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FUELS PREPARATION DEPARTMENT

MONTHLY REPORT

JUNE

1962

Reviewed by USTP

OCT 0 1992

HANFORD ATOMIC PRODUCTS OPERATION

RICHLAND, WASHINGTON

GENERAL ELECTRIC MASTER

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FUELS PREPARATION DEPARTMENT

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MONTHLY REPORT --- JUNE 1962

Compiled by Fuels Preparation Department

July 9, 1962 - Richland, Washington

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

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MANUFACTURINGProduction - AlSi Process

1. High efficiency and yields resulted in a production output that exceeded the forecast.
2. A 2.1 month supply of finished fuels and a 1.7 month supply of bare cores was on hand at month end.
3. The first autoclave failure of an AlSi bonded fuel since July, 1961 was experienced.

Production - Coextrusion Process

1. Uranium input of 15 tons resulted in 93 production extrusions. Nine additional extrusions were completed for fuels development purposes, of which two were primary extrusions.
2. Assembly of billets was hampered by loss of the exhaust system in the chemical processing bay.

ENGINEERINGPresent Reactor Fuels

A total of four (4) regular production, natural uranium, I&E fuel elements failed in reactors during June. No unusual trends are indicated by this experience.

Approximately 176 tons of alloyed dingot uranium are being irradiated and 1,626 tons have been discharged. A moratorium is in effect during which no dingot uranium will be canned or reactor charged. Release of the canned dingot elements in storage is planned during July after stringent retesting has been completed. Mallinckrodt Chemical Works is preparing dingots having various carbon and intermetallic precipitate (U_6Fe) levels. These will be used in pickling and bonding studies.

Two completely untransformed enriched cores were rejected by the FPD UT-2 testers. With the new enriched heat treating facility now being used at National Lead Company of Ohio (NLC) the chance of skipping the heat treating step will be virtually eliminated.

NLC UT-2 testers rejected a number of partially untransformed oil quench cores. It is believed that the sludge level in the salt bath was excessive, allowing the bottom of the core blanks to remain at a temperature lower than the alpha-beta transformation phase. Since NLC tests only 5 cores per ingot sample on their UT-2 testers, it is likely that a number of partially

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untransformed cores were shipped to HAPC in the 44 tons of oil-quenched cores heat-treated in May. All of the cores will be thoroughly tested for transformation by FPD.

Irradiation experience continues to show that "bumper" fuel will effectively minimize gross fuel misalignment in ribbed process tubes and associated (hot spot) corrosion ruptures. No "hot spot" failures have been experienced to date in over 300,000 "bumper" fuels which have been irradiated.

Surface corrosion of elliptical rail bumper fuels exposed to 1,060 MDW/T was less than that observed on rectangular rail control pieces. This confirms data from a previous test exposed to 800 MWD/T.

Metallographic examination of fuel elements produced to study the effects of duplex canning furnace variables on bonding layer formation indicate:

1. There is a significant difference in the percentage of UAl_3 -type structure when comparing ingot and dingot cores cycled together in the duplex bath. The dingot cores have less UAl_3 -type compound layer.
2. More optimum conditions will produce a larger percentage of the desired UAl_3 -type structure. These include longer preheat, higher lead temperature and lower silicon content.

All fuel end closure welding machines in the ALSi Shop finishing area have now been converted to DC-welding.

An irradiation test comparing Sylcor hot press, HAPC ALSi bonded and HAPC hot press fuels was charged June 2.

Product Specifications to produce 1,000 CIVE enriched 94% I&E fuel elements by the Sylcor hot press process have been completed. Uranium cores will be ordered by FPD and delivered to Sylcor for assembly.

Contract negotiations have been completed with Battelle Memorial Institute to pressure bond 128 fuel assemblies for process optimization -- at a cost of \$24,780.

Studies to determine the time-temperature relationship during the preheat portion of the bonding cycle for the hot die sizing process have been completed. The resulting data have been computer-processed and the relationships plotted.

It has been theorized that initial diffusion between nickel-uranium couples must take place in the preheat furnace if the hot die sizing process is to provide reproducible bonds of the desired high quality. Preliminary examination of thermal cycled nickel-plated uranium cores confirms this theory. This diffusion may minimize core cleaning and plating problems and contribute to a uniform and strong nickel-uranium diffusion layer.

Work assignments have been realigned in order to provide more direct technical assistance to manufacturing nondestructive test programs. This has resulted in modifications to the Uranium Surface and Bend Testers which have improved the reproducibility of testing results.

N Reactor Fuels

KER Test Loops 1 and 2 have been shut down for modifications to increase pump capacity. Startup is expected during August. KER Loop 3 was recharged with eleven prototypic N fuel assemblies (NAE-1) and a thermocouple fuel element. Fourteen prototypic (NAE-1) fuels in Loop 4 are operating satisfactorily and have reached an exposure of about 500 MWD/T. Backup charges on hand include the tapered end closure test and a charge of 14 NAE-1 fuels. Twenty N-inner enriched "heater" fuels with Zircaloy sleeves are being fabricated in the Pilot Plant for loop testing.

Development extrusions carried out during June included seven composite, two Zircaloy, one copper and one uranium billet.

Acceptable fuel element supports are still in short supply. Support vendors are developing flexure and bend tests, which will be used to screen the Zircaloy strip used for support fabrication. The strip supplier (Wah Chang) is sampling and testing after each process operation to find where process variability may occur. The heat treating and rolling methods are new processes and subtle changes in processing appear to have a profound effect on subsequent fabrication of the strip.

The problem of copper pickup during support welding on NPR outer fuel elements has been eliminated by inserting zirconium pads in the ground electrode. Similar modifications are planned for the inner fuel welding fixture.

Wah Chang Corporation has delivered their second lot of Zircaloy-2 inner clad shells for both inner and outer billets as part of the vendor qualification program. Wah Chang has already been qualified to bid on outer clad shells for billets.

Improved billet lubrication has reduced die pickup and heat treating yields of 93 to 96 per cent were achieved after improved lubrication techniques had been adopted.

An improved technique has been developed for the temperature recorder and controller system for N fuel braze closures. This involves the calibration of the recorder scale in reference to the freezing points of the Be-Zr (960° C) and Ti-Fe (1085° C) eutectics. The output of the optical temperature sensing instrument is exponential and establishment of a scale between these points is relatively simple. Precise control of the brazing cycle is necessary to prevent uranium contamination in the braze-weld area. It is generally agreed that the present levels of contamination do not constitute a problem and that the small amount of contamination occurring on end

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closures is definitely preferred to less serviceable closures which may result if brazing temperatures are lowered. Existing testing equipment, which was designed to monitor inner tubes for contamination, has been modified for the testing of outer tube geometries.

Tests have demonstrated that very smooth uranium surfaces with acceptable depth tolerances can be produced by horizontal chemical milling. Work is under way to develop the process for production use.

A double step aluminum nitrate stop bath after etching has proven effective in the control of white oxide formation on the welds of autoclaved fuels. Variables causing white oxide in the N Fuel Production Facility were found to be a) excessive etchant carryover into the aluminum nitrate stop bath and b) incomplete waterfill and hot blowdown in the autoclave. Specifications have been issued to more closely control these variables and a special training program was initiated to demonstrate to Manufacturing personnel the most desirable processing techniques. Of the 40 fuel elements processed under this arrangement, all except two fuel elements with clad stains were acceptable after autoclaving.

SORT equipment is being adapted to N fuel testing in order to provide an additional source of data regarding extruded uranium. Laboratory investigations are also under way to determine if the change in longitudinal and torsional resonant frequencies accompanying heat treatment are sufficient for measurement purposes.

Equipment for the examination of N fuel is essentially complete and is being debugged. This system will be installed in the 105-KE basin.

GENERAL

Review and integration of the 300 Area Evacuation Plan to take effect in the event of a criticality incident is under way.

PERSONNEL STATISTICS

Number of employees as of May 31, 1962 829
Number of employees as of June 30, 1962 831

	<u>Exempt</u>	<u>Nonexempt</u>	<u>Total</u>
General	2	1	3
Manufacturing	90	355	445
Engineering	48	28	76
Financial	13	8	21
Plant Facilities	38	247	285
Employee Relations	1	0	1
TOTAL	192	639	831

<u>Employment</u>	<u>June</u>	<u>May</u>
Additions: Exempt	5	2
Nonexempt	13	14
	<u>18</u>	<u>16</u>
Reductions: Exempt	3	1
Nonexempt	13	5
	<u>16</u>	<u>6</u>

Additions to the Department payroll included six new hires -- five as replacements and one Metal Handler addition; a Summer Professor; three recalls from CE&UC who were on ROF status as Metal Handlers, two as replacements and one as an addition; three Engineers on the Manufacturing Training Program; one reactivate from personal illness; two Craftsmen replacements on Request For Transfer; one transfer from HLO as a replacement due to medical restriction; and one Engineer replacement.

Reductions included two retirements; resignation of an Engineer to accept other employment; transfer of a Technician to HLO; transfer of a newly hired Pipefitter to IPD in place of Craftsman with Request for Transfer who decided to cancel his request after all arrangements had been made; transfer of an Engineer on the Manufacturing Training Program to the Ordnance Department; transfer of Manager, General Accounting to C&AO; a pregnancy leave; secretarial resignation due to marriage; transfer of Metal Handler, a Motor Messenger, and a Craftsman to HLO on Request for Transfers; transfer of non-exempt Service Manual Writer to exempt position in PRTR; transfer of Metal Handler to former classification in CE&UC on Request for Transfer; Metal Operator on leave of absence; and deactivate due to personal illness.

STAFF

General Manager	R. L. Dickeman
Manager, Manufacturing Operation	W. N. Mobley
Acting Manager, Engineering Operation	J. T. Stringer
Manager, Financial Operation	W. S. Roe
Manager, Plant Facilities Operation	E. Kilgeman
Manager, Employee Relations	C. O. Steinnagel
Consultant, Business Effectiveness Program	J. W. Talbott

SAFETY

Days since last disabling injury 78
 Hours worked since last disabling injury 348,067

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Section	MEDICAL TREATMENT INJURIES					
	This Month		Last Month		Year-To-Date	
	No. of Cases	Frequency Rate	No. of Cases	Frequency Rate	No. of Cases	Frequency Rate
Manufacturing	27	3.50	22	3.14	170	3.80
Plant Facilities	21	3.96	13	2.97	127	4.51
Engineering	3	2.38	2	1.62	11	1.48
Financial	0	0.00	0	0.00	0	0.00
Total	51	3.45	37	2.83	308	3.70

There were no serious or disabling injuries during the month of June.

Manufacturing Maintenance completed one million man-hours of exposure without a lost-time injury on July 1, 1962.

SECURITY

One security violation was experienced during the month when an unlocked combination file cabinet was found in the 313 Building. This is the fourth violation in the Department for the calendar year.

Section	SUGGESTION PLAN									
	Number Received		Number Evaluated		Number Adopted		Amount of Awards		Net Annual Savings	
	Mo.	CYTD	Mo.	CYTD	Mo.	CYTD	Mo.	CYTD	Mo.	CYTD
General	--	--	--	--	--	--	--	--	--	--
Engineering	2	2	--	2	--	--	--	--	--	--
Financial	1	1	--	--	--	--	--	--	--	--
Manufacturing	13	154	30	119	14	71	\$255	\$1730	\$1202	\$11,393
Plant Facilities	15	146	43	183	12	103	115	2010	63	10,015
Total	31	303	73	304	26	174	\$370	\$3740	\$1265	\$21,408

Section	Accepted in June		Total Accepted CYTD	
General	--		--	
Engineering	\$ 80,500		\$124,300	
Manufacturing	156,814		277,738	
Plant Facilities	2,954		40,334	
Total	\$240,268		\$442,372	

PATENT SUMMARY - JUNE 1962

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 June. 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.

General Manager
Fuels Preparation Department

RL Dickeman:mkm

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MANUFACTURING OPERATION

JUNE, 1962

CURRENT OPERATIONS

Production

Statistics - ALSi

<u>Current Month's Production</u>	<u>C</u>	<u>K</u>	<u>Reg.</u>	<u>Bumper</u>	<u>C</u>	<u>K</u>	<u>Reg.</u>	<u>Bumper</u>	<u>N</u>	<u>Total</u>
Acceptable Fuel Elements Produced (Tons)	2.6	193.1	208.0	45.2	19.1	28.6	13.5	44.6	*.73	554.7
As % of Forecast Production	4	124	234	32	-	84	27	95	2	104
Cum. % of Forecast for Current Quarter	68	118	161	34	117	135	250	109	2	107
As % of Past 3 Month's Average Production	4	82	170	68	159	46	170	139	-	93
As % of Past 12 Month's Average Production	5	72	156	62	147	58	123	139		88
% of Forecast Achieved Last Fiscal Quarter	48	126	120	81	102	106	84	73		102
% of Forecast Achieved Last 4 Fiscal Quarters	105	112	115	91	76	103	106	104		104

Operating Efficiency

Current Month (%)	97.5
Forecast (%)	95.0
Previous Month (%)	97.7

Manufacturing Yield

Current Month (%)	97	93	90	83	89	88	91	87
Forecast (%)	90	90	90	85	90	90	90	85
Previous Month (%)	93	94	93	-	94	90	91	82

Bare Uranium Available for Processing (Tons)	1039
Finished Products in Storage (Tons)	1276
Special Products Finished (Pieces) Boll	171
Uranium Utilization	98.2

*Not included in total

Statistics - Coextrusion Production (1)

Forecast Process Input (Tons) 30
Actual Process Input (Tons) 15

Unit Operation	Station Throughput				Inventory of Pieces Awaiting Processing					
	Outers		Inners		Outers			Inners		
	Pieces Process.	Defect Rate(3)	Pieces Process.	Defect Rate(3)	24"	18"	12"	24"	18"	12"
Extrusion	33(2)	-	60(2)	-	33	Extrusions awaiting cutup				
Chemical Milling	0	-	810	-	14	2	0	745	10	33
Braze	98	5.0	714	6.7	0	0	0	87	1	3
Heat Treat	120	0	531	11.5	0	0	0	119	3	5
Machining	192	0	363	-	0	0	0	205	6	5
Welding	514	1.4	165	-	0	0	0	26	1	1
Non-Dest. Tester	603	19.9	205	9.2	66	0	0	155	5	16
Autoradiograph	735	6.7	786	-	673	65	51	619	116	13
Support Weld	786	0.1	459	-	711	19	30	792	58	0
Autoclave	400	-	310	-	295	42	0	107	23	0
Final Inspection	216	68.0	114	65.0	231	45	4	219	53	0

Process Inventory

Production Pieces held for Rework	416	82	10	271	128	12
Production Pieces Awaiting Evaluation	202	34	12	282	35	9
Production Pieces - Scrap	<u>161</u>	<u>23</u>	<u>19</u>	<u>98</u>	<u>14</u>	<u>7</u>
Total Process Inventory - Pieces	2769	312	126	3725	453	104
Total Process Inventory - Pounds	75,012	6,321	1,682	50,511	4,589	694

Produced for in-reactor test .49 Ton
Finished Production for June .73 Ton
Total finished inventory .73 Ton

Oxide Burned - pounds 294.72

- (1) Input and inventory to-date consists of enriched U.
(2) Billets
(3) Includes pieces held for rework, pieces awaiting evaluation, and scrap pieces.

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Production

Plant Operation - ALSi

Production output exceeded the forecast as a result of high yields and efficiency, and operation of the plant on nine canning line shifts per day for a period of six days. A total of 170 canning line shifts were operated during the month.

Significant increases in reject rate were experienced from stuck sleeves, ALSi slop, and marred surfaces for eight-inch material. The stuck sleeve reject rate was affected by a malfunction of the sleeve machine in which sleeves were not soaped internally. The increase in ALSi slop reject rate occurred during the use of cans which were fabricated prior to a specification change in ALSi ring dimensions and during the use of two shipments of cans from a new vendor. The marred surface rejects were caused primarily by assorted sharp edges and micro-switch failures in the conveyor system and by sleeve scratches on the fuel element surface.

An increase in marred surface reject rate for six-inch material was also caused by conveyors and sleeve scratches.

Bumper welding produced 89.8 acceptable tons welded during June, with a welding yield of 93 percent. Production and reactor charging for projection elements during June and to-date is as follows:

	<u>June 1962</u>		<u>To-Date</u>	
	<u>Natural</u>	<u>Enriched</u>	<u>Natural</u>	<u>Enriched</u>
F.P.D. produced	45.2	44.6	1169	659
I.P.D. charged	83	24	974	588
Finished inventory	195	71.0	195	71
Average welding yield	92	94		

The first autoclave failure of an ALSi bonded fuel since July, 1961, occurred in June. The apparent cause was damage to the can from a shipping carton staple.

During the month, processing was started on lead cadmium pieces. None, however, reached finished storage by month end.

The inventory of finished fuels at month end reflected a 2.1 month supply based upon projected reactor usage.

Month end inventory of bare cores reflected a 1.7 month supply based on anticipated fuels process needs.

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

8" Normal I&E	15,576
6" Enriched I&E	2,143
6" Water Mix	<u>1,811</u>
Total	19,530

Three scrap shipments were made during the month of which one shipment contained 14.6 tons of metal scrap and the other two contained 7.4 tons of C-6 oxide. One additional shipment was made containing 390 boxes with lids.

Plant Operation - Coextrusion

A total of 102 extrusions were completed during the month of June, of which 60 were inners and 33 were outers for production. Loss of the exhaust system over the chemical bay hampered the assembly of billets to complete the 30 tons of input scheduled.

Finished output for production consisted of thirty-six (36) assemblies of twenty-four inch fuel elements.

Manufacturing Engineering

Design and Projects

CGF 903 Projection Fuel Element Modifications - 313 Building

	<u>Scheduled</u>	<u>Actual</u>
Design	100	100
Construction	86	96

The third ultrasonic welder has been installed. Testing and conveyor hookup are not yet complete.

CAF 954 High Pressure Autoclave Development Facility

The project proposal is awaiting action by the AEC.

CAF 961 Consolidated 303 Area Services Facility - Phase I

This project proposal is awaiting action by the AEC.

CAF 973 Steam Distribution Line Modifications - 300 Area

This project proposal is awaiting action by the AEC.

Miscellaneous

313 Building

Conversion of the production end cap welders in the 313 Building to DC welding was completed.

333 Building

The new Gisholt lathe has arrived and has been set in the lathe room.

Fabrication and installation of the new welding fixture for attaching locking clips was completed.

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The status of the maintenance engineering program for the 333 Building is as follows: Spare parts - 95% complete; lubrication instructions - 40% complete; maintenance procedures - 30% complete.

General

Installation of the nuclear incident alarm system as originally scoped was completed. The system is operable, but use is not planned until all personnel are educated in alarm sounds and the evacuation procedures. Some changes to the system are expected as a result of changed criteria.

An integrated 300 Area Evacuation Plan to take effect in the event of a criticality incident is being prepared. Equipment requirements, evacuation route determination both in-building and area-wide, staging area locations, and procedures were established. A report, HW 74108, was issued to define the problem and summarize status of work to implement the program.

Drafting and Duplicating

Drawings Produced

New	50
Revisions	72
Small Charts	30
Large Charts	18
Miscellaneous	96

Duplicating Production

Xerox Masters Prepared	563
Multilith Impressions	266,832
Ozalid Copies	7,423
914 Copier Copies	18,811

PLANT CONDITIONS, INCIDENTS, AND IMPROVEMENTS

ALSI

High operating efficiency was sustained during June which approached the record high attained during May. About 70 percent of the downtime was caused by equipment malfunctions, the remainder being attributed to operational problems.

An autoclave failure occurred on June 18, 1962, from Lot KZ-390-H. The failure was located on the side wall of the can approximately one-half inch from the male end. Dye penetrant testing failed to reveal any pinholes through the weld. Sectioning the fuel element longitudinally through the defect area revealed a foreign metallic object which was determined to be a staple, the source of which was probably the cap and can cartons.

Modification of the UT-2 uranium grain size testers to permit calibration with a range of three standards has begun. Reduced measurement error and improved

reproducibility are expected. One UE-1 external bond tester has been modified to improve reproducibility and reduce spurious responses. Evaluations to date confirm an improvement, and plans have been made to complete modification of the other testers.

An experiment was designed and run on the D-C welders to determine the effects of various welder adjustments on depth of weld penetration and weld width. Welding parameters investigated included gas flow, electrode length, arc gap, and current. Analysis of the resulting data has been published in a report, "Effect of Various DC Welder Factors on Weld Quality - HW 73691" by W. F. Stevenson and dated May 22, 1962. It has been recommended that further experimentation be done in this area to evaluate effects of the currently-used argon shielding gas.

The incorporation of a number of minor changes into the support welders plus extremely close follow-up by an engineer during the operation of the welders has shown that they can be operated with a relatively low reject rate, and that the 2% reject rate which has been discussed is not completely unreasonable. During one full day of operation this month, a reject rate of only 0.6% was obtained. The above rate does not include re-weld rejects or process samples.

Layout work in support of the FPD Plant Improvement Program (FY 1963-72) has been completed. This included both partial and complete conversion to overbore fuel elements and various production levels. A report defining the basis for layout work and layout prints is being prepared.

An as-built drawing status measurement program was developed. The report will show the following on a monthly basis: Total as-built drawings, scheduled goal and actual number of reviews for the month and to-date, and the monthly and to-date average hours per revision.

Coextrusion

The defective rate at Final Inspection for the month was 59.2 percent, the major cause being white stains on the cladding and supports of both inner and outer pieces. As a result, processing through final etch and autoclave was stopped until process changes were made. Tests were conducted using a new final etch process which had a four percent reject rate. On June 28, the processing of production material was resumed using the new process.

The primary cause of peel test rejects is believed to be leaks in the copper welds on the billet assembly. The welds are checked for leaks before preheating, but leaks have developed during preheating. A test is being developed to measure the vacuum in the billet immediately before coextrusion. The test is being designed to enable a decision to be made to reject or to extrude the billet within the 30 to 45 second period the billet is being moved from the preheat furnace to the extrusion press.

Receipt of a replacement impeller for the chem bay fans which had a crack in the impeller blade at almost the same location as the one which failed originally provides strong evidence that the initial cause of the failure was residual stress created during fabrication of the impeller. The new impeller blade was found to be cracked when taken out of the shipping crate. There was no evidence of shipping

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crate damage whatsoever. After the fans were all repaired and ready to go back into service, the Number 4 fan with an original impeller in it was inspected and found to have a blade cracked at approximately the same location as the others. It is probable that this blade also cracked as a result of a residual stress and has been cracked for some time. Serious consideration is being given to replacing the plastic impellers with stainless steel.

On June 25, 1962, the fan motor on the Number 3 air conditioner failed as a result of overheating of the motor, causing severe damage to the windings and bearings. These units normally operate on an automatic system controlled by the direct relationship between building and atmospheric pressure. It is theorized that the failure may have been the result of excessive motor off-on cycling caused by rapid changes in outside pressure during a gusty wind storm.

OPERATING PLANS

Operation of both the AlSi Shop and Coextrusion Shop is scheduled to be curtailed during the first two weeks of July to permit the scheduling of vacations for a major portion of the operating personnel. During this period equipment maintenance and overhaul activities will be accelerated to take advantage of availability of equipment.

FPD HEALTH AND SAFETY

	<u>June</u>	<u>May</u>
Disabling Injuries	0	0
Serious Accidents	0	0
Medical Treatment Injuries	51	37

The 300 Area Emergency Plan rough draft was circulated for comments during June. R. H. Scott and K. R. Heid of HLO, and W. O. Goslin - FPD compiled comments for revision. The plan has been assembled in final form for approval and issue.

An instruction brochure for use by supervisors in training employees proper response actions in a criticality emergency has been prepared for comment. The instructions are based on the 300 Area Emergency Plan and a study of potential exposures conducted by Methods Engineering.

Respiratory protection masks for chemical emergencies were recommended for purchase and installation in Coextrusion Shop, AlSi Shop, and Materials. The masks for Coextrusion Shop are on site, and arrangements for personnel training, mask inspection and servicing, and cylinder recharging are being made with Fire Protection.

FPD SUGGESTION PLAN

Suggestion Plan Participation

	<u>June</u>	<u>May</u>
Number of eligible employees	641	640
FPD suggestions received	31	44
Annualized rate per 1000 eligible employees	543	825
Number of suggestions adopted	26	34
Net annual savings	\$1,265.00	\$4,124.00
Amount of awards	\$ 370.00	\$ 810.00
Percent of total awards to savings	29.2	19.6
Average amount of awards	\$ 14.23	\$ 23.82

SIGNIFICANT REPORTS ISSUED

HW 74042	Uranium Quality Control Analytical Results	6/19/62	G. B. Hansen
HW 73550	Summary of Radiography Studies	5/2/62	B. K. Boyd
HW 73674	NPR Fuels Data Processing Task Force Progress Report	5/15/62	L. T. Hagie W. R. Kirk T. D. Naylor
HW 74053	Analysis of the Beta Heat Treating Process - Coextruded Fuels	6/19/62	T. R. Sparks
	Effect of Various DC Welder Factors on Weld Quality	5/22/62	W. F. Stevenson
	Evaluation of Measurement Error at the UE-1 Station	6/18/62	W. F. Stevenson
	Water Mix Fuel Element Crush Quality	6/19/62	J. J. Wick
HW 73172	Alternate Budget Assumptions	6/29/62	F. W. Grubb R. E. Middaugh
HW 73895	Autoclave Vessel and Equipment Requirements, NPR Fuels, 333 Building	6/1/62	R. G. Curran
HW 73979	Inspection Manpower Requirements	6/12/62	R. G. Curran
HW 74069	Cost Associated with Taking Hot Warp Measurements	6/21/62	J. P. Keenan
HW 74108	FPD Protection Program - Critical Radiation Event	6/27/62	W. L. Hampson

EMPLOYEE RELATIONS

Safety

Members of the Manufacturing Operation sustained twenty-seven medical treatment injuries during June.

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During June a safety audit was performed by supervision in each of the operations in the AlSi and Coextrusion Shops. A critical review of procedures, equipment hazards, and Job Hazard Breakdowns was completed and appropriate changes made.

On July 1, 1962, Manufacturing Maintenance completed one million man hours of exposure without a lost time injury.

Security

A combination lock file located in the 313 Building was inadvertently left open on June 1, 1962. Patrol found the unlocked file the following morning and secured it. An inventory of materials stored in the file revealed nothing had been removed.

Radiation and Beryllium Control

The total of the exposures in excess of 100 mrad for Manufacturing Section personnel for the four-week badge period ending May 18 was 7,370 mrad compared with an average of 6,550 mrad per four-week badge period for the previous year. There were no exposures in excess of 300 mrad during this badge period.

Five air samples and 28 smear samples were taken during the period from May 24 through June 21. The beryllium concentration in each of the air samples was less than 10 percent of the maximum acceptable concentration for indoor air. The beryllium smear samples were below the HAPD control limit or were taken in areas where contamination is known to be present and adequate control is maintained.

Visits

<u>Name</u>	<u>Company</u>	<u>Contact</u>	<u>Date</u>	<u>Reason</u>
G. Miller	Columbia Machine, Inc. Vancouver, Wash.	Mr. Rick	6/6/62	Inspection of Ultrasonic Welding Machine
A. G. Blasewitz	General Electric Co. Manufacturing Services New York City, N. Y.	W. J. Masser	5/29/62	Discuss Quality Control develop- ments and Tech- niques
	Sylvania Hicksville, N. Y.	H. Watts	5/31/62	Discuss hot press fuel elements
	ALCOA New York, N. Y.	A. VanVorst	6/1/62	Discuss aluminum components
	Nuclear Congress		6/4/62 through 6/7/62	Attend Congress
J. R. Lundquist	Washington State University	American Chemical Soc.	6/17/62 through 6/20/62	Attend ACS Regional Meet- ing

<u>Name</u>	<u>Company</u>	<u>Contact</u>	<u>Date</u>	<u>Reason</u>
D. W. Darsow	Harvey Aluminum Torrance, Calif.	G. A. Mowdry E. Wright	6/4/62	Zircaloy II cladding tubes
	Airling Welding & Engineering Gardena, Calif.	H. L. Meredith R. Harmon	6/5/62	Inspection copper silicon rolled & welded sleeves
	Great Lakes Carbon Corp. Rosamond, Calif.	R. F. Markel W. M. Kenan H. Westcott	6/6/62	Graphite follower blocks
	Bridgeport Brass Riverside, Calif.	C. H. Hoehne L. L. Becker D. A. Doss	6/7/62 6/8/62	Zircaloy II cladding tubes
H. P. Kraemer	Rottler Boring Bar, Seattle, Wash.	D. B. Rottler	6/22/62	Steel sleeves
	Stoker Engineer Tacoma, Wash.	E. A. Gress	6/22/62	Bumper supports
	Wilkins & Assoc. Tacoma, Wash.	R. Wilkins	6/22/62	Steel sleeves
<u>Visitors</u>				
J. C. Lowey Floyd Mickelson	Metal Industries of Chicago	W. A. Hendrickson W. E. Stavig J. D. Stauffer H. A. Jones	6-4-62	Component cleaning compounds
Floyd Mickelson	Metal Industries of Chicago	G. Hansen J. D. Schaffer G. W. Johnson W. A. Hendricksen H. G. Powers H. A. Jones	6-5-62	Toured FPD to review cleaning techniques
Dr. E. B. Saubestre	L. H. Butcher Co. Seattle, Wash.	W. E. Stavig H. G. Powers H. P. Kraemer H. A. Jones	6-6-62	Discuss application of Enthone products to our process
J. Sohmer J. M. Dugger	Chas. Pfizer Co.	H. A. Jones IPD & CPD representatives	6-7-62	Decontaminating problems
F. Schricker G. Pearson	Van Water & Rogers Co.	R. R. Watts H. P. Kraemer H. G. Powers	6-7-62	Metal cleaning problems

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<u>Name</u>	<u>Company</u>	<u>Contact</u>	<u>Date</u>	<u>Reason</u>
D.B.B. Janisch	Risley, United Kingdom Atomic Energy Authority	W. O. Goslin	5/31/62	Safety Meeting

Patent Summary

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 June.

Manager - Manufacturing

WN Mobley:HFT:mr'b

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ENGINEERING OPERATIONJUNE, 1962VISITORS

<u>Name</u>	<u>Company</u>	<u>Contact</u>	<u>Date</u>	<u>Reason</u>
JW Croach	Savannah River Plant Aiken, South Carolina	JT Stringer	6-5/6	FEDC meeting
FL Cuthbert	National Lead Co. of Ohio, Cincinnati, Ohio	JT Stringer	6-5/6	FEDC meeting
JA Fellows	Mallinckrodt Chemical Works, St. Louis, Mo.	JT Stringer	6-4/8	FEDC meeting
JW Ruch	AEC, Oak Ridge Operations Oak Ridge, Tennessee	JT Stringer	6-4/6	FEDC meeting
NJ Donahue	AEC, Savannah River Operations, Aiken, South Carolina	JT Stringer	6-4/5	FEDC meeting
W. Devine	AEC, Washington, D.C.	JT Stringer	6-5/6	FEDC meeting
WE Tragert	GE Research Lab. Schenectady, New York	JT Stringer	6-5/6	Consultation
F. Michalelson	Diversey Corporation, Chicago, Illinois	JD Schaffer	6-4/5	Technical assist- ance on cleaning
J. Lowey	Diversey Corporation, Chicago, Illinois	JD Schaffer	6-4	" "
K. Newman	Turco Corporation Los Angeles, Calif.	JD Schaffer	6-25	Technical assist- ance.
F. Morris	Turco Corporation Spokane, Washington	JD Schaffer	6-25	" "
K. Weikle	Brush Beryllium, Elmore, Ohio	WK Alexander	6-15	Discuss braze fabrication

TRIPS

JT Stringer	ASTM Standards Commit- tee Meeting, New York City, NY		6-23/30	Attend meeting
	GE Research Lab. Schenectady, NY	WE Tragert		Technical discussions
	Sylcor, Hicksville, NY	Ed Meyer Boyd Metz		Consult on programs

TRIPS

EA Weakley	National Lead Company of Ohio, Cincinnati, Ohio	CA Polson	6-25/27	U technology and specifications
	Mallinckrodt Chemical Works, St. Louis, Mo.	NF Neumann	6-28/29	
CH Allen	Columbia Machine Co., Vancouver, Washington		6-5/6	Confer with machinist
	Stoker Engineering, Seattle-Tacoma, Wash.	Mr. Gress	6-21/22	Bumper support fabrication
DC Worlton	Pacific Northwest Metals Conference Seattle, Washington		6-8	Present paper
GW Riedeman	Rem, Inc., Portland, Oregon	CA Brown	6-13/14	N fuel component designs
	Wah Chang, Inc., Albany, Oregon	RA Graham	6-25/26	Supports
	Rem, Inc., Portland, Oregon	CA Brown	6-25/26	N fuel components
CH Shaw - TD Naylor	National Lead Co. of Ohio, Cincinnati, Ohio	CE Polson	6-19/20	N billet specifica- tions & fabrication
	Bridgeport Brass Co., Ashtabula, Ohio	DR Jefferson	6-21	" "
	Mallinckrodt Chemical Works, St. Louis, Mo.	W. Buntz	6-22	" "
SM Gill	National Lead Co. of Ohio, Cincinnati, Ohio	CE Polson	6-18/20	N billet specifica- tions
	GE Research Lab. Schenectady, New York	WE Tragert	6-21	Metallurgical bonding techniques
	National Research Corp. Cambridge, Mass.	PJ Clough	6-22	Discuss DDR-139
	Nuclear Metals, Inc. Concord, Mass.	P. Loewenstein	6-22	Contract work
TB Correy	Oslo, Norway	G. Parsloe	6-25/29	Attend International Institute of Welding Annual Meeting

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PERSONNEL

Additions

A. N. Chaston, Summer Professor, joined Testing Methods Engineering on June 11, 1962.

P. K. Hoffman, Technical Graduate, transferred into AlSi Product Engineering for a 3-month rotation on June 13, 1962.

T. F. Archbold, Summer Professor, joined Advance Fuel Engineering on June 18, 1962.

R. D. Ehrlich, Technical Graduate, transferred into AlSi Product Engineering for a 3-month rotation on June 25, 1962.

L. O. Slind, Technical Graduate, transferred into Coextruded Product Engineering for a 3-month rotation on June 25, 1962.

Removals

R. L. Straley, Technical Graduate, transferred out of Coextruded Product Engineering on June 1, 1962.

G. X. Beard, Technician, transferred out of Coextruded Product Engineering on June 4, 1962.

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 June, 1962. Such persons further 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.

SIGNIFICANT REPORTS ISSUED

HW-67575 REV 2, "Specifications for Uranium Metal Billets for NPR Fuel Elements," Fuels Preparation Department, June, 1962 (Unclassified).

HW-72376 1, "Alternate End Closure For New Production Reactor Fuel Elements," T. B. Correy, June 18, 1962.

HW-72848, "Technology, Economics and Incentives for a Solid State Diffusion Bonding Process -- Hot Die Sizing," C. A. Burgess, March 1, 1962.

HW-72990, "NPR Billet Design Modifications," C. H. Shaw, June 15, 1962.

HW-73238, "Ingot-Dingot Comparison," R. R. Bloomstrand, May 21, 1962.

HW-73638, "Assembly and Performance of Fuel Elements for H-Reactor E-N Demonstration Load - Final Report, PT-IP-350-C," W. A. Blanton and W. H. Hodgson, May 25, 1962.

HW-74071, "Provisional Process Specifications for Solid State Diffusion Bonded Fuel Elements (Sylcor Hot Press Method)," C. A. Burgess, June 20, 1962.

SECURITY

There were no security violations in the Engineering Section during June. Total CYTD - 1.

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ADVANCE FUEL ENGINEERING

Fuel Performance

A total of four (4) regular production I&E fuel elements failed in the reactors during June. No unusual trends are indicated from this experience. All were natural uranium. A summary of these ruptures is as follows:

<u>Fuel Element Type</u>	<u>Tube and Reactor</u>	<u>Exposure MWD/T</u>	<u>Rupture Classification</u>	<u>Failure Date</u>	<u>Canning Date</u>
Natural					
Bumper	3065-D ⁽¹⁾	533	Unclassified	6/14/62	1/18/62
"	3378-D ⁽¹⁾	600	Side-Other	6/18/62	1/18/62
Non-Bumper	2272-F	486	Side Hot-Spot	6/25/62	3/14/62
" "	1268-DR ⁽²⁾	455	Unknown	6/26/62	11/17/62

- (1) Alloyed dingot. Same HAPO lot.
 (2) Vendor "B".

Nuclear Safety

The Technical Specifications for the Hanford Test Reactor are completed.

The Operating Specifications for the Hanford Test Reactor are being revised and reissued as "Nuclear Safety Specifications - Hanford Test Reactor". An attempt will be made to separate nuclear safety limits from operating advice, with adherence to the latter category being optional.

There were no violations of the Nuclear Safety Specifications in June in either the Hanford Test Reactor or the Engineering Facilities.

O2 Metallurgy Research and Development Program

The document describing the Fuels Preparation Department-sponsored O2 Metallurgy Research and Development Program has been completed.

ALSI PRODUCT ENGINEERING

Uranium Technology

Approximately 115 tons of alloyed dingot are being irradiated in the old reactors and 1387 tcns have been discharged at goal. In addition, 61 tons of alloyed dingot are being irradiated in the K reactors and 239 tcns have been discharged. Two bumpered dingot failures occurred this month at 533 and 600 MWD/T and were classified as an unclassified and a side other failure. In addition, a non-bumpered dingot failure occurred at 455 MWD/T and a non-bumpered ingot control failure occurred at 486 MWD/T. Neither of these failures have been classified. A moratorium is continuing in which no dingot cores will be canned or reactor charged. However, it is expected that the 102 tons of canned dingot elements in storage will be released in July for reactor usage after a more stringent weld inspection, a tighter UT-4 test, a longer autoclave cycle, and a retest of non-bumpered material for bond quality.

MCW is currently preparing three dingots having carbon levels of approximately 100, 250, and 500 ppm to evaluate the effects of carbon content on nitric acid pickling rates and Al-Si bonding properties. MCW is also preparing dingot cores with various concentrations of intermetallic precipitates (U_6Fe) for pickling and bonding studies. Preliminary evaluation of vacuum precipitation annealed dingot metal indicates that the nitric acid etch rate is about three times faster than for standard beta treated dingot metal.

Two completely untransformed enriched cores were rejected by the UT-2 testers this month. These cores had been vacuum outgassed before beta heat treatment. Since the outgassing step oxidizes the surface giving the uranium an appearance of having been heat treated, it is conceivable that the core blanks could have been mistaken for heat treated material and not heat treated. With the new enriched heat treating facility now being used, however, the chance of skipping the heat treating step will be virtually eliminated.

Approximately 1.5 tons of hollow core blank, oil quenched, ingot fuel elements had been discharged as of June 1 without incident and 9 tons are under irradiation. Fifteen (15) tubes charged in February are scheduled for discharge at 800 MWD/T goal by the end of June. On or about September, a total of 25 tons of oil quenched ingot elements will have been charged and the charging rate will be increased from 5 to 25 tons per month for a four-month period and then increased to 90 tons per month for 6 months.

NLO rejected a number of partially untransformed cores on their UT-2 testers from the oil-quench cores heat treated in May. NLO uses the SRP salt bath

oil-quench facility to heat treat HAPO test material, and it is believed that the sludge level in the salt bath was excessive. This allowed the bottom of the core blanks to be immersed in sludge, which has a temperature lower than the alpha-beta transformation temperature. Since NLO UT-2 tests only a 5 cores/ingot sample, it is quite likely that a number of these partially untransformed cores were shipped to HAPO in the 44 tons of oil-quenched cores heat treated in May. All of the cores will be thoroughly tested for transformation before processing.

Revision 6 to the feed site specifications was issued this month. Several revisions to the new specifications that are currently being contemplated include: (1) changes in the carbon specification limit to prevent acceptance of cores having greater than 750 ppm carbon, (2) excluding the use of drip crops and other undesirable feeds from the ingot remelt, and (3) a change in the composite sample limit for zirconium.

AlSi Process Development

Irradiation experience continues to indicate "bumper" fuel will effectively minimize gross fuel misalignment in existing ribbed process tubes and associated accelerated (hot spot) corrosion ruptures. Of the thirty (30) ruptures sustained to date in over 300,000 "bumper" fuel elements exposed to variable goal in the old reactors, none have been of the hot spot type "bumper" fuel was designed to prevent. The overall performance of "bumper" fuel is about a factor of two better than non-bumper fuel. Currently, the D and H Reactors and the enriched fringe columns of the B, DR, and F Reactors are loaded with "bumper" fuel. Conversion of the central columns in DR Reactor to natural "bumper" fuel is in progress and scheduled for completion in July.

Post-irradiation examination of an additional four columns each of elliptical "bumper" fuel and rectangular "bumper" control fuel exposed to 1060 MWD/T has confirmed earlier data on five columns of each fuel type exposed to 800 MWD/T. Surface corrosion of the test pieces was generally less than observed on the control pieces. As soon as the overall test data is analyzed, IPD concurrence is expected in large-scale use of elliptical rails to take advantage of reduced flow resistance.

Fabrication of a prototype automatic feeder to feed elliptical rails, pre-stamped in "tape" form, into the ultrasonic welders is 50 percent complete. Design is complete except for a sensing circuit to detect and compensate for any rails that may be missing in the "tape". An order has been issued to obtain quotations and initial quantities of rails for test purposes. Contacts with a potential vendor indicate no difficulty is foreseen in supplying rails in the prescribed "tape" or metal strip form. Until the prototype feeder is satisfactorily demonstrated on or about September, capacity for attaching elliptical rails will be limited to a manual welder. Thereafter, the capacity will be increased from about 100 to 1200 pieces/shift on the prototype automatic welder until the production welders are converted.

IPD has recently placed an order for 5200 ribless zircaloy tubes to retube the K Reactors. Delivery of the first 200 tubes is expected by November 1; however, installation will not begin before December. Manufacturing

procurement of components for the revised natural and enriched fuel models under this program is pending receipt of an IPD forecast of fuel requirements. Optimization of projection rails for these fuel models is progressing in the Hanford Laboratory. Dies have been fabricated for a preliminary arch-type rail design stamped from 50 mil 8001 alloy stock. Ex-reactor testing of this rail design will begin early next month. In order to demonstrate process capability for controlling projected fuel diameters and minimum rail heights within the desired tolerances for irradiation, dies are also being fabricated to evaluate post-sizing techniques after rail attachment. Dimensions of the K Reactor fuel models requested by IPD to provide the necessary annular flow and temperature balance, as well as clearance for charging, are as follows:

	KVNS	KVES
Finished Fuel O.D.	1.580 ± 0.006	1.509 ± 0.006
Maximum Support Circle	1.710	1.710
Minimum Rail Height	0.092	0.097

An analysis of KVN fuel measurements to date does not indicate any serious difficulty in meeting the finished fuel O.D. tolerances. Fuel element ellipticity (4 - 5 mils average), however, will constitute a problem in controlling rail height.

Self-support rails (130 mils high) were welded on approximately 500 KIVN fuel elements for charging in the 1706-KE single-pass corrosion facility. Rails were also attached to 250 spacers and 88 perforated dummies for use in this facility.

A welding head with a "screw-on tip" for the 306 Pilot Plant manual ultrasonic welder has been rebuilt by the vendor and returned for evaluation of various tip designs.

Studies to provide a corrosion resistant film on aluminum jacketed fuel elements by autoclaving in potassium dichromate solution included selection of several promising process cycles, based on accelerated corrosion data, and exploring the effect of these process cycles on the AlSi-uranium bond. These tests were deemed desirable since fuel cladding corrosion increases with increased autoclave temperatures. Autoclaving for 40 hours at 290°C produced measurable deterioration of the AlSi-uranium bond, as indicated by ultrasonic bond testing. Autoclaving 40 hours at 230°C appeared to have no effect, but the data have not been completely evaluated.

Metallographic examination of fuel elements produced to study the effects of duplex canning furnace variables on bonding layer formation for ingot and dingot metal is continuing. Thirty-five percent of the metallurgical samples have been studied and photographed. This represents at least one section from 69 percent of the fuel elements assembled for the test. The following conclusions are based on preliminary data:

1. There is no difference, at the 5 percent level of significance, between the internal and external bonding layers from the standpoint of thickness or percentage of UAl_3 -type structure for either ingot or dingot uranium.

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2. No significant difference in the thickness of either the internal or external primary bond layer is evident when comparing paired samples of ingot and dingot cores cycled together in the duplex bath.
3. There is a significant difference at the 5 percent level in the percentage of UAl_3 -type structure on both the internal and external surfaces when comparing paired samples of ingot and dingot cores cycled together in the duplex bath. The dingot cores have less UAl_3 -type compound layer.
4. More optimum duplex conditions will produce a larger percentage of UAl_3 -type structure in the bonding of both ingot and dingot uranium fuel elements than the present process. These conditions involve longer lead preheat time, higher lead temperature, and lower percentages of silicon in the duplex bath. Greater changes will be necessary to optimize the bonding of dingot cores than for ingot cores. Complete evaluation of all metallographic samples is required before the exact conditions can be determined.
5. A majority of the bond fractures observed in metallographic samples is due to the abrasive cutting operation. All samples were marked and cut in a predetermined direction, showing bond fractures where the bond was stressed in tension. The internal and external bonds fractured at locations 180 degrees apart.

Development of process conditions to improve uranium-AlSi bonding continues to be impeded by the lack of a reliable testing technique other than metal-lurgical examination. A "stud pull test" is useful in measuring large differences in bonding, but is not of much value in making a direct comparison of slight process changes because of variations in the area stressed during the test from one stud to the next. Weld area has been made more nearly constant by reducing the diameter of the studs from $1/4$ to $3/16$ inch. This change is now being evaluated.

Data developed from heat treatment of nickel-plated AlSi bonded fuel elements shows a reduction in fuel element bond strength (stud pull test) for rather long times at high temperatures. This data covers a temperature range of $400^{\circ}C$ up to a maximum baking time of 100 hours. An exponential relationship was indicated, with the bond strength dropping essentially to zero after 100 hours. This relationship can be expressed by $y = \alpha t^B$, where α and B are constants characteristic of the fuel elements and temperature. It is possible that α or B is some function of fuel element bond quality. A test has been designed and is underway to evaluate the effects of thermal cycling and annealing on bond quality. An attempt will also be made to evaluate the capability of non-destructive testing methods to measure the condition of the bonds before and after thermal treatment.

An attempt to measure the strength of internal bonds by shearing the internal tube out of $1/4$ inch sections of fuel elements with a mandrel punch has not been successful. In every case, failure occurred in the aluminum tube wall at a force of about 7,500 pounds. This does not mean that the bond is stronger

than the aluminum tube. A very high radial force was produced by the action of the punch, which loaded the bond in compression. This could prevent the normal shear failure of the bond. Further development is required to produce a satisfactory technique.

Normal I&E fuel elements are out of round or elliptical as much as 15 mils. The average value is roughly 4 - 6 mils. This condition results from deformation of the canning sleeve during service. The design of the KVN and KVE self-supported fuel for use in ribless zircaloy tubes in the K Reactors, however, requires tighter tolerances on fuel and support dimensions than previous models to maintain a delicate balance between hydraulic and corrosion conditions during irradiation. As a possible improvement in the fuel element ellipticity, a portion of the gap between can and sleeve equivalent to the height of the upset metal at the can grooves was eliminated for that portion of the sleeve encasing the canned slug. This was actually accomplished for a small-scale test by reaming the top one-half inch of 15 KIVN sleeves 5 mils oversize to permit entry of a standard CIIN can. Dimensional data have been analyzed for 45 fuel elements each of 1) CIIN cores and cans in CIIN sleeves, 2) CIIN cores and cans in the modified KIVN sleeves and 3) KIVN cores and cans in KIVN sleeves. These data show a significant decrease in average ellipticity of treatment 2 above, as compared to the two sets of controls. The average values were:

<u>Treatment</u>	<u>Ellipticity (Mils)</u>
1	4.5
2	3.6
3	4.4

Although the above results are encouraging, additional testing now in progress is required before the value of this change can be measured in terms of bond quality as well as ellipticity control. A potential gain in terms of increased core O.D. will result from reducing sleeve diameters. CIIN fuel elements were readily assembled in KIVN sleeves (5 mil smaller diameter) without sticking or non-seating. Average O.D. at the center point (O.D.₂) was 6 mils less than standard CIIN fuel elements.

On June 18, a fuel element from lot KZ-390-H was found to have a blister located about one-half inch from the base, following autoclave testing. Examination of the male end revealed the core wall was penetrated by a steel staple similar to the type used on component shipping boxes. Gouging on the inside of the can wall indicated the staple was forced to the bottom of the can during core insertion. The upset metal caused by the gouging resulted in the core non-seating approximately one-quarter inch.

All fuel end closure welding machines in the AlSi Shop finishing area have now been converted to D-C welding.

Several equipment additions to the 306 Pilot Plant were accomplished. A sonic orientation resonance tester (SORT) and a UT-2 tester were installed. The UT-2 tester is being used for testing CVI cores.

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Process specifications (HW-47029) were revised and the major changes are outlined briefly as follows. (1) Fuel element core specifications were revised to incorporate uranium grain size (FEDC) and quench cracked core limits, uranium chemical composition limits, a 0.053 in. increase in core length while retaining the former length as an alternate, reactivity limits for as-received cores, and limits for U-235 concentration for natural and enriched uranium. (2) Finished fuel element specifications were changed to permit a reduction of fuel element rotation in parallel plate gages to 180 degrees, and to reduce 100 percent lot sampling for reactivity tests to periodic audits after reactivity limits for new fuel models have been established. (3) The atomic percent of Li-6 in lithium-aluminum target elements was changed to conform with SRP limits. (4) Specifications for lead-cadmium elements were changed to relax core diameter tolerances and limits for boron content were added. (5) Specifications for fabricating bismuth elements were also added.

During the period of May 29 through June 25, a total of 2,083 pieces were canned in the 306 Pilot Plant. Of these, 636 were for reactor use, 1,447 were for destructive test, 1,768 pieces were processed for weld reclamation and 220 peris for reactor use had rails welded on.

Alternate Process Development

Hot Press

An irradiation test IP-490-A-PP comparing Sylcor hot press, HAPC hot press and HAPC Al-Si bonded fuel elements was charged in C Reactor on June 2, 1962. The test has proceeded without incident.

Product specifications (HW-74071) to produce 1000 GIVE enriched (.94%) I&E fuel elements by the Sylcor hot press process have been completed. Uranium cores of the prescribed design will be ordered by HAPC and delivered to Sylcor for fuel assembly. Bare core testing will be performed at NLO.

Fluid Pressure Bonding

Contract negotiations have been completed with Battelle Memorial Institute to pressure bond 128 fuel assemblies to optimize process cycles at a cost of \$24,780. Schedules for this work are currently being developed with Battelle. Fuel element assembly will be scheduled at HAPC in coordination with this schedule.

Hot Die Sizing

Studies to determine the time-temperature relationships during the preheat portion of the bonding cycle have been completed. The resulting data has been computer processed, and the useful relationships plotted graphically.

It had been theorized that initial diffusion between Ni-uranium couples must take place in the preheat furnace. Preliminary examination of thermal cycled nickel plated uranium cores has confirmed this theory.

A total of nine (9) fuel assemblies, nickel plated cores in lubricated cans, preheated for 20, 30 and 40 minutes, one each, at furnace temperatures of 580°C (1076°F), 610°C (1130°F) and 640°C (1184°F) have been sectioned. As a result of the metallographic examination of these pieces, it was concluded that nickel-uranium diffusion takes place during preheat and that uranium oxide and nickel interdiffuse. Diffusion thickness was observed to range from 0.04 to 0.32 mils for the test conditions. Increased time and temperature improved the uniformity of diffusion as well as increased diffusion layer thickness. The following table shows the effect of time and temperature on diffusion layer thickness for a one-piece sample of each of the above test conditions.

DIFFUSION LAYER THICKNESS IN MILS

<u>Preheat Time*</u>	<u>580°C</u>	<u>610°C</u>	<u>640°C</u>
20	0.04	0.12	0.24
30	0.12	0.20	0.32
40	0.16	0.28	0.16

*NOTE: Preheat time is defined as the time the assembly at room temperature is placed in the furnace until it is removed.

The observed uranium oxide and nickel diffusion may minimize core cleaning and plating problems and contribute to uniform nickel-uranium diffusion. This diffusion phenomena reduces the requirement for roughened uranium core surface and as-plated nickel adhesion to the uranium.

Experimental end caps to prevent cap mushrooming and promote end bonding during hot die sizing have been fabricated. These caps will be tested as soon as testing time is available on the sizing press.

Installation of the sizing press has been completed and preliminary testing is in progress. Fabrication of the end bonding press has been completed and installation is scheduled early next month. A vacuum dryer, fabricated at an off-site vendor, is also ready for installation.

Electro-Nickel Plating

Improvement of the process for electrodeposition of nickel plate on metallic uranium included a comparison of the nickel adhesion produced by various uranium pretreatment methods and a preliminary determination of uranium etching rates. An investigation of methods to improve the integrity of nickel plate was also initiated.

Nickel plate adhesion was found to be qualitatively the same for electrolytically etched, and for chemically etched uranium, employing chemical etchants which produce a high degree of micro-roughness. Adhesion tests include thermal shocking by immersion in a 600°C (1020°F) salt bath and water quenching. The adequacy of the chemical etching cycle will be

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further checked by metallographic study of the U-Ni interface and by bond testing canned fuel elements.

Efforts to improve the continuity of the plate were prompted by the presence of pores at contact alignment points of the plating racks. Although both the electrical and alignment contact points are automatically changed during the pretreatment and plating cycles, the uranium oxidizes at these points upon exposure to air in a furnace. Tests to eliminate the problem have so far been inconclusive.

COEXTRUDED PRODUCT ENGINEERING

K-East Reactor Fuel Development

KER Loop Testing

Loops 1 and 2

Loops 1 and 2 have been shut down for pump modifications. These pump modifications will increase pump capacity. It is anticipated that Loops 1 and 2 will be back on the line sometime after 8/1/62.

Loop 3

A thermocouple train and a charge of eleven prototypic NAE-1 fuels was discharged from Loop 3 on 6/18/62. Exposure at discharge was about 800 MWD/T. Originally a goal exposure of 1000 MWD/T was planned for this charge. Because of extensive non-prototypic "cold" water irradiation, Loop 3 was discharged at an exposure less than the planned 1000 MWD/T goal exposure.

On 6/20/62, eleven prototypic NAE-1 fuels and a thermocouple were charged in Loop 3. Present exposure is approximately 55 MWD/T. Goal exposure for this charge is tentatively set at 1000 MWD/T.

Loop 4

The fourteen prototypic NAE-1 fuels in Loop 4 are operating satisfactorily. Present exposure is about 500 MWD/T. Approximately 60% of this exposure has been on single pass water.

Test Fuel Fabrication

Loops 1 and 2

1. To test Loops 1 and 2 modifications, twenty NIE-1 heater fuels with zircaloy-2 sleeves will be required by August 1, 1962. These heater fuels are at various stages of processing in the 306 Building Pilot Plant.
2. The "tapered end closure test" is available at the K-East Reactor for charging. The fuels for this test have "V" shaped end recesses with mating "V" shaped end caps.
3. Fabrication of 1.6% enriched KSE-5 fuel elements has been delayed due to lack of Nuclear Safety Specifications.

Loops 3 and 4

A charge of fourteen NAE-1 fuels is available at the K-East Reactor for charging. Material for a backup charge is now being procured from Manufacturing and should be ready for shipment about July 5, 1962.

Other Items

The schedule on the next page shows the other fabrication activity in the pilot plant in 306 Building.

Materials DevelopmentZircaloy-2 Cladding Shells

Wah Chang has delivered their second lot of qualification shells for the inner clads of both outer and inner billets. Samples of each size have been coextruded with copper cores as the final quality test. Only two short lengths of inner tube extrusion have been stripped yet, and the Wah Chang inner clad appears satisfactory from these. Full evaluation will require that the whole tubes be stripped and the cladding carefully measured and visually examined for any deleterious memory effects. Wah Chang has already qualified on the two larger outer clad sizes; qualification of the smaller inners will make Wah Chang a fully qualified vendor to bid on cladding shell requirements.

In the same copper cored test billets mentioned above, samples of the new Harvey outer tube outer cladding and samples of special outer tube inner cladding provided by HLO were included.

The Harvey tubes were fabricated by an old standard qualified direct extrusion procedure that Harvey returned to after running into trouble on their last batch of drawn tubing. Some of this tubing gave peculiar readings from an ultrasonic test that could not be explained; the test coextrusion was to find if the ultrasonic results have any relation to cladding quality.

HLO provided two outer tube inner clads fabricated by Bridgeport Brass Company and HAPCO completely by extrusion, with no forging. Normally, 16" diameter cast ingots are forged to an intermediate size suitable to machining into billets from which the final cladding shells are extruded. With all the difficulty encountered with memory and memory's association with non-uniform working (such as forging), the question arose whether forging per se was a harmful operation. HLO's special non-forged tubes should shed some light in this area. These parts have not been stripped or examined.

C.P.E. PILOT PLANT WORK SCHEDULE

DATE ISSUED: June 29, 1962

IN PROCESS DATE	PWR NO.	EXTRUSION DATE	TUBE NUMBER	WORK DESCRIPTION	TYPE AND QUANTITY REQUIRED	PROCESS LOCATION	EXPECTED COMPLETION DATE	COMMENTS
5/2/62	43			Prepare fuel assemblies for process tube scratch test and charging machine tests.	(200) NAE	Prepare fuels for supports.		Program to continue for indefinite period.
5/29/62	44			Provide heater fuels (throw-aways) for KER Loops 1 and 2.	Reactor Grade. (10) 23-inch NIE-1 (10) 17-inch NIE-1	Abrasive blasting	7/15/62	
4/30/62	45			Provide coextruded I&E fuel elements with supports for effluent activity tests.	(45) I&E Reactor Grade	Nondestructive testing	7/25/62	

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Supports

The support supply situation has not changed appreciably: production is still on a "hand to mouth" basis for all except locking clips. The fabricability of each new lot of zircaloy-2 strip has a marked effect upon part quality and dimensions and cannot readily be predicted by analysis of strip fabrication or chemistry. Currently, the vendors are developing flexure and bend tests that may provide an acceptable screen of candidate strip to reduce the variation in material submitted for fabrication. The main problem in strip variability lies in the newness of the rolling and heat treating process. Relatively little strip has been made in this new way, and subtle changes in processing appear to have a profound effect upon strip fabricability.

The strip supplier (Wah Chang) is now carefully monitoring his processing operations and sampling strip between each operation to find where the variability is occurring. This analysis will require several weeks to finish and, in the meantime, the fabricator (Rem) is compensating for the variation by altering the support forming tools for each new lot of strip.

Rem now has satisfactory tooling for producing all parts, subject to strip limits. Several design modifications called out by application experience here at Hanford are pending a tooling service contract that is about to be negotiated with Rem. This contract will provide for six months charges for modifying tools to make part changes we find we need to improve our operations here.

One interesting item emerged during the month. With relatively little effort, outer tube supports from a single die can be deformed to make almost any of the height variations we now individually specify. The implication is that we may be able to basically form the part on one major set of tools and alter the height to whatever we need in a simple auxilliary sizing operation. A step such as this will take the burden of extreme precision away from the forming operation which is inherently not very precise. Auxilliary sizing can be very precise.

Coextrusion Process

Extrusion

The following Coextruded Product Engineering extrusions were made during this month.

7.5 Inch Tooling

Three Composites - ZT-22 & 23, and UT-34

ZT-22 & 23 - NOE size with copper core to evaluate zircaloy clad components.

UI-34 - NON size with Fe-Al alloyed uranium core.

6.0 Inch Tooling

One Uranium Billet - PU-70

PU-70 - 4 x 1 inch tube

Two Zircaloy Billers - Z-133 & 134

Z-133 - KSE-5 end cap stock

Z-134 - KSE-5 inner clad component stock

One Copper Billet- NIT size tubing

Four Composites - ZT-20 & 21, and X-24 & 25

ZT-20 & 21 - NIE size with copper core to evaluate zircaloy clad components.

X-24 & 25 - KSE-5 size to evaluate accuracy of new billet design and determine final tool dimensions.

Warp

As per the May Monthly Report, the increase of the inner tube warp reject rate during late April and early May was attributed to the die pickup which occurred on this material during extrusion. With the elimination of the die pickup problem late in May, it was believed that the warp reject rate would decrease to a more reasonable level (approximately 6%). Actual experience during June shows a yield of 93 to 96 per cent at heat treat for inner tube material extruded during late May and early June following elimination of the die pickup problem.

The effect of billet heat treatment on warp has not been completely evaluated, but the overall warp yield of 93 to 96 per cent indicates that this difference will not exceed 1 to 2 per cent in either direction.

Brazed Closure: Temperature Calibration

A new technique, which is quick and inexpensive has been developed for calibration of the production brazing temperature recorder-controller system. The present technique of imbedding a thermocouple in a cap as a check for the optical recorder controller system has been found to be quite time consuming and expensive and not as reliable as desired. The new technique consists of establishing two reference points to be used as the bases for making the recorder scale. These two points are 960°C, which is the freezing point of the Be-Zr eutectic and 1085°C, which is the freezing point of the Ti-Fe eutectic. These two points are fixed and well known and can be identified by sharp thermal arrests in the cooling curves of these two alloys. With these two points established on the actual operating

equipment, it is relatively simple to fill in the scale between these points since the output of the optical temperature sensing instrument has been found to be exponential throughout this range. The sharp thermal arrest noted each time a brazed closure cools provides a continuous calibration check.

This procedure will become the standard as soon as the appropriate material and fixtures are obtained.

Support Welding

The problem of copper pickup has been eliminated on the outer NPR elements by inserting zirconium pads in the ground electrode. There is a zirconium pickup but this is readily removed when the element is bright etched. The copper pickup on the inner NPR elements is very minute and is not considered a problem. The problem of pickup will never be entirely eliminated because of irregularities in the surface of the cladding and the minute movement during welding when the element re-seats itself in the V of the ground electrode. As a precautionary measure, zirconium pads are to be installed on the inner NPR welding fixture ground electrode.

Chemical Processes

Horizontal Chemical Milling

In tests performed in the pilot plant on both inner and outer N-fuels, using horizontal milling techniques, very smooth uranium surfaces well within depth variation tolerances were produced. In these tests, the nitric acid concentration was reduced while other chemical constituents were maintained at normal levels. Additional tests will be performed with the ultimate goal of establishing a horizontal milling process for the production facility.

Final Etching and Autoclave

Recent tests in the pilot plant have shown that a double aluminum nitrate stop bath in the etching process is effective in the control of white oxide formation on welds of autoclaved fuels. The first stop bath serves to retain most of the etchant carried over from the etch tank. The second stop bath receives carryover from the first stop bath which has a low etchant concentration. Although the etchant carryover concentration into the first bath is allowed to build up to levels not permitted if a single bath is used, immersion time in this (first) stop bath is reduced to a few seconds and does not allow sufficient time for the white oxide producing effects to occur.

Tests performed in the pilot plant during the past two months were designed to determine variables causing white oxide in the 333 Production Facility. The principal variables were found to be (a) excessive etchant carryover into the aluminum-nitrate stop bath, and (b) incomplete water fill and hot blowdown autoclave procedure. Specifications were issued controlling these variables. Fuel elements subsequently processed in the production facility had improved weld surfaces but developed white spots and stains on the cladding areas. These were evidence of inadequate operating techniques. Engineering personnel were requested to operate the etch facility using practice fuels to demonstrate that a workable process had been established. Approximately 40 outer fuel elements were processed in the production facility. With the exception of clad stains on two elements, all fuels were acceptable after autoclaving. Welds were generally black to a dark acceptable gray. On the basis of this demonstration, Manufacturing is proceeding to correct equipment deficiencies, process deviations, and inadequacies in operator technique. Additional tests will be performed to demonstrate capabilities of production personnel and facilities to etch and autoclave fuels to meet product specifications.

Zircaloy-2 Scratching: Assembly Operation

The scratched NPR outer fuel representing a 10 mil and 20 mil interference fit per support has been exposed to 400°C steam at 1500 psi for one month. The resulting corrosion product over the scratched area is approximately 1.5 times thicker than the oxide over the adjacent metal. There have been no observed differences to date between the scratches produced by as-etched assemblies and those produced by 72 hour autoclaved assemblies.

Exposure to 400°C steam and 360°C water is continuing for 10, 20, 30, and 60 mil interference fit samples.

White Welds: Corrosion Testing

The end caps from a white weld autoclave reject (from the burst rupture disc load 3/26/62) and an acceptable fuel element with black welds have been exposed for one month to 400°C steam. The thickness of the corrosion product formed at the weld areas for both fuels was approximately the same (approx. 0.0007"). Exposure will continue until after the first transition and accelerated corrosion begins.

Vapor blasting and re-analyzing the beryllium to zircaloy ratio of white and black welds using the microspark spectrographic analysis technique has resulted in a Be:Zr intensity ratio of about 4.0. Before vapor blasting, the white welds had a ratio of 6.5 and the black welds had a ratio of 3.7. These results compare favorably with other reported data that higher surface beryllium concentrations are sometimes associated with white welds. However, x ray diffraction analysis of filings from several white welds has not identified any beryllium compounds.

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Equipment Development

Rotating Electrode for Locking Clips

A modified electrode was fabricated, equipped with a Class 10 tungsten copper tip. The Class 10 copper was used because of the hardness of material, increasing the life of the tip.

The modified electrode will be installed at the same time the new table for the spike welder is installed. Installation time will be decided.

Copper Vapor Deposition

Modifications were made to the small vacuum system used for depositing copper on zircaloy-2.

The electrode used for cathodic etching was modified, and with the help of a permanent magnet, the etching arc can be moved about the substrate getting the entire surface etched.

A small furnace was built in the vacuum system to heat the substrate to approximately 625°C after copper deposition. The furnace will be used to diffuse the copper to the zircaloy-2.

Gaseous Etching

A high voltage bushing is being fabricated for the beam welder chamber. It is necessary to make a few changes in the high voltage tank on the beam welder in order to switch from beam welding to gaseous etching.

TESTING METHODS ENGINEERING

N Fuel Testing

For the first time end closure surface contamination measurements have been made on outer tube geometries. Initial tests of two fuel elements show the contamination to be in the order of 18 micrograms per end closure. Existing test equipment, which was designed to accommodate inner tubes only, was modified for these tests. More extensive testing of outer tubes will be performed with equipment now under fabrication.

Contamination measurements of inner fuel tubes is also continuing. A complete extrusion of seventeen elements recently checked indicated a contamination of around 24 micrograms per end closure. There has been no evidence of contamination on the cladding surfaces. It is generally agreed that the present levels of contamination do not constitute a problem, and that the small amount existing on the end closures is definitely to be preferred to less serviceable closures which may result if the brazing temperatures were lowered.

Laboratory effort is being devoted to the development of a nondestructive test method capable of assuring complete beta transformation of extruded N-fuel. Present investigations are determining if the change in longitudinal and torsional resonant frequencies accompanying heat treatment are sufficient for measurement purposes. Data obtained on a group of five elements showed the resonant frequency of the longitudinal mode to be 2789 cps before heat treatment and 2832 cps after heat treatment. Although this difference could be utilized to distinguish non-heat treated material, it is doubtful if the technique could be refined to reliably detect small regions of incomplete transformation.

SORT equipment is being adapted to N fuel in order to provide an additional source of data regarding extruded uranium. Plans are to collect sufficient data to establish the degree of uniformity of extruded fuel as measured by SORT.

The design of mechanical equipment suitable for the "production line" sonic vibration of N fuel during brazing has proven more difficult than originally envisioned. Design now being evaluated accommodates both inner and outer geometries and supports the elements at the upper nodal point with a quick disconnect clamp.

An efficient method of electronically driving the sonic vibrator has been developed and evaluated. The system incorporates a feedback loop in which the fuel element itself determines the frequency at which the system is driven.

Experiments are planned in which N fuel elements will be ultrasonically inspected during the end closure brazing operation. Pulses will be induced in the cold end of the element such that they will propagate the length of the fuel element and reflect from the interface between the uranium end and the zirconium closure ring. This technique may be of value in determining the point at which the interface becomes wet with molten braze alloy.

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FINANCIAL OPERATION

JUNE, 1962

Based on revised production data and operating assumptions, a revised set of alternate budgets for the five-year period, FY 1963 through FY 1967, were prepared in accordance with a request from HOO-AEC. Preliminary work was begun on additional studies involving reduced production rates.

Breakdown of the revised FY 1963 budget was prepared and issued to all managers and supervisors responsible for specific cost centers. Purpose of this was to ensure knowledge of the extent of budgeted funds.

Considerable time was spent in preparation for year-end closing activity.

The annual review of routine Work Orders, on which FPD components are customers, was initiated. All changes are scheduled for completion in time to be reflected in July costs. Also, all IME and billing rates were reviewed and updated to reflect actual going rates.

New work order forms were distributed within the Department during June. The new forms have been designed to minimize clerical and key-punch work and provide additional information to assist in cost coding.

The mechanization of Engineering cost distribution is progressing according to plans and will be implemented during the first week in July.

A procedure was developed, with approval of Managers, Co-extrusion Process Engineering and Materials Operation, which outlined the coding procedures to be used in connection with procurement of regular production material and developmental material for use in the co-extrusion process.

A method for determining equivalent production in the co-extrusion shop has been developed and will be used beginning with the month of June, 1962, for production cost reports.

The physical inventory of the Department's fixed assets is essentially complete. The original goal of completion and report by July 1, has been revised due to reassignment of several inventory personnel. We now anticipate completion of counting and reconciliation and the issuance of a report by August 1.

The final preparations have been made to transfer the responsibility for EWIP and GWIP accounting to C&AC. The work will be assumed by them without an increase in personnel. Liaison functions, as well as a number of related functions, will be performed by FPD personnel. The physical transfer of the records will take place about mid-July, after year-end business has been completed.

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A review of the Department's depreciation allocation practices has been under way for the past several weeks. Review of several methods of and basis for allocation revealed that the past practice was not far out of line. Some minor adjustments in the amount allocated to HLO and FPD-R&D accounts will be made and some adjustments may also be made in the allocation of costs to products (AlSi and Co-extruded).

A review of action required to comply with the Walsh-Healey Public Contracts Act and the recent Department of Labor interpretation has been completed. Compliance with the new interpretation entails notifying vendors that the Act is applicable to their contract preparing and submitting a report for each of the 48,000 purchase contracts placed annually. This additional work will require the time of some five clerks.

Travel for June will amount to \$11,900 and will bring FY 1962 travel costs to \$74,200, an increase of \$24,000 (32%) over FY 1961. Three hundred and fourteen (314) days were spent in travel status in June for a FY 1962 total of 1,399 days. This is nine days less than FY 1961. The higher level of expense with fewer days in travel status is attributable to increases in moving costs on transferred personnel.

Expenditures for attendance at professional meetings will run about \$1,670 and off-site course participation will cost \$2,007.

Considerable progress has been made on the Department policy letter manual which should be ready for issue in July.

Eight (8) HAPO OPG's were issued in June and internal guides relating to nuclear safety and product quality were further modified and referred to the Department General Manager for review.

Cost improvements totaled \$310,008 for the six-months ended June 30, 1962. However, acceptance of one cost improvement proposed with estimated savings of \$119,227, which is currently under evaluation, will bring this figure to \$429,235, 48% of the CY 1962 goal of \$900,000.

Work is being pursued on a cost improvement brochure which is scheduled for issuance July 20, 1962. Among the topics included are:

1. FED Cost Improvement History and Philosophy, including past examples of achievements;
2. Clarification of program administrative procedures and guidelines as to what constitutes a cost improvement; and
3. Suggested approaches by first-line management to cost improvements, including general areas of potential savings.

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Audit of FPD mailroom and messenger service by C&AO Auditing Operation has been completed. A few minor discrepancies were noted; however, in general procedures and operations were found to be satisfactory.

No reports of unusual significance were issued during the month.

The Financial Section had no security violations during June.

Manager - Finance

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PLANT FACILITIES OPERATIONJUNE 1962I. RESPONSIBILITY CHANGES

None.

II. ACHIEVEMENTSA. Statistics

<u>Utilities</u>	<u>June</u>	<u>May</u>
Average steam generated (M lbs/hr)	42	54
Maximum steam generated (M lbs/hr)	69	84
Total steam generated (M lbs)	30,494	39,955
Coal consumed (tons)	1,588.25	1,922.09
Evaporation rate (steam/# coal)	9.60	10.39
Efficiency - Actual	64.5	69.7
Efficiency - Theoretical	69.4	73.3
No. of Boilers on: 2		
Date of Change : None		
Sanitary water from 3000 Area (M Gals.)	146.76	158.8
Total water from 3000 Area (Avg. rate gpm)	3,397	3,557
Total water from #3 and #4 wells (M Gals.)	18.38	17.34
Total water from #2 well (M Gal.)	.30	.30
Peak water consumption fro 24 hours (M Gals.)	5.6	5.9

Coal consumption continues to exceed that experienced in previous summer months primarily due to the continued colder than normal temperatures which have prevailed.

B. Operating Experience

Numbers 4 and 5 Boilers were in service for the entire month, with Nos. 1 and 2 in reserve. Number 6 Boiler is undergoing summer overhaul. Availability of manpower has delayed progress to some extent. The pre-heater tubes are scheduled for cleaning the first week of July. No decision has yet been reached on the weld repairs. We are awaiting word from the Travelers Insurance representative on this matter.

A localized loss of instrument control air in Building 308 resulted in an unscheduled ventilation outage. Investigation revealed that the emergency exhaust fan failed to come on the line due to the control breaker being open. An indicator light has been installed to indicate to the power operator when the breaker is closed. A by-pass PRV station was installed to utilize normal air if this condition would occur again.

A new HNO₃ destruction column was fabricated and installed in the 321 Bldg. An exhaust hood covers the top of the enclosure. The nitric acid will be blended with formaldehyde and iron and test results analyzed.

Hanford Laboratories will review the SWP work procedures for operation of the laboratory vacuum pumps in the 325 Building. Some radiation at this location has created a problem when the power operators service these units during periods when monitoring personnel are not on duty.

A new steam line was installed to permit isolation of the shop unit heaters in 328 Building. This new line will maintain process steam and heating steam in the paint booth.

The freon units servicing the counting room of the 329 Building required additional maintenance to maintain adequate cooling in this area.

The Number 4 well was pulled and inspected. Four of the eight stages of the pump were found to be in poor condition with the others showing considerable wear. This pump has operated continuously since 1948 with very little maintenance. The entire pump section is being renewed.

C. Equipment Experience

All instrumentation on the autoclaves in the 308 Building was inspected, tested and calibrated. Ammeters were installed on the two vertical autoclaves to indicate electrical load and will be a quick indicator of heating element failure.

A new transformer was installed in 700 Area to eliminate excessive line voltage supplied to the Annelex Printer. This has been the cause of several unscheduled outages due to power supply failure from overvoltage.

A 400 Channel Analyzer and associated equipment was placed in operation for an experimental eight signal input system for the Radiological Chemistry Operation in the 325 Building. Shop fabrication of nine transistorized printed circuit preamplifiers was necessary to complete this system. Circuit breaker testing has been started in this building and, in general, all breakers tested to date have been in bad need of calibration and repair.

Extensive painting of laboratory rooms and change and locker rooms in the 329 Building was accomplished. Some required Amercoat because of the chemicals used. The ceiling panels, which are metal, were very dirty and required a great deal of cleaning and preparation. Metal storage cabinets were taken to the shop for cleaning and painting. Since laboratory personnel required use of the rooms each day, cleaning and other preparation work was performed first, then the lab people would leave in the middle of the afternoon and the actual painting would get underway. In this manner, overtime was reduced to a minimum.

Repair work on the 333 Building Coextrusion Shop exhaust system and modification of ductwork and draft boxes in the Chemical Bay has been completed. Isolation of exhauster fans from the exhaust side to the roof plenum, as well as at the inlet side from the washer plenum, has resulted in a quieter and smoother fan performance. Isolation was accomplished by welding 1/8" Karoseal rubber to matching polyvinyl chloride flanges and mounting in the exhaust side of the blower. This technique should be useful in future installations of exhausters and blowers.

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 and belief, no inventions or discoveries were made in the course of their work during June 1962.

E. Cost and Savings

One Cost Improvement item of \$13,666 was approved with \$63 in suggestions to bring the total for June to \$13,729. The total savings approved for the calendar year to date are \$50,348 or 43.8 percent of goal.

F. Status of Projects and Major Jobs

Air Dryer Installation, 384 Building -- Installation is complete and the dryers are in service. Preliminary information indicates excellent performance. Dew point tests were made on air being supplied through these dryers with results ranging between -450°F and -55°F.

Auxiliary Instrument Panel, 384 Building -- The three hardness analyzers have been placed in service and are being debugged. Problems involved in reducing the hardness of the boiler feedwater have shown up and corrective action is being taken. Installation of recorders for the compressors in 382 Building pumps is continuing. The operation time recorder for the 384 Building air compressors has already brought out erratic cycling periods of some of the compressors.

Modification of No. 5 Sanitary Water Pump -- All work has been completed with the exception of cleanup and painting. After several days of shake-down running, the equipment was placed in continuous service.

Intercommunication System, 384 Building -- Field work is 95 percent complete with debugging and final checkout to be completed in July.

Emergency Power System -- Detailing of the forecasted loads and preparation of the financial evaluations of alternate solutions is continuing.

Compressed Air Expansion -- A construction contract has been negotiated with J. A. Jones Construction Company for the installation of the compressor. All major equipment has been ordered and is scheduled for delivery during July and August.

Lawn Sprinkler System, 3760 Building -- Awaiting AEC approval to proceed.

Service Piping, 382-384 Buildings -- Field work was started after settlement of the construction strike and is 50 percent complete. Because of the delay caused by the strike, funds will have to be obtained from the FY 1963 capital work order budget.

Process Sewer Extension -- Field construction started after settlement of the Carpenter, Teamster, and Operating Engineer strike reached 10 percent before being held up by the Iron Workers strike.

West High Tank Inspection -- Inspection of the high tank was completed June 30, 1962. No major problems were encountered and the inspection report will be issued in mid-July.

Major Studies

4th Expansion, Steam Generation Plant -- Hazards and economic analysis reports were completed. The project proposal is scheduled for shipment to the AEC by July 12, 1962.

G. Special Reports Issued

None

H. Visitors

Mr. A. J. Schwertfeger, General Superintendent of the Works Engineering Department, Savannah River Plant, E. I. duPont deNemours Company, visited June 20, 1962, to discuss the maintenance aspects of fuel production facilities.

III. PERSONNEL

A. Safety, Security and Radiation Experience

Medical Treatment Injuries	21
Frequency Rate	3.96
Disabling Injuries	0
Serious Accidents	0
Security Violations	0
Radiation Incidents	0

B. Meetings

Round Table - Staff	14
Safety and Security	17
Information	6

Manager
Plant Facilities Operation

E Hilgeman:RTM:jse

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**DATE
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12 / 14 / 92