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HAN-76990

FUELS PREPARATION DEPARTMENT

MONTHLY REPORT

OCTOBER

1960

HANFORD ATOMIC PRODUCTS
OPERATION

GENERAL  ELECTRIC

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**HANFORD ATOMIC PRODUCTS OPERATION
RICHLAND, WASHINGTON**

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FUELS PREPARATION DEPARTMENT

76990

MONTHLY REPORT - OCTOBER 1960

Compiled by Fuels Preparation Department

November 7, 1960 Richland, Washington

Work performed under Contract No. AT(45-1) - 1350 between the Atomic Energy Commission and General Electric Company.



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[REDACTED]

FUELS PREPARATION DEPARTMENT
MONTHLY SUMMARY REPORT
OCTOBER - 1960

PRODUCTION

Finished production for October was 681.8 tons -- 105% of forecast.

At month end the bare uranium inventory was 1,337 tons compared to 1,341 tons for September. Finished inventory was 970 tons at month end as compared to 928 tons for the previous month.

ENGINEERING

A total of twenty-three extrusions were made; all showed excellent surface finish. The problem of die pickup did not appear on any of the extrusions.

End closures for 80 coextruded fuel tubes were made by beryllium-zircaloy brazing followed by arc finish welding. Equipment operation was satisfactory.

White oxide deposits on brazed closure areas were noted following autoclaving of several special zircaloy-clad coextruded fuel tubes. Detailed investigation is underway.

There were seven fuel element failures in October; this is not appreciably different from average experience during the past half year.

Post-irradiation warp data from approximately 2500 I & E fuel elements showed characteristics which indicated metal quality or canning technique variations existed in different processing periods.

Approximately 142 of the 315 tons of dingo uranium under test irradiation have been discharged; failure rates for this material have not been found to be significantly different from those for ingot uranium.

A promising approach to the nondestructive evaluation of ultrasonic welds was discovered. The method comprises monitoring rate of change of current during welding. Poor welds were observed to be uniquely associated with constancy of current.

GENERAL

Manufacturing yield for 8-inch I & E was 88.3 per cent as compared to 88.2 per cent for the previous month.

Two autoclave failures occurred during October, bringing the total for the year to seventeen.

The October operating efficiency was 92.3 per cent compared to 93.9 per cent for September.

Project work on the new fuels facility is proceeding satisfactorily. Requisitions have been issued for all major equipment except beta heat treating, brazing and straightening.

PERSONNEL STATISTICS

Number of employees - Sept. 30, 1960	800
Number of employees - Oct. 31, 1960	806

	<u>Exempt</u>	<u>Nonexempt</u>	<u>Total</u>
General	1	1	2
Manufacturing	73	329	402
Engineering	36	27	63
Financial	12	6	18
Plant Facilities	36	276	312
Relations Practices	5	4	9
TOTAL	163	643	806

STAFF

General Manager, Fuels Preparation Department	R. L. Dickeman
Manager, Manufacturing Operation	W. M. Mathis
Manager, Engineering Operation	J. W. Talbott
Manager, Financial Operation	W. S. Roe
Manager, Plant Facilities Operation	E. Hilgeman
Manager, Relations Practices Operation	R. W. McCullugh

PATENT SUMMARY - OCTOBER, 1960

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 October, 1960, 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.

George R. Hanson)	A terminal strip which provides internal jumpers.
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R L Dickeman

General Manager
Fuels Preparation Department

RL Dickeman:sd

MANUFACTURING OPERATION

October, 1960

CURRENT OPERATIONS

Production and Productivity

Statistics

	NORMAL						ENRICHED			Total		
	8"	8" I & E				6" C 6" O		6" I & E				
		Solid	CIIN	CIVN	KIIN	OIIN	OIIIN	Water	Water		CIIE	KIIE
<u>Current Month's Production</u>												
Acceptable Fuel Elements Produced (Tons)	44.5	57.3	0	219.3	277.7		0	15.2	18.2	48.6	1.0	681.8
As % of Forecast Production	97	99	0	101	112		0	101	96	105	-	105
Cum. % of Forecast for Current Qtr.	97	99	0	101	112		0	101	96	105	-	105
As % of Past 3 Month's Average Production	106	140	-	101	129		-	507	152	124	-	111
As % of Past 12 Month's Average Production	71	125	-	108	118		-	304	152	135	-	107
% of Forecast Achieved Last Fiscal Quarter	82	157	12	100	112		93	91	97	97	66	99
% of Forecast Achieved Last 4 Fiscal Qtrs.	107	115	38	103	105		102	103	94	103	85	103

Operating Efficiency

Current Month (%)	92.3
Forecast (%)	93.0
Previous Month	93.9

Manufacturing Yield

Current Month (%)	90	89	-	89	88		-	86	78	86	72	
Forecast (%)	87	87	-	87	87		-	80	87	87	-	
Previous Month (%)	-	86	-	89	88		-	-	91	86	84	
Bare Uranium Available for Processing (Tons)	11	67	40	474	384	87	13	-	24	29	208	1337
Finished Products in Storage (Tons)	88	105	9	264	326	-	7	22	26	52	71	970
Special Products Finished (Pieces) Boll												2437
Uranium Utilization												97.8

ACTIVITIESProduction

Finished production for October was 681.8 tons, or 105 per cent of forecast. The production increase over the previous month is attributed to increased yields and to the reduction of the in-process inventory resulting from two-shift operation of the final inspection operation during most of the month. Ten canning line shifts per day were operated for a total of 210 canning line shifts for the month.

Approximately 12,000 solid fuel elements were canned early in October, which was the final scheduled production run on the solid models. Following recovery of all solid elements, there are expected to be approximately 4,000 bare cores in inventory; however, all but 700 of these pieces have been processed through the recovery operation at least once, and most of them have been recycled several times. These cores are somewhat sub-standard in appearance and weight and it is felt they should be scrapped. Nonwetting problems of this material which were encountered in the current run makes the feasibility of canning the remaining cores appear questionable. The aluminum components have been in storage longer than desirable and difficulty was experienced removing the resulting oxide film.

Because of a delay in charging of the E-N demonstration load until April, 1961, no OIIE elements were canned this month. Approximately a two month supply of finished OIIE fuel elements is on hand at the end of October, so no processing of this model was included in the October production schedule. Some of these pieces are scheduled to be fabricated during November for attachment of bumper rails for use in D reactor and to start building a finished inventory of bumpered elements for the E-N load. About 260 tons of enriched elements scheduled for the central zone of H reactor E-N demonstration load will be supplied with bumpers.

Approximately 7,000 OIIN-W (water-mixers) were canned, spools attached, and placed into finished storage by month end. This is the final run of this size since future deliveries will be of OIIIN-W dimensions.

A total of 2,021 six-inch solid boll pieces were machined during October, 1,608 of which reached finished storage. The B dry canning process was used with an over-all yield of 80 per cent being attained for the month. Most of the yield loss was due to impurities found in the bar stock, causing machining rejects. These pieces are being machined in the Special Products room. Tooling for the four-inch I & E boll pieces should arrive by mid-November, and production of this material is scheduled to start shortly thereafter.

Yield Control

Manufacturing yields of 88.3 per cent and 83.5 per cent for the 8-inch and 6-inch I & E fuel elements respectively, reflect a slight reduction from the corresponding yields of 88.2 per cent and 86.7 per cent attained during September.

The assembly reject rate in these models increased from the level of the previous month due primarily to nonseating cores or spires. The internal thin wall reject rate showed an accompanying increase. Both conditions probably result from low canning temperatures. This theory is supported by a sizeable reduction in the external thin wall reject rate. These yield conditions indicate that canning temperatures may be slightly below optimum.

The only significant change in enriched I & E reject rates is an increase in the assembly reject category due to a faulty vibrator incident in the canning operation.

The manufacturing yield of 90.4 per cent for the solid elements reflects essentially the same level of performance as that attained during August, the last month during which solid elements were processed. Many sizeable differences are noted in the individual reject rates due to the small number of fuel elements produced during each run. The most significant of these differences is an appreciable improvement in the weld reject rate and an increase in the external braze layer integrity reject rate.

All product models show some improvement in the marred surface reject rate, which reflects careful handling of fuel elements and quick elimination of the mechanical causes of marred surfaces.

Two autoclave failures occurred during the month, both of which were caused by water penetration through the cap weld and brazed.

Construction Projects

CAF-847 - New Fuel Cladding Facility

All equipment has been placed in the heating and ventilation facility. Remaining work includes piping equipment, installation of duct work, electrical and control work, and installation of the roofing and siding.

Interior finishing of the building is proceeding very satisfactorily. The autoclave pit walls have been poured and underground piping, manholes, sanitary and process sewers are in varying stages of construction.

Design of the chemical facility is essentially complete and a material takeoff is being made for procurement of long delivery material items.

Requisitions have been issued for all major equipment pieces except beta heat treating, brazing and straightening.

A requisition has been issued for an excess universal tool grinder for the tool and die shop. This piece of equipment would have cost approximately \$25,000, will cost approximately \$3,000 and is in excellent condition.

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CAF-894 - Increased Compressed Air Capacity - 300 Area

The bid package on this facility has been transmitted to HOO-AEC.

CGF-903 - Projection Fuel Element Modifications, 313 Building, Phase I

Basic criteria for this facility have been established and design criteria are being prepared. Design for architectural modifications and preparation of drawings and specifications for the procurement of production welders is in progress.

CGF-915 - Additional Storage Space - 303 Area

The project proposal on this facility has been forwarded to HOO-AEC for approval.

Other Activities

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

8" I & E	21,216
6" Water Mix	278
6" Enriched I & E	12,042

Total	33,536
-------	--------

The Drafting and Files Unit completed the following drawings during the month:

New Drawings	37
Revised Drawings	43
Small Charts	17
Large Charts	24
Miscellaneous	12

PLANT CONDITIONS, INCIDENTS, AND IMPROVEMENTS

General

The operating efficiency was 92.3 per cent during October, compared to 93.9 per cent efficiency experienced in September. Of the total outage time 47 per cent was due to operating problems and 53 per cent was for equipment outages. The high contributors for equipment downtime this month were the cap and can cleaning machines, jacks and agitators and UT-2 bare core testers. Safety and information meetings, housekeeping and other routine factors caused the operational portion of the time loss.

The total bare inventory of 1337 tons was on hand at month end. This is a 2.0 month supply. Favorable yields and efficiencies and reactor consumption rates have allowed removal of overtime shifts previously

planned for this period and consequently less metal is being used than was previously scheduled. Based on the recent review of the Production Forecast, it will require several months to decrease the bare inventory to a normal level.

Finished product inventories at month end totalled 970 tons or 1.5 month supply based upon scheduled reactor usage. The finished inventory level is expected to be reduced to an approximate one month supply until our inventory starts accumulating for the block charging of the E-N load. Pre-producing will be required for these enriched pieces because of a capacity limitation on the bumper welder.

Two shipments of scrap were made during the month totalling 98,557 pounds of normal uranium, 6,075 pounds of enriched uranium, and 654 pounds of C-6.

The October Review, FPD Production Forecast, HW-67160, dated 10-21-60, was completed and issued this month. Several changes in reactor and FPD production requirements were detailed in this review as compared with the July forecast. The primary changes were:

1. The production and charging of the E-N demonstration load in H reactor has been delayed until April, 1961. Bumper attachments will also be required for the central portion of the E-N load.
2. Mass tube replacement with zirconium tubes is not scheduled to be accomplished during the forecast period, reducing the production requirements for self-supported fuel elements.
3. A limited number of Zircaloy-clad coextruded fuel elements will be produced from enriched billets (0.947% U-235) during the third and fourth quarters FY 1961. These elements will be produced for irradiation testing in one of the K reactors and will provide production experience in the 333 Building prior to initial fabrication of NPR fuels.

As a result of the delay in charging the E-N demonstration load, the enriched uranium delivery schedules were reduced sharply during the current quarter. Storage limitations prohibit receipt of this enriched material so far in advance of requirements. In this forecast review, normal uranium delivery schedules remained approximately the same for the current quarter, but were reduced in the two following quarters to reduce bare and finished inventories to normal levels.

Design changes have been approved on several of the present fuel element models. Based on assumptions used in the October Forecast Review, the present core sizes will be phased out as follows:

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<u>Old Model</u>	<u>Last Receipts</u>	<u>Last Production</u>	<u>Replaced By</u>	<u>First Receipts</u>	<u>First Production</u>
KIIIN	Oct. '60	Dec. '60	KIVN	Oct. '60	Dec. '60
OIIN	Nov. '60	Jan. '61	OIIIN	Sept. '60	Nov. '60 (Bumpers)
OIIN	Nov. '60	Jan. '61	OVN	Jan. '61	Feb. '61
OIIN-W		Oct. '60	OIIIN-W	Feb. '61	Mar. '61
CIIE	Nov. '60	Jan. '61	CIIEE	Dec. '60	Feb. '61
KIIIE	Nov. '60	Jan. '61	KIVE	Dec. '60	Feb. '61
OIIE	Jan. '61	Apr. '61	OIIIE	Feb. '61	Mar. '61

The prototype ultrasonic welder recently installed in the 306 Pilot Plant was operated for a short period early in the month to demonstrate its capabilities. It was disassembled on October 10, 1960, for modifications required to change from four-rail to three-rail bumper fuel elements. At the same time the capacity of the hydraulic system was increased to improve the capacity of the welder. The machine is expected to be available for production use early in November.

One vendor participating in the vendor development program has experienced considerable difficulty in producing acceptable components. Of the initial receipts from this vendor, 39,000 cans have been rejected due to copper contamination and 45,500 caps rejected for small wafer O.D. In addition, approximately 19,000 spires containing grains which are larger than those permitted in the specifications have been found unacceptable. Efforts are being made to correct or replace the defective material by November 21, 1960, to phase out the OIIN model with scheduled core receipts.

After evaluating favorable test results of the OIIN contour base cans processed in September, 1960, it was decided to include the contour base feature on all models. This involved alterations on orders of KIVN, OIIIN, CIIEE, and KIVE components which will cause the inventory of some items to be below normal during November and December, 1960.

A test designed to yield specific information about a DC weld process has been completed. The test was intended to show to what extent the oxide covering the weld hampers visual inspection by masking defects. Since welding also serves as a destructive test of the closure zone, it was also the purpose of this test to determine the ability of the DC welding process to serve as a destructive test of the closure zone. Results of the test follow:

1. There was no significant difference in the ability of the in-process weld inspectors to inspect either the AC or DC weld.
2. Both the AC and the DC welding operations have the capability of acting as a destructive test of the closure zone.
3. The BLC and pinhole rejection rate for the DC welded pieces was significantly lower than experienced by the AC welded pieces.

4. The absence of raised metal from arc strike in the DC weld provides an improvement in contour mating of the welded pieces.

A 25 megacycle external bond test was placed in service on 1-B station on October 13, 1960. On October 17, 1960, total count data for the Quality Certification Program was recorded on enriched material for the first time, using this tester.

The next tester to be converted to 25 megacycles will be one used in 105-C Test Basin so that accurate before and after measurement of total count and unbondedness can be made. Following that, the remaining testers in 313 Building and 306 Building will be converted. All testers are scheduled to be converted within two months.

Laboratory metallographic examination of a number of UT-2 tester reject cores, during the month, revealed an unusual type of grain structure. Material involved was the KIIIN size of normal NLO ingot production. The examination showed the usual fine grain structure interlaced with unusual areas of large grains. These areas were first revealed by etching the entire piece and observing the appearance on the surface. Sectioning the core transversely and etching this section revealed the large grains as bands extending toward the center of the core. The cause for this banding of large grains is as yet unknown.

A joint study of fuel element length, together with residual cap and base thickness, has been undertaken with the objective of maximizing the uranium content of the fuel element. A thorough analysis of our process capabilities for as-canned length, finished length, and lathe depth-of-cut capabilities has suggested that at least one, and possibly two, beneficial changes can be made, as follows:

1. Capability studies indicate that the average residual base thickness can be lowered to 0.292 inch, and still guarantee the .250 inch minimum at 99.5 per cent tolerance and 99 per cent confidence.
2. Over-all length capability studies show that nominal fuel element length can be increased by .067 inch and still meet the present maximum length limit at 99.9 per cent tolerance and 99 per cent confidence.

306 Pilot Plant

A total of ten development tests were conducted in the 306 ALS1 Pilot Plant this month. Work was done on determination of a canning cycle for four-inch I & E elements, comparison of wettability of contour-base with flat base cans, spire pulsing, evaluation of bottomless sleeves, and several other activities. Attachment of bumper rails continued on the Resistance Spot Welding unit until October 12, 1960, when production was stopped in order to start training personnel for ultrasonic welding which will supersede the resistance machine.

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305 Test Reactor

Routine testing of production materials in the 305 Test Reactor continued to remain in a current status this month. Approximately 25 per cent of the reactor operating time was made available for special testing. A total of nine special measurements on graphite bars, ceramic balls and poison splines were performed for Reactor Plant Engineering personnel.

The NPR graphite testing program which was begun with the Test Reactor on April 6, 1960, is approximately 40 per cent completed as of this date. Testing of base graphite has been completed and the core graphite is currently being processed.

OPERATING PLANS

Projection Fuel Element Schedule

In order to meet reactor requirements for projection fuel elements, Phase one of Project CGF-903 will be required for completion as scheduled in the first quarter, FY 1962. Welding capacity on the prototype ultrasonic welder is expected to be approximately 120 tons of eight-inch fuel elements per month on a two-shift basis. At the normal-to-enriched ratio required beginning December, 1960, the two-shift capacity will be 107 tons of good finished product. When the two production welders are completed in the 313 Building, an additional 300 tons of eight-inch fuel element capacity will be added to supply additional reactors with these elements.

Tests are being conducted in the 306 Pilot Plant to establish and prove out the cleaning and processing cycles associated with the bumper and self-support programs.

Quality Certification Program

The Quality Certification Production Test has been extended to cover the charging of enriched fuel elements. Quality measurements of canwall thickness, external bond count, and finished dimensions were started in October on samples from enriched fuel element lots. Monitor charges were made up from these measured samples for irradiation. This procedure will be continued routinely during future enriched production runs.

EMPLOYEE RELATIONS

Safety Performance

Members of the Manufacturing Operation were treated for 19 medical treatment injuries during October, a frequency rate of 2.87.

Radiation Control

For the four week badge period ending September 9, 1960, Manufacturing personnel received a combined total of 6,595 mrad of radiation exposure. Two individual badges in excess of 300 mrad were reported during that period.

Security Violations

None

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 October.

Visits and Visitors

On October 12, 1960, Mr. M. H. Smith, Director, Manufacturing Division, E.I. duPont deNemours and Company and Mr. W. H. Holstein, Production Manager, of the Savannah River Plant visited the Department and toured the 313 Building.

On October 19, 1960, Mr. C. W. Cole, Personnel Superintendent and Mr. R. B. Fenninger, Superintendent of Technical Services of the duPont Company, Savannah River Plant, visited the Section and Department.



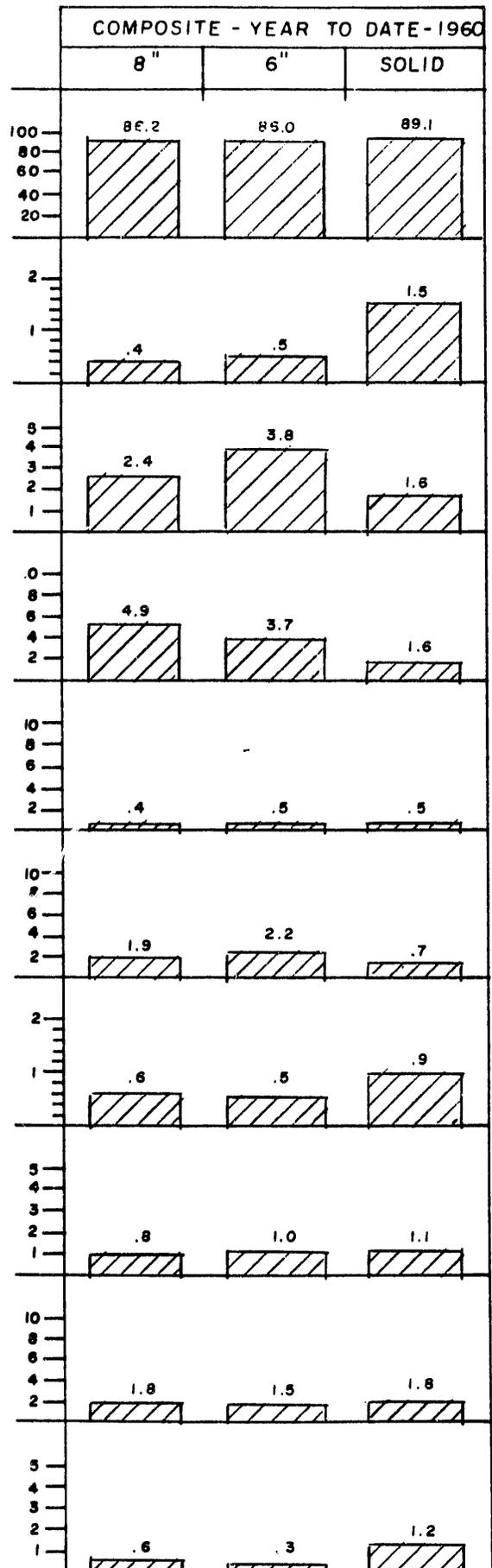
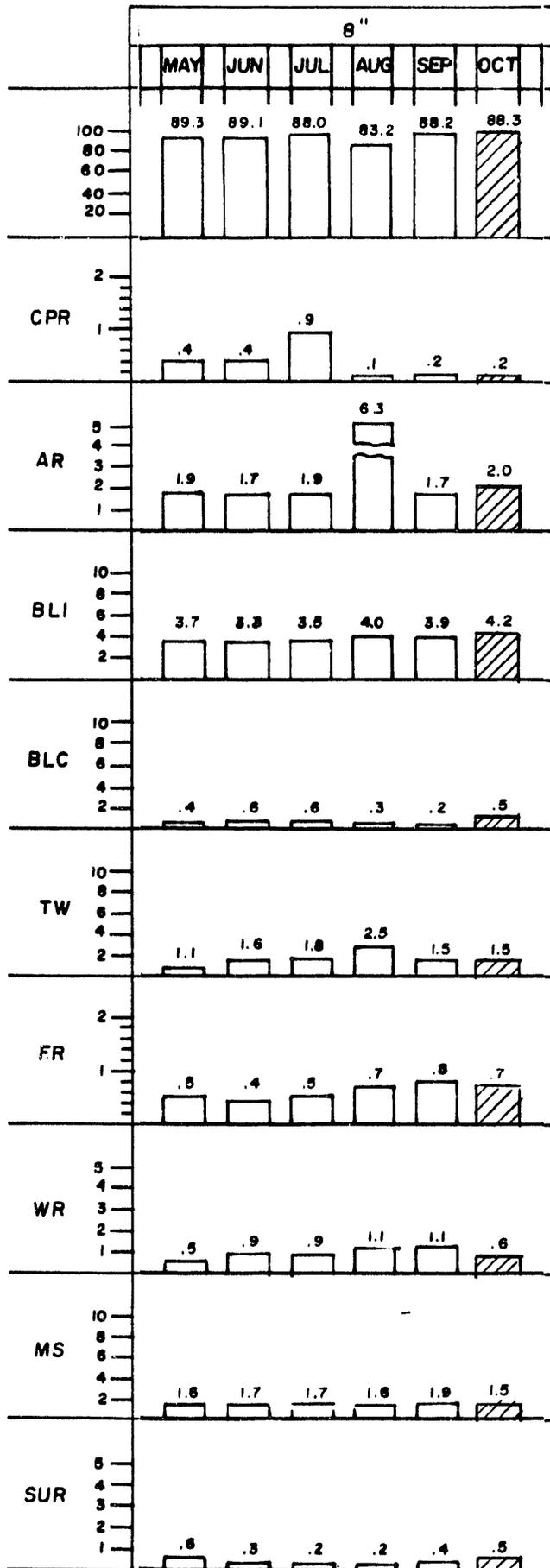
Acting Manager - Manufacturing

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STATISTICS

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ENGINEERING OPERATION

October, 1960

VISITORS

	<u>Company</u>	<u>Contact</u>	<u>Date</u>	<u>Reason</u>
J Woodhouse	duPont	JT Stringer	10/25	Fuel element problmes
D Babcock	duPont	JT Stringer	10/25	Fuel element problems
JW Dickinson	Linde Co., Seattle	GR Hanson	10/26	Welding equipment
MH Wahl	duPont	JT Stringer	10/26	FFDC Meeting
JN Donahue	SROO	JT Stringer	10/26	" "
FL Cuthbert	NLO	JT Stringer	10/26	" "
JW Ruch	OROO	JT Stringer	10/26	" "
W DeVine	AEC, Wash.	JT Stringer	10/26	" "
JA Fellows	MCW	JT Stringer	10/26	" "

TRIPS

	<u>Company Visited</u>			
TB Correy	AEC Welding Forum		10/3-6	Attend Conference
TB Correy	Instituto Tecnologico y de Estudios Superiores de Monterrey, Monterrey Nuevo Leon, Mexico	FG Roel	10/7	Welding progress in Mexico
"	Instituto de Investigaciones Nacionales, Monterrey, Mex.	C Duhne		" " "
"	Ecuela Practicia de Soldadura, Monterrey, Mex.		10/7	Visit welding school
"	Hojalata y Lamina Monterrey, Mex.	E Theissen	10/8	Visit steel mill
WK Alexander	National Spectrographic Lab., Cleveland, Ohio	JT Rozsa	10/5	Discuss & inspect beryllium monitoring equipment
"	NMI	P Loewenstein	10/6-7	Discuss fuel development

TRIPS, Cont'd.

	<u>Company Visited</u>	<u>Contact</u>	<u>Date</u>	<u>Reason</u>
WA Hendrickson CH Shaw	Turco Products, Inc. Wilmington, Calif.	R Selff	10/20-22	Contract on chemical milling and discuss research information
GW Riedeman	NLO	JF Schiltz	10/19-20	U ²³⁵ and Zr fabrication for NPR
"	Allegheny-Ludlum	R Paul	10/21	" " "
"	Carborundum Metals	HA Anderson	10/24	" " "
"	GE Metallurgical Prod.	RJ Stulgross	10/25	" " "
CA Burgess	ASM Show		10/25-22	
"	Sylvania-Corning	DB Metz	10/25	Discuss fuel tech.
GR Hanson	Los Alamos Scien- tific Lab, N.M.		10/2-14	Present paper at AEC Welding Forum and discuss welding and equipment
"	AEC Welding Forum, San Antonio			
"	Industrial Center, Monterrey, Mex.			
"	SRP, Augusta			
"	Vickers, Inc., St. Louis	C Bennett		
"	Eagle Signal Co., Moline			
"	Sciaky Bros., Chicago			
EA Weakley	NLO	CE Polson	10/11	Uranium technology
"	MCW	RF Hartmann	10/21	" "
JT Stringer	OROC	B Robinson	10/9-12	Discuss overbore program
"	NLO	CE Polson		
"	MCW	JA Fellows		
DC Worlton	Argonne Nat. Lab.		10/2	Present paper at symposium on Physics of Non-destructive Testing
SJ Ostrom	Pacific Plastics, Skagit Glass, Scongal Rubber, Seattle		10/20	Investigate making test tanks of fiber glass

TRIPS, Cont'd

	<u>Company Visited</u>	<u>Contact</u>	<u>Date</u>	<u>Reason</u>
CL Frederick	Philadelphia and Schenectady		10/14	Attend Non-destructive Testing Convention and symposium on Solid State Electronic Devices

PERSONNEL

<u>Name</u>	<u>Title</u>	<u>Operation</u>	<u>Nature of Change</u>	<u>Date</u>
LV Marple	Technician	4440	Trans. from Mfg.	10/10
DR Thorson	Technician	4440	Trans. from Mfg.	
LM Langford	Clerk	4440	Trans. from Plant Facilities	10/24

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 October, 1960 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.

George R. Hanson A terminal strip which provides internal jumpers

Alsi PRODUCT ENGINEERING

Fuel Performance and Requirements

Seven I & E fuel elements (two natural and five enriched) failed in the reactors during October. A summary of these ruptures is as follows:

<u>Fuel Element Type</u>	<u>Reactor</u>	<u>Exposure (MWD/T)</u>	<u>Rupture Classification</u>	<u>Canning Date</u>	<u>Cladding Alloy</u>
I & E Natural	H	42	Unknown	9/28/60	X-8001
	KW	285	Unknown	7/22/60	X-8001
I & E Enriched	C	597	Internal	6/ 6/60	C-64
	DR	186	Mechanical	7/18/60	X-8001
			Damage		
	F	461	Side Hot Spot	6/15/60	X-8001
	H	620	Side Hot Spot	6/17/60	X-8001
	KW	134	Internal	8/18/60	X-8001

Both of the I & E natural uranium fuel elements were lost in discharge. Unfortunately, the rupture sustained in H Reactor was the first involving new vendor (Harvey) aluminum components undergoing production transition testing. The rupture column was discharged on other metal because of a high pigtail reading observed during outage to discharge an enriched I & E rupture. Only about 15,000 OIIN fuel elements clad in Harvey X-8001 alloy components have been processed to date, and charged in F and H Reactors. Processing of Harvey components was discontinued in September because of copper contamination found on the surface of the cans. Approximately 46,000 cans were returned to the vendor for cleaning. In addition, about 39,000 cap spires were returned because the cap wafer diameter fell below the minimum specified tolerance.

Both of the enriched I & E ruptures classified as internal failures may be directly related to fuel quality oriented problems. Previous examinations of internal ruptures have shown coolant entry was gained through defective end closures. A review of the canning history of the internal rupture sustained in C Reactor indicates failure may possibly be the result of spire damage caused by improper vibration during the preheat cycle. This rupture is scheduled to be examined by Radiometallurgy to determine actual cause of failure.

Based on in-reactor thermocouple probe and poison spline tests, IPD has requested that I & E bumper fuel elements be provided with three solid bumper rails 90 degrees apart on each end of the fuel element rather than four rails. In addition, the longitudinal spacing of bumper rails from the ends of OIIN I & E fuel elements has been increased from about 1/2 inch to 1-1/4 inch to facilitate charging in excessively bowed old reactor process tubes. Prototype ultrasonic welder modifications to accommodate these changes in bumper fuel design were completed during the month.

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As previously reported, only 20 columns of a 100-tube I & E bumper fuel demonstration test in D Reactor have been charged. Charging of the remaining columns is being withheld pending resolution of a nozzle reaming problem and the development of satisfactory charging equipment.

Visual examination of four columns (72 pieces) of OII enriched (1.47% U-235) I & E bumper fuel elements, exposed to 960 MWD/T in D Reactor under a run-to-rupture test which demonstrated a 38-fold improvement in rupture resistance over the control material, has been completed in C Basin. After cleaning no hot spots were visible, indicating the film patterns observed earlier on the surface of some of these pieces were superficial and were of no real consequence with respect to localized corrosion attack.

Statistical analysis of the post-irradiation warp of ^{238}U natural uranium I & E fuel elements, irradiated in monitor charges under the Quality Certification Program, shows a significant difference in warp for fuel elements grouped by canning dates. These data suggest a variation in metal quality and/or canning techniques for the period during which the material was processed. In addition, a strong correlation exists between the average warp of a group of fuel elements and the percent of hot spots observed. Overall average warp for the pieces examined was 10.7 mils, or about one mil greater than reported six months ago. Maximum warp continues to fall in the range of 45-50 mils. Limited data from six columns of CIVN I & E self-supported fuel elements, exposed to 750-900 MWD/T at average specific powers ranging from 47 to 51 KW/ft., shows an average warp of 5.8 mils and a maximum warp of 47 mils. These data continue to support earlier data showing lower average warp values for self-supported fuels.

Uranium Technology

Approximately 173 tons of dingot uranium are currently being irradiated; about 142 tons have been discharged to date. There were no dingot failures during the month; there have been three failures to date. Statistically the failure rate for dingot is not significantly different from ingot uranium. About 55, 32, and 10 tons of regular virgin, vacuum outgassed virgin, and recovered dingot cores, respectively, were canned during the month. One completely untransformed core was rejected by the UT-2 testers from a production lot of vacuum outgassed dingot cores heat treated by NLO. How this core by-passed the beta heat treating step at Fernald is unknown. The first production quantities of I & E cores heat treated and machined by MCW were received this month. MCW's machining capacity is about 80 tons per month with their present equipment. Starting in November, receipts of dingot will be increased from 60 to 90 tons per months for the next six months, at which time unlimited use of dingots will be approved if irradiation performance is satisfactory. Thus, MCW will be heat treating and machining about 90% of the dingot cores for the next six months.

Test quantities (1000 pieces) of the cores for the overbored C tube program (CVIN model) have been ordered. These large diameter cores (1.883 inch OD, 0.452 inch ID) are being produced from low hydrogen alloyed dingots that are (1) gamma

extruded to 7 inch bars, machined into hollow billets, and alpha extruded into tubes by MCW, and (2) tubes straightened, core blanked, beta heat treated, and machined to core size by NLC.

NLO has developed an oil quenching technique for the SRP Mark VB-(IF) core that will be used for heat treating production quantities of SRP cores. This SRP core model has about the same OD as our OIIIN cores, 1.340 inch and 1.356 inch, respectively. Production test quantities (1500 pieces) of oil-quenched OIIIN cores produced by a technique similar to that used on the SRP cores have been ordered to evaluate the dimensional stability of oil quenched cores during irradiation.

Process Development

Partial results of post-irradiation examination of nickel-plated fuel elements irradiated to approximately 800 MWD/T indicate that adhesion of the nickel plate is satisfactory. Critical examination of all eight charges prior to cleaning revealed no sloughing. Examination of three charges after cleaning revealed "possible" sloughing in a single area 1/8-1/4 inch diameter on two fuel elements from the group which was baked at 300 C for three hours. Irradiation of 64 nickel-plated fuel elements in the IPD Mechanical Development Poison Column Displacement Test continued without incident. The accumulated irradiation time is about 11 weeks. Ex-reactor corrosion tests of chemical nickel-plated fuel elements in 120 C and 165 C process water flow tubes continued with essentially no changes since last month's report. The 165 C tube was examined after a total of 15 weeks' exposure. Sloughing of the nickel was observed in three of four approximately 1/16-inch diameter areas on the rib marks of each fuel element. This is not unexpected, since the fuel elements have been charged and discharged five times.

Tests of canning in nickel-plated components yielded highly encouraging results in that an assembly technique was discovered which drastically reduces braze-layer porosity and also eliminates AlSi penetration of the aluminum. The results are preliminary, based on assembly of 25 pieces with only one reject; however, the high degree of improvement that was achieved indicates a good chance of future success. Can wetting is enhanced and braze-layer porosity is reduced by inserting and withdrawing a hot steel plunger from the AlSi-filled can, thus effecting a "change-out" of the AlSi. Dissolution of the nickel is minimized by canning at a low temperature - 7-9 C above the freezing point of the AlSi.

The ultrasonic welder for self-supports went into operation October 3 welding the four-row bumper type element. In order to comply with IPD's request for three-row type (90° spacing), it was necessary to partially dis-assemble the machine for modification. These modifications have been completed and the machine is now capable of producing either three- or four-row type, selection being made by a single selector switch. In addition to the modifications for three-row type elements, dual pump hydraulic units were installed, along with other modifications

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to increase production rate and improve control. A rate of three fuel elements per minute has been achieved with the three-row type element. Development and optimization of the process for attaching supports continued. The difference between nitric acid and caustic to clean the fuel element prior to rail attachment was not significant. The longer the storage time (up to 7 days) after soaping, the more complete and consistent the weld becomes.

The pH control of Diversey solution for aluminum component cleaning is a requirement for good deoxidizing and subsequent brazing properties. It has been established that the pH must be controlled below 3. In addition, it has been established that it is necessary to activate the Diversey solution when it is freshly made up. The phenomenon that takes place is not clearly understood, but seems similar to the catalytic reaction between nitric acid and uranium.

A wetting test on Harvey can components that had been specially treated to remove copper inclusions was completed. This test was designed to show (a) if Harvey could clean the cans both internally and externally by a copper inclusion removal process; (b) if there would be any effect on the internal surface if Harvey cleaned the cans externally only. The results of the test indicate that any treatment of the internal surface of the can components by Harvey would result in gross non-wetting.

Evaluation of alternate processes for producing fuel elements for present reactor use continues. Final plans for procurement of about 2000 hot press pieces were completed with Sylcor. A firm bid is expected from them about November 1. A delivery date of April 1 has been tentatively agreed upon.

Fabrication of equipment to actuate the HAPO hot press process is in progress. Plating racks, dies, punches, and a rebuilt furnace block are being procured. Pieces are expected to be produced in the Pilot Plant beginning in early January.

Receipt of uranium and aluminum components for fluid pressure bonding studies is expected in November and December and pressure bonding of assembled fuel elements at Savannah River should be carried out in January. In the meantime, pieces assembled from miscellaneous material on hand will be sent to Savannah River for initial evaluation of pressure-temperature-time relationship for HAPO size fuels.

Process Technology

A preliminary statistically designed test was made in the Pilot Plant to optimize canning cycles for "O" size (OVN) four-inch I & E fuel elements, which will be required in production quantities for old reactor fringe loadings early next year. Analysis of the test data indicated minimum finished fuel element internal and external braze porosity and maximum bond strength would result if the four-inch cores are preheated in the lead layer of the duplex canning bath for 23 seconds and agitated in the AlSi layer for three seconds, and if the can-sleeve assemblies are

preheated in the AlSi canning bath 60 seconds. Standard bath temperatures, agitation, and vibration rates were applied in this test. Further testing is currently in progress to confirm optimum cycle times before preparing process specifications.

Nuclear safety specifications were revised for the recovery of 0.96% enriched fuel element canning rejects and for the storage and transportation of process sludges from 0.96% enriched uranium. Up to 1088 pieces may be processed safely in the recovery tanks at one time, providing the array is no more than two vertical layers high and 27 inches wide. Sludges generated through the neutralization of nitric acid used to clean 0.96% enriched uranium cores is infinitely safe, providing the sludge is not mixed with metallic uranium scrap.

Further test work was done to evaluate etching before welding. A 1200-piece test was made, welding alternately on buffed and etched pieces and it was found that there was no significant difference in weld quality between the etched and the buffed elements. There was a significant increase in weld rejects, however, with the etched pieces and this was attributed to poor drying. It was concluded that etching would not produce a better weld surface than buffing.

A quick setting gauge for repetitive changing of weld current for the outer and inner weld was designed and installed. Once the gauge is set, the operator will not have to weld to set the machine to the proper current. One setting will be used for outer welds and the other setting for inner welds.

Fabrication of the prototype pressurized quench machine is about 75% complete and installation in the Pilot Plant is scheduled for the second week in November.

Equipment for sizing E-N I & E pieces on the press in Special Products has been fabricated. Setup and adjustment of the press is in progress. Installation of the E-N welder is about 90% complete.

Design and fabrication of Pilot Plant and 313 Bldg. equipment to produce the initial test run of CVIN pieces is approximately 40% complete. All equipment is scheduled for completion by December 1.

306 Pilot Plant Activities

Approximately 2800 uranium cores were dip brazed in the Pilot Plant for process development purposes. Two hundred and fifty (250) of the fuel elements are for reactor use. The major items of development were:

1. Aluminum component cleaning and wettability tests in molten AlSi to:
 - a. Evaluate spire pulse preheat on etched and non-etched spires.
 - b. Compare 313 and 306 degreasers using trichloroethylene solvent.

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2. Canning of nickel-plated components to investigate the bond between AlSi and nickel.
3. Caustic etching of fuel elements before and after DC welding.
4. Evaluate use of an aluminum bottom in an open bottom sleeve.
5. Determine effect of can preheat temperature on residual wall thickness.
6. Investigate canning cycle for four-inch I & E elements.
7. Produce nickel-plated elements for welding tests.
8. Study effect of hydrogen control on ingot metal.
9. Determine heating rates of OIVN components.
10. Investigate canning cycle for OIVN elements.
11. Provide elements for DC welding studies.

COEXTRUDED PRODUCT ENGINEERINGNPR Fuel DevelopmentFuel Element Fabrication

Eleven KER elements (1.6 enriched) were assembled. Autoclaving will be complete by 11-7-60. A dual autoclave cycle (40 hours steam plus two days water) will be used. Assuming successful completion of the autoclave cycle, the elements will be completed by 11-9-60.

Material Procurement

A bid package for cladding shells for the I & E program was submitted to vendors. Bids are due on November 10, 1960.

The contract negotiations with Bridgeport Brass Company are continuing. Progress has not been satisfactory. A meeting with their representatives is being scheduled during the week of November 7, 1960.

Billet Assembly and Preheating

Five coextrusions were made during the month in which interface cleanliness and bonding were sub-standard due to poor billet evacuation and/or billet component cleaning. Billet assembly is now being followed closely to determine why billet leak checking methods and/or component cleaning techniques are not achieving a good quality extruded product.

Four billet assemblies assembled and extruded immediately prior to the above five, using the same cleaning and evacuation techniques, were satisfactory in all respects.

Preheating of billets has, in some cases, produced heating curves that indicate evacuation may be lost on occasion during preheating.

Tests have been set up which should evaluate some of the most obvious flaws in billet assembly techniques, or at least indicate what deviations from standard practices result in poor quality extrusions. The preliminary work on these tests should be complete by 12-1-60.

Extrusion

The following extrusions were made during the month.

- 1) 14 composite billets
- 2) 7 uranium primary
- 3) 2 zircaloy primary extrusions.

All extrusions showed excellent surface finish. The problem of die pickup has been eliminated.

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The seven uranium extrusions were made to provide stock for the large fuel elements proposed for use in the AlSi process, and to provide various sizes of uranium for a heat treat study being conducted at Nuclear Metals, Inc. These billets were extruded using copper foil as an extrusion can. Techniques of canning were developed and extrusions were satisfactory.

Chemical Milling

Pilot plant work continues on establishing controls for the $\text{HNO}_3\text{-H}_2\text{SO}_4$ solution. At present a 270 mil recess can be produced with a tolerance of ± 10 mils. The etch rate is 1.3 to 1.7 mils per minute. Only one end is etched at a time. Total time per piece is 5-6 hours.

Two new chemical milling tanks were installed. Maximum capacity is 24 pieces per day, using the present process.

Turco Products has shown good progress in their work. They are using an HCL solution and attaining etch rates of 5 to 6 mils per minute on both ends simultaneously. No detailed evaluation of their samples is available.

End Closure Brazing

About 80 fuel tubes were brazed during the month. Equipment is operating satisfactorily.

On several KER tubes brazed for HLO, the brazed closure showed white oxide after autoclaving. Several tests are being conducted to determine the cause of this abnormal behavior.

End Closure Welding

Ultrasonic Welding

Work at Aeroprojects on the ultrasonic welded closure has been discontinued. Aeroprojects is to furnish a complete report on all of the work performed to date. Future work on this process will be conducted by HLO.

Diffusion Bonding

A mechanical manipulator has been installed in the high vacuum welding chamber. It is planned to process the pieces for the BMI autoclaving test using this device.

Brazed Closure Welding

A contour has been worked out for NPR and KER single tubes which is satisfactory. It is a step cut 0.030 inch deep along the axis of the tube and 0.060 inch deep across the axis of the tube.

Two welding techniques have been worked out for each tube. One is a low current, low speed weld which essentially dissolves a small amount of zircaloy-2 into the braze and recasts the braze producing a fine grained structure in the very narrow braze and a coarse grained structure in the wide. The second technique uses a high current and high welding speed producing a fine grained structure in all widths of braze. Auto-clave tests are in progress to evaluate the two techniques.

HLO is working on a welding technique using the metal inert gas shielded arc process to add filler metal in a scarfed-out area to dilute the braze.

Pulsed Welder

The progress report has been received and reviewed. The control and inversion circuits have been breadboarded and are ready for testing. Testing will start about 11-1-60.

Unbonded Closure Welding

Material is being prepared for use in working out the parameters and contours for an unbonded closure for NPR size tubes. It is anticipated that this work will be complete by 12-1-60.

Salt Bath Heat Treating

Process Design Criteria

When the NPR outer tube geometry is oil quenched after beta heat treating, the grain structure that results is quite duplexed. In areas where the samples have been braze closed, a coarse grained, columnar structure is observed. In areas away from the ends, where an as-coextruded structure initially exists, the heat treated structure is finer grained and little columnar structure is found. These observations lead one to conclude that the quenching rate is too fast when oil is the quench medium.

For a type of oil usually used to quench steels, the quench rate is faster than 50C°/second (in the range from 685°C to the start of the transformation). Some variability (toward even faster quenching rates) was found. However, the effect is masked by interactions of the temperature of the quench and the nature of the salt film on the section.

When a martempering oil was used as the quench medium, the quenching rate was decreased by a factor of 2 (for the range from 685°C to the start of the transformation). However, during the last stage of cooling, the quench rate was the same for both oils (about 80°C/second in the interval 450 to 600°C). Thus, it was concluded that warp tendencies would be the same for both oils.

A martempering salt, used by HLO, was tested. This salt effectively decreased the quench rate to $24^{\circ}\text{C}/\text{second}$ (for the range from 685° to the start of the transformation). Whereas this was a first consideration for using a salt quench, an even better result occurred when the quench rate for the interval from 600 to 450°C was also reduced by a factor of 2. This last observation is deemed important in minimizing warp. (In a previous report, it was stated that a goal of the heat treating was to reduce warp so that the undesirable effects of straightening could be avoided).

Inasmuch as the heat treating of reactor fuels closely matches the requirements for neutral hardening of steels, it is to be expected that the choice of a chloride salt for the heating medium would be followed by either a second salt bath or a martempering oil. The second salt bath was chosen on the basis that one would predict less warp with its use.

Application of the Process Design Criteria

A salt bath, for use as a quenching facility, has been built so that full length fuels can be processed.

Twenty-one 18 inch lengths of the KER single tube geometry were heat treated and quenched. The heating medium was a mixed chloride ($\text{NaCl}:\text{KCl}$) and the quenching medium was a mixed nitrate:nitrite ($\text{KNO}_3:\text{NaNO}_2$). The as-received warp (double-throw) ranged from 4 to 15 mils with a mean of 7.3 ± 2.8 . After heating and quenching, the warp ranged from 4 to 14 mils with a mean of 8.4 ± 2.8 . In seven cases, heat treating decreased the warp; one case showed no change; 13 cases showed an increase in warp but no increase exceeded 7 mils.

It is concluded that straightening will not be required if the NPR geometries follow this trend for the proposed process.

An unforeseen observation was made after the beta heat treating of these twenty-one KER single tube pieces. The process consisted of - mixed chloride salt, followed by a 20 second air delay, followed by 5 minutes in the mixed nitrate quench, followed by a 5 minute rinse in cold water. Every piece showed a dull black oxide on the zircaloy clad. However, some samples showed a dull white oxide in the heat-affected zone of the end braze. Every sample showed some of the dull white oxide in the weld area of the end closure. This attack was worse at the upper end of the fuel (the fuels were heated vertically).

Inasmuch as the white oxide is associated with the brazing and heating, a problem is thought to exist in those prior processes. However, the selective attack at the upper end shows an effect of the heat treating process. The salt in the bath had only been molten for one day and undoubtedly an equilibrium H_2O vapor content had not resulted. The

bath is described as neutral, but there are sufficient oxides and water vapor to cause both hydrogen pickup if bare uranium is processed and oxygen to promote the black and white films. The need to braze, beta heat treat, machine and then weld is indicated.

Chemical Processing

A perchlor degreaser dryer has been installed in the 306 Chemical Bay. This will be used as a general degreaser and as a dryer for braze closure after facing.

A new zircaloy-2 etch solution has been made using ammonium bifluoride instead of hydrofluoric acid. On the basis of limited use, it appears to be effective and as good as HNO₃-HF.

A test was conducted to determine the depth of copper diffusion into zircaloy-2. During extrusion, successive layers of 1/2 mil was removed with HNO₃-HF and was analyzed. For copper, three samples of NPR outer tubing were successively etched removing (3) 1/2 mil layers and (2) 1 mil layer. These samples have been submitted for analysis.

Vapor Blast

A new process for heat treat and autoclave film removal is being investigated. This uses dry abrasive instead of the present water abrasive slurry. A demonstration of internal cleaning will be made by the Vacu Blast Corporation the first week of November. This process appears to be a faster method than the present vapor blast.

Billet Induction Heating

Minor Construction has started installation of the transformer and working coil.

Two billets have been assembled and are ready, including thermocouples and instruments.

The first billet will have 12 thermocouples located in various locations and will be used only to determine the heat transfer in the billet. The second billet will be heated to the desired temperature and then extruded in the press.

TESTING METHODSProcess Fuel Element TestingCanned Fuel Element Testing

Modifications permitting 25 megacycle operation have been completed on four process ultrasonic bond testers. Operating two units in the canning line to date indicate that this modification tends to decrease yield by 1.5 percent, although rejection rates five or six times this have been observed on some material. These results were not unexpected in view of the more reliable operation of the modified equipment.

Penetration tester changes have been made which allows the same equipment to be used on either external or internal surfaces.

Bare Core Testing

New UT-2 circuits have been developed and put into service which appear to eliminate programming and reject malfunctions. Slippage between the drive rolls and fuel cores which significantly lengthens the testing time has been overcome through the use of "O"-rings at the input end of the drive rolls, permitting the equipment to operate on a nine second test cycle as originally designed.

Further work is aimed at putting the data logging and surface quality test in operation.

NPR Fuel Element Inspection

An external unbond extending over most of the surface area on an NPR inner fuel tube was detected and confirmed by destructive examination. Although unbond indications have been not infrequently observed at the inner clad, this particular extrusion is the first instance of external surface unbonding observed by the prototype testers.

The closure of 20 fuel tubes were inspected by ultrasonic test with no significant defect indications observed.

Test procedures for the second production line inspection station have become sufficiently firm to allow start of equipment fabrication. Tests for uranium grain size, uranium integrity, and end closures are planned for this station.

On-site fabrication of the electronic portions of the first station is proceeding. Favorable bids have been received for off-site fabrication of the mechanical portions of both stations.

New Methods Development

Closure Inspection

Recent destructive examination tend to confirm the ability of the UT-4 test to reveal harmful closure defects. A test of some 1500 D.C. welded pieces, in which over half produced large defect indication, revealed pieces having broken bonds between cap and AlSi. One of these extended from weld bead to core and covered two thirds of the cap periphery.

A major obstacle to practical utilization of the test is the readiness with which it responds to braze layer porosity. Techniques for reducing sensitivity to porosity while maintaining ability to detect more objectionable defect geometries have been developed and are being made ready for production line evaluation.

Self-Support Weld Inspection

Monitoring of the ultrasonic welding current has revealed effects which may lead to a direct way of assuring self-support weld quality. This current decreases with time at what appears to be an exponential rate throughout the weld period - provided good welds are formed. When poor welds are made, no change in current amplitude is observed. Thus, the slope of the current wave trace with time appears to be a reliable measure of the effectiveness with which the weld is made. Instrumentation is being developed to read out this slope automatically.

Zirconium Hydride Tests

Attempts to observe differences in zirconium samples according to hydrogen content with one to twenty-five megacycle ultrasonic waves have been unsuccessful. Recent off-site experiments in which the ultrasonic frequency was raised to sixty-five megacycles revealed a marked increase of attenuation in a section of a zirconium process tube containing 1000 ppm hydrogen, as compared to a similar hydrogen-free sample. High frequency equipment is being obtained in order that studies may be continued on-site.

Lamb Wave Testing

Investigations of wave behavior in small diameter tubing have brought to light anomalous effects which bear directly on tubing inspection applications. It is observed, for example, that depending upon beam to tube alignment, defect indication amplitude is markedly dependent upon defect position in the tube wall, and may actually vary inversely with defect amplitude.

Although test procedures have been empirically arrived at by which discrimination against defect amplitude is possible to a degree satisfactory for present purposes, these effects are also being studied from a more fundamental approach. Flat plate samples with milled-in notches of various depth are being procured for initial investigations.

ENGINEERING GENERAL

Hanford Test Reactor

Routine testing continued throughout the month. Several special tests were conducted. N.P.R. graphite testing is about 40% complete. The testing program will probably be complete by February 1, 1961. There are approximately 530 more sample bars to be tested.

A document entitled "New Fuel Element Standards and Dih Testing in H.T.R.", HW-67038 was issued. This report states the general methods used to obtain Hanford Test Reactor standards and testing procedures for new shaped production fuel elements.

Asymmetrical Power Measurements

The 105 C basin prototype is now about 95% complete. A few of the assembly parts were sent off site for cadmium plating. These parts should be returned by November 1, and the assembly should be completely installed by November 15. HW-66990 entitled "Interim Report on Fuel Element Power Asymmetry Measurement" was issued.

Another application for the prototype has been investigated. The accuracy of the prototype facility may be high enough to allow measurements which would be indicative of the fuel element power generation just prior to reactor shut-down as compared to the average power during the total irradiation. Such information could be used to support particular fuel element irradiation behavior models. The possibilities of obtaining this type of data will be further examined.

Overbored Fuel Study

A study was completed of potential irradiation performance and process limitations in fabrication of large OD (1.991 in.) fuel elements for overbored process tubes in C and the old reactors. This was provided as assistance for ALSi Product Engineering on their larger study on providing fuel for the overbored case for the old reactors in addition to C reactor.

Control Studies

An additional section on design criteria is being written at the request of Operations Research of HLO for their report "Nuclear Materials Management in Reactor Fuel Fabrication".

L.H. McEwen
Manager - Engineering

FINANCIAL OPERATION

OCTOBER, 1960

Work Authority CAF 894 (2) has been received authorizing G.E. to incur \$15,000 for scoping, criteria preparation, Title III and related management services for increasing the compressed air capacity of 384 Building. This is an increase of \$4,500 over the previous authorization. The remaining \$65,000 of the estimated cost will be incurred by AEC, primarily in conjunction with the fixed price contract.

The current equipment expenditure estimate for the balance of FY 1961 has been submitted to Contract Accounting. Estimated expenditures based on the current allocation of \$1,150,000 are shown below by quarter.

<u>Quarter</u>	
1st (actual)	\$ 150 000
2nd	250 000
3rd	280 000
4th	<u>470 000</u>
	<u>\$1 150 000</u>

The unusually high estimate shown for the last quarter is based on a planned expenditure of \$300,000 on Project CGF 903, Projection Fuel Element Modification (Phase I), during that quarter.

Twenty-six appropriation requests, totalling \$196,000, have been approved so far this fiscal year. In addition, several requests, amounting to nearly \$100,000, are being prepared and will be routed for approvals during the coming month.

At the present time eight miscellaneous capital work order jobs totalling \$89,000 are active. All of these jobs have been initiated since July 1, 1960. Work initiated during FY 1960 was essentially complete by year end.

The FY 1961 Plant Acquisition and Construction Budget Midyear Review is currently underway. The review will be completed and information submitted to Contract Accounting by mid-November as requested.

October travel amounted to \$6,000 and included \$1,400 for movement of household goods, \$500 for attendance at the Advanced Management Course at Crotonville, and \$750 for attendance at Professional and Trade Societies and Offsite Courses. The balance of \$3,350 represented mainly vendor contacts.

Five new HAPO guides and six revisions were issued during October. In addition, FPD OPG 11.4--Delegation of Routine Authority--was reissued. This represented the first major revision of this guide since it was completely rewritten and issued last July.

In an effort to ensure that the Department OPG system was completely up to date, Section Managers were requested to review all guides in their respective functional areas. Preliminary indications are that the system generally is adequate for all concerned.

Report covering audit of FPD Duplicating facilities was completed and issued during the month.

FPD management personnel were advised that all requests for reproduction or procurement of forms will require review by the Specialist, Audits and Procedures. This action was found necessary due to the comparatively large number of forms in use within the Department which had not cleared through established procedure as defined - OPG 55.18.

Study of FPD essential materials control procedures, records and reports was commenced. This is part of a broader study directed toward effective application of electronic data processing in the manufacturing process.

A Records Management Workshop, conducted by the C&AO Office Procedures Operation, was held twice during the month in the 300 Area for both FPD and HLO personnel. Objective of the workshop was to discuss services available at the HAPO Record Service Center and pointers for improvement of the HAPO records management program. A total of twenty-one FPD people attended the two meetings.

The major portion of the month was spent recasting costs and revising forms for cost reporting. Organizational changes, which became effective October 1, 1960, made it necessary to revise all forms used for cost reporting. In addition, CY 1960 and FY 1961 costs were recast to fit the new organizational structure.

Revision of the Department cost code structure in accordance with the re-organization of Manufacturing and Engineering Sections was completed during October. New cost code books were issued to Department personnel during the first week of the month.

Budget preparation is currently under way with final budget schedules being due to Contract and Accounting November 18, 1960. The meeting of this due date is contingent upon receipt of a production schedule from Manufacturing Section during the fore part of this week. Some delay has resulted from the lack of production schedules.

A preliminary budget estimate was prepared for FY 1961, using first quarter actual and nine months' estimates to ascertain whether or not funds required were within the scope of the current Financial Plan.

All process material standards and some operating labor standards were up-dated during October.

At the request of HOO-AEC, a schedule was prepared showing actual consumption of caps and cans by product model for FY 1969 and FY 1960, together with actual finished production by product model for the same period.

Effective this month, Department cost accumulation procedures were revised to provide for charging all internal services to the FPD organization requesting the service. In the past, these costs were charged to a department overhead pool and distributed to department end functions based on individual analysis of costs included in the pool. The revised procedure will eliminate the overhead pool and provide a more efficient and equitable basis for distributing indirect overhead costs to the Department end functions.

Reconciliation of September's physical inventory of precious metals indicated no discrepancies between quantities held by Department custodians and reconciled book balances.


Manager - Finance

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PLANT FACILITIES OPERATION

OCTOBER, 1960

I. RESPONSIBILITY CHANGES

None

II. ACHIEVEMENTS

A. Statistics

1. Duplicating

<u>Process</u>	<u>No. Of Impressions</u>
Multilith	830,747
Verifax	7,109
Ozalid	<u>11,743</u>
TOTAL	849,599

2. Utilities

	<u>Oct.</u>	<u>Sept.</u>
Average steam generated (M lbs/hr)	50	35
Maximum steam generated (M lbs/hr)	76	50
Total steam generated (M lbs)	37,435	24,899
Coal consumed (tons)	1,824.31	1,161.70
Evaporation rate (steam/coal)	10.26	10.71
Efficiency-Actual	67.3	74.2
Efficiency-Theoretical	71.0	71.0
No. of boilers on	1 5 4 5	3
Date of change	14 15 17	19
Sanitary water from 3000 Area (M̄ Gals.)	119.76	108.42
Total water from 3000 Area (Avg. Rate GPM)	2,683	2,510
Total water from #3 & #4 wells (M̄ Gals.)	20.16	16.10
Total water from #2 well (M Gals.)	.30	.30
Peak water consumption for 24 hrs. (M̄ Gals.)	4.5	5.1

B. Operating Experience

On October 14, a water wall tube on the east water wall of No. 6 boiler failed at a location approximately two feet above the grate surface. A top priority program was initiated to complete the overhaul of boilers No. 3 and 5 to the extent that these units could be placed in service. Boilers No. 1, 2, 3 and 4 were put on the line and No. 6 boiler taken off the same evening. Of the total 42 side water-wall tubes, 19 were found to be blistered, all at about the same elevation above the grate surface. However, all tubes are being replaced since the remaining 23 tubes are also suspects. An investigation of the incident indicated that improper operation of the water-wall blowoff valves was the probable cause.

C. Equipment Experience

The sanitary water system pressure swings, caused by improper operation of the automatic make-up water valve at the 309 Building, were corrected following the replacement of the pilot valve.

The 12" import sanitary water line was restored to service on October 21. The line had been removed from service on September 28, for re-routing of the line west of the 309 Building.

A flashover occurred on the primary bushing of the 300 KVA normal transformer servicing the 327 Building, burning the conductors. It was discovered that the transformer was originally installed with 600 volt instead of 2300 volt wire. The trouble was repaired on October 22.

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 October 1960.

E. Costs and Savings

Cost improvements reported during the month totaled \$2,547. Cost improvements submitted for the calendar year-to-date total \$74,578.

F. Status of Projects and Major Jobs

ESR-102, 384 Building Personnel Facilities - A construction contract for \$17,900 was awarded to the R. J. Britton Construction Company. The scheduled completion date is December 31, 1960, with field construction 12% complete at month's end.

ESR-103, Renovation of 303-J Building - The construction contract with J. A. Jones Company is approximately 80% complete. Occupancy of the eight offices being created by converting this space is scheduled for November 7, 1960.

ESR-130, 3717 Building Sheetmetal Shop Addition - Preparation was completed on a design and bid package to provide a 1500 sq. ft. addition to the building. An invitation to bid was issued with bid opening scheduled for November 25, 1960.

ESR-203, Compressed Air Facility - A detailed design and bid package covering the building addition and increasing the capacity of the compressed air system by 815 cfm, was completed. Bid opening is scheduled for November 25, 1960.

ESR-222, North Ground Storage Reservoir Piping Modifications - A lump-sum construction contract for \$11,300 was awarded to the R. J. Britton Construction Company. The scope of the work is to modify piping in this vicinity to provide better fire protection capacity in keeping with the plant improvement program. Field construction is 15% complete.

Modification and Extension of Hydrovac System - The construction contract with J. A. Jones Company is approximately 80% complete.

G. Special Reports Issued

R. G. James, Plant Engineering, has prepared a technical paper on the 384 Building Hydrovac System. The paper is being cleared for publication.

III. PERSONNEL

A. Safety, Security and Radiation Experience

Medical Treatment Injuries	19
Frequency Rate	3.77
Disabling Injuries	0
Serious Accidents	0

B. Meetings

Round Table-Staff	20
Safety and Security	18
Information	8



Manager
Plant Facilities Operation

E. Hilgeman:GSS:sd

RELATIONS PRACTICES OPERATION
OCTOBER, 1960

STATISTICS

<u>EMPLOYMENT</u>	<u>October</u>	<u>September</u>
Additions: Exempt	1	1
Nonexempt	8	26
Total	<u>9</u>	<u>27</u>
Reductions: Exempt	2	2
Nonexempt	4	12
Total	<u>6</u>	<u>14</u>

HEALTH AND SAFETY

Disabling Injuries	0	0
Serious Accidents	0	0
Medical Treatment Injuries	39	51
Medical Treatment Frequency	2.91	4.04

SECURITY

Violations - FPD	0	0
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SUGGESTION PLAN PARTICIPATION

Eligible employees	643	638
FPD suggestions received	65	53
Annualized rate per 1000 eligible employees	1,213	997
No. of suggestions adopted	29	27
Net annual saving	\$ 11,204	\$8,596
Amount of awards	1,455	\$1,200
Percent of total awards to savings	13.0	13.95
Average amount of awards	\$ 50.17	\$ 44.44

GENERAL

The Department's excellent safety performance was extended through October. The Department is within fifty days of completing the necessary 406 day period to win the Safety Council Award, as provided by the HAPO Safety Award Plan. The October medical treatment frequency rate was 2.91, the lowest rate experienced this calendar year.

Arrangements were completed this month to modify the test schedule for the Crash Alarm System and Civil Defense sirens. Effective November 4, crash phones will be tested each Friday at 10 a.m., and the sirens will be tested on the first Friday of each month at 10 a.m. The modified schedule will permit Civil Defense tests in 300 Area to coincide with those in the City of Richland.

An effective Fire Prevention Program was conducted in October. The program consisted essentially of five phases; safety meetings, a central display, fire prevention inspections, slogan contest, and a home fire safety check list to employees' homes.

Employment activity dropped off sharply in October. Only nine new employees were placed in the Department compared to twenty-eight during the previous month. Employment needs are forecasted to increase again shortly to staff the new fuel cladding facility.

The reassignment of personnel according to the announced reorganization of the Engineering and Manufacturing Sections continued in October. Reorganization has progressed far enough that new functional-structural organization charts and organization directories are being prepared.

R W McCullugh

Manager - Relations Practices

RW McCullugh:mb

END

**DATE
FILMED**

12 / 16 / 92

