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FUELS PREPARATION DEPARTMENT

MONTHLY REPORT FOR AUGUST, 1959

Compiled by Fuels Preparation Department

September 23, 1959 Richland, Washington

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TABLE OF CONTENTS

General Summary	A-1 through A-5
Manufacturing Operation	B-1 through B-8
Engineering Operation	C-1 through C-18
Financial Operation	D-1 through D-1
Maintenance & Power Operation	E-1 through E-2
Relations Practices Operation	F-1 through F-2

FUELS PREPARATION DEPARTMENT
MONTHLY REPORT SUMMARY
FOR AUGUST, 1959

PRODUCTION

Five hundred twenty-one tons of acceptable uranium fuel elements were produced. This was 93% of forecast production.

At month end there were 613 tons of bare uranium cores in storage, compared to 525 tons at the end of July. Finished fuel element inventories in combined 100-300 Area storage totaled 674 tons, compared to 760 tons at the end of July.

ENGINEERING

Fuel element performance continued on a favorable trend with regular production failures equal to the lowest reported for any single month this year.

Braze layer defects received special study to determine the effect of pinholes on weld closures and needs for new standards or process steps to eliminate resultant rupture prone material.

Hot spot production test indicated two-thirds of the failures were due to misalignment and one-third to bond quality.

Slug blank warp reduced by changing quench temperatures at National Lead.

Nickel plate adherence on C-64 jacketed fuel elements significantly improved by five to ten minute heat treatment at 400 C with no deleterious effects on bond quality observed.

Metallographic examination of irradiated Ni plated elements showed that: (1) the plate prevented corrosion in hot spot regions; (2) observed plate separation in other areas was not due to water entry and subsequent undercutting; (3) intergranular attack occurred in one hot spot fringe area where higher than normal surface temperatures existed; (4) aluminum corrosion at plating discontinuities in areas of normal surface temperature was negligible.

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HW-61756

Aluminum cleaning and wettability tests were emphasized in pilot plant activities to further improve cap and can wetting in order to reduce unbonds.

Two coextrusion runs completed during the month. General results were good and desired data was gained. Four additional billets prepared and scheduled for September extrusion.

Zircalloy extrusion at Nuclear Metals, Inc., of three primary billets for HAPO clad components indicate that standard lubrication techniques may be feasible, thereby eliminating the need for copper jacketing of billets in the coextrusion process. Further work necessary to develop this concept.

GENERAL

Manufacturing yield for 8" I & E fuel elements improved sharply to 85.3% versus 80.9% last month. The external braze layer integrity and braze layer contamination reject category improved. Operating efficiency was 93.2% compared to a forecast of 94%.

A prototype core grain size and surface quality tester was installed at month end. This instrument, sometimes referred to as the attenuation tester, is expected to replace present nondestructive transformation testers.

A comparison was made of HAPO and Savannah River Operation fuel preparation costs for FY-1959.

Arrangements with Data Processing Operation were completed for the processing of costs related to work orders which will result in advancing the weekly reporting to field personnel by three to four days. This action will eliminate certain field clerical work now performed.

A request for a rescue bus for use in the 300 Area was approved by the Commission. This vehicle will be modified and available in case of emergency in the area.

A disabling injury was sustained by an employee of the Maintenance & Power Operation. This employee, a carpenter, knelt on a small lag screw and was hospitalized with pre patellar bursitis of the knee.

PERSONNEL STATISTICS

Number of employees July 31, 1959 726
 Number of employees August 31, 1959 730

	<u>Exempt</u>	<u>Non-Exempt</u>	<u>Total</u>
General	1	1	2
Manufacturing	54	286	340
Engineering	51	29	80
Financial	13	7	20
Maintenance & Power	32	245	277
Relations Practices	5	6	11
 TOTAL	 156	 574	 730

STAFF

General Manager, Fuels Preparation Department	L. L. German
Manager, Manufacturing Operation	W. M. Mathis
Manager, Engineering Operation	J. W. Talbott
Manager, Financial Operation	W. S. Roe
Manager, Maintenance & Power Operation	E. Hilgeman
Manager, Relations Practices Operation	W. A. Shanks

PATENT SUMMARY - AUGUST, 1959

All persons engaged in work that might reasonably be expected to result in inventions or discoveries advise that, to the best of their knowledge and belief, no inventions or discoveries were made in the course of their work during August, 1959 except as listed below. Such persons further advise that, for the period therein covered by this report, notebook records, if any, kept in the course of their work have been examined for possible inventions or discoveries.

<u>Inventor</u>	<u>Title</u>
H. L. Libby	Eddy Current Ultrasonic Transducer (HW-61629) A method of generating and detecting ultrasonic waves in metals by eddy current means.

General Manager
 Fuels Preparation Department

LLGerman/jm

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HW-61756

MANUFACTURING SECTION

August, 1959

CURRENT OPERATIONS

Production and Productivity

Statistics

	8" Solid	NORMAL 8" I & E				6" Water Mix	ENRICHED 6" I & E			6" Solid	Total
		C	K	Rev. K	O		C	K	O		
Current Month's Production											
Acceptable Fuel Elements Produced (Tons)	65.2	66.8	99.5	69.3	178.2	0.1	8.6	33.5	-	-	521.2
As % of Forecast Production	99	128	89	77	93	-	96	134	-	-	93
As % of Past 3 Month's Average Production	116	142	163	94	85	5	96	129	-	-	104
As % of Past 12 Month's Average Production	105	202	106	169	88	3	32	279	-	-	106
% of Forecast Achieved Last Fiscal Quarter	106	95	73	102	101	106	76	113	94	-	98
% of Forecast Achieved Last 4 Fiscal Qtrs.	109	101	107	75	107	152	96	106	95	72	103

Operating Efficiency

Current Month (%)	93.2
Forecast (%)	94.0
Previous Month (%)	92.8

Manufacturing Yield

Current Month (%)	88	85	87	86	83	-	85	82	-	-
Forecast (%)	82	82	82	82	82	-	82	82	82	-
Previous Month (%)	87	-	84	84	79	53	86	86	82	-
Bare Uranium Available for Processing (Tons)	95	81	64	156	108	2	31	22	54	- 613
Finished Products in Storage (Tons)	78	86	88	132	185	7	26	44	28	- 674
Special Products Finished (Pieces)	Poison									2400
Uranium Utilization										94.9

ACTIVITIES

Production

Finished production for the month of August was 521.2 tons, 93% of the official forecast. Production was achieved through the use of eight canning lines except for a two week period beginning August 10 when an extra line (ninth line) was placed in operation. Operation of nine canning lines all month was purposely avoided to conserve bare core inventories. Extra manpower, available when the ninth line was not in operation, was utilized to produce "N" and poison elements.

Yield Control

Favorable yield trends were sustained during August with gains made in most major product lines. The August 8" I & E yield was 85.3% compared to 80.9% last month. The 8" solid yield was 87.9% versus 87% in July. Significant gains were made in the external braze layer integrity, braze contamination and external thin wall reject categories. These gains were partially offset by a slight increase in the assembly reject category.

AlSi slopover rejects continued to be a problem during August. Shipments of new sleeves with a one mil smaller inside diameter began arriving near the end of the month but could not be placed in operation soon enough to significantly alleviate the AlSi reject problem. On August 13 acceptance sampling of in-process sleeves was initiated to remove those that were apt to cause AlSi rejects. A sleeve lot is being removed from service when sampling indicates that more than 5% of the lot is outside established limits. Tests have also shown that the long preheat cycle lessens the AlSi problem but this cycle was used on a very limited basis during August because of other process difficulties.

Braze layer quality improvements achieved this month are attributed in part to daily changes of component preparation solutions. The alkaline cleaning solution and the deoxidizing solution in the aluminum component cleaning machine were changed every 24 hours. Frequent changes of these solutions appears to reduce the severity of component nonwetting.

The long preheat cycle was run periodically on one canning line from August 5 through August 12. Since earlier tests showed that the cycle was prone to cause nonwetting, an attempt was made to mitigate this condition by increasing the submerge time. The cycle requires a 73 second preheat and a 37 second submerge time but is otherwise identical to the regular cycle. Observed advantages of the long cycle were higher external bonding layer integrity, lower internal thin wall defective rate, and fewer AlSi slopover rejects. Coincidental disadvantages were increased internal bonding layer integrity and external thin wall defective rates as well as the stronger tendency toward nonwetting. Viewed over-all, the optimized cycle weighs on the plus side of the balance. However, the higher incidence of nonwetting which is associated with it makes its adoption impractical until better wetting is achieved through modified cleaning processes.

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HW-61756

Evaluation of proposed new radiograph standards during a two-week period indicates that a rejection rate of about 4-5 percent might be experienced if these standards are adopted. Since the full effect of these standards in relation to closure integrity of outgoing material is not known, it was decided to continue using the existing standards, but placing a special identification mark (a triangular stamp) on the base of all I & E fuel elements which contain defects of the type covered by the proposed standards. This identification should make it possible to trace the material and thus determine if such pieces are more rupture prone.

Only one autoclave failure occurred in August compared to four last month. This failure was a partial one, being a blister on the can wall near the female end of the piece and apparently being associated with a pinhole in the female weld bead.

Other Activities

The Special Products crew fabricated 2400 Pb-Cd pieces and 513 "N" pieces during August. Emphasis was placed on production of these elements rather than on the reprocessing of regular fuel elements with defective welds. Consequently, the backlog of work awaiting reprocessing increased to about 9500 fuel elements.

Development efforts in the 306 ALSi Pilot Plant were concentrated on component cleaning methods. Fifteen separate tests were conducted in the Pilot Plant during the period resulting in the canning of 4426 fuel elements and wetting tests on 2355 aluminum components. New chemical cleaning solutions were evaluated, a new chemical dryer was tested and effects of impurities in cleaning solutions were studied.

The following pieces were processed through the Fuel Recovery Operation:

8" Solid	2,615
8" I & E	27,793
6" Water Mix	<u>751</u>
Total	31,159

PLANT CONDITIONS, INCIDENTS AND IMPROVEMENTS

General

Operating efficiency improved somewhat to 93.2% this month but remained slightly below forecast of 94%. Process problems, lack of relief manpower particularly during the period that nine canning lines were operating, and meeting time taken to discuss product quality contributed to canning down time.

The inventory of bare uranium cores increased to 613 tons at month end compared to 525 tons on hand at the end of July. NLO was able to meet our minimum metal requirements during August by delivering approximately 645 tons. Curtailing the operation of the ninth canning line also helped to improve the bare metal situation.

Inventories of finished fuel elements decreased to 674 tons compared to 760 tons on hand last month. Reactor usage of finished fuel exceeded the forecast by about 13%. The finished fuel element inventory level and the balance of finished product types were adequate during the period.

Horizontal Agitation

It appears that horizontal agitation of bare uranium cores in the duplex furnace has been sufficiently tested and evaluated to demonstrate its value as an improved operating technique. Only one prototype horizontal agitator is presently available for production use. However, Manufacturing and Engineering personnel have agreed to expedite the adoption of this technique on all canning lines. Horizontal loaders must be fabricated and the present duplex agitators must be modified to accommodate this change. In the meantime the prototype model is being operated as often as possible.

Nondestructive Testers

A prototype attenuation tester for core grain size and surface quality evaluation was installed in 313 Building at month end. Initial tests were run to compare the instrument's performance with that of the existing transformation testers with favorable results. Production models of the new instrument are scheduled for completion by November 1.

During August the reproducibility of six bond testers was tentatively established using 20 fuel elements which varied widely in total count. These 20 fuel elements were run through each tester 20 times each. From the collected data the average total count, and standard deviation for each piece on each tester was computed. The results showed that (1) some testers drifted more than others during a two-hour period; (2) there was a large variation among testers both in total bond count and reject rate; (3) there was a fair correlation between total count and reject rate; and (4) the standard deviation increased as the total count increased.

Points (1), (2), and (4) are considered undesirable. Testing Methods, in an effort to remove part of the problem, installed a prefocused lithium sulfate crystal on the Quality Control tester. Preliminary evaluation of this crystal indicated much more stable tester operation plus an almost complete removal of the correlation between total count and standard deviation. In addition, the variation of tester results with varying residual can wall, which has been a serious problem since inauguration of this test, seemed to have been radically reduced with this new crystal and associated circuit modifications. A production line test is planned for this crystal type followed by conversion of all testers if the results are favorable.

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HW-61756

Economy Measures

Two new economy measures were adopted this month which together are expected to permit about \$2,500 annual savings. A local vendor has expressed an interest in purchasing our discarded component cardboard shipping containers and fillers as scrap paper. This material is being set aside for salvage. It has been impossible to use all the X8001 (high nickel) aluminum components in the canning process since they cause a rapid build up of nickel content in the AlSi baths. Sufficient aluminum make up metal is now being obtained from lathe scrap and other sources such that these components can be set aside and sold as scrap.

The operating efficiency of the Material Movement forces was also improved this month with the addition of two four-wheel trailers that are towed by lift trucks. The trailers will eliminate the need for several trips between the 3715 Warehouse and the 313 Building. It appears that there are also other valuable uses for this equipment within the 313 Building.

Six metal containers for shipping enriched uranium were received on August 8. These containers will permit all enriched uranium scrap to be returned to NLO along with regular scrap shipments of normal uranium. Heretofore it has been necessary to return excess enriched scrap via railway express at considerable cost.

Analytical Laboratory Activities

Support of the NPR fuel element effort has consisted of X-ray diffraction and metallographic examination of experimental samples and development of a scheme for the cleaning of coextruded samples prior to welding.

X-ray studies have been made on samples of zirconium coextruded rods and tubing. The tubing is being studied more extensively since it is the apparent extrusion product from which the final NPR element will be designed. Each sample is being studied on radial, longitudinal and transverse surfaces. The purpose of these studies is to predict dimensional changes such as longitudinal or circumferential growth which may occur upon irradiation. At the present, samples are being studied which have been heat treated in different ways to determine which set of conditions will provide an element that will be dimensionally stable under irradiation.

Cleaning of coextruded tubing prior to electron beam welding tests has also been investigated. It was found that the standard zirconium bright etch caused excessive oxidation of the uranium and inhibited the welding process. It is desirable to have the uranium as free of oxidation as possible since in addition to closing the tube, the welding should also form a bond between the uranium core and the zirconium cap. A scheme was devised and tested in the laboratory by which the samples could be cleaned and maintained free of oxidation until welding. This scheme has been submitted to the Pilot Plant for further evaluation.

Emphasis has been placed on metallographic examination of electron beam welded samples for completeness of closure and bonding. So far the electron beam techniques have not provided the desired weld. More of the samples have been completely bonded at the zirconium-uranium interface and the weld penetration has not been very deep. Engineering personnel are continuing these tests using thinner cap washers and higher current levels to see if this will improve the welds.

OPERATING PLANS

IPD has indicated that an optimized reactor production program, which includes adjustments in both reactor power and exposure levels, will increase their normal uranium requirements by 260 tons in the next five months. The majority of the increase occurs after October, and a tenth canning line may be necessary to meet the increased needs. Production and uranium deliveries will be revised to reflect the increase when the Official Production Forecast is reviewed in the latter part of September.

EMPLOYEE RELATIONS

Safety Performance

Members of the Manufacturing Section were treated for 28 medical treatment injuries. This is equivalent to a frequency rate of 5.43.

A serious accident occurred on July 29, too late to be included in last month's report. In this case an employee of Manufacturing Maintenance sustained an injury to his head and elbow when he fell from a four foot metal stepladder that upset while he was standing on the third step from the bottom. The injured was able to return to his regular duties.

During a recent wiring inspection Maintenance Engineers discovered that several llo circuits in the canning line Flex-O-Timers were still hot when the equipment had been tagged out. Circuit design modification was initiated and completed. Actual rewiring is in progress.

Radiation Control

Greater than 300 mrad	July	August
Combined Manufacturing Section Exposure	2 badges	2 badges
	6,000	5,316

Security Violations

None

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HW-61756

PERSONNEL MATTERS

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 August.

Union Relations

Three grievances were submitted by employees in the Manufacturing Section. Each of these alleged discrimination in the distribution of overtime.

Visits and Visitors

Representatives of the Federal Power Commission and the Atomic Energy Commission toured Manufacturing facilities on August 31.

A group of Naval officers toured the 313 Building Production Plant and the 305 Building Test Reactor on August 24.

On August 7, 1959, F. Hunter traveled to Seattle, Washington to discuss equipment problems with Perine Machine and Supply Co., Inc.

WM Mathis
Manager - Manufacturing

WM Mathis:RWM:gl

STATISTICS

1958-59

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ENGINEERING OPERATION
August, 1959

VISITORS

<u>Name</u>	<u>Company</u>	<u>Contact</u>	<u>Date</u>	<u>Reason</u>
P.R.Morris	NLO	C.L.Frederick	8/3,4	Discuss Ultrasonic Attenuation Test
M.E.Bergstresser	SRP	J.T.Stringer	8/11,12	Discuss welding techniques for fuel element closures
L.Lewis	Bridgeport	G.W.Riedeman	8/4 -	Discuss coextrusion
D.R.Jefferson	Brass, Adrian,	J.W.Nickolaus	8/6	program
H.Schaffer	" "	S.M.Gill	8/24 -	" "
"	" "	J.W.Nickolaus	8/26	" "
"	" "	G.W.Riedeman	"	" "
T.A.Prater	G.E.Research	J.W.Talbott	8/25,26,	Consultation on metal-
W.E.Trager	Lab., Schen.		27	lurgical problems

TRIPS

	<u>Company Visited</u>			
S.M.Gill	NLO	C.E.Polson	8/27	Discuss uranium billet development
" "	Bridgeport Brass	D.R.Jefferson	8/28	Observe HAPO extrusions
C.H.Shaw	" "	"	8/27	Perform coextrusion work
J.W.Nickolaus	" "	"	"	" "
C.H.Shaw	Nuclear Metals	H.F.Sawyer	8/31	Discuss extrusion tooling
J.W.Nickolaus	Concord, Mass.	"	"	" "
T.B.Correy	National Northern, Div. of Am. Potash & Chem. Corp., West Hanover, Mass	J.Haynes	8/25 - 8/31	Discuss explosive welding
A.J.Karnie	Baldwin-Lima- Hamilton Corp., Hamilton, Ohio	H.Matre	8/3 - 8/9	Design coordination on extrusion press
"	Loewy Hydropress	F.J.Kent	"	" "
"	New York	R.Strauss	"	" "
"	Nat. No. Div. of	E.H.Kent	"	" "
	Am. Potash & Chem.	J.A.Haynes	8/10	Discuss explosive
	Boston, Mass			Welding

TRIPS (Cont'd.)

<u>Name</u>	<u>Company Visited</u>	<u>Contact</u>	<u>Date</u>	<u>Reason</u>
L.A.Conner	Perine Machinery & Supply Co., Seattle	D.B.Petherick L.Martindale E.Delaney	8/6, 8/7 "	Inspect equipment for Finishing Operation " " "
"	Boeing, Seattle	M.Pitsen		
J.T.Stringer	MCW	Dr. Fellows	8/23,24,	Uranium heat treating and Alpha extrusion
"	Bridgeport Brass	Mr. Jefferson	"	" "

PERSONNEL

<u>Name</u>	<u>Title</u>	<u>Operation</u>	<u>Nature of Change</u>	<u>Date</u>
Nitta Hoover	Secretary	4470	Terminated	8/21
J.W.Green,Jr.	Draftsman	4480	New Hire	8/24
Gale Bollinger	Steno-typist	4430	Transferred from CE&U	8/3
C.H.Shaw	Engineer	4440	Transferred from Mfg.	8/1
K.K.Gritner	Eng. Asst.	4440	" "	8/24
F.L.Suckow	Draftsman	4480	Terminated	8/21
J.E.Bergman	Engineer	4430	Transferred to APED	8/31

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 August, 1959 except as listed below. Such persons further advise that for the period therein covered by this report, notebook records, if any, in the course of their work have been examined for possible inventions or discoveries.

<u>Inventor</u>	<u>Title</u>
H. L. Libby	Eddy Current Ultrasonic Transducer (HW-61629)
	A method of generating and detecting ultrasonic waves in metals by eddy current means

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HW-61756

PROCESS ENGINEERING

Regular Production Rupture Experience

Three natural uranium I & E fuel elements and one solid enriched fuel element failed in the reactors during August. These ruptures are summarized as follows:

<u>Fuel Element Type</u>	<u>Reactor</u>	<u>Exposure (MWD/T)</u>	<u>Rupture Classification</u>	<u>Jacket Alloy</u>
Solid Enriched	H	946	Core Split	C-64
I & E Natural	H	727	Unclassified	C-64
I & E Natural	F	886	Side Other	C-64
I & E Natural	KE	817	*	X-8001

* Lost in discharge

Fuel element performance has continued to show a sustained favorable trend, with the actual number of regular production ruptures experienced this period being comparable to the lowest reported for a single month during the calendar year.

IPD Liaison

A study has been initiated under the joint sponsorship of IPD and FPD to determine the effect of I & E fuel element braze voids on heat transfer during irradiation. This study will involve computing the effects of braze defects, 0.25 to 2.0 square centimeters in area, for fuel elements operating at specific powers ranging from 40 to 120 KW/ft.

Of mutual concern to both IPD and FPD is the establishment of adequate process control measures to reject fuel elements that may be rupture prone because of small pinholes or porosity in the weld closures. As a part of the overall program to improve closure integrity, a program was started on August 10, 1959, to determine if more stringent radiograph standards could be applied effectively to reject rupture prone fuel elements. Fuel elements passing present radiograph standards, but failing to meet tighter secondary standards, are being identified for irradiation to establish whether the marked material is more rupture prone.

Production Tests

Further analysis of the post-irradiation data from a production test to compare the incidence of hot spots on 30 tubes of I & E enriched fuel elements with bond quality shows about two-thirds of the hot spots were associated with fuel misalignment or warp. Of the remainder, the ratio of hot spots by bond test category (premium, borderline, and rejects) is 1:8:12, indicating a direct relationship between the incidence of hot spots and bond quality.

Uranium Technology

An initial shipment of 129 pieces of I & E extruded uranium cores has been received from MCW. Tests have been limited to visual inspection since the quantity is limited and does not represent extruded uranium metal quality because of the variation in processing techniques used in producing this material. Results of visual inspection

were that all material met production dimensional and surface inspection requirements.

Quench water temperatures at NLO were reduced from 130° F to 100° F during the week of 8/17/59 to determine the effect of temperature on blank warp. At the lower temperature the average warp reading was 0.009 T.I.R. with a range of 1 - 32 compared to an average of 0.015 T.I.R. and a range of 1 - 60 for the 130° F water quench temperature material. Samples of this material are presently being evaluated to determine if there is any change in grain size or orientation.

Process Technology

The Nuclear Safety Specifications have been changed to permit an unlimited array of 0.94% enriched uranium cores when individual columns are encased in iron or steel tubes 0.100" thick.

The long preheat canning cycle was run on one line from August 5 through August 12. Because of can wetting problems, additional canning using the long preheat cycle will be delayed until an improvement is made in can wettability.

Can wetting tests indicate that the pH of the final cap and can cleaning rinse is important, and that very small amounts of flux in the final rinse improve can wetting.

The present 60° radiograph trays give better definition of voids on the cap end than the new 25° trays.

Since August 10, 1959, fuel elements with certain types of voids in the cap weld have been stamped to check for ruptures associated with cap voids. The defective rate has been 4.0 per cent.

Two groups of fuel elements have been checked for voids in the base weld and braze using Xeroradiography. One group of a thousand fuel elements with voids in the cap weld had a defective rate of 8.5%. Another group of fuel elements (448 pieces) had a defective rate of 19%.

Fabrication and assembly of mechanical components for the automatic stamper has been completed. Piping, wiring and testing will be done by Manufacturing Maintenance. In deference to IPD's interest in serial stamping, two stamping heads will be purchased for appraisal.

Design work has begun on a production water-mix welder to be built around a Sheldon 10" turret lathe acquired for the purpose. A drive unit similar to that used on the automatic welders will be used, with a Flex-O-Timer geared directly to it for controlling the weld cycle.

Installation of a Detrex Kem-O-Dryer in the component cleaning line of the Al-Si Pilot Plant is complete. The purpose of this unit is to test the use of perchloroethylene vapors as a drying agent to replace the methanol-air-dry combination presently used.

Installation of an automatic dip quench machine in the Al-Si Pilot Plant has been completed and the unit is in operation. This slightly modified version of the type used in the 313 Building features two-step quenching (delayed submerge) and adjustable cap seating pressure.

Nickel Plated Fuel Elements

Work on the electrolytic-hydrogen test for adherence of nickel plate has been completed

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HW-61756

by HLO-Coatings & Corrosion Group with the standardization of test conditions and exploratory tests of nickel plate processed under a variety of conditions. Autoclaving, followed by a five to ten minute heat treatment at 400 C appears to significantly improve plate adherence. Further tests will be carried out to optimize the heat treatment.

The effect of heat treatment on the tensile strength of Al-Si uranium bond has been further assessed. Results of stud-pulling tests revealed a drastic decrease in bond strength resulted from heating to 500 C for periods of 3 minutes and longer. Heating to 400 C for as long as ten minutes has no effect. Tests are continuing, exploring times up to 24 hours at 400 C and up to 100 hours at 300 C.

Single pass process water flow tube tests continued, giving a total of 22 weeks at 120 C and 12 weeks at 165 C. Shortly, the elements will be visually examined and some of the areas having defective nickel plate will be examined metallographically to determine the extent of aluminum corrosion.

Metallographic examination of an irradiated fuel element having 1/2 mil thick chemical plate (on a C-64 alloy jacket) has been completed. Results may be summarized:

- 1) The nickel plate was effective in preventing aluminum corrosion at the "hot spot" with an estimated maximum surface temperature of 350 C. In addition, the high surface temperature appeared to be beneficial in improving the adherence and integrity of the nickel plate since the normal laminations disappeared and Al-Ni diffusion was induced.
- 2) Separation of the nickel from the aluminum was not due to water entry and resultant "undercutting" of the plate.
- 3) Intergranular attack of the aluminum occurred in an area of Ni-Al separation. This occurred in the fringe of the hot-spot area.
- 4) Aluminum corrosion at discontinuities in the plating in regions of normal surface temperature was generally negligible, and the corrosion did not preferentially follow the Ni-Al interfaces. One pit, approximately 10 mils in depth was discovered. However, whether this occurred in-reactor or in the more corrosive discharge basin water cannot be ascertained.

Present radiometallurgy work is devoted to detection of hydrogen in the gas which is present at the Al-Ni interface void.

Two X-8001 jacketed nickel plated dummy fuel elements developed areas of severe aluminum corrosion after 4 weeks exposure in a 300 C demineralized water flow loop. This behavior appears highly anomalous since a number of coupons of the same alloy and plated at the same time, showed negligible corrosion after 7 weeks in a 360 C low-flow autoclave. The loop test is being repeated with more elements having the same fabrication and plating history, and the badly corroded elements are being autoclaved to determine the effect of the flow.

Process Development

About 700 acceptable OIIN self-supported fuel elements were produced for Production Test IP-262-A-11 FP. The yield through the spot welder was 86.6% with reject rates of: 9.2% poor welds; 2.6% spot weld testing machine damage; and 1.6% malfunctioning of the automatic positioning device.

Forty KIIIN self-supported fuel elements were fabricated for use in a front face discharge test.

Four charges of seven-inch 1.47% enriched self-supported fuel elements were produced for Production Test IP-247-A-8 FP.

HLO is now preparing self-support fuel elements with rails attached by ultrasonic welding for reactor testing. The shear strengths of the ultrasonic welds are in the 200-300 pound range and there is no reduction in strength after 20 and 40 hours of autoclaving. The ultrasonic welds are relatively easy to "peel" from the jacket, but the forces expected to be encountered in the reactor will be shear stresses.

Electron beam welding of I & E Li-Al target elements has not been satisfactory to date due to a crack in the internal weld that extends nearly to the surface of the weld bead. However, a simpler welding technique has been developed that will do a satisfactory job. This technique uses a single pass, direct current, straight polarity, heliarc process with the target element clamped in a copper chill block to keep the Li-Al core below its outgassing temperature.

Horizontal duplex bath agitation of I & E cores improves the structure of both the internal and external compound layers with a reduction in brittle bonding. Large scale testing in 313 Building of horizontal agitation resulted in significant improvements in braze layer integrity (porosity and brittle bonds) and in weld contamination reject rates. All production lines are expected to be converted to horizontal duplex agitation with automatic basket loading by February, 1960.

The long preheat cycle used in the 313 Building produced fuel elements with total external bond count rates that averaged one-half that of the control pieces. However, there were some problems with external penetrations and can non-wetting that is believed to be due to furnace temperature control difficulties. The long preheat cycle is expected to be used again after the current can non-wetting incidents are controlled.

Can wetting has been found to be improved by increasing the Diversey 514 concentration from 16 oz/gal. to 32 oz/gal. Large scale testing using increased Diversey 514 concentrations will be made shortly in the production facilities.

Al-Si Pilot Plant Activities

About 4400 uranium cores were canned in the Al-Si Pilot Plant for Process development purposes and 45 six-inch solid Doe cores were dip-canned for high temperature corrosion tests in the KER loops. The major items of process development were:

1. Large scale test of effect of chemically roughened cores on bonding characteristics.
2. Aluminum cleaning and wettability tests in molten Al-Si to:
 - a. Compare GMC 114A cleaner and Wyandotte 2487 deoxidizer with present solutions.
 - b. Evaluate effect of different final rinses in the cleaning process on can wetting.
 - c. Evaluate effect of increased Diversey 514 concentrations on wetting.
 - d. Compare zincate cleaning with present method.
 - e. Determine effect of chemical dryer on aluminum wetting, core bonding and sleeve drying.

DECLASSIFIED

HW-61756

- f. Determine effect of using a UCV-19 Vibrator for sleeve assembly vibration on can wetting.
 - g. Test effectiveness of ultrasonic cleaning in a soap-Versene-trisodium phosphate solution.
 - h. Test effect of hexachloroethane addition to methanol on aluminum wetting.
3. Test of effect of high porosity on welding by the single and double pass methods.
5. Comparison of two-step and quick submerge quenching methods.
6. Normal canning of fuel elements to provide:
- a. Prototype CIVN fuel elements for initial reactor flow studies in ribless process tubes.
 - b. Seven-inch 1.47% enriched pieces for comparison of fuel elements in PT-IP-247-A-8-FP.
 - c. Pieces for evaluating the square wave welding transformer.
 - c. Spire-can component fuel elements for welding tests.

MATERIALS ENGINEERING

NPR Fuel Development

Uranium Billets

Beta heat treatment cracked all four dingots which were gamma pierced and extruded to 9" OD x 2-5/8" ID last month at MCW.. Therefore, the heat treatment step has been eliminated and these items are being remade. The current schedule for producing hollow coextrusion billets from dingots is as follows:

1. Gamma pierce and extrude dingot to 9" OD x 2-5/8" ID;
2. Machine as necessary to alpha extrusion billets;
3. Alpha extrude to rough billet dimensions, allowing for cleanup;
4. Beta heat treat (triple);
5. Machine to final size.

MCW has processed a second batch of four dingots through Steps 1 and 2 and shipped the material to Bridgeport Brass Company at Adrian, Michigan, where it is to be alpha extruded on 9-12-59. Steps 4 and 5 will be done here at Hanford.

Rough as-extruded sizes being made are as follows:

NPR Tube-Tube/OT	6.35" OD x 2.3" ID
NPR Tube-Tube/IT	5.9 " OD x 0.9" ID
KER Tube-Tube/OT	4.8 " OD x 2.0" ID
KER Tube-Tube/IT	3.9 " OD x 0.9" ID

Up to the present time all billets used by FPD from NLO (Fernald) have been cast to 4" diameter, extruded from 7" ingots or machined from 7" ingots. Experience to date indicates that the NPR fuel element billet should be hot worked, probably 3X in the high alpha range and must be substantially sounder than current 7" ingot production. Discussions with NLO have resulted in initiation of a development program utilizing the following schedule:

1. Cast ingots 11-1/8" diameter x 20" high;
2. Alpha phase pierce and extrude to NPR billet sizes, tentatively specified as those listed above plus 7.3" OD x 2.5" ID;
3. Cut to rough billets and multiple beta heat treat;
4. Machine to finished size.

The NPR fuel element will be made from enriched uranium. To duplicate the characteristics of the UF₆ route metal, depleted uranium will be largely used in the above program.

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Uranium Metal Quality

HW-61756

Several months ago some hollow cast uranium ingots were received from Fernald. After coextrusion (prototype tubes), the tubes were found during metallographic examination to be of very poor metal quality. To establish a basis of quality, coextruded product from the routine 7" Fernald ingots has been made. Rods 41, 42, and 43, which are from billets made from the regular production 7" ingots, have been investigated for soundness.

Several sections of the rods were initially examined ultrasonically for defects and the results indicated that the ultrasonic tester would have to be calibrated in order to detect defects. The calibration was accomplished by having 3-, 5-, 10-, and 20-mil holes drilled in rod samples and observing the results on the instruments.

Nondestructive testing indicated that the rods were free from cracks, voids, and inclusions, over and above the microscopic voids and non-metallic stringers which are present in this metal. Only one minor defect was indicated in the three rods and metallography showed it to be merely a 2-mil diameter void.

Having calibrated the ultrasonic tester, three of the prototype tubes of the poorest quality (those extruded at a reduction ratio of 15:1) were chosen for evaluation of the calibration of the tester. Initial results confirm the information obtained metallographically that the tubes are of poor quality. Predicted defects above 3-mils in diameter average about six per foot.

Evaluation of Coextruded Products

1. Rods

The effort on this geometry was terminated when the measurements of the grain size of the uranium, the variability in clad thickness and the smoothness of the interface were completed.

The importance of control of the rate of deformation during coextrusion is well illustrated by the grain size data. In the first FPD off-site coextrusion, where rods were produced under reduction ratios of 39:1 (KER) and 22:1 (NPR), the average grain size varied directly with the reduction ratio, i.e. 0.075 mm (NPR) and 0.150 mm (KER). The KER geometry showed a tendency for a duplex structure; usually the grain size near the zircaloy clad averaged 0.180 to 0.250 mm with the grain size along the central axis at 0.022 to 0.150 mm.

The clad thickness was measured on metallographically prepared samples. The clad was projected on a viewing screen and measurements were made at 0°, 90°, 180°, and 270° in relation to a die position. At these positions, measurements of the clad thickness were made at 11 intervals separated by 0.005-in. Differences in thickness of 0.0001-in.

could easily be distinguished. The clad thickness is reported as the average of the 11 readings; the roughness of the interface is reported as the standard deviation of the mean value.

J. L. Jaech (Operation Research and Synthesis) has made a statistical evaluation of the clad-thickness data and has concluded:

1. There is no significant difference in thickness between the die positions of 0°, 90°, 180° and 270°.
2. At any position, the average standard deviation, i.e. roughness, for the 11 readings was 0.75 mils.
3. From maximum and minimum values of thickness, 12.5 per cent of the rods show a clad thickness variation exceeding ± 2 mils; 4 per cent show a clad thickness variation exceeding ± 2.5 mils.
4. The standard deviation between clad thickness measurements at the fronts of the rods compared to the backs is ± 2.4 mils (i.e. if the thickness of clad at the front is X mils, the thickness at the back is $X \pm 2.4$ mils).
5. The range between average value of the clad thickness at the front versus the back was 5.0 mils.

This metallographic technique of measuring the clad thickness (average) and the roughness of the interface is a valuable tool in ascertaining the relation between the history of the components of the billet and the coextrusion process variable vs the product.

2. Tubes

Four tubes of the NPR outer-tube geometry, coextruded at Bridgeport Brass on 7-21-59, have been given preliminary evaluation of the quality of the interface. Samples, one-half inch long were cut from the back and front of each of four tubes (16 through 19) for dimensional checks. To remove the copper jacket, the samples were pickled in acid and a very preferential attack of the interface (uranium:zircaloy) occurred. Metallographic examination was made to determine if the undercutting was related to either non-bonds or impurity within the interface. The interfaces in samples immediately adjacent to the acid-undercut samples were shown to be of good quality. There is no indication of either unbonding or impurity on samples from the front, middle, and back.

One acid-pickled sample that showed extensive undercutting by the acid was slowly compressed (radially) in a vise such that an undercut area on the ID was subjected to tension. The zircaloy that was adhering to the uranium failed in tension before the non-adhering zircaloy failed. This failure may be interpreted to indicate that the inside clad is in tension but the part that was undercut underwent elastic recovery.

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HW-61756

The solution to this program is important from consideration of the limitation imposed upon both a chemical milling and a machining plus etching step for uranium removal prior to end-closure fitting and welding.

Beta Heat Treating

1. Induction Heating

The Staff at the Magnethermic Division (Ajax Magnethermic Corporation) have been "L" cleared. The AEC Contracts Operation expect to begin negotiation shortly on a DDR Contract on "The Induction Method of Beta Heat Treating Zircaloy Clad Uranium Fuel". The Ajax Magnethermic management have reported their laboratory facilities can be made available to us during the first two weeks in October.

The preparation of samples is under way.

2. Fundamental Studies

Earlier reports have described the relations between the changes in dimensions affected by beta heat treating. It was shown that the magnitudes of these changes are related to the reduction ratios of coextrusion.

X-ray examination of these same beta heat treated and air cooled samples has been done and Growth Indices for (predicted) length changes has shown the same correlation with the prior history of reduction ratio. It is surprising that beta heat treating and air cooling have not resulted in predicted dimensional stability.

Over and above the differences in reduction ratio, these samples have linear variation in wall thickness (U) and clad thickness (Zr-2). Present efforts are devoted at describing whether predicted growth characteristics of the tubes are determined not by extrusion history but by a geometry effect and/or clad restraint effect during beta heat treating.

Coextrusion

Two coextrusion runs were completed during the month.

On 8-28-59, nine NPR outer tubes were extruded at Bridgeport Brass Company, Adrian, Michigan. Preheat temperatures were recorded to determine heating characteristics of the salt bath furnace. One billet was extruded after six hours preheat with serious breakthrough resulting. For future extrusions, a minimum preheat of seven hours will be used. This will provide a one hour soak after the billet reaches temperature (as measured with a thermocouple inserted in the billet ID). From samples cut at Adrian the tubes are bonded with dimensions satisfactory for heat treat and welding development.

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The problem of inner clad thickness variation is apparent in all extrusions and is about the same magnitude as encountered by NMI on this geometry using heat treated billets.

Die breakage was a problem again. However, the problem disappeared when bolster shims were changed to give more pressure against the liner. The mandrels performed very well. Due to a misfit with the mandrel holder, an adaptor piece was cracked after the sixth extrusion. On the ninth extrusion the mandrel broke free, but the extrusion was not damaged.

In future extrusions at Adrian, the liner will be brushed and swabbed between extrusions and the die lubricated between extrusions. These steps are necessary to produce a better surface condition.

On 8-31-59, eight KER inner tubes were extruded at NMI. All extrusions were satisfactory. Billet length up to 14" were extruded over a .495" mandrel. The mandrels showed no necking or bending. Previously a nine inch maximum billet length had been used.

Included in this run was the use of a true floating or "free" mandrel. With this technique the mandrel is placed inside the billet-cutoff assembly without attachment to either dummy block or ram. Theoretically this should give the best results in terms of concentricity. With some refinement this could become a practical manufacturing technique.

Bond samples of three NPR tubes from the Adrian run were evaluated by NMI personnel. Results showed that the bond quality was equal to that produced by NMI on the ABC press using a seal-pin zircaloy end seal billet design.

Zircaloy Extrusion

On 8-1, H. Sawyer of NMI extruded three primary billets of zircaloy-2 for HAPO clad components. These extrusions were made bare (no copper). The extruded surface was excellent. Although this attempt did not include reductions typical to coextrusion, it indicates that bare zircaloy extrusion at coextrusion temperatures, using standard lubrication techniques, is feasible. Further work on this process should be pursued.

NPR Pilot Plant Equipment

Welders

The fabrication on the glove welding box for the electron beam welder has been completed and delivered to 306 Building.

The electrical hook-up for heliarc welding in the glove box is now in progress. This means installing welding leads, relay control cabinet and control leads to the glove box.

The pipe installation, consisting of lines for both helium and argon gases is also in progress. Both gases are piped into the box for back filling

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HW-61756

purposes, and also piped to the torch for purging.

No drying or purifying system will be installed on the gas system at this time.

A compound gauge was installed on the tank to indicate either vacuum or pressure. A rupture disc was also installed as a safety precaution.

Smooth sound welds have been made in the 200 Areas in a static atmosphere in the tank. This means no automatic regulation on the gases, and also welding with a dry torch.

FPD Drafting has started the design on a manipulator to be used in the glove box for handling material to be welded. With a large volume to pump down, (30" diam. x 48" long) it is desirable to produce a number of welds in the tank without breaking the seal.

A small compact electron gun was designed to make quick and easy changes whenever a filament burned out. This design also allows different size apertures to be used in order to regulate the size of the electron beam used.

Vapor Blast

The vapor blast machine was received and installed in the 306 Building pilot plant. Further testing and training of personnel in its operation will commence shortly.

Billet Assembly and Evacuation

Power and water supplies for the outgasing vacuum system are being installed in the can welder booth to enable use of this system for billet evacuation. This equipment will evacuate three billets simultaneously and should eliminate the evacuation bottleneck in billet assembly.

KER Loop Element Fabrication

The thickwalled "Doe" element charge which was to be charged into KER Loop 3 was autoclaved at 350°C water in the high temperature pressure autoclaves in 314 Building. After a 48 hour period, the elements were removed. The support rails had corroded almost entirely away. This was traced to inadvertant use of 2S aluminum support rails instead of X-8001.

IPD has requested fabrication of 40 thinwall and 40 thickwall "Doe" elements for the KER aluminum testing program. Presently fabrication is held up due to the fabrication of additional supplies of X-8001 support rails.

TESTING METHODS

Process Fuel Element Testing

External Bond Test

Experimental data has been obtained definitely showing that variations in residual can wall thickness adversely effect test results. Transducer tuning adjustments and transducer cable length determine discrete values of wall thickness for which test effectiveness is markedly reduced. Consequently, unless these factors are accounted for, they may cause differences in tester performance. They have undoubtedly contributed to variations in test results observed between different testers.

Optimum tuning adjustments and cable lengths have been determined and identically applied, so far as practical, to all testers. Further tests have shown Lithium Sulphate crystals to be less sensitive to wall thickness variations than quartz. Recommendations to convert the testers to Lithium Sulphate will be made as units now on order become available.

Internal Bond Test

The Internal Bond Test chassis have been modified to make them interchangeable with the External Bond Test chassis.

External Penetration Test

A new tape-head is installed in 306 Building test equipment for evaluation. Consideration will be given to adapting this design to process test equipment pending the results of these tests.

General

New oscilloscope units for the production testers are being designed and fabricated in the laboratory as replacement for commercial equipment now used. The abnormally large amount of maintenance required by the present units has prompted this action.

NPR and Category II

Present estimates are that the NPR test equipment will be available for check out by 10/1/59.

Tests are being performed to establish standards for the ultrasonic core integrity tests. Tests show that a 0.010 inch diameter hole drilled 0.035 inches deep along the longitudinal axis of a one-half inch diameter uranium rod is readily detected.

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HW-61756

New Methods Development

Bare Core Station

The prototype core station was moved to the 313 Building production test facility August 28, Initial start-up ran smoothly, and the equipment was placed in production service standardized on the old transformation test standards. Although excessively fine grain is the only criteria for rejection at present, the equipment records the maximum, minimum, and uniformity of grain structure, plus relative surface integrity, for each element. Present experience reveals the paper punch mechanism as being not entirely satisfactory for production use. A more rugged design is planned for the final models.

Construction and purchase of equipment for the production units are on schedule. If delays in acquiring a special relay can be avoided, it is believed that the November target date for installation of this equipment can be met.

End Integrity Test

Modification of the Cap-Core testing tank to include the Weld Bead test has been completed. The equipment has been moved to the production area for check-out and further evaluation. Plans are to evaluate both the Weld Bead and the Cap-Core bond test simultaneously.

Sonic Orientation Test

Nine hundred I&E bare cores, previously categorized by SORT and ultrasonic attenuation test, have been dimensionally measured as part of a program to evaluate the Sonic Orientation Test. Diameter measurements (at the center and both ends) and warp measurements were obtained on each piece. These data will later be compared with similar post irradiation measurements.

Customer Work

Resin Level Detector

The resin level detector was returned to the electronic shop for extensive rework. This work has been completed and the instrument is now in the laboratory for further check-out.

Washington Designated Nondestructive Testing Program

Electromagnetic Testing

A report (HW-61629) covering work to date on the Eddy Current Ultrasonic Transducer has been issued. An invention disclosure describing the novel features of this work has been prepared.

Work is now being directed toward developing refinements in the eddy current method of measuring temperatures. Emphasis is being placed on the utilization of more stable coil forms and balance circuits.

A low noise preamplifier has been constructed in order to facilitate pulse response measurements of simulated networks.

Lamb Wave Testing

Amplitude vs thickness data has been obtained on plates ranging from 0.010 inches in approximately 0.002 inch steps using both narrow and wide frequency band electronic equipment at a center frequency of ten megacycles. The narrow band results showed marked variation in amplitude with plate thickness, there being certain depths at which the response dropped to nearly zero. The wide band results showed much less severe amplitude variations.

Attempts are being made to develop a variable frequency method of generating ultrasonic pulses as a possible means of maintaining a uniform response with changes in thickness. A pulser has been built which successfully sweeps the frequency from 5 to 10 Mc. Although its power capabilities are low at present, it is hoped that with further effort it will develop into a practical instrument for thickness measurements.

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HW-61756

DESIGN & PROJECTS

CGF-810 - 306 Building Pilot Plant Modification

Installation of the autoclave and the Vapor Blast machine is complete except for minor adjustments and start-up.

Information recently received from Loewy Hydropress indicates the press will not be shipped until the second week in November, three to four weeks after scheduled shipment.

A change in the foundation drawings was made by Loewy which requires a fairly extensive change in form work completed thus far. Loewy has assured us the foundation drawings are now final.

CAF-820 - Additional Storage Space, 300 Area

Sprinkler system piping was installed and tested. Electrical work has been completed except for the fire alarm system. The floor slab and ramps have been poured. Installation of the doors and completion of the fire alarm system remains.

CAF-847 - New Fuel Cladding Facility

Notice to proceed on the building was issued on August 7, 1959 to Gate City Steel, Inc. Preliminary building drawings have been reviewed and returned to the contractor.

The contractor moved on-site August 18, and has completed excavation and partial forming for the press foundation and some of the building footings.

Installation of the main power supply lines is underway. This work is being done by Minor Construction.

DRAFTING AND FILES

Major Jobs in Drafting

306 Building	Chemical Bay - Tanks, Piping, Ventilation Area I - Ventilation Improvement
313 Building	Zig Zag Conveyor - Back Stop Device Wiring Diagram - Quality Control Reporting System Bare Core Test Tank Readout Panel Fuel Element Buffer - Assembly and Details
333 Building	Extrusion Press Foundation Outside Utilities Extrusion Press - Related Equipment Studies
Miscellaneous	300 Area Layout Map Revisions 300 Area Parking Lot

Drawings Produced

New	69
Revised	42
Small Charts	5
Large Charts	6
Miscellaneous	42

ADVANCED ENGINEERING

An accumulation of data on the irradiation experience with coextruded fuel elements has been started and will be kept current. A bibliography of available literature on the same subject has been completed and will also be kept current.

Operation of 305-A Test Reactor continued normally.

Manager - Engineering

C-18

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FINANCIAL SECTION
AUGUST, 1959

Reconciliation work in connection with the Department's physical inventory of installed equipment was completed during August. The formal inventory report is nearing completion.

Installed equipment identification tags were delivered in August and work of affixing them to designated property units was commenced. This work will be completed during October.

Tabulations of uninstalled equipment were furnished property custodians in August. These tabulations reflect the status of uninstalled equipment as of July 31, 1959. They are intended for use by custodians in maintaining the required level of property control and management for which they are responsible.

Procedural details were resolved with Data Processing Operation for the development of machine programming changes necessary to provide FPD and other interested departments with work order cost to date listings each Monday. Salary cost distribution will be submitted separately from time cards for the week ending on Friday so that machine processing can now be accomplished over the week-end. As a result, work order data will be issued three to four days earlier than in the past, thereby benefiting maintenance scheduling and control and financial monthly cost closing. This procedure will be used beginning with October reporting.

An audit of Frozen Lunches was made during the month. A number of minor discrepancies are being corrected and control procedures are being improved.

A detailed review was made of the integrated procedure pertaining to HLO calibration and FPD repair of portable radiation instruments. Several suggestions have been accepted for improving the compilation and reporting of the instrument maintenance information.

A comparison of SRO and HAPO 300 Area product cost, FY 1959 and Fourth Quarter FY 1959, was issued to the Department General Manager.

At the request of AEC a cost estimate was prepared for fabrication of 24 tons of 7" I & E depleted fuel elements.

Discussions are currently under way with all Level 4 Managers in the Manufacturing and Engineering Sections in an effort to improve the usefulness of the Product Cost Report. Suggested changes are under consideration, and certain improvements will be incorporated into the August report.

A system is being developed to determine "How Is the Maintenance Dollar Spent." HLO is reviewing this system to determine if it will also satisfy their needs.

At the request of the AEC, quarterly budget information by program was furnished.

Manager - Finance

WS Roe:mh

MAINTENANCE AND POWER OPERATION

AUGUST 1959

DUPLICATING

<u>Process</u>	<u>Number of Impressions</u>
Multilith	667,553
Verifax	5,559
Ozalid	8,344
Total	<u>681,456</u>

The total number of impressions was 20 per cent above the previous high reached in April of this year. This large number of impressions was the result of work on Functional-Structural Charts for HLO, IFD, CPD AND FPD. In addition, there were an increased number of Formal Reports prepared for HLO.

GENERAL

A pedestrian gate was provided in the Plutonium Recycle Project perimeter fence on August 31, 1959. This gate permits easy access to this area by authorized personnel and reduces the vehicular traffic between areas.

The installation of candy, cigarette and cold beverage vending machines started on August 18. Power and water service were made available, at General Electric's expense, as required.

A request for a rescue bus for use in the 300 Area was approved by the A.E.C. on August 28. This vehicle will be modified and available in case of emergency or disaster in the Area.

POWER

<u>Statistics</u>	<u>August</u>	<u>July</u>
Average steam generated (M lbs/hr)	24	25
Maximum steam generated (M lbs/hr)	35	40
Total steam generated (M lbs)	18,014	18,569
Coal consumed (tons)	1,167	1,301.42
Evaporation rate (steam/#coal)	7.72	7.13
Efficiency - Actual	65.0	61.3
Efficiency - Theoretical	65.2	64.7
No. of Boilers on: 1 2 1 2		
Date of change : 1 6 8 25		
Sanitary water from 3000 Area (Million Gals.)	95.1	87.9
Total water from 3000 Area (Average Rate GPM)	2,132	1,970
Total water from #3 and #3 wells (Million Gals.)	11.3	10.8
Total water from #2 well (M Gallons)	.30	.30
Peak water consumption for 24 hrs. (Million Gals.)	3.5	3.4

INVENTIONS

All personnel in the Operation engaged in work which might lead to inventions and discoveries advised that to the best of their knowledge none were made in the course of work during August, 1959.

SAFETY, SECURITY AND RADIATION EXPERIENCE

Medical Treatment Injuries	19
Frequency Rate	4.44
Disabling Injuries	1
Near-Serious Accidents	0

The one disabling injury (FPD 59-2) involved a Carpenter Journeyman and occurred on August 7, 1959. The injured knelt on a small lag screw. After leaving work his knee started to swell and the injured reported to Kadlec Methodist Hospital First Aid at 5:40 p.m., for initial treatment. The injured was hospitalized on August 10, 1959 with pre patellar bursitis, right knee. The injury was classified as disabling, subsequent to admission to the hospital.

There were no Security Violations or Radiation Incidents reported.

MEETINGS

Round Table-Staff	11
Safety and Security	16
Information	8

Manager
Maintenance and Power Operation

E. Hilgeman:JPF:mkm

RELATIONS PRACTICES OPERATION
AUGUST, 1959

EMPLOYMENT

Personnel added: 21 Removed: 13

Reduction of force by FPD: 0; by seniority bumping 1

Upgrades within FPD: 5 Transfer requests active at month end: 59

Procurement: Offers 7; Interviews 14; Requests for personnel 12; Transfers (all) 19

Perfect attendance recognition awards: 6

Service Pins: ten year 1; five year 11

HEALTH AND SAFETY

	<u>August, 1959</u>	<u>July, 1959</u>
Disabling Injuries	1	0
Serious Accidents	1	1
Medical Treatment Cases	49	46
Medical Treatment Frequency	4.35	3.84

An employee of Maintenance and Power, Area Maintenance, sustained a disabling injury on August 7. He knelt on a 1/4" x 2" lag screw that was lying on the floor while nailing a wall panel.

A serious accident occurred on August 29, resulting in burns to the fingers of a machinist in Manufacturing Maintenance.

While machining zirconium, the machinist noticed a spark coming off the cut, and on impulse he reached for the small accumulation of chips in the lathe tray. As he picked up the metal in his bare hand, the mass ignited, causing second degree burns to the fingers on the palm side of his right hand.

Program

Distribution of the 1959 Supervisor-Employee Safety Contact program material was completed in August. Copies were sent to all supervisors of Manufacturing and Maintenance and Power.

The first in a series of seven topics on hand injury prevention was distributed to all Department supervision. The program is sponsored by the Health and Safety Program Council and has been planned to cover a period of fourteen weeks.

EMPLOYEE COMPENSATION

Suggestion Plan Participation

	<u>August, 1959</u>	<u>Year to Date</u>
Eligible employees	576	578
FPD suggestions received	36	298
Annualized rate per 1000 eligible employees	750	771
No. of suggestions adopted	19	108
Net annual saving	\$ 1,940	\$ 56,578
Amount of awards	\$ 445	\$ 4,245
Percent of total awards to savings	22.9	7.5
Average amount of awards	\$ 23.42	\$ 39.31

GENERAL

Security Violations in the Department this month: 1

W. J. Shanks

Manager - Relations Practices

WA Shanks:mb

END

**DATE
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9 / 16 / 92