E. Guay	9/15/61	Data exchange on beta heat treating & high temperature irradiation.
W.D. Kelly	Sciaky Brothers, Inc. Los Angeles, Calif.	W.I. Steinkamp	9/11- 9/25/61	Set up welding machine.
J. E. Foss	Bridgeport Brass Co. Seattle, Wash.	S.M. Gill G.W. Riedeman	9/25- 9/26/61	Discuss delivery schedules of N fuel components.
L.L. Becker	Bridgeport Brass Co. Riverside, Calif.	"	"	"
G.A. Moudry	Harvey Aluminum Torrance, Calif.	G.W. Riedeman	9/26- 9/27/61	Discuss N-reactor fuel component scheduling and technology.
W. Fidman	General Astrometals Yonkers, N.Y.	W.K. Alexander	9/18/61	Witness tests of braze alloy.

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TRIPS

<u>Name</u>	<u>Company</u>	<u>Contact</u>	<u>Date</u>	<u>Reason</u>
L.H. McEwen	AEC Germantown, Md.	F.P. Baranowski	9/7-8	Attend FEDC Meeting.
	GE, Engr. Services New York, N.Y.	O. Sorensen	9/11/61	Discuss Engr. Personnel Register.
	GE, GERL Schenectady, N.Y.	W.E. Tragert	9/12/61	Discuss NPR Fuels Technology.
	GE, GEL Schenectady, N.Y.	J.N. Groves	9/13/61	Discuss nondestructive testing tech.
D.R. Stenquist	Mallinckrodt Chem. Works, Weldon Spring, Mo.	R.F. Hartmann	9/6/61	Feed site orientation and technical discussion of operation.
	National Lead Co. Cincinnati, Ohio	F.L. Cuthbert	9/7/61	" "
	General Electric Cincinnati, Ohio	M. Haas	9/8/61	Briefing meetings for Mfg. Studies Program.
G.W. Riedeman	Wah Chang Corp. Albany, Oregon	R. Graham	9/11/61	Conference and inspection of Zircaloy tubing.
A.E. Guay	Boeing Aircraft Seattle, Wash.	W.D. Ashley	9/28/61	Consultation on fluid-bed heat treating.
T.B. Correy	AEC Welding Forum San Antonio, Texas	F. Davis	9/20- 9/27/61	Present paper.
	Battelle Memorial Institute Columbus, Ohio	C. Boyer	9/28- 9/30/61	Discuss pressure bonding Zr-2.
G. R. Hanson	AEC Welding Forum	---	9/20-	Present papers on
E. V. Padgett	San Antonio, Texas	---	9/22/61	DC & ultrasonic welding.
	American Welding Society Fall Meeting Dallas, Texas	---	9/25/61	Attend AWS meeting.
G.L. Waldkoetter	National Lead Co. Cincinnati, Ohio	J. Colby	9/13- 9/14/61	Discuss nondestructive testing.
D.C. Worlton	GE, GEL Schenectady, N.Y.	J.N. Groves	9/12- 9/13/61	" "

PERSONNEL

Additions

<u>Name</u>	<u>Title</u>	<u>Reason</u>	<u>Date</u>
S. K. Caldwell	Steno-Typist	New hire (Temp.)	9/7/61
R. R. Bloomstrand	Engineer, Proc. & Dev.	Transfer from IPD	9/1/61

Removals

L. E. Kusler	Engineer	Transferred to IPD.	9/1/61
K. W. Atwood	Engineer	Temp. Employee Terminated (Summer Professor Program)	9/1/61
T. W. Cannon	Engineer	Temp. Employee Terminated	9/1/61

INVENTIONS

All Engineering Operation personnel engaged in work that might reasonably be expected to result in inventions or discoveries advised that to the best of their knowledge and belief no inventions or discoveries were made in the course of their work during September, 1961, 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.

"A Method for Improved Arc Starting for Tungsten-Inert-Gas Welding"
G. R. Hanson

SIGNIFICANT REPORTS ISSUED

HW-68448 A, W. H. Hodgson and M. A. Clinton, "Design of PT-IP-310-A-FP, Determination of the Dimensional Stability of Uranium Fuel Cores Classified by the Fuel Core Tester (UT-2)", September 21, 1961.

HW-70692, G. R. Hanson, "The Effect of Current Ripple on Direct Current Welding of Hanford Aluminum-Clad Fuel Elements", September 6, 1961.

HW-70770, G. R. Hanson, "An Analysis of Direct-Current Welding for Hanford Aluminum-Clad Fuel Elements", September 14, 1961.

HW-70821, G. L. Waldkoetter, "Ultrasonic Inspection of Uranium Billets to Predict Coextrusion Performance", August 22, 1961.

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HW-71216

SIGNIFICANT REPORTS ISSUED (Continued)

- HW-70828, G. F. Jacky, "Preparation and Irradiation Behavior of Chemically-Nickel Plated Aluminum Jacketed Fuel Elements", September 5, 1961.
- HW-70898, L. T. Hagie, "Initial Test Results of Bumpered Fuel Elements in the Hanford Reactors", September 1, 1961.
- HW-70919, G. L. Waldkoetter, "A Nondestructive Test for Determining Grain Size and Uniformity in Massive Uranium Fuel Cores", September 1, 1961.
- HW-70938, E. V. Padgett, "Production Application of Ultrasonic Welding to HAPO Aluminum Clad Projection Fuel Elements", September 14, 1961.

ALSI PRODUCT ENGINEERINGFuel Performance & Requirements

One (1) natural and eight (8) enriched fuel element ruptures occurred in the reactors during September. A summary of these ruptures is as follows:

<u>Fuel Element Type</u>	<u>Tube and Reactor</u>	<u>Exposure (MWD/T)</u>	<u>Rupture Classification</u>	<u>Failure Date</u>	<u>Canning Date</u>
I&E Natural	1465 D	13	Mechanical Damage	9-3-61	6-12-61
I&E Enriched	*2667 H	843	Hole (Cap End)	9-2-61	12-16-60
	*2178 F	338	Side Hot Spot	9-5-61	4-10-61
	*1581 H	554	Side Other	9-6-61	5-22-61
	*4072 D	986	Hole (Cap End)	9-15-61	4-12-61
	2384 F	434	Side Hot Spot	9-15-61	5-16-61
	2561 DR	93	Side Hot Spct	9-18-61	8-12-61
	2795 F	1098	Side Other	9-19-61	9-15-60
	0766 DR	154	Mechanical Damage	9-26-61	8-12-61

* "Bumper" fuel

Fuel performance continues to be adversely affected by a high incidence of fuel oriented ruptures and an indicated upward trend in "side hot spot" ruptures. Four (4) of the enriched ruptures (2 hole and 2 side other) sustained in September are of the types normally associated with fuel closure defects, as compared to five (5) (2 natural and 3 enriched) of the six (6) ruptures incurred last month being classified as fuel oriented "hole" failures. Although all of these ruptures were canned prior to the use of a pressurized quench to suppress braze voids and related weld closure defects, further emphasis is being given to the control of product quality and the introduction of process innovations to minimize these ruptures. Limited post-irradiation data on "Quality Certification" monitor columns of enriched fuel indicates dimensional changes may tend to increase the incidences of closure failures if pieces are of marginal quality. Subsequent alloying of enriched uranium with small amounts of iron and silicon to refine grain size and texture is expected to improve dimensional stability.

It will be noted that two of the ruptures sustained this period were caused by mechanical damage incurred during reactor charging. In addition, a low-exposure enriched "side hot spot" rupture (2561 DR) was attributed to a new process tube having been buckled during installation. Total ruptures incurred this month was three (3) more than experienced last month and six (6) more than in the same period last year. Severity of service remains approximately twice that of a year ago.

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Radiometallurgy examination of the second of two previous natural alloyed dingot transverse split ruptures has not revealed any additional evidence regarding the exact failure mechanism. However, several transverse cracks originating at the core I. D. apparently existed prior to failure, further suggesting that these defects either caused or otherwise contributed to rupture. Recognizing the severity of the quench after beta heat treatment may induce internal cracks in solid dingot and ingot core blanks, evaluation of uranium heat treated in the hollow blank form and quenched in 130 F oil is being expedited to alleviate this problem.

Adequate quantities of overbore fuel have been prepared for the 21 additional charges required to complete the expansion of the C reactor test facility to sixty-two (62) tubes early in October. Irradiation of overbore fuel is continuing without incident.

The performance of "bumper" fuel continues to confirm that "bumpers" will minimize gross fuel misalignment in reactor ribbed process tubes and will significantly reduce associated "side hot spot" ruptures. Ten (10) ruptures have occurred to date in "bumper" fuel loadings. Of this number, two (2) resulted from uniform corrosion under severe surface temperatures at high exposure, one from mechanical damage during reactor charging, and the remainder (6 end and 1 side other) were fuel oriented ruptures. Based on the accumulated severity index for "bumper" fuel loadings, approximately fourteen (14) ruptures would have been expected. Rupture experience during the past year indicates these ruptures should be about equally divided between "side hot spot" and fuel oriented ruptures. The absence of "side hot" ruptures confirms the effectiveness of "bumper" fuel. Although the number of fuel oriented ruptures appears excessive, the number is not unreasonable in comparison with non-bumper fuel performance if the higher exposure (1.3 to 1.4 times) of bumper fuel is considered.

Uranium Technology

Approximately 302 tons of additive dingot uranium were being irradiated and 752 tons had been discharged by mid-September. One internal rupture occurred in a regular dingot lot on August 31 at 786 MWD/T. This makes a total of 13 dingot ruptures to date as compared to 9 ingot control ruptures. An initial shipment (38 tons) of "K" size (KIVN) dingot cores was received and canned this month. In addition, 39 tons of OIIIN dingot cores vacuum outgassed prior to beta heat treatment, and 9 tons of regular OIIIN dingot cores were canned during the month.

Three UT-2 surface testers, to detect and reject quench cracked ("mud-flat") cores, were in operation the first of the month and a fourth tester was installed about mid-September. Thus far, two quench cracked recovered normal ingot cores have been rejected by the testers. Both of these cores were originally shipped to HAPC in October, 1960, and were included in recovered OIIN cores that were re-worked to OIIIN size. Chemical analysis confirmed a high iron content (375 and 443 ppm) similar to the quench cracked ingot cores found in shipments received the latter part of last year.

UT-2 testing of 8.4 tons of extruded dingot overbore cores, vacuum cutgassed after heat treatment, was completed. A total of 0.7% was rejected for large grains, fine grains, and large grain variation. The surface test rejected 1.7 and 1.2% for internal and external defects, respectively.

Approximately 76 tons of large grain uranium cores segregated by the UT-2 testers were being irradiated and 116 tons had been discharged by the first of September. Two failures have occurred to date in a large grain dingot lot, but neither of these failures were attributed directly to metal quality. The current large grain reject rate at 0.3 minimum voltage is less than 1.5 percent as compared to greater than 10 percent last December through February when the feed sites were experiencing a grain size control problem. Preliminary "Quality Certification" monitor tube data shows the larger grain material has a tendency toward surface bumping. Complete data is not yet available for analysis.

During the past quarter, 4 enriched and 5 natural ingot uranium cores sampled from incoming lots to audit producer-site chemical analysis have exceeded the maximum specified limits for nitrogen (100 ppm) and/or carbon (750 ppm). One natural ingot core was particularly high, containing 1121 ppm carbon and 115 ppm nitrogen. The producer-site has been requested to take action as warranted to prevent future shipment of out-of-specification cores. Possible segregation during ingot casting will be investigated.

Process Development

Seventy (70) tubes of nickel plated fuel elements were charged in 105-DR on September 5, for irradiation to approximately two times normal goal exposure under PT-IP-263-A-FP, Supplement A. This material includes both 0.2 mil and 0.5 mil thick nickel plate, with ten monitor charges of each. Two tubes are being routinely sampled for effluent contamination.

Preparation for a 100-tube test of nickel-plated enriched fuel elements in a K-reactor was initiated. About 1300 pieces were canned in C-64 alloy jackets and finishing is in progress. Plating in the 304 Building plating facility is expected to begin early in October.

Evaluation of 500 fuel elements canned in nickel-plated aluminum components revealed 20 to 100% non-wetting of about one-third of the caps. These non-wets were most prevalent in a single group of cap-spires which also exhibited a high internal bond reject rate; however, non-wet caps were not confined to this group of spires exclusively. Thus, the quality of this group of fuel elements appears marginal, and improvement of cap-wetting is necessary prior to preparing material for irradiation testing. A small scale cap-wetting test, and examination of fuel elements from preceding tests have not revealed a cause for the anomalous behavior.

The quality of the chemically deposited nickel-plate produced in the 304 Building facility was significantly improved by discarding the plating bath, and thoroughly cleaning the system with hot-detergent caustic, followed by prolonged pickling in hot nitric acid. Using a freshly prepared plating bath, it appeared that

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plate adhesion was markedly affected by bath age, with the best adhesion after depositing about 0.3 sq. ft. mils per gallon solution. Adhesion became poorer after plating about 1.2 sq. ft. mils per gallon of solution. Deterioration of the bath (probably due to impurity build-up) was also indicated by changes in the appearance of the plate and a reduction in plating rate. Further tests are under way to confirm the above results with a second freshly prepared bath. The variance in plate adhesion was determined by the electrolytic hydrogen blister test, since the conventional bend-test was not reliable. No effect on plate adhesion was observed in varying the plate deposition rate from 0.5 to 1.0 mil/hr., the plating bath pH from 4.4 to 4.7, and minor variations in the pretreatment cycle. Porosity of the plating varied from 0 to 10 pores/fuel element can for 0.5 mil thick plate and 10 to >50 pores/can for 0.2 mil thick plate. The significance of the 0.2 mil plate porosity will be evaluated by testing in hot caustic solution. Although extensive tests have not been carried out, a marked effect of aluminum surface condition on porosity is indicated by the fact that the internal can wall was virtually pore-free on all samples tested.

Recent developments in the deposition of corrosion-resistant chromic acid films on X-8001 aluminum have yielded encouraging results. Films produced on samples initially autoclaved in 170 C water, followed by autoclaving in 1.0 wt. % chromic acid at 170 C, reduced the corrosion rate by factors of 15-25 under accelerated tests in boiling 5% Na₂ CO₃ and boiling 3% Na Cl + 1% H Cl. Test results covering a range of time and temperature for both the water and chromic acid autoclaving are being statistically analyzed to select parameters for further work. Filaform corrosion (worm tracking) during the chromic acid treatment was eliminated by a preceding water autoclaving. Some pitting of the aluminum occurred during the chromic acid autoclaving at temperatures of 210 C and higher, but none at 170 C. The pitting appears to be an electrolytic effect, and will be further investigated.

The Sylcor Division of Sylvania Electric Products completed a contract to assemble 1,000 HAP0 CV-size, diffusion-bonded fuel elements by their hot-press process on September 11. A total of 500 acceptable pieces was shipped to HAP0 on September 22, and the remainder will follow within ten days. Upon receipt, these fuel elements will be subjected to rigorous inspection and testing.

Bond testing of 348 fuel elements assembled in the HAP0 hot-press facility shows a 9.2% external and 8.9% internal bond reject rate. Limited metallography indicates the external bond rejects resulted from micro-porosity at the uranium-nickel interface. The cause and source of this porosity has not been established. Internal bond rejects appear to have resulted from a lack of diffusion. This most likely was caused by an insufficient preheat cycle. All of the internal bond rejects were located either near the cap or base end of the fuel elements, corresponding directly with thermal gradients in the hot-press furnace die. Techniques for hot-working the fuel closure through the use of a multiple three-part closure punch have consistently produced a fold in the internal tube-wall closure zone. Although HLO reported this problem was resolved in earlier process development by increasing the preheat cycle, the cycle time used was over three times that recommended. Extensive tests have shown the folds are more

closely related to annealing time and cap thickness. If the closure is heated above the annealing temperature (300 C) for 12-15 minutes to fully stress-relieve the X-8001 cladding alloy, flow characteristics of the aluminum are significantly improved and the folding tendency of the inner tube is reduced. Increasing the cap base thickness from 100 mils to 300 mils further improved metal flow and overall closure characteristics. Pre-annealing of the aluminum components proved unsuccessful, since cold work during the sizing operation is sufficient to obviate pre-annealing of the tube. Studies are currently being made to determine the effect of extending the preheat cycle from 10 to 15 minutes, reducing the pressing cycle from 5 to 4 minutes, and the use of caps having a 300 mil base thickness, on diffusion bonding and the grain structure of the cladding. Further production runs will depend on the results of these studies.

During May, 1961, one hundred sixty (160) fuel assemblies were shipped to the Savannah River Laboratory to optimize process parameters for fluid pressure bonding. Bonding of these fuel elements was completed on September 11, and the pieces were shipped to HAPQ for evaluation. Average fuel element bond strength reported by SRL was 8,500 psi under the maximum process conditions. The bonds were observed to be weak between the nickel-uranium interface. A complete investigation of this problem will be made upon delivery of the fuel elements.

Delivery of 2,500 uranium cores and aluminum components for hot-die sizing development work at HAPQ has been promised during October.

Process Technology

A total of 1,006 CVIN overbore fuel elements was canned in the Pilot Plant to provide replacement charges for the C reactor test facility. Finishing and testing of these fuel elements will be completed early in October.

Because of the potential economic incentives for using integral spire-can aluminum components, a preliminary test was run using prototype components in inventory to evaluate ALSi process parameters for fuel assembly. A total of 140 fuel elements was canned before discontinuing the test when an unsafe condition developed as a result of incomplete drying of the internal surface of the spires during component preparation. No difficulty is foreseen in alleviating this condition for subsequent tests. Based on the limited data obtained from this test, use of spire-can components appears feasible; however, further tests will be required to optimize component designs and process parameters. Current quotations on the relative cost of spire-can components are being obtained.

Tests to further optimize the canning process for enriched fuel elements in standard components have been completed. The resulting data is being statistically analyzed to establish optimum limits before revising specifications.

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Approximately 26,800 bumper fuel elements have been prepared on the ultrasonic production welders. The yield through the inspection station during September was 93.3%, as compared to 81.9% for August. Only 2.5% of the fuel elements required rewelding, and rejects for mechanical malfunction and rail tab deformation were reduced to 1.8%. Yield improvement has resulted primarily from the design and installation of tapered chucks in the welders to hold the fuel elements in a fixed position, rather than supporting one end in an O-ring. Pieces requiring rewelding should be further reduced upon installation of automatic weld control circuits, scheduled late in October.

The production facility soap solution tank continues to adversely affect ultrasonic rail weld strength, even though all foreign substances have been removed from the system. Average rail weld strength has recently dropped to 48.3 pounds, as compared to a 56 pound average in the Pilot Plant facilities. The drag-chain conveyor system in the soap tank evidently contributes to the sub-standard rail-weld strength, since fuel elements manually dipped into the tank for the prescribed time have an average rail-weld strength above 60 pounds. Although further tests are in progress, the ultimate solution to the problem will undoubtedly result from a revision of the present soap dipping technique.

Fabrication of elliptical solid bumper rails has indicated the stamping dies will require minor alteration to maintain length tolerance and the desired taper on the leading edges of the rails. Adequate quantities of acceptable rails are available to provide fuel elements for evaluation under a preliminary production test. Welding of the elliptical rails to the test material is awaiting the fabrication of a suitable positioning device for the manual ultrasonic welder.

A prototype core-bore plug press was tested on CVIN cores in the Pilot Plant. Loading and unloading the press and feeding lead strip manually, the feasibility of punching lead plugs directly into each end of the cores was demonstrated. An automatic unloader and strip feeder have been designed and are being fabricated.

An order has been placed for a hot die-sizing press and delivery promised by mid-December. Specifications for the press hydraulic system were completed and procurement initiated. Design of an "end" bonding press is 75% complete and detail drawings are being prepared.

An equipment layout for accomplishing all process steps in the AlSi Pilot Plant except radiography and final inspection has been completed. All current and future equipment changes will be carried out in accordance with this plan.

Studies of low-current ripple DC welding power supplies have indicated a serious arc starting problem develops if a large amount of inductance is introduced in the circuit of a conventional power supply to reduce

current ripple. As a result, a method was devised (Invention Report HWIR-1423) to overcome the arc starting problem by short circuiting the welding current for a short period preceding arc starting. The shorting current overcomes the inductance of the circuit and, when this current path is interrupted, the arc is easily initiated, since the inductance of the circuit tends to keep the current flowing rather than resist current flow. This method has been extensively used in the welding laboratory and has proven to be very reliable for improving arc starting.

Shielding gas cup-to-work distance on helium gas requirements for DC welding fuel closures was investigated. The resulting data showed that, as this distance is increased from 1/16 to 3/16 of an inch, helium consumption increased from 16 to 24 cubic feet per hour. This represents a 50% increase in gas consumption as the welding torch is retracted from the work.

A program was initiated to study the effects of higher temperature and pressure autoclave test conditions on AlSi bonded fuel elements.

AlSi Pilot Plant Activities

A total of 1,889 fuel elements was canned in the Pilot Plant during September, of which 1,087 were for reactor use. In addition, 1,300 miscellaneous assembled pieces were processed for various tests, including Turco etching, nickel plate recovery, and can wetting.

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DECLASSIFIEDCOEXTRUDED PRODUCT ENGINEERINGN-Reactor Fuel DevelopmentKER Loop Testing

The test charge in Loop 1 was discharged during the month because of neutron monitor malfunction. The five NIE-1 elements charged 5/28/61 had achieved about 1800 MWD/T (goal had been approximately 2000 MWD/T), and the two NIE-1 elements subsequently charged 7/17/61 achieved about 800 MWD/T. The loop has been recharged with prototypic NIE-1 fuel elements.

Three throw-away charges (two NIE-1 and one NIN-1) were exposed from 9/1 to 9/17 in Loop 2 as a trial run for loop coolant testing. They were discharged at 230 and 198 MWD/T and replaced with five NIE-1 elements on 9/17 which are operating satisfactorily to date.

The suspect rupture fuel element (NIE design) discharged from Loop 4 in April because of loop activity has been tested in IRP facility and has been examined visually by Radiometallurgy. The results from the visual examination indicate that there might be a possible abnormality in a support spot-weld area where one of the supports is loose. Examination of the cross section at a support location on a companion NIN-1 fuel element from the discharged Loop 4 elements is being carried out.

Coextruded I&E² Program

The six tubes of K-I&E² fuel elements charged during August are at approximately 350 MWD/T exposure and operating satisfactorily. There are currently about 400 K-size I&E² elements in process in 306 Building.

Pilot Plant ProductionMaterials Handling TestsN-Charging Machine

1. 23.13-inch Fuel Assemblies - 72 required.

Status: 44 complete.
30 in process in 306 Pilot Plant.

2. 11.53-inch Fuel Assemblies - 36 required.

Status: 45 in process in 306 Pilot plant.

High Temperature Flow Tests

1. 23.13-inch Fuel Assemblies - 20 required.

Status: 22 in process in 306 Pilot Plant.

Materials Development and ProcurementUranium Billets

National Lead of Ohio has continued experiments in outgassing billets to reduce hydrogen levels to the 2.0 ppm required by HAPO specifications. The hydrogen contents of most ingots produced have met the specification. However, in a recent test production run at NLO, the melting cycle was altered to control the carbon level to less than the specification of 400 ppm limit, which it did, but with about fifty ingots concurrently containing hydrogen from 2.0 to about 3.0 ppm.

The NLO outgassing experiments were designed to reclaim the billets produced from these high hydrogen ingots. The outgassing has reduced the hydrogen content of the billets to less than 2.0 ppm and NLO is now experimenting with the outgassing of ingots. As yet, HAPO has not evaluated any outgassed uranium billets. No deleterious side effects are expected, but metallurgical evaluation will be required before the process can be considered satisfactory.

Zircaloy Fuel Supports

Product designs for the N-cutter tube supports were completed some weeks ago, and the producer has completed the basic tooling. Proof parts showed cracks in the weld projections but this condition has now been corrected. Final proof parts will arrive in about one week and, upon their approval, the dies will be dressed and production started. All necessary strip is available.

Inner tube support tooling is now about 75% finished. This part (the "buggy-spring" design) is quite complicated and requires rather intricate tooling. Two to three weeks time will be required to finish the final tooling adjustments after the satisfactory proof parts are made.

Locking clip designs have just been received. No work has started.

Steel shoes are in final proofing stage. They will be ready by the time outer tube supports are delivered.

Copper Sleeves

Currently, the only proven method for fabricating outer sleeves of copper-silicon alloy is by rolling and welding. A development order to provide both an alternate source and fabrication method by direct precision extrusion was let several weeks ago. So far, no acceptable parts have been produced. A series of tooling failures have hampered the effort. It is expected that satisfactory parts will be produced in the 6-inch size within the next few weeks. Using the same 3% silicon alloy, directly extruding the 7 1/2 inch sleeve appears marginal at this time. A slightly lower silicon content may help but has not been evaluated.

Zircaloy End Caps

Several thousand end caps have been fabricated with approximately 1,000 each ofouters and inners delivered. Apparently the design requires some slight modification to insure a final minimum cap thickness, without special control in the process. This special control is being exercised and no hold-up to production is involved.

Extrusion ProcessExtrusions

The following extrusions were made during the month:

11 Inch Tooling

One Zircaloy Extrusion (Bare) #115 - 11 inch OD to 7.5 inch OD for HLC.
One Copper Billet - 6 inch OD copper preshape stock.

6 Inch Tooling

Four Coextrusions: T-255 through T-258

All billets were standard NIE.

One Special Coextrusion:

Grid billet for study of flow in NIT coextrusions. Uranium core was filled with zircaloy-2 wire.

One Zircaloy Clad Copper Rod:

To evaluate Wah Chang zircaloy outer clad stock.

Three Uranium (1.6 Enriched) Billets:

Initially upset for HLC dual enriched KER single tube billet.

One Copper Extrusion:

To NIT size.

5 Inch Tooling

Two Zircaloy Billets (Bare):- Zr #116 and Zr #117

Zr-117 - for copper diffusion studies.
Zr-116 - for HLO

Two Uranium Billets (Bare):

For development of bare extrusion uranium.

Inner Tube and Mandrel Failures

Considerable difficulty has been encountered with inner tube mandrels during the past three weeks. A large portion of this difficulty has been due to defective mandrels, but in some extrusions, high quality mandrels failed in tension during the extrusion and overall average mandrel life has been decreased from 10 extrusions to 2.

Actual mandrel failures during extrusion have been eliminated by eliminating mandrel preheating. The only benefit received from this temperature reduction is that a thicker coat of lubricant is retained on the mandrel at billet upset. There is probably no effect on the coextrusion from this temperature change since the mandrel cross section is small enough that it should reach billet temperature almost immediately following upset.

To increase the life of inner tube mandrels, two steps are now being taken. These two steps are as follows:

1. The Rockwell "C" Hardness Specification of the mandrels has been increased from 58 to 60.
2. Development work has been started on use of different lubricants for these mandrels.

Extruded Tube Warp

The initial NIE extrusions made by Manufacturing warped badly during cooling on the runout table. These tubes were straight when extruded but started to warp approximately three to five minutes following extrusion. Continuous rolling of the tube during cooling did not improve the straightness.

In an attempt to eliminate the above problem, billet temperatures were reduced to 1155 F, the minimum of the Process Specifications. This reduction in billet temperature eliminated 90% of the problem.

A side effect associated with the above problem is warp following beta heat treatment. Very few acceptable pieces were obtained following beta heat treatment due to very high warp figures, but preliminary data shows a considerable reduction in beta heat treated warp rejects of material extruded with lower billet temperatures. This data is by no means complete.

Some background on the problem is that very few (4 or 5) NIE extrusions were at temperatures above 1160 F during development work. Lower temperatures were used to reduce the as-extruded uranium grain size at the front portion of the coextrusion. The exact effect of the large grains was, and is, not known but it was felt that the grain size in the inner tube should compare with those in the outer tube. However, when specifications were written, it was believed that until further data on the effect of large grain size was available and to optimize furnace cycles for preheating, the temperature of both billets should be the same. The effect on tube straightness of 10 to 20 F was not remotely suspected. It had also been proven that the effect on grain size was primarily controlled at the two temperatures involved by extrusion speed.

To further evaluate the effect of billet temperature on as-extruded warp and beta heat treated warp, a series of NIE billets will be processed prior to any further Manufacturing extrusions of NIE materials.

Tube Cutting

Considerable work was performed during the month on alignment and quality performance of the abrasive cutoff saw. The initial cuts made by the saw were not perpendicular to the tube axis within the specified tolerance requirements.

Investigation showed considerable misalignment of the saw components which created a large portion of the out-of-square condition. The saw has been completely aligned and its capabilities have been defined for NIE material.

A detailed report on the saw capabilities for NIE material will be issued by 9/29/61. The conclusions of this report are that NIE material can be cut within one-half degree of square and that most cuts will be in the 1/4 degree range.

Experience with NOE cutting will begin on 9/28/61 and sufficient data should be available for evaluation by 10/4/61.

Copper Welding

During the latter part of this month, Manufacturing has started to can 7-1/2 inch diameter coextrusion billets in silicon copper cans. A process has been formulated and results are satisfactory.

Manufacturing has also expressed the desire to attempt to salvage the copper components that have been rejected for out-of-tolerances. To accomplish this, it is planned to work out processes of filler metal addition. An automatic wire feed unit and two spools of .030 inch diameter wire, one Everdur, the other Oxweld 63, have been procured. Both wires will be used to ascertain which has the greater potential. The addition of filler metal will help considerably and will also allow relief from the present tolerances.

Chemical Milling

A horizontal chemical milling basket for full size N-fuel elements has been fabricated and is now being installed in the 306 Pilot Plant Chemical Bay. More complete process information may be developed on horizontal milling of N-fuels with this equipment. The bulk of process data on horizontal milling to date has been with I&E coextruded fuel elements.

Last month it was reported that a development program was initiated for liquid/liquid extraction in-process recovery of uranium from chemical milling solutions. This month, Separations Research, HLO, has reported that work was being concluded on this program and indicated that a laboratory process had been successfully developed. An Engineering study will be made for equipment specifications and the cost for installation on a pilot scale in the 306

Coextrusion Pilot Plant. As previously pointed out, this process would provide better solution control and process uniformity, as well as savings in reduced chemical consumption.

Abrasive Blasting

Installation of the Vacu-Blast unit in the 300 Building has been completed. During the month, two types of NIT-ID nozzles were tested, (1) the open end of a 1/4 inch ID lance, and (2) a nozzle silver soldered to the lance consisting of two 1/8 inch holes at 30 degrees to the axis of the tube. The test showed that both nozzles would adequately clean the ID. The test also indicated that the nozzle with two 1/8 inch holes was more efficient than the open end nozzle.

Several pieces were blasted at a slow traverse rate to determine the effect on material removal. The maximum measured change of an NOT OD for a traverse rate of 1.1 in/min. was 0.003.

Experience has shown that a hot water rinse or a hot alkaline rinse provides better cleaning prior to blasting than trichloroethylene degreasing.

Pressure Bonded End Closure

Development work to date on the cathodically etched pressure bonded (650 C at 10,000 psi) end closure has shown that high strength U:Zr bonds are achieved reliably. The clad-cap (Zr:Zr) bond is weak and usually shows some porosity.

Seven test specimens of inner and outer N-fuels having pressure bonded end closures (not welded) were autoclaved in steam at 400 C at 1500 psi. All specimens failed after 16 hours of exposure with complete uranium oxidation. It is not known when failure occurred in this 16-hour period. Examination of the bond line between the cap and sidewall revealed porous regions that were the likely entry path for steam.

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TESTING METHODS ENGINEERING**DECLASSIFIED**Process Fuel Element TestingUE-1 Bond-Penetration Testers

Attempts to evaluate present fractured or "brittle" bond quality trends have not been successful due to inconsistencies in bond tester data. The problem stems from the poor signal response obtained from these kinds of unbond defects, which, at best, is marginal for automatic readout purposes. It thus appears that present test equipment is incapable of supplying meaningful "brittle" bond test data. Laboratory efforts to develop better test techniques for this purpose are underway; data obtained to date appear very promising.

Operation of the Bond-Pen stations was otherwise satisfactory. Good results continued to be obtained in the detection of void and non-wet types of unbond defects. The tape head installation is complete. Performance of this equipment is expected to show further improvement as maintenance crews become accustomed to their use. A potential problem exists as a result of the unexpected high failure rate of external bond test transducers. This problem is currently being discussed with the vendors.

UT-2 Fuel Core Test Stations

Several weeks operation of the quench crack detector on all four UT-2 stations has been satisfactory. Through careful transducer alignment and other techniques this test has been made relatively insensitive to surface defects other than quench cracks. In a test involving over nineteen-thousand recovered cores, for example, only about one and five-tenths percent of the cores were rejected by the tester. Two of these were revealed to have severe quench cracks. Yield losses are much less on virgin material because of the comparatively smooth surface of this material.

Continuing circuit development, and other efforts to devise improved operating methods, have successfully improved reliability of grain size test data. Peak, average and difference grain size as obtained from all testers on the same material now agree within two percent.

N Fuel Testing

The N Fuel cladding testers have shown satisfactory operation to date - although material throughput has been somewhat less than expected. Testing efficiency is expected to increase as operators gain experience. One incidence has occurred in which destructive examination brought to light errors in the cladding thickness test data. Although the situation was readily corrected with only minor maintenance of the equipment, the fact that the faulty operation was not otherwise apparent points out a continuing need for destructive tests to cross-check this particular

test.

Transducer failures have been prevalent with the end closure test. Investigations are underway to develop the use of more reliable transducer material. Standards for essentially all of the tests have been completed and are in beneficial use.

UT-4 Prototype

The UT-4 prototype has been completed and is now in the laboratory undergoing checkout. No major problems have developed. Conveyors to continuously re-cycle test material through the equipment is being installed in order that potential trouble spots may be uncovered.

Fabrication of the project equipment is progressing slightly behind schedule. Although purchase of certain critical items required unexpected lead times, it is still hoped that four units will be completed and in place by year's end.

New Test Development

Uranium Surface Contamination Monitor

Tests designed to better define the capabilities of the N Fuel surface contamination tester have revealed that a standard element containing a surface smear of approximately one-hundred micro-grams of uranium responds with a background count five times background. Eighteen N Fuel elements tested at this sensitivity level revealed no evidence of contamination. Modifications are now being developed to apply the test to the ends and inner surfaces of N Fuel.

Post Irradiation Studies

Scoping of the test facility has been completed and equipment will be ordered in October. Complications in testing the irradiated material include bumps on inner surface, necking down of outer surface detection and problems associated with testing of self-support elements. Design is underway and about twenty-five percent complete on mechanical equipment for these tests.

Hanford Test Reactor

Preparations are being made to test NPR graphite dust generated during construction of the core. A program for determination of Plutonium concentration in PRTR fuel elements has been drawn up using the HTR as a neutron source and detecting with scintillation counters.

Ultrasonic Quench of AlSi Fuel

Experiments have investigated the effect of quenching AlSi canned fuel elements in water irradiated with ultrasonic energy. Five ceramic fifteen KC ultrasonic transducers were mounted in a twenty-five gallon oil drum

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(filled with room-temperature water) and driven with approximately one KW of energy. Destructive examination of some eighty elements, only half of which were quenched with power applied to the transducers, revealed no significant differences of bond quality between the two respective groups of material. Although these results are not considered definitive in view of the inefficiency with which this arrangement coupled energy into the canned fuel element, an interesting effect was observed in that ultrasonic energy quickly blasted any AlSi "slop-over" from the outside sleeve surface.

Bond Inspection of Fluted N Fuel

Techniques have been developed and applied to the bond inspection of the experimental "fluted" geometry N Fuel that is under development by Fuel Element Design Operation, Hanford Laboratories Operation. Of the limited number of pieces examined to date, no instances of unbonding has been detected.

End Cap Thickness Tester for N Fuel

Similar to equipment developed and successfully applied to AlSi fuel, an instrument is being developed to nondestructively measure the end cap thickness of N Fuel. A one and five-tenths KC transformer is placed on the end of the element and connected in a null-balance arrangement. The system is balanced to zero on a cap thickness corresponding to the minimum acceptable value. Deviations from this standard value give positive or negative readings depending on whether the cap is thicker or thinner than the standard. Following successful bread-board demonstrations a pilot unit for 333 Building use has been placed under construction.

Lamb Wave Testing

Production line problems with internal bond probes have spurred laboratory investigation into optimizing Lamb wave probe design. Tests have shown that little improvement can be obtained by changing from the present setting but that more closely controlled settings are necessary and that fixed, non-adjustable fixtures appear preferable. All variables have been determined except crystal to spine spacing which is still being investigated.

Continued study of use of Lamb waves for detection of fractured bond on non-wet type elements has been promising. By operating at a higher frequency (twenty MC) and using three-sixteenths inch quartz transducers large signals can be detected from an N type Zirconium clad core with a borderline type unbond. Signal to background noise ratios of ten to one for this defect is a noticeable improvement over the reflection test presently used. More elaborate tests are planned to determine the ability of this method to detect types of fractured bonding on AlSi elements. The bonding on AlSi elements is not strong at best and signals are received even with the better bonds so that a comparison with fractured bonds is more difficult and complicated. An amplitude sensitive mapping of the complete element will be investigated using the new intensity modulated mapper.

Manager, Engineering

LH McEwen:dl

FINANCIAL OPERATIONSEPTEMBER, 1961

The semi-annual physical inventory of precious metals was taken during September. All quantities on hand were recorded and verified by Financial representatives. Formal reconciliation and reports will be issued during October.

During September the first production runs began in the Coextrusion Shop. Coding systems and accounting methods are in place to appropriately identify costs of work stations which have begun productive work. Costs chargeable to production in September include process materials, labor and indirect expense associated with the stations in operation and a share of general overheads.

Preparation of the FY 1962 Midyear Budget Review is in process. The budget is scheduled for completion by November 17, 1961.

Departmental components are now gathering the following information for use in Budget preparations:

1. Personnel forecasts by Subsection.
2. Overtime hours forecast
3. Personnel forecast by end function
4. Estimate of other costs and on-site service

Production assumptions will be based on the official forecast schedule for issue during October.

Travel expense for September amounted to \$4,700 and reflected 111 days in travel status.

Eleven OPGs were issued during the month and two proposed drafts were reviewed. There are three HAPO guides presently on hand pending issue and one guide revision being reviewed.

Seven tuition refunds of \$15 each were issued to qualified employees for satisfactory completion of work at the Graduate Center.

Assistance was provided in the preparation of an agreement with the General Engineering Laboratory in Schenectady to cover the repair and loan of instruments, certification of instruments to standards and instrument design and consultation as needed for the Instrument Shop of Plant Facilities Section.

Project CAF 894, Increased Compressed Air Capacity - 384 Building, was completed during August. The Construction Completion and Cost Closing statement for the General Electric portion of the work was issued during September. Total G.E. incurred costs including a \$400 accrual to cover unitization and other engineering amount to \$15,000, the entire amount authorized. The project entailed the installation of an 835 cubic feet per

minute compressor and construction of a 594 sq. ft. addition to the north side of the 384 Building to house the compressor. The effective capacity of the system was increased 90% by the addition.

Concurrent with the start of production, depreciation of a proportionate share of the Department's common use facilities is being charged to coextruded products. The September charge amounted to \$7,000 and will increase substantially as more assets are added to the "In Service" accounts. After completion and booking of the project in December, depreciation costs applicable to coextruded elements will level off.

Preliminary steps have been taken in the implementation of the newly revised OPGs 1.6 and 1.12 and General Accounting Instruction 1350. The revisions, which were instituted by General Manager, HAPO, essentially restrict all departments except CE&UO from the performance of engineering work on Plant Acquisition and Construction projects. The respective departments will, however, retain responsibility for the performance of owner-manager functions.

Proposed format, content and frequency of EDP prepared fixed property reports have been reviewed with appropriate Contract & Accounting personnel. Although the Department's fixed property records will not be maintained by the EDP equipment until well into CY 1962, report requirements are currently being integrated into the machine program. An effort is being made to minimize the number of reports and yet provide adequate information for identification and analysis by both financial and operating management. Provisions are also being made to facilitate the use of the Department's unique fixed property identification tagging system.

AEC Directive 161, Modification 4 extending the completion date of Project CAF 847, New Fuel Cladding Facility from October 1 to December 31, 1961, has been issued. The time extension was necessary because of delay encountered in negotiations for four additional autoclaves. The balance of the facility and production capability, except for the autoclaves, are not affected by the extension.

Mechanization of the production forecasting portion of the Manufacturing procedures study has been completed and work in production scheduling is currently underway. The portion of work now completed makes it possible to produce in $2\frac{1}{2}$ minutes of computer time, work normally requiring one week of manual endeavor.

Study of essential material pricing was completed during September and report issued.

Work in the area of SS accountability is currently directed toward reduction in accountability stations with the concomitant reduction in SS material transfers and related record keeping.

Design for a new cost improvement sign and other promotional ideas were completed and passed to Plant Facilities for accomplishment.

Four new cost improvement proposals were received in September bringing the total for the year to 41. Dollar savings realized to date total \$671,623, 134% of CY 1961 goal and 65% of target. Four proposals totaling \$76,559 are currently under evaluation.

No reports of unusual significance were issued during the month.

Manager - Finance

WS Roe :mh

PLANT FACILITIES OPERATIONSEPTEMBER 1961I. RESPONSIBILITY CHANGES

Effective October 2, 1961, the Plant Facilities Operation will assume the responsibilities for integrating and coordinating nonexempt personnel placement, transfer, promotion and downgrading activity for the Department and liaison with Relations Operation Employment Office. Other former Relations functions assumed will be pre-retirement counseling for the Section; conduct of exit interviews for nonexempt; arranging for testing of nonexempt employees; and administration of the Supervisory Selection Program. All of the above functions will be assigned to the Specialist, Plant Facilities Administration.

II. ACHIEVEMENTA. Statistics1. Duplicating

<u>Process</u>	<u>No. of Impressions</u>
Multilith	748,948
Verifax	12,156
Ozalid	14,145

2. Utilities

	<u>Sept.</u>	<u>Aug.</u>
Average steam generated (M lbs/hr)	52	36
Maximum steam generated (M lbs/hr)	81	45
Total steam generated (M lbs)	37,140	26,700
Coal consumed (tons)	1,879.5	1,295.4
Evaporation rate (steam/#coal)	9.88	10.3
Efficiency - Actual	64.0	63.5
Efficiency - Theoretical	68.0	67.5
No. of Boilers on: 2 4 3 4 5 4		
Date of Change : 16 17 20 21 22		
Sanitary water from 3000 Area (M Gals.)	159.83	168.37
Total water from 3000 Area (Avg. Rate GPM)	3,700	3,772
Total water from #3 and #4 Wells (M Gals.)	19.93	18.42
Total water from #2 Well (M Gals.)	.30	.30
Peak water consumption for 24 hrs. (M Gals.)	5.9	5.9

B. Operating Experience

Boiler Nos. 1, 2, 3, 4 and 5 were utilized during the month to maintain adequate steam generation during the period. Dow Industrial Service was chemically cleaning Nos. 3, 4, 5 and 6 Boilers. No. 6 Boiler experienced a failure of a bell reducer located in the rear header circulating section. The failure occurred after cleaning was completed and before firing the boiler. After microsonic examination the cause of the failure was attributed to thermal fatigue. A new reducer section was installed and hydro-hammer tested. All field welds of the new reducer section, the welds of the existing reducer section on the opposite side of the boiler, and the saddle weld of the tubes leading to the mud drum were radiographed and approved by the welding engineer. No. 4 Boiler is ready for overhaul and work will begin when No. 6 is back on the line about Oct. 5, 1961. Extensive electrical renovation and cleanup was completed during the month, throughout the 384 Building, including Class A overhaul of all motors on No. 6 Boiler.

The ash sluice transport line from the 384 Building failed for the second time on September 17, 1961. Temporary repairs were made to hold the line until it can be replaced with a more durable pipe. It is planned to have this new line in service by October 31, 1961.

It is planned to remove the new No. 5 air compressor from service for a few days during the month of October to revise the air intake manifold. The other four compressors will be used while No. 5 is down.

A second failure of a sand collector grit pot occurred and the existing pots will be replaced with rubber lined pots to retard the sand erosion.

The north process pond is full and will require cleaning. The south pond will be utilized while the cleaning of the bottom of the north pond is carried out.

The prototype BF₃, fabricated in the portable instrument shop and sent to the field for evaluation, was returned with favorable comment. Drawings are now being prepared to permit outside vendors to bid on the fabrication of this unit.

C. Equipment Experience

Reactor operation at PRTR this month was the most successful to date. There were three main outage periods. The first was devoted almost exclusively to repairing D₂O and helium leaks and substantial reductions were achieved. The second was an unscheduled twenty-four hour outage, which permitted the accomplishment of work without danger of delaying reactor startup. During this particular shutdown the systems are pressurized and the reactor is ready for operation but is held down because of xenon poison buildup. During this outage it was discovered that two of the 4 dump valves failed to open due to the occurrence of two grounds in the system. The two grounds formed a path through the two dump valves, thus not allowing them to open. Neither ground showed up on the ground detection system. The condition has been corrected and a modification to the ground detection system is being engineered to eliminate recurrence.

The last outage was the planned 5-day one just completed. Principal jobs completed during this period were:

1. Four ion chambers were replaced. These were accomplished in radiation beams of 200 to 360 R without a single "burnout."
2. Replaced trim on a large 6" valve on the inlet to the deaerator. The new trim will provide better flow control.
3. Installed dual power supply for light water injection system to reduce chance of accidental trip.
4. Repaired oil leak on high pressure helium compressor. This leak was between the high pressure head and the compressor body. The successful method for sealing this leak was to seal weld a special expansion joint fabricated from a quarter section of 3/8" pipe bent into about a 6" circle on the outside of the seam.
5. The bellows was replaced on R-3 valve, located in the reflector system. The job required freezing of a 4" line twice since machining of the internal parts of the valve were needed to fully effect repairs.
6. The secondary system chemical addition pump was completely overhauled and strainers installed in the lines.

C. Equipment Experience (Cont'd)

7. One process tube was relocated and one was replaced. High radiation beams were encountered on both the top and lower reactor faces during the job.
8. Repairs were completed on the top and bottom shield coolant pump #1 and new type seals were installed.
9. The design change involving gasometer level instrumentation was completed. Other design changes covering revisions to the IP compressor control pressure switches and providing sampling stations at manhole #2 and the river overflow structure were also completed.
10. A new Graham heat exchanger was adapted for use on the helium dryer. The old exchanger was badly corroded and had ruptured in several places.

A Washington State elevator inspector performed an inspection on the building freight elevator in the 308 Building. Upon completion of the inspection he complimented the maintenance group on the excellent condition of the equipment.

A new instrument rack was fabricated for the Radiological Chemistry Counting Room in the 325 Building. The new installation provides increased flexibility and decreases equipment downtime.

A few delays have been experienced on the non-isothermal loop in the 326 Building due to problems encountered with sulphur in the metal, which caused weld failures. This problem seems to have been solved satisfactorily.

The painting of safety signs and striping in 333 and 309 Buildings is completed.

The 220 KVA X-ray located in 3745 Building required considerable attention during September due to erratic operation. Weak rectifier tubes required replacement and one X-ray tube failed. The unit has been restored to service. The 256 Channel Analyzer located in 3745-B was restored to operating condition with the assistance of a technician from the manufacturer's plant. Cause of failure was attributed to poor workmanship during the original vendor fabrication and extensive modifications performed at Hanford over a period of several years.

C. Equipment Experience (Cont'd)

The electrical work required for the NFR charging machine was drastically altered during the month and will require considerably more work than had been anticipated. It is now expected that it will be late in October before the job can be considered complete.

D. Inventions and Improved Methods

All personnel in the Operation engaged in work which might lead to inventions and/or discoveries advised that, to the best of their knowledge, none were made in the course of their work during the month of September 1961.

E. Costs and Savings

It is anticipated that improved operating efficiency will be achieved from Boilers 3, 4, 5 and 6 since their being acid cleaned this month. Several months of operation will be required before this can be determined. Two cost improvement items are currently being considered, one for \$618 and the other as yet undetermined. Total annual savings remain at \$88,154 -- 73.5 per cent of CY-1961 goal.

F. Status of Projects and Major Jobs

Compressed Air Expansion, 384 Building, Project CAF-894 -- The procurement necessary for modification of the intake air filter system for the No. 5 compressor was under way by J. A. Jones. This work is scheduled for the latter part of October.

Replacement of Breeching Damper - The draft gage installation from breeching to control panel is to be completed by mid-October.

Ash Disposal System, 300 Area - Completion is being delayed due to the necessity to replace part of the ash sluice line.

Modification of No. 1 I.D. Fan - Pipe fabrication continued during the month. Due to the late delivery of the turbine and gearbox, this job will not proceed until Spring 1962. Approaching weather conditions will not permit this unit to be out of service until the heating load subsides.

Water Chemistry Laboratory - Complete except for minor piping installation.

F. Status of Projects and Major Jobs (Cont'd)

384 Building Maintenance Shop - The bid opening for this job is October 3, 1961.

No. 6 Boiler Overhaul - The pari-flex coupling between the motor and the I.D. fan is complete as is the installation of the magnetic clutch between fan and turbine. The quick-opening solenoid steam valve is installed and the wiring should be complete early in October.

Chemical Cleaning of Boilers - Dow Industrial Service completed acid cleaning of Boiler Nos. 3, 4, 5 and 6 on October 1, 1961. Total cost is in the neighborhood of \$8,200. Before and after scale thickness checks indicate a good job was performed.

Ash Disposal Line Replacement - A purchase order has been placed for 522 feet of 8 inch ash handling pipe. Delivery is scheduled for October 11, 1961 with excavation to start October 2, 1961.

Street Paving, 303 Area - Due to problems in connection with forklift traffic and because of the approach of cold weather, a crash program is under way to repave the street between 3722 and 303-J Buildings. A fixed price contract in the amount of \$6,500 is to be let by J. A. Jones. The work is to be completed early in October.

Lawn Sprinkler System, 3760 Building - The bid package is essentially complete and the request for AEC Contract Services is scheduled for the first week in October.

Monumenting Burial Grounds, 300 Area - Locations for about 200 monuments have been staked in the field. The specifications and bid package are being prepared for fixed price contracting.

Major Studies

300 Area Telephone System - An analysis of the current FPD usage was made and a report issued to Section Management covering utilization and suggested areas of improving telephone usage.

F. Major Studies (Cont'd)

Steam Distribution in 300 Area - A new schedule has been developed for unmetered steam in the 300 Area. The new system has been submitted to Finance and is based on the accuracy of flow meters in 306, 306-A, 313 and 321 Buildings and the laboratory condensate meters.

328 Building Electrical Discharge Machine - Considerable time has been spent with the factory engineer and plant electricians in trouble shooting the "Electrojet" electrical discharge machine, which is used for working tempered metals in ELO. HLO has requested that we make the necessary improvements and establish standards for trouble shooting this equipment.

G. Significant Reports Issued

300 Area Telephone System Analysis prepared by T.H.Whatley.

Emergency Power Load Study by T.D.Sibbs, dated Sept. 27, 1961.

III. PERSONNELA. Safety, Security and Radiation Experience

Medical Treatment Injuries	21
Frequency Rate	3.37
Disabling Injuries	0
Serious Accidents	0
Security Violations	0
Radiation Incidents	1

One radiation incident was experienced in the PRTR when a pipefitter received high radiation to his hand when he handled a radioactive pin (about 100R) from a fuel element hanger. The incident happened when he was cleaning up his tools and other loose material after changing a rupture disc at the bottom of the fuel transfer pit. The survey of the 26 foot deep pit by the radiation monitor by means of a GM suspended from a long cord revealed nothing and he okayed entry to do the work.

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III. PERSONNEL (Cont'd)

B. Meetings

Round Table-Staff	18
Safety and Security	26
Information	9

Manager
Plant Facilities Operation

E. Hilgeman:RTM:mkm

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RELATIONS PRACTICES OPERATION
SEPTEMBER, 1961

STATISTICS

<u>EMPLOYMENT</u>	<u>September</u>	<u>August</u>
Additions: Exempt	1	3
Nonexempt	<u>22</u>	<u>9</u>
	23	12
Reductions: Exempt	4	2
Nonexempt	<u>14</u>	<u>13</u>
	18	15

SECURITY

Violations - FPD	1	2
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SUGGESTION PLAN PARTICIPATION

Eligible Employees	711	702
Suggestions Received	53	76
Annualized Rate/1000 Eligible Emp.	895	1,299
Number of Suggestions Adopted	71	18
Net Annual Savings	\$7,394	\$3,579
Amount of Awards	\$1,515	\$445
Per cent of Total Awards to Savings	20.5	12.4
Average Amounts of Awards	\$21.34	\$24.72

Employment

The one exempt addition in September was a transfer from IPD. The four exempt reductions were K. W. Atwood, Summer Professor; T. W. Cannon, Engineer (summer temporary); and two transfers to other HAPO components.

Five craft trainees on the Craft Training Program were added and this completes our total requirement of ten.

Nonexempt reductions included one retirement, two military service leaves, and two resignations.

Security

One violation was recorded in the Department in September. Violations CY to date total seven

Benefits

Seventeen applications for tuition refunds for fall course work have been approved.

Eligible nonparticipants in the Savings and Stock Bonus and Savings and Security Programs are being recanvassed through a planned program.

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Significant Reports Issued

No significant reports were issued by the Relations Practices Section during September.

Acting Manager - Relations Practices

GD Barr:mfj

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