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FUELS PREPARATION DEPARTMENT

MONTHLY REPORT

JULY

1962

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HANFORD ATOMIC PRODUCTS OPERATION

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FUELS PREPARATION DEPARTMENT

MONTHLY REPORT --- JULY 1962

Compiled by Fuels Preparation Department

August 7, 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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MANUFACTURING

Production

AlSi Process

1. Plant output exceeded the forecast as a result of high operating efficiency and a slight reduction of in-process inventory.
2. A 1.8 month supply of finished fuels and an eight month supply of bare cores was on hand at month end. These inventories exclude dingot cores and fuels being held for evaluation and 47 tons of oil quench cores to be scrapped.
3. A new record high plant operating efficiency of 97.8 per cent was attained during July.

Coextrusion Process

1. Uranium input to the plant was reduced to permit a reduction of the in-process inventory. Eighteen outer extrusions for production were completed during the month.
2. The yield through the final etch operation showed a significant improvement as a result of changes in the operation.

ENGINEERING

Present Reactor Fuels

Present Canning Processes

Five enriched uranium, I & E fuel elements failed in reactors during July. No unusual trends were indicated by this experience.

Approximately 87 tons of alloyed dingot uranium were being irradiated at month end and 1714 tons have been discharged at goal. A moratorium during which no dingot uranium is canned or reactor charged is still in effect. Release of 99 tons of canned dingot fuels in storage is planned, however, after stringent testing has been completed. Disposition of about 250 tons of alpha rolled and 52 tons of alpha extruded dingot cores at HAPO, and 41 tons of alpha rolled dingot cores at Mallinckrodt Chemical Works will not be made until vacuum outgassing and canning process optimization studies have been completed.

Samples which were produced to study and define the conditions for improvement of the AlSi braze bonding layers were examined. These indicated that a combination of changes in duplex canning bath temperatures, lead preheat time, and the percentage of silicon in the AlSi layer of the duplex canning bath results in very significant improvements in bonding layer quality. A pilot scale test to verify these results is in progress.

Mallinckrodt Chemical Works is preparing dingot uranium having various carbon and intermetallic precipitate levels. Completion of their program is expected by mid-August and this material will be used in pickling and bonding studies at HAPO.

An excessive sludge level in the salt baths resulted in some partially untransformed ingot cores in oil quenched uranium heat treated at National Lead Co. of Ohio during May. Corrective action has been taken to prevent slug sludge buildup. Forty-eight tons of this uranium will be returned to National Lead Co. of Ohio for remelting.

Approximately 1510 tons of bumper fuel elements have been charged and 995 tons discharged to date. Irradiation experience continues to show the bumper fuels will effectively minimize gross fuel misalignment in ribbed process tubes and associated (hot spot) corrosion ruptures. No "hot spot" failures have been experienced in the bumper fuel elements irradiated to date. The Pilot Plant ultrasonic welder is being modified to prepare production quantities of elliptical bumper fuel for irradiation. The elliptical bumper rail is designed to reduce the hydraulic resistance of bumper fuel during irradiation. Present bumper rails are rectangular in shape.

The fuels development effort for projection fuels which is designed to optimize rail strength, collapsibility features, and dimensions is being expedited to meet the retubing schedule for the installation of 5200 zircaloy tubes in the K Reactors. Installation of these tubes will start in December, 1962.

Tests show that improved deoxidation of the aluminum component surfaces prior to canning can be accomplished and solution life can be tripled by a closer pH control of the Diversey cleaner.

New Canning Processes

The irradiation test comparing Sylcor hot press, HAPO hot press, and HAPO AlSi bonded fuel elements has reached 400 MWD/T, or 50 per cent of goal exposure, without incident. One thousand each 0.94 per cent enriched Sylcor hot press and HAPO hot press cores have been ordered to prepare fuel elements for testing under more severe irradiation conditions.

Installation of the hot die sizing press was completed and 59 assemblies have been pressed to debug equipment and to establish conditions for process development. A radiation pyrometer has been installed to monitor the temperature of fuel assemblies during the actual sizing process. Tests results indicate that a chemical etch pre-treatment prior to nickel plating of the uranium cores is superior to the anodic etch treatment. Additional tests are planned to develop the process more completely.

Other Items

1. Rough draft copies of the Technical Specifications for the Hanford Test Reactor have been forwarded to the HOO-AEC for review.
2. Nondestructive Testing -

Steps have been taken to correct the erratic performance of the external bond test. Changes in frequency have been made to reduce the spurious

signals which have tended to vitiate test results in the identification of real bond defects.

One weld monitor has been installed on a production line ultrasonic welder. Whereas this welder could not be made to function with satisfactory yields without the monitor, yields of 97 per cent were achieved after installation of the monitor.

Unexpected difficulty is being experienced in obtaining uniform UT-2 (uranium surface) tester response. Efforts to correct this difficulty are continuing with strong emphasis.

Favorable reports are being received from both National Lead and Mallinckrodt on the use of UT-2 units at these sites. A \$48,000 request has been received from NLO for the construction of two more automatic UT-2 testers.

The effect of vibratory energy on the wettability of metals is being investigated with moderate effort. Early studies have indicated that the wetting of nickel and uranium by AlSi can be markedly improved with the application of sonic energy.

Work is proceeding on a long range program to identify individual AlSi fuel elements ultrasonically as a method of cataloging pre-irradiation data by fuel element numbers which can be compared with post-irradiation data.

N Reactor Fuels

KER test loops #1 and #2 have been shut down for modification to increase pump capacity and startup is expected during September, 1962. The 11 prototypic (NAE-1) fuels in KER test loop #3 reached an exposure of 250 MWD/T, or about 12 per cent of goal exposure, without incident. The 14 NAE-1 fuels in loop #4 have reached an exposure of 720 MWD/T, or 36 per cent of goal exposure, without incident. Backup charges of various types are on hand for loop testing as required.

Zircaloy-2 inner clad shells supplied by a third vendor as part of the vendor qualification program appear to be satisfactory. Qualification of this vendor is still pending a more thorough analysis of coextrusion test results.

Fuel element supports for outer tubes and locking clips are in fair supply. Buggy spring supports are in short supply because of low fabrication yields. Several new batches of strip material are being heat treated experimentally to define more precisely the heat treating conditions necessary to produce the best strip for use in making buggy spring supports.

Development extrusions carried out during July included three zircaloy billets, two primary uranium extrusions, 12 composites and two uranium billets.

A program has been developed to monitor and closely evaluate the billet assembly and extrusion process performance during the next two or three months. The

primary objective will be to define the extent and character of wall thickness problems and the relationship of these problems to process conditions and/or component materials.

Analysis of recent low yields at the heat treating operation show that (1) material coextruded when there is copper pickup on the die has a slightly larger warp after heat treating, and (2) the low yield was about one-third attributed to warp after heat treating and two-thirds attributed to reverse bending and the re-beta heat treating step. Data on wall thickness, clad thickness and coextrusion process variables has been assembled for statistical analysis to study the dependence of warp on these variables and to further define process capabilities.

Modification of the final etch prior to autoclave has apparently eliminated the occurrence of white oxide on closure welds as a serious problem.

Improved braze closure equipment has been installed in the N Fuels Pilot Plant. This replaces experimental equipment installed two years ago. The UT-10 equipment for the post-irradiation inspection of N fuels is undergoing laboratory check-out. This equipment will be installed in the KE Basin.

The longitudinal and torsional resonant frequencies of approximately 250 N-fuel elements from 40 billets have been measured by SORT before and after beta heat treatment to (a) determine if these parameters are reliable indicators of complete beta transformation, and (b) assess the uniformity of different extrusions as measured by these frequencies. The results indicate that SORT readings can distinguish heat treated elements from those which have not been heat treated.

The N fuel nondestructive tester has continued routine operation.

A new ultrasonic test to detect incomplete cap-core bonding after brazing has been made operational.

A method has been developed to position N fuel elements in the vacuum chambers during brazing in a manner which will insure the efficient application of sonic vibration and improved brazing.

GENERAL

Preliminary tests of the criticality alarm detectors were satisfactory. The tests are continuing.

PERSONNEL STATISTICS

Number of employees as of June 30, 1962 831
 Number of employees as of July 31, 1962 825

	<u>Exempt</u>	<u>Nonexempt</u>	<u>Total</u>
General	2	1	3
Employee Relations	1	0	1
Engineering	49	28	77
Financial	12	7	19
Manufacturing	89	353	442
Plant Facilities	37	246	283
TOTAL	190	635	825

<u>Employment</u>		<u>July</u>	<u>June</u>
Additions:	Exempt	2	5
	Nonexempt	12	13
		14	18
Reductions:	Exempt	4	3
	Nonexempt	16	13
		20	16

Additions to the Fuels Preparation Department during the month of July included three reactivates from personal illness; a Secretarial re-hire; five new hires -- four as replacements and one Metal Handler addition -- a Military Reactivate (formerly with CE&UO); one Janitor replacement on Request for Transfer; one Reproduction B on temporary loan from CE&UC during extended illness absences; one Engineer on rotational assignment on the Manufacturing Training Program; and a Manager, Engineering transferred from KAPL.

Reductions included rotational reassignments of three Engineers on the Manufacturing Training Program; transfer of Specialist, Product Cost Analysis to C&AO as Senior Auditor; transfers under the Request for Transfer procedure as follows: A Serviceman to Motor Messenger in HLO; a Metal Handler to Junior Power Operator in IPD; a Junior Power Operator to IPD; a Janitor to IPD and another to CPD; transfer of a Motor Messenger to CE&UO as a Machine Operator. Reassignment of a Business Training Recruit to CE&UO; five deactivates due to personal illness; three resignations (two to accept other employment); and one retirement.

STAFF

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

Effective July 23, 1962, Louis M. Loeb (formerly Manager, Nuclear Core Section, KAPL) was appointed Manager, Engineering.

SAFETY

Days since last disabling injury	109
Hours worked since last disabling injury	465,700

MEDICAL TREATMENT INJURIES

<u>Operation</u>	<u>This Month</u>		<u>Last Month</u>		<u>Year-To-Date</u>	
	<u>No. of Cases</u>	<u>Frequency Rate</u>	<u>No. of Cases</u>	<u>Frequency Rate</u>	<u>No. of Cases</u>	<u>Frequency Rate</u>
Manufacturing	24	3.96	27	3.50	194	3.81
Plant Facilities	19	4.65	21	3.96	146	4.53
Engineering	3	2.58	3	2.38	14	1.63
Financial	0	0.00	0	0.00	0	0.00
Total	46	3.91	51	3.45	354	3.72

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

SECURITY

No security violations were experienced during the month. Calendar year-to-date violations in the Department remain at four.

SUGGESTION PLAN

<u>Operation</u>	<u>Number Received</u>		<u>Number Evaluated</u>		<u>Number Adopted</u>		<u>Amount of Awards</u>		<u>Net Annual Savings</u>	
	<u>Mo.</u>	<u>CYTD</u>	<u>Mo.</u>	<u>CYTD</u>	<u>Mo.</u>	<u>CYTD</u>	<u>Mo.</u>	<u>CYTD</u>	<u>Mo.</u>	<u>CYTD</u>
General	--	--	--	--	--	--	--	--	--	--
Engineering	--	2	--	2	--	--	--	--	--	--
Financial	--	1	1	1	--	--	--	--	--	--
Manufacturing	13	167	30	172	8	79	\$110	\$1840	\$ 523	\$11,916
Plant Facilities	13	159	13	223	7	110	295	2305	2015	12,030
Total	26	329	44*	398	15	189	\$405	\$4145	\$2538	\$23,946

COST IMPROVEMENTS (EXCLUDING SUGGESTIONS)

<u>Operation</u>	<u>Accepted in July</u>	<u>Total Accepted CYTD</u>
General	\$ ---	\$ ---
Engineering	---	124,300
Manufacturing	104,640	382,376
Plant Facilities	2,080	42,414
Total	\$106,720	\$549,092

* Does not include two re-evaluations.

PATENT SUMMARY - JULY 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 July. 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.

FOR

General Manager
Fuels Preparation Department

RL Dickeman:WN Mobley:mkm

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MANUFACTURING OPERATION

JULY, 1962

CURRENT OPERATIONS

Production

Statistics - AlSi

<u>Current Month's Production</u>	<u>NORMAL</u>				<u>ENRICHED</u>				<u>N</u>	<u>Total</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>		
Acceptable Fuel Elements Produced (Tons)	49.9	198.9	81.2	100.6	2.7	15.0	0.1	21.0	2.2*	469.4
% of Forecast Production	161	133	198	97	11	33	-	91	37	112
% of Forecast for Current Quarter	161	133	198	97	11	33	-	91	37	112
% of Past 3 Month's Average Production	116	91	49	287	23	28	-	50		81
% of Past 12 Month's Average Production	102	76	63	138	19	31	-	64		76
% of Forecast Achieved Last Fiscal Quarter	68	118	163	34	117	135	250	109		107
% of Forecast Achieved Last 4 Fiscal Quarters	92	113	111	76	90	108	124	102		103

Operating Efficiency

Current Month (%)	97.8
Forecast (%)	95.0
Previous Month (%)	97.5

Manufacturing Yield

Current Month (%)	93	93	89	83	90	88	-	80
Forecast (%)	90	90	90	85	90	90	90	85
Previous Month (%)	97	93	90	83	89	88	91	87

Uranium Available For Processing (Tons)	849
Finished Products in Storage (Tons)	1164
Work in Process	157
Special Products Finished (Pieces) Lead	1727
Uranium Utilization	98.0

*Not included in total

Statistics - Coextrusion Production (1)

Forecast Process Input (Tons) 17
Actual Process Input (Tons) 3.7

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	18(2)	-	0	-	8 Extrusions awaiting cutup					
Chemical Milling	306	0.3	663	0.3	220	3	0	19	5	1
Braze	247	5.6	699	5.7	123	0	0	0	5	0
Heat Treat	0	-	825	10.9	217	1	0	215	10	5
Machining	33	-	442	-	84	0	0	218	0	10
Welding	0	-	484	1.2	0	0	0	139	21	13
Non-Dest. Tester	0	-	478	0.0	19	0	0	35	11	8
Autoradiograph	388	10.6	253	0.0	186	24	15	513	54	16
Support Weld	615	0.0	541	0.4	456	30	41	755	36	10
Autoclave	504	-	487	-	315	0	0	135	19	0
Final Inspection	753	43.6	680	31.0	0	0	0	0	0	0

Process Inventory

Production Pieces held for rework	449	82	10	379	134	12
Production Pieces awaiting evaluation	167	34	12	98	31	9
Production Pieces - Scrap	190	37	40	110	25	16
Total Process Inventory - Pieces	2426	211	118	2616	346	100
Total Process Inventory Pounds	65,720	4,275	1,575	35,473	3,525	667

Finished Production for July 2.2 tons
Total Finished Inventory 2.93 tons

Oxide burned - pounds 266

- (1) Input and inventory to-date consists of enriched Uranium.
(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 operating efficiency and a reduction of the in-process inventory. The plant was scheduled and operated at reduced rates during the first two weeks of July to permit the scheduling of vacations for a major portion of the operating personnel. A total of 137 canning line shifts were operated during the month.

A slight decrease was noted in the 6-inch nonbumpered yield due primarily to an increase in assembly rejects. Ultrasonic welder rail alignment and other mechanical problems accounted for a decrease in the 6-inch enriched bumpered yield.

AlSi sloop problems associated with the processing of new sleeves were again encountered. Preliminary heating rate studies have resulted in some degree of control over this defect by adjusting the sleeve level in the bath during pre-heat. Additional heating rate studies are now being conducted for the purpose of further investigating various AlSi sloop mechanisms.

Projection welding produced 128 acceptable tons during July, with a welding yield of 94 per cent. Production and reactor statistics for July and to-date are:
(Production to-date are adjusted figures.)

	<u>July 1962</u>		<u>To-Date</u>	
	<u>Natural</u>	<u>Enriched</u>	<u>Natural</u>	<u>Enriched</u>
FPD Produced	107	21	1307	653
IPD Charged	212	63	1201	623
Finished Inventory	106	30	106	30
Average Welding Yield	95%	91%		

There were no failures of AlSi fuels in the autoclaves during July. Total failures for the year remain at one.

The inventory of finished fuels at month end reflected a 1.8 month supply based upon projected reactor usage. This inventory excludes 102 tons of dingot cores awaiting evaluation.

Month end inventory of bare cores reflected a .8 month supply based upon anticipated fuels process needs. This inventory excludes 307 tons of dingot fuels awaiting evaluation and 47 tons of oil-quenched cores to be scrapped.

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

8" Normal I&E	17,237
6" Water Mix	1,355
Total	18,592

Plant Operation - Coextrusion

A total of 18 outer extrusions were made for production during July.

Copper stripping problems with inner tubes continued. Vacu-blasting prior to copper strip is necessary to insure complete removal of the copper.

Bonding was a major problem during the month. On investigating the problem it was found that the remachined end plates were aggravating welding difficulties and that the billet crimper was not operating properly. Corrective action has been taken. In addition, the peel test sample saw has been moved into the extrusion area and peel test results are now available within one working day.

Final bright etch development work continued throughout the month. Several changes were made resulting in greatly improved yield by month end. Major improvement was the elimination of the teflon roller basket. The teflon rollers were causing a major portion of the stain. Close attention is still being given to operating techniques in order to eliminate acid splashes and handling contamination.

Manufacturing Engineering

Design and Projects

CGF-903 Projection Fuel Element Modifications - 313 Building

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

* Complete with exceptions. Exceptions are start-up of third ultrasonic welder and installation of conveyor to this welder.

CAF-954 High Pressure Autoclave Development Facility

Action on this project proposal is awaiting the development of further information by Engineering.

CAF-961 Consolidated 303 Area Services Facility - Phase II

This project proposal has been approved locally.

CAF-973 Steam Distribution Line Modifications

This project proposal has been approved. Action is awaiting the release of FY-63 funds.

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Miscellaneous

The status for the maintenance engineering program for the 333 Bldg. follows:

Spare Parts Lists	95%
Lubrication Instructions	70%
Maintenance Procedures	40%

A letter, "FPD Action Required to Implement FPD Protection Program, Critical Radiation Event" was issued on July 10, 1962. Practice evacuations for FPD buildings are scheduled for completion by September 1, 1962. Further modification and evaluation of the detection system is in progress.

Preliminary results from the tests on the criticality alarm detectors indicate that they will be satisfactory. Testing is continuing.

Drafting and Duplicating

Drawings Produced

New	46
Revisions	56
Small Charts	25
Large Charts	11
Miscellaneous	21

Duplicating Production

914 Copier Masters Prepared	693
Multilith Impressions	273,876
Ozalid Copies	7,613
914 Copier Copies	20,568

PLANT CONDITIONS, INCIDENTS, AND IMPROVEMENTS

ALSI

A new record high plant operating efficiency was attained in July. About 65 per cent of the downtime was caused by equipment malfunctions, the remainder being attributed to operational problems.

A system has been set up to provide a periodic audit of the current degree of measurement error of various testing and measurement areas. Reports on a quarterly basis will be issued giving the results of such an audit. The first such report has been issued. It is expected that the information gained from such audits will be beneficial to personnel concerned with design, maintenance, and control of the various testing devices.

Segregation of nickel in X8001 aluminum alloy was found in components supplied by one vendor. The defect was observed following autoclaving of finished fuel elements in the form of white streaks along the can wall. This defect is visually not apparent until after autoclaving; hence, a considerable cost can be involved before its discovery. The segregation extended to a depth of 0.002 to 0.003 inches from the surface. Past incidents involving this type of defect have been attributed to incomplete scalping of the ingot before rolling. Cans in inventory from the shipment involved are now being sampled on a drop basis for autoclaving as a test for segregation.

A partially transformed ingot core that was detected at the transformation tester was studied by x-ray diffraction. This core had a fine alpha-like structure for two inches along one end. It was progressively x-rayed--a small transverse section at a time--through the small grains into the large grain area to determine where the core changed from untransformed to transformed crystal structure. It was noted that the alpha structure continued into the large beta-type grain area. It has been determined that the grain structure of this core resulted from apparent partial submersion in sludge in the salt bath.

The program to measure routinely and electronically compute fuel attribute (yield) data has been completed. All data input systems have been installed, and a complete report output by the 7090 computer is programmed. Routine machine process reports are available on a daily, weekly, and monthly basis; and complete analysis of operating shift, product model, and equipment type and number is possible. Nonroutine reports are available to evaluate any or all of these control factors on a variable time basis.

Preliminary design for conveyor improvements to reduce marred surfaces has been completed. An Appropriation Request is being prepared to correct the several points on the conveyor which have been contributing to the marred surface reject rate.

Rail welder performance from 6-11-62 through 7-27-62 is summarized as follows:

	<u>Number</u>	<u>Per cent</u>
Total Pieces Welded	71,988	100.
Rewelds	1,881	2.61
Mechanical and Alignment Rejects	2,457	3.41
Crack and Smash Rejects	454	0.63
Sample and out-of-process	602	0.84

The above statistics represent a better sustained performance than previous experience. Facilities Engineering and Quality Control are continuing efforts to correlate reject types with welder variables. A regression analysis is being prepared for computer output.

Coextrusion

A test has been developed for determining billet vacuum after preheat. Evacuation tube samples as short as 1-1/4 inch will provide manometer measurements in inches of water which are directly convertible to billet vacuum.

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Testing of actual billets is expected to start as soon as new billets are canned. The test has been developed primarily for controlling billet air leakage prior to extrusion.

A chemical process for the evaluation of interface cleanliness of coextruded fuels is being developed which utilized H_3PO_4 in attaching the UO_2 in the bond zone. Tests are being conducted to determine the optimum acid concentration and temperature. While the H_3PO_4 shows a strong affinity to attack a dirty interface, it has not shown appreciable attack of either the uranium or zirconium metal pieces.

Selectively fitting supports to the outer pieces has proven to be an effective control over the support circumscribed circle diameter. The support circle diameter is being taken after the welding of the pieces and after autoclaving. The results of the latest group of material through autoclave show an average change between the two measuring steps of 0.004 inches with a 3-sigma control limit of 0.001 inches.

The inner support welding was discontinued during July because of poor weld integrity caused by poor quality supports. Coextruded Product Engineering has identified three problems in attaching the inner supports. These are weld projections not centered; base of support not flat; and sides of support not straight. The vendor was contacted to correct the support configuration. The supports on hand are being re-formed to fit the inner piece where this can be done satisfactorily. Welding has been resumed.

A shear testing device for evaluation of support welds is being developed. The test is capable of shearing the support weld without an appreciable tensile stress or causing faulty shear results by galling of the cladding.

Recommendations for fuel element pallet modifications and plastic bag containers were issued. Current process specifications require that the fuel elements shipped after assembly be held rigidly and be kept clean and dry for the initial load waiting period. This can be accomplished by modifications to the existing pallet and the use of a plastic bag with desiccant for each fuel element.

A layout was provided in the billet welder area which coordinated the requirement of the concerned groups. The layout is expected to provide maximum flexibility for operating and maintenance personnel, while incorporating the requirements of the other groups involved. Equipment changes as specified in the layout are now under way.

The horizontal milling equipment has been removed from the chemical bay and will be stored awaiting development of a satisfactory process. Additional vertical baskets are being fabricated to increase the throughput capacity.

FPE HEALTH AND SAFETY

	<u>July</u>	<u>June</u>
Disabling Injuries	0	0
Serious Accidents	0	0
Medical Treatment Injuries	46	51

On July 1, the Manufacturing Maintenance Sub-section passed the 1,000,000 hour mark without any member of the component having sustained a disabling injury. Manufacturing management arranged a special safety meeting for the purpose of commendation of the personnel involved. The time required to achieve 1,000,000 hours was approximately six years.

The 300 Area Emergency Plan has been forwarded to department and section management in HLO and FPD for final comments and approval.

Central Safety Council inspection of Department facilities for July covered the general office buildings. Several specific requests for improved house-keeping were made.

Improved procedures for maintaining clearance and restriction records for personnel being assigned to beryllium work have been agreed upon by Occupational Medicine and FPD Health & Safety. All personnel hired by FPD beginning March 1, 1962 are cleared unless specifically restricted by an occupational physician.

Training in the use of emergency self-contained breathing apparatus was conducted in July by Fire Protection officers for personnel of the chemical operations, Coextrusion Shop. The emergency masks have been installed in appropriate locations of 333 Building and are ready for use.

FPD SUGGESTION PLAN

<u>Suggestion Plan Participation</u>	<u>July</u>	<u>June</u>
Number of eligible employees	636	641
FPD suggestions received	26	31
Annualized rate per 1000 eligible employees	491	543
Number of suggestions adopted	15	26
Net annual savings	\$2538	\$1265
Amount of awards	405	370
Per cent of awards to savings	16.0	29.2
Average amount of awards	\$ 27.00	\$ 14.23

SIGNIFICANT REPORTS ISSUED

HW-74118	AlSi Shop Projection Welder Requirements for Cases I, II, and III of the Plant Improvement Program	6/27/62	D. E. Blahnik
HW-74366	AlSi Shop Production, Manpower, Equipment and Layout Requirements for Cases I, II and III of the Plant Improvement Program	7/19/62	D. E. Blahnik
HW-74374	Storage Requirements for Fuels Preparation Department Within the 303 Area	7/20/62	R. E. Daling
HW-74158	Uranium Quality Control Analytical Results	7/2/62	G. E. Hansen

HW-74203 Uranium Quality Control Analytical Results 7/6/62 G. B. Hansen
 HW-74469 Uranium Quality Control Analytical Results 7/31/62 G. B. Hansen
 HW-74215 Evaluation of Measurement Error of Electronic Testers - ALSI Process 7/5/62 W. F. Stevenson
 HW-74131 Dimensional Variation of As-Extruded N-Reactor Fuel Tubes 7/11/62 W. A. Hendricksen

EMPLOYEE RELATIONS

Safety

Members of the Manufacturing Operation sustained 46 medical treatment injuries during July.

Security

No security violations were incurred in the Manufacturing Operation during July.

Radiation and Beryllium Control

The total of the exposures in excess of 100 mrad for Manufacturing Operation personnel for the four-week badge period ending June 15 was 5,850 mrad compared with an average of 6,750 mrad for the previous 13 badge periods. There were two exposures in excess of 300 mrad during this badge period. The average number of exposures in excess of 300 mrad is 1.2 per badge period for the calendar year to date.

Twelve air samples and 71 smear samples were taken during the period from June 22 through July 23. The beryllium concentration in each of the air samples was less than one per cent of the limit for indoor air. Sixty-two of the smear samples were below the HAPD control limit and the remaining 9 samples were from areas where contamination is being adequately controlled. The sample results continued to indicate good control.

Visits

<u>Name</u>	<u>Company</u>	<u>Contact</u>	<u>Date</u>	<u>Reason</u>
H.P. Kraemer, Jr. and H.E. Berg	Bridgeport Brass Riverside, Calif.	C.H. Hoehne	7-10-62	Zirconium cap & can quality & delivery problems
"	R & R Tool & Die Hollywood, Calif.	G. Del Faro	7-11-62	Inspect shop & metal stamping facilities
"	Alan Mold & Eng. Hollywood, Calif.	G.W. Schuster A. Diehl	7-11-62	Discuss sleeve procurement

Visits (Continued)

<u>Name</u>	<u>Company</u>	<u>Contact</u>	<u>Date</u>	<u>Reason</u>
H.P. Kraemer, Jr. and H.E. Berg	Harvey Aluminum Co. Torrance, Calif.	J.L. Frankel G. Christenson	7-12-62	Zirconium cap & can quality & delivery problems
D.W. Darsow	Rem Inc. Portland, Oregon	C.A. Brown	7-12-62	Zircaloy III, end caps, supports
"	Wah Chang Albany, Oregon	R.A. Graham	7-12-62	"

Visitors

R.E. Brechlt	Gisholt Machine Tool Madison, Wisconsin	D.C. Lahfeldt	7-24-62 thru 7-31-62	Assist in start-up of new Gisholt lathe
M.A. Ziegler & D. Guy, Jr.	ALCOA, Edgewater, NJ. Seattle, Wash.	H.E. Berg W.N. Mobley H.P. Kraemer	7-18-62 7-19-62	Discuss quality, delivery and pro- curement problems relative to caps and cans
R.A. Graham	Wah Chang Albany, Oregon	D.W. Darsow H.E. Berg	7-31-62	Zircaloy III, end caps & supports

Training

Instruction and training in tester maintenance and electronics circuitry continued during July with 106 instruction hours being completed.

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 July.

Manager - Manufacturing

WN Mobley:HFT:mfj

6" NORMAL

8" BUMPERS

6" ENRICHED

6" BUMPERS

1-11-10000, 1-11-10000

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HW-74506

ENGINEERING OPERATION

JULY, 1962

VISITORS

<u>Name</u>	<u>Company</u>	<u>Contact</u>	<u>Date</u>	<u>Reason</u>
PN McCreery	National Lead Co. of Ohio, Cincinnati, Ohio	LT Hagie	7-30/31	Data processing, accountability & quality control
L Cooper	" " "	"	7-31	" "
CE Bussert MA DeSesa	National Lead Co. of Ohio, Cincinnati, Ohio	JT Stringer	7-31/ 8-2	Quality control
H Meyer	E.I. duPont de Nemours Co.	DO Hunter	7-25	Nondestructive testing
JL Klein	Nuclear Metals Inc., Concord, Mass.	WK Alexander SM Gill	7-23/27	NPR fuel process audit
S Yih	Wah Chang, Inc., Albany, Oregon	GW Riedeman	7-30	NPR support tooling
R Graham A Riesen	" " " "	" "	7-30/31 "	" "
CA Brown	Rem, Inc., Portland, Oregon	GW Riedeman	7-31	NPR support tooling

TRIPS

<u>Name</u>	<u>Company Visited</u>	<u>Contact</u>	<u>Date</u>	<u>Reason</u>
DR Stenquist CA Burgess	Battelle Memorial Inst., Columbus, Ohio	CB Boyer	7-17	Gas pressure bonding technology
	Savannah River Lab., Aiken, South Carolina	RT Huntoon	7-19/20	Fuel element technology - hot die sizing
CJ Denton MF Zeuschel	Automation Industries Boulder, Colorado	J McElroy	7-11/15	Vendor liaison and establish quality control of equipment
TR Groupman	Linde, Inc., Seattle, Washington	J Dickenson	7-5/6	Evaluate use of sigma process for copper billet welding.

TRIPS (cont'd.)

<u>Name</u>	<u>Company Visited</u>	<u>Contact</u>	<u>Date</u>	<u>Reason</u>
NC Davis	Rem, Inc., Portland, Oregon	CA Brown	7-11/12	NPR fuel element supports - correct tooling detail
GW Riedeman	Rem, Inc., Portland, Oregon	CA Brown	7-19/20	NPR fuel element supports - correct tooling detail
TB Correy	Atomenergi A.B., Stockholm, Sweden	O Hindbeck	7-3	Discuss automatic electron beam welding of fuel elements and inspect automatic equipment
	Univ. of Birmingham, Birmingham, England	EC Rollason CJ Cooksey DR Milner	7-10/11	Discuss and physics and paper to be presented at British Welding Society Forum on Welding And Physics
	General Electric Co., Ltd., Wembley (London) England	R Smith	7-13	Discuss twin argon welding
	Edwards High Vacuum, Ltd., Crawley, England	L Holland	7-16	Cathodic etching and potential process applications
	Institute of Welding, London, England	G Parsloe	7-17	Arrangements for paper on welding and physics
	Electrical Research Association, London, England	JC Needham	7-17	Discuss welding and physics
	British Welding Research, London, England	A O'Neil	7-18	Welding developments
	Sciaky, S.A. Paris, France	M Sciaky	7-23	Automatic electron beam welding equipment
	Saclay, Paris, France	JA Stohr	7-24	Automatic electron beam welding of fuel elements

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PERSONNEL

Additions

L. M. Loeb transferred from KAPL to fill the position of Manager, Engineering Operation on July 23, 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 July, 1962. 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.

SIGNIFICANT REPORTS ISSUED

HW-73274, "Irradiation Effects on Nuclear Fuel Elements in the Hanford Reactors,"
L. T. Hagie and J. L. Jaech, May, 1962.

SECURITY

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

ADVANCE FUEL ENGINEERING

Fuel Performance

A total of five (5) regular production I&E fuel elements failed in the reactors during July. No unusual trends are indicated from this experience. All were enriched 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>
Enriched					
Bumper	3958-F	9	Mech. Damage	7/1/62	3/28/62
Non-Bumper	2059-F	468	Side-Hot Spot	7/7/62	4/4/62
" "	1692-C(1)	838	Side-Hot Spot	7/19/62	2/13/62
" "	4078-B	661	Side-Other	7/23/62	2/1/62
" "	3962-C(1)	412	Inclassified	7/27/62	2/13/62

(1) Same HAPO lot.

Nuclear Safety

Four rough draft copies of the Technical Specifications for the Hanford Test Reactor were given to HOO-AEC (R. L. Plum) on July 24, 1962. These are to be reviewed by the HOO-AEC in preparation for joint discussions with Engineering representatives.

There was one Nuclear Safety Specification violation in Engineering facilities in July (on July 31). There were no violations in the Hanford Test Reactor Operation. Formal monthly audit reports for these two areas, including a description of the violation, will be submitted separately from this report.

Regulations governing tours in the 305 Building to insure against inadvertent involvement of visitors in a nuclear safety incident have been prepared. These regulations now are being drafted into a new Organization and Policy Guide for inclusion into the Fuels Preparation Department system.

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HW-74506

ALSI PRODUCT ENGINEERING

Uranium Technology

As of August 1, the irradiation status of alloyed dingot was as follows:

	<u>Tons of Alloyed Dingot Uranium</u>	
	<u>Undergoing Irradiation</u>	<u>Discharged at Goal*</u>
Old reactors	59	1443
K reactors	28	271

* Average goal exposure: Old reactors - 675
K reactors - 650

There were no dingot or ingot control failures this month. A temporary halt in the canning and charging of alloyed dingot uranium has been in effect since mid-May and will remain in effect until a better definition of the factors which have contributed to the poorer performance of dingot over ingot is obtained. As previously reported, the presence of quench cracks on the interior bore of dingot uranium and the greater resistance of dingot uranium to chemical attack which results in poorer ALSi-uranium bonding are thought to be the major factors contributing to poorer dingot performance. Tests are in progress 1) at the feed sites to alleviate the quench cracks by a combination of hollow (rather than solid) core blank heat treatment followed by quenching in oil and vacuum annealing after heat treatment, and 2) at HAP0 to devise a more optimum canning cycle for dingot. These programs are reported elsewhere in this report.

As a part of the study to improve the performance in the reactors of dingot uranium, MCW has found that heat treating core blanks in hollow form (rather than solid), quenching in oil at 55°C rather than water at 130°F, and vacuum annealing at 950°F for 12-16 hours after heat treating eliminates the quench cracks previously observed, reduces the surface hydrogen to less than 1 ppm, and precipitates U_6Fe as an intermetallic which improves the chemical reactivity of dingot. Also, MCW is preparing dingot with controlled additions of carbon to give cores with carbon in the range of 100, 250, and 500 ppm (standard dingot averages 25 ppm carbon, ingot ranges between 400 and 800 ppm carbon). Higher carbon content in dingot (approaching ingot) is expected to improve the chemical reactivity of dingot and contribute to better canning characteristics. Fuel cores from both of these programs are expected in mid-August for canning tests to determine if bonding characteristics are improved by the above processes.

Approximately 6.6 tons of hollow core blank, oil quenched, ingot fuel elements have been discharged at approximately 700 MWD/T without incident and 8.5 tons are under irradiation. Fifteen (15) monitor columns of alternately charged oil and water quenched ingot cores were discharged at goal (800 MWD/T) for examination. It is planned to increase the charging rate from 5 tons per month to 25 tons per month in September for a four month period, and then increase to 90 tons per month for six months to complete the testing program which is approximately two months behind schedule.

Forty-eight (48) tons of oil quenched cores heat treated at NLC in May as part of the test schedule for evaluating oil quenching were found to have some partially untransformed cores thought to be the result of a sludge buildup in the salt bath which resulted in erratic temperature effects. Only those cores known to have been processed when the salt bath was operating satisfactorily will be used. It has been noted by SRL and HAP0 that uranium beta heat treated in the low beta phase temperature range (668-685°C) can produce large grains that are oriented. These areas of large oriented grains cannot be detected by any of the present non-destructive tests.

AlSi Process Development

Approximately 1510 tons of bumper fuel elements have been charged to date in the old reactors and 995 tons discharged at variable goal, incurring a total of thirty-four (34) ruptures. None of these ruptures have been of the accelerated fuel cladding corrosion (hot spot) type that bumper fuel was designed to prevent. The single enriched bumper fuel rupture sustained this period occurred after only 24 hours exposure in F Reactor, and resulted from mechanical damage during charging.

In support of an impending conversion from the present rectangular bumper rail to an elliptical rail design to reduce the hydraulic resistance of bumper fuel during irradiation, fabrication of a prototype automatic elliptical rail feeder was completed. The feeder is being installed on the Pilot Plant ultrasonic welder for demonstration starting early next month. An order for 8001 alloy elliptical rails, pre-stamped in metal strip form, has been issued and delivery is expected in about three months. In the meantime, rails fabricated on-site will be used to demonstrate the prototype feeder and to prepare production quantities of elliptical bumper fuel for irradiation.

Delivery of the first 200 of 5,200 ribless zircaloy tubes on order for retubing the K Reactors is scheduled by November 1. Fuels development effort in support of the retubing program is being expedited to provide projection fuel with optimum rail strength, collapsibility features and dimensions to meet reactor conversion schedules. Rails of a potentially more optimum arch-type design for the K Reactor fuel models, stamped from 50 mil 8001 alloy stock, have been prepared by HLO for preliminary ex-reactor tests after experiencing some difficulty in stamping die fabrication. A small quantity of these rails have been ultrasonically welded to KVN fuel elements for initial deflection load tests to compare strength and integrity with present collapsible bridge rail design. In addition, samples have been sent to the flow laboratory for hydraulic studies.

In order to establish process capability for controlling maximum projected fuel diameters and minimum rail heights within the desired dimensions for irradiation, a series of small-scale tests have been completed to evaluate post-sizing techniques. Based on rails of the present collapsible bridge design and nominal height (94 mils) attached to KVN fuel elements, rail height after ultrasonic welding increases an average of 3-4 mils, yielding projected diameters up to 6 mils above the desired maximum (1.710 in.). Using a 1.705 in. slotted die for post-sizing, nominal rail height was reduced about 2 mils with a corresponding reduction in projected diameter. A subsequent test utilizing a 1.702 in. slotted sizing die yielded rail heights falling within the limits for maximum projected diameter (1.710 in.) and minimum rail height (92 mils). Following a statistical

analysis of the resulting data, further tests will be run to more fully evaluate post-sizing techniques on projection fuels having both present and new rail designs as they become available through optimization studies. Thus far, post-sizing appears to be the most simple and amenable method for controlling projection fuel dimensions.

AlSi Bond Formation Studies

Metallographic examination of the samples produced to study and define the effects of duplex canning furnace variables on the bonding layer formation for both ingot and dingot uranium metal was completed. The following conclusions are based on the data:

1. Improved dingot bonds from the standpoint of compound layer thickness and percentage of UAl_3 -type structure were obtained with 7.5 ± 0.5 weight percent silicon in the AlSi layer of the duplex bath, whereas the present specification calls for 9.0 ± 0.5 weight percent. In addition, the lead bath temperature was increased from $616^\circ\text{C} \pm 7^\circ\text{C}$ to $625^\circ\text{C} \pm 5^\circ\text{C}$ and the lead preheat time was reduced from 37 ± 3 seconds to 33 ± 3 seconds.
2. The percentage of the more desirable, ductile UAl_3 compound layer under the above conditions was increased in internal dingot bonds from a range of 19-80 percent to 93-100 percent and in external dingot bonds from a range of 9-60 percent to 85-100 percent.
3. Internal bonding of both ingot and dingot cores was better than the external bonding from the standpoint of thickness and percentage of UAl_3 , and was improved from the previous canning conditions.
4. Bond quality of ingot fuel elements may be improved by decreasing the silicon concentration in the AlSi layer in the duplex furnace to 8.0 ± 0.5 weight percent silicon, increasing the lead temperature to $625^\circ\text{C} \pm 5^\circ\text{C}$ and reducing the lead preheat time to 33 ± 3 seconds. A pilot-scale test to verify the above results is in progress.

Neither present non-destructive tests nor stud pulling were of value in investigating optimum AlSi bonding process parameters. The factors most indicative of improved bonding were the thickness and percent of UAl_3 -type compound layer formed adjacent to the uranium surface. The presence of the UAl_3 -type structure is an indication of a good bond since: 1) it is less brittle and less subject to fracture than a laminar USi_3 -type structure, 2) when a crack does occur in the UAl_3 -type structure, its propagation is stopped or, in the case of undercutting, the propagation is near the top of the UAl_3 layer, away from the uranium, and 3) heat transfer is at least three-fold better than through the laminar USi_3 -type structure.

A series of baking tests, designed to determine the effects of baking time and temperature upon the quality of fuel element AlSi bonding layers, is essentially complete. Fuel element samples were placed in a muffle furnace at temperatures ranging from 200°C to 500°C for periods ranging from 1 - 100 hours. Bond quality was measured by internal and external total bond count, stud pull and shear strength tests. The latter test is being developed to measure the strength of internal bonds. Results of the testing to date have shown:

1. AlSi bonding layers deteriorate after baking for one hour at 500°C. All of the fuel elements baked at 500°C for more than 25 hours rattled when shaken indicating destruction of the AlSi-uranium bond.
2. Complete deterioration of the AlSi bonding layer occurred after 25 hours at 400°C.
3. One hundred hours at 300°C did not produce a detectable change in the bond quality as measured by differences in the total bond count.
4. The total bond count data indicated the internal bonds deteriorated more rapidly than the external bonds.

Final measurements and analysis of the data from the series of samples baked at 200°C are underway.

Ellipticity in Fuel Elements

In order to meet the tighter O.D. tolerance requirements for KVN and KVE fuel models, it is essential to reduce fuel element ellipticity. The out-of-roundness or ellipticity in present fuel models averages 4-6 mils with maximums up to 15 mils as a result of sleeve deformation during service life. Additional test data has substantiated values reported last month showing an improvement in ellipticity obtained by reducing the gap between the can and sleeve. The average values were:

Treatment	Ellipticity (Mils)	
	Previously Reported	Present Results
1) CIIN cores and cans in CIIN sleeves	4.5	4.0
2) CIIN cores and cans in modified KIVN sleeves	3.6	3.0
3) KIVN cores and cans in KIVN sleeves	4.4	3.7

These data continue to show a significant decrease in average ellipticity for treatment 2, which involved a 5 mil decrease in gap between the sleeve and can. The standard deviation was 1.1 mils.

Component Cleaning

A program is underway to determine the composition and develop techniques for controlling the quality of the surface film produced on aluminum components prior to canning to gain a better understanding of the cause of non-wetting between the Al can and the AlSi. Since deoxidation of the component surfaces, the final step in the cleaning process, takes place in an acid solution (Diversey 514) containing dichromate ions, the film produced on the surface is considered to be a chromate conversion coating. In other processes utilizing coatings of this nature, control of the solution pH was found to be very important. Using the standard wettability test as a control, the effects of controlling the deoxidizer solution pH were investigated. The following results were obtained:

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- 1) The normal surface activation period, presumably to reduce some hexavalent chromium to trivalent chromium, inasmuch as the trivalent chromium is a major constituent of a chromate conversion coating, was bypassed. The actual cause of this phenomenon is not known. Further testing will be required to confirm this result.
- 2) The wettability test indicated the use of the deoxidizer could have been extended beyond two normal solution lives. Since the annual cost of the deoxidizer is about \$31,200, a substantial saving may be made provided pH control could be accomplished through addition of an inexpensive acid.
- 3) Although pH control was maintained with sulfuric acid, some changes in pH during use indicated a more completely hydrolyzed acid would give more uniform control.

A more complete report on the results of this test will be made when laboratory analysis of data is available.

A lot of cans was recently received from component vendor "A" in which the base well (spire well) was galled and extremely irregular in appearance. The problem was correlated with a high fuel element rejection rate for defective male-end closures. Normal cleaning had little or no effect on the surfaces in question, apparently because some extrusion lubricant was entrapped beneath a thin layer of smeared aluminum. Outgassing of the lubricant during canning or welding produced a poor bond between the spire and can at the base. To alleviate the problem, cans were treated with an aluminum etchant followed by a rinse, a nitric acid dip, two rinses and dried. Times in the etchant were varied from 5 to 30 seconds. From these tests the following preliminary observations were made:

- 1) Etching does eliminate a flaking problem which is believed to be caused by lubricant under a thin layer of aluminum.
- 2) Blisters formed under the surface were too deep to be caused by galling.

Further investigation is required to determine if the cans are acceptable and can be reclaimed for fuel assembly.

During the period of June 25 to July 25, 1962, a total of 3196 pieces were canned in the 306 Pilot Plant. Of these, 413 CVINS fuel elements were for reactor use. The balance, canned under development programs, are being held pending evaluation before release for reactor use. In addition, approximately 300 fuel elements were reclaimed by rewelding end closures, and self-support rails were welded on 2,333 fuel elements.

Preliminary data on canning of CVIIN overbore fuel, designed as a potential replacement for CVIN, indicate the preheat cycle used for CVIN is applicable for the CVIIN model.

Alternate Process Development

Hot Press

An irradiation test (IP-490-A-FP) comparing Sylcor hot press, HAPG hot press and HAPG Al-Si bonded fuel elements has proceeded without incident. The current level of exposure is 400 MWD/T.

Enriched uranium (.94%) to produce 1000 CIVE I&E fuel elements by the Sylcor hot press process has been ordered. An identical number of cores has been ordered to prepare fuel elements by the HAP0 lead-dip process for controls.

Fluid Pressure Bonding

Metallographic examination of the center from each of five fuel element samples produced by fluid pressure bonding at the Battelle Memorial Institute has lead to the following observations:

- 1) Uranium-nickel diffusion at pressures as high as 10,000 psi at 500°C for 40 minutes is not uniform or sufficient to dissolve the inherent uranium core oxide layer between the nickel plate and the uranium surface.
- 2) Uranium-nickel diffusion increases without increased pressure.
- 3) Nickel-aluminum diffusion increases with time.
- 4) Bond failure occurs between the uranium and nickel plate due to the presence of oxide and small amounts of diffusion product.

Hot-Die Sizing

Installation of the sizing press in 3716 Building was completed this month and a total of 59 fuel assemblies have been pressed to debug the press and to establish operating conditions for conducting process development tests. Two internal die supports failed structurally due to excessive stress, but preliminary development work was continued to develop conditions for producing reasonable external bonds and to eliminate a cap mushrooming problem. External bonds having tensile strengths estimated to be in excess of 20,000 psi have been produced by sizing pieces preheated at 610°C for 25 minutes in argon purged cans. Uniform diffusion between the nickel and uranium has been noted on sound nickel plate. No nickel-aluminum diffusion has been observed on any of the hot-die sized bonded elements. Bond strength samples are fracturing at the nickel-aluminum interface. Crack propagation is very short and no damage to either the nickel plate or the nickel-uranium diffusion bond was observed. No problems are expected in achieving high integrity diffusion bonds on the internal and external surfaces between the uranium and the nickel.

Additional thermal studies of the fuel assembly are being made to determine the effect of an argon purge of the assembly during preheat. The increased operating efficiency of the furnace will also be determined. A radiation pyrometer has been installed to monitor the temperature of the fuel assemblies during the actual sizing process.

Nickel Plating

Further testing was completed on a chemical etching pre-treatment of the uranium surface in lieu of an anodic etch to improve the quality of the nickel plate. Based on the results, chemical etching is probably superior. Tests and evaluations included heating fuel elements to 600°C in a muffle

furnace and cooling in air, metallographic examination of the uranium-nickel interface and testing of the jacket-core bond strength of clad fuel elements. Heating plated fuel elements to 600°C and cooling in air produces small blisters at random locations on the fuel element surface. Comparing 15 chemically etched and 15 electrolytically etched pieces, the former had a lower frequency of blistering. Metallographic examination of the uranium-nickel interface from the same fuel elements revealed less cross on the chemically milled pieces than on those electrolytically etched. Cladding to core bond strength of fuel elements clad in exploratory hot-die sizing tests were equal.

Tests designed to eliminate plate blistering, as described above, included several modifications to the process cycles as follows:

- 1) Vacuum outgassing of uranium core prior to plating.
- 2) "Pre-corrosion" of uranium cores in boiling water.
- 3) Reduction of the plating bath surface tension by approximately two-fold.
- 4) Vacuum outgassing of plated cores. (Found beneficial by BMI in recent reports.)
- 5) Increasing the depth of etching during pretreatment.

Increasing the depth of etching proved to be the only technique that resulted in improvement.

At present, tests are underway to determine if plate blistering can be eliminated by deep chemical etching, prolonged etching in nitric acid, and prolonged final neutralization and rinsing before plating.

COEXTRUDED PRODUCT ENGINEERING

N-Reactor Fuel Development

KER Loop Testing

Loops 1 and 2

Loops 1 and 2 are shut down for modifications. Originally it was expected that Loops 1 and 2 would be back on the line sometime after August 1, 1962. Because of delays, it is now anticipated that these loops will be back on the line sometime after September 1, 1962.

Loop 3

The eleven NAE-1 fuels in Loop 3 are operating satisfactorily. Present exposure is about 270 MWD/T. The goal exposure is 2000 MWD/T.

Loop 4

The fourteen NAE-1 fuels in Loop 4 are operating satisfactorily. Present exposure is about 720 MWD/T. Approximately 45% of this exposure has been on single pass water. Goal exposure is 2000 MWD/T.

Resume of Loop 3 and 4 Testing

Loop 3

<u>No. Fuel</u>	<u>Exposure and Goal</u>	<u>Comments</u>
2-NAE-1's	Ap. 400 MWD/T Completed	Fuels used for testing loop modifications
11-NAE-1's	Ap. 800 MWD/T Completed	Discharged because of extensive non-prototypic cold water irradiation
11-NAE-1's	Ap. 270 MWD/T Goal - 2000 MWD/T	Currently in loop

Loop 4

<u>No. Fuel</u>	<u>Exposure and Goal</u>	<u>Comments</u>
5-NAE-1's	Ap. 600 MWD/T Completed	Fuels used for testing loop modifications
14-NAE-1's	Ap. 720 MWD/T Goal - 2000 MWD/T	Currently in loop

Loops 3 and 4 are used for testing full size N Fuel assemblies. Loops 1 and 2 are used for testing smaller I.D. geometries.

DECLASSIFIEDTest Fuel FabricationKER Loops 1 and 2

1. Throw-away fuel elements are being processed on schedule in the N Fuels Pilot Plant for delivery to the KER test facility by September 1, 1962. These fuels are being specially processed to provide "heater" fuels which will be used for testing the effectiveness of KER test loop modifications. As throw-away fuels they are not receiving the extensive pre-irradiation measurements which would normally be given to fuels which will be used for longer term testing.
2. Fabrication of 1.6% enriched, KSE-5 fuel elements will be initiated upon completion of the Nuclear Safety Specifications for this enrichment. The 1.6% enriched uranium is on hand and the Nuclear Safety Specifications are in final stages of completion. The KSE-5 fuel element is a new design which has been developed to scope the swelling problem in the single tube design for N reactor application.

KER Loops 3 and 4

1. A back up charge of fourteen prototypic NAE-1 fuel elements was completed during the month to replace an obsolete charge of NAE-1 fuels currently on hand at the KER test facility. The new charge has the most recent support hardware and is more representative of the present production material than the charge replaced.

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

The qualification inner shells supplied by a third vendor appear satisfactory. The inner tube inner shell produces a coextruded clad with slightly more wall thickness variation than normally found on similar shells from either Harvey or Bridgeport Brass. Of six samples measured, the third vendor clad varied plus or minus 0.0025 compared to 0.001 for the other vendors. The additional variation should not effect the quality of a coextruded inner tube. The outer tube inner shell samples produced cladding virtually indistinguishable from normal Harvey and Bridgeport Brass material. Qualification of this vendor is still pending a more thorough analysis of the test coextrusion results.

Supports

The support supply situation has changed slightly--stocks are in fair shape for outer tube supports and locking clips. Buggy spring supplies are very low and are being replenished very slowly because of low manufacturing yields.

C.P.E. PILOT PLANT WORK SCHEDULE

DATE ISSUED: July 31, 1962

N 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"-NIE-1; (10) 17"-NIE-1	Heat treat and welding	8/15/62	
4/30/62	45			Provide coextruded I&E fuel elements with supports for effluent activity tests.	(45) I&E Reactor Grade	Nondestructive testing	8/20/62	

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Surface cracking during the forming of buggy spring bends continues to be a problem. An evaluation of all material supplied so far has shown that only a small portion of the strip provided for fabricating buggy springs has been properly heat treated. Apparently small changes in material fabrication history or composition can cause a significant change in that material's response to a given heat treating cycle. Several new batches of strip are being heat treated experimentally to define more precisely the heat treating conditions necessary to produce the best strip. Both the strip supplier and HAPO will jointly examine the new strips and buggy springs fabricated from them to define the important process parameters related to making good buggy springs.

Coextrusion Process

Extrusion

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

11.1 Inch Tooling

Two Zircaloy Billets - Z-136 and Z-137

- Z-136 - 6-inch O.D. rod
- Z-137 - 7½-inch rod for HLO

Two Primary Extrusions - PU-74 and PU-75

- PU-74 - NON billet stock for evaluation of high Fe-Al alloy
- PU-75 - Special - 7½-inch O.D. x 1-¼-inch I.D.

7.5 Inch Tooling

Five Composites - X-26 & X-27; UT-35, UT-36 & UT-37

- X-26 & X-27 - NOE size with copper cladding components for uranium billet evaluation.
- UT-35, UT-36 and UT-37 - NON size with Fe-Al alloyed uranium billet core

One Primary Extrusion

- PU-73 - 6-inch O.D. x 2½-inch I.D.

Two Uranium Billets - U-99 and U-100

- U-99 & U-100 - Upset NOE billets for HLO

6.0 Inch Tooling

Seven Composites - ZT-24; X-28, X-29; and T-327 Through T-330

ZT-24	- NIT size with copper billet core for inner clad zircaloy component evaluation
X-28 & X-29	- NIE size with copper cladding components for uranium billet evaluation
T-327 Through
T-330	- NIE standard material for pilot plant usage

One Zircaloy Billet - Z-135

Z-135	- NIT shroud tube for KER loop testing

Extrusion Process Evaluation

A program has been developed to monitor and evaluate the billet assembly and extrusion process performance during the following two or three months. The primary objective of this program is to more fully define the extent and character of the wall thickness and clad thickness problems and attempt to determine if these problems are related to the process or component materials.

Warp Studies - N-Inner Pieces

Much physical work is being done to make special measurements which would define the effect on warp, of liner temperatures of 600°F and 800°F, and billet loader temperatures at ambient conditions and 1140°F. An analysis of recent low yields at the heat treating operation has been completed. The analysis shows:

1. Material that was coextruded when there was copper pickup on the cone has shown a slightly larger warp after heat treating.
2. The low yield was about one-third attributed to warp after heat treating and two-thirds attributed to the reverse bending and re-beta heat treating step. The recovery process was only 60 to 70 percent efficient compared to a predicted efficiency of 90 percent that has been realized for many months. Accordingly, attention is now directed at why the recovery efficiency is so low.

Special tests are under way to determine if the reverse bending step (and thus the entire recovery process) is temperature sensitive. It is possible to take pieces off the conveyor as they leave the water rinse at $60 \pm 5^\circ\text{C}$. Too, it is possible that the backlog of material may cause a delay and straightening may be done at 25-30°C. Preliminary data show that a more consistent product is produced (with respect to both the magnitude of the

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reverse bending and the angle of the reverse bending) when the pieces are at 25-30°C. There is no indication, however, that the yield is better.

Future work will be directed at perfecting improved instructions for reverse bending so that the mean value of re-beta heat treated warp will be reduced from 17 mils (d.t) to zero mils.

Data on wall thickness, clad thickness, warp, and coextrusion process variables have been assembled for statistical analysis. The dependence of process variables versus these quality parameters is sought along with a description of process capability.

NPR Support Welding

Outer Supports

Copper ground blocks have caused copper contamination of the zircaloy cladding in the past. Thirty mil zircaloy supports were attached by rivets to the copper ground blocks to eliminate this copper pickup during welding. This method proved satisfactory initially, but during usage the rivets worked loose causing a brass pickup. The rivets have been eliminated and the problem solved by using zircaloy bonded to copper.

Inner Supports

The same type of ground blocks have been installed for inner supports as described for outer supports with satisfactory results.

A loss of shear strength in projection welds has been eliminated by hand straightening the feet of the support and discarding supports having off center projections. A 400-pound shear force test is now being consistently applied to individual welds without failure. Since the shear test is considered as partially destructive in nature, weld strength qualifications are performed on elements rejected for other reasons at a ratio of one rejected element tested to 20 acceptable production elements produced.

DDR-153 Modifications

Negotiations are in progress with Nuclear Metals, Inc. to add approximately \$75,000 worth of R&D work to the subject contract for FY 1963. The major part of this work will be concerned with basic uranium metallurgy in an attempt to find a dilute alloy which has better fabrication and irradiation characteristics. The effects of small additions of Fe, Al, Si and Cr will be studied since it is known that small amounts of these elements have significant effects on the behavior of uranium.

Also included in the modification of DDR-153 is a comprehensive audit of the NPR Fuel Program, and process, by key senior members of the Nuclear Metal's staff.

Chemical Processes

During the month, most of the effort in chemical processing has been directed toward improvement of the final etching process prior to autoclaving.

White oxide no longer forms on end closure welds in significant amounts since modifications to the etching process have been put into effect. The modifications consisted of reducing etchant carryover and buildup in the aluminum nitrate stop bath by using a double stop bath process. The autoclave procedure was changed to prove a complete hot blowdown at 450°F. Additional minor changes will be made in the etching process involving solution temperature and concentration controls.

More recent problems have been associated with clad stains and marks from Teflon rollers. These were corrected by additional instruction of operating personnel in the care, effort and skill required in the rinsing and handling techniques. Roller baskets were replaced with wire baskets. The most recent production through the autoclaves has approached 100% acceptable. Assistance to the Manufacturing Operation has also been given in etching of fuel supports and in chemical milling.

Inner supports are being "flattened" after inspection. This requires contact of the projection on the bed of the press. Possible pickup and imbedding of foreign material has been suspected, which in effect ruins the etched surface of the support. This has been corrected by an additional flash etch of inner supports before welding.

Fuels which are removed from the chemical milling solution prior to completion and are left to stand overnight, or for a prolonged period, will, on occasion, develop a surface passivity to the milling solution. A short immersion in nitric acid has been effective in correcting this problem. Fuel elements are being routine processed as described to eliminate this problem.

Equipment Development

Revisions to 306 Building Brazing Equipment

The experimental brazing equipment, which was installed in the 306 Building Pilot Plant two years ago, has been replaced by a new piece of equipment. The object of the replacement was to give additional flexibility so that a wide range of fuel geometries could be brazed. Also, the new equipment is more precise and easier to operate.

Evacuation Tube Crimping Equipment

Quality Control personnel have indicated that on occasion there was not sufficient bonding when the evacuation tube was crimped. Investigation revealed that the equipment was out of adjustment and that the copper evacuation tubes were not adequately cleaned. After adjustment of the equipment, a number of evacuation tubes were cleaned properly and then crimped while connected to the vacuum system. These tubes were sectioned and it was found that the bonded area was greater than the can wall thickness.

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New electrodes are being made with a 3/16 inch radius; the electrode now in use has a 1/8 inch radius. The larger radius electrode will increase the bonded area.

High Voltage Power Supply For Gaseous Etching

A high voltage power supply is being designed and will be fabricated for gaseous etching in the electron beam welding chamber. This power supply will be portable so that it can be used as a power supply for electron beam welding in the small vacuum system now being used for copper deposition work.

"N" Single Tube Coextrusion

The N-single tube billet design was completed during the month. This design, although somewhat limited by the existing extrusion liner size, will be used to evaluate extrusion capability on this geometry.

Areas of primary concern with this geometry are wall thickness variation, bond quality, and clad thickness variation. Wall thickness variation should not be a significant problem, but coextrusion experience is very limited on thick wall, large diameter tubes. Bonding is, of course, of concern only because the extrusion reduction ratio is low (13.5/1) and experience has shown that some inconsistency of bond quality may occur at this reduction. Clad thickness variation should not exceed that which presently exists on the outer tube coextrusions, however, evaluation of actual extrusions will be necessary to determine the thickness variation which will exist with the standard uranium billet fabrication process. Billet designs were also made to produce tubing with three different clad thickness nominals (0.010, 0.030, and 0.045 inches) to define the relation of thickness variation to nominal thickness.

TESTING METHODS ENGINEERING

N Fuel Element Testing

The longitudinal and torsional resonant frequencies of approximately two hundred and fifty N fuel elements from some forty billets have been measured by SORT before and after beta heat treatment to a) determine if these parameters are reliable indicators of complete beta transformation and b) assess the uniformity of different extrusions as measured by these frequencies. The results indicate that SORT readings can distinguish heat treated elements, there being an average shift in frequency from 1795 cps to 1830 cps associated with the heat treating process. Other measurements showed however, that as-extruded elements which were annealed at 300°C for seven minutes but not heat treated exhibited a change in resonant frequencies essentially identical to that produced by heat treatment. Thus, SORT measurements do not distinguish between the annealed and heat treated condition; however, since annealing is not a regular process step, the technique would offer the possibility of assuring beta heat treatment by nondestructive test.

Evidence that these resonant frequencies are remarkably sensitive to billet extrusion conditions was established by comparing measurements made with the extrusion press liner at different temperatures. The torsional frequencies measured on fuel elements extruded at 600°F liner temperature were near 7174 cycles per second, whereas the same measurements made with the temperature increased to 800°F dropped to about 7115 cps. The significance of this frequency shift in terms of the physical properties of the fuel elements is presently under investigation; its possible relationship to warp is being considered first.

The N fuel nondestructive tester has continued routine operation. Some difficulty experienced with increased drift of the cladding thickness tester was reduced by incorporating more rigid mounts on the eddy current test head.

A new test recently made operational is located physically near the end braze station. This ultrasonic test, which detects incomplete cap-core bonding, may be applied directly after the brazing process to give early indication of abnormal conditions in that process.

Special emphasis is currently being given the development of optical methods of evaluating the presence of white oxide on the fuel element surfaces after autoclave. First attempts will employ photocells to compare light reflected from an unknown surface to that reflected from a known, acceptable surface. It is hoped that a prism arrangement may be incorporated in the system to distinguish the so-called "grey" from white oxide.

Considerable effort has been required to develop a practical method of positioning N fuel elements in the vacuum chambers such that they may be efficiently vibrated during the brazing operation. The problem appears to have been solved by a technique which places the vibrator directly under the chamber with the vibrating shaft slightly off-set from the longitudinal axis of the element.

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AlSi Fuel Testing

Steps being taken to correct the erratic performance of the external bond test are apparently successful. Under normal operating procedures this test does not distinguish between bona fide unbond defects and the so-called "brittle" bonds, which appear from destructive examination to be acceptable even though they are rejected by the tester. In order to avoid loss of this material, instrument set-up and alignment procedures were adopted on the production line testers which vitiated test results so far as real bond defects were concerned.

The problem thus, was to establish operating conditions under which the test is insensitive to "brittle" bonds, and at the same time reliably detect bona fide unbond defects. Investigations suggest that this can only be achieved by a reduction in test frequency. Accordingly, one line tester has been made operational at 15 instead of 25 megacycles. On the basis of the favorable results obtained from this mode of operation, the remaining testers are to be similarly modified.

One weld monitor has been made operational with a production line ultrasonic welder. Whereas this particular welder could not be made to function with satisfactory yields without the monitor, yields of 97 per cent were achieved with initial production runs after installation of the weld monitor on this unit.

Unexpected difficulty is being experienced in obtaining uniform UT-2 tester response. Circuit modifications developed and checked out in the laboratory have not performed suitably in the production testers. This effort is continuing with major emphasis.

A firm \$48,000 request has been received from National Lead Company of Ohio for the construction of two additional automatic UT-2 testers. Favorable reports are being received from both NLO and Mallinckrodt on the use of the UT-2 units now in place at these sites.

New Test Developments

The effect of vibratory energy on the wettability of metals is being investigated with moderate effort. Early studies indicate that the wetting of nickel and uranium by AlSi can be markedly improved with the application of sonic irradiation. The next phase of this work will prepare AlSi coated fuel cores for canning under the hot die sizing process.

Work to develop methods of individually identifying AlSi fuel elements is proceeding under a long range program. The objective of this program is to develop practical methods of cataloging pre-irradiation data by fuel element number

which can be compared with post irradiation data. Experiments to date have succeeded in reading by ultrasonic means 1/8" X .005" deep notches placed on the core surface according to a numbering code. Attempts will be made to read the code on canned elements.

The UT-10 equipment (post irradiation inspection of N fuel) is in the laboratory undergoing checkout. Plans are to move the equipment to 189 D Building within the next two weeks for further checking.

Manager, Engineering

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FINANCIAL OPERATION

JULY, 1962

A major effort during the month has been a study of the effect on production costs of reorganizing the Plant Facilities Section. This information, prepared in detail by Sub-section level, was issued in a report, "FPD Plant Facilities Study," July 25, 1962, and presented to interested parties.

Reconciliation of the steam coal inventory taken in May disclosed a physical inventory surplus of \$2,378 (292 tons). This represents a 4% variance from the book balance of \$59,348. A formal report was issued to interested Department managers.

Mechanization of Engineering cost distribution was implemented as planned during the first week of July. This represents the initial phase of an over-all program to provide machine reporting of all Engineering operating and end function costs. Additional data processing programs required in order to implement mechanized reports are scheduled for completion by March, 1963. In addition, assistance was provided the Engineering Section in evaluating the economics of the dingot material program.

Operating labor and process material cost standards for each product model and each station of the AlSi process were revised. A detailed cost report for Coextrusion Shop was developed for use with July, 1962 business. The report details all costs by the various stations within the shop.

Preliminary results of the Department's physical inventory of fixed assets, consisting of 2,800 items of fixed property with first cost valuation of \$21.7 million, reveal ten unlocated items valued at slightly over \$12,000. The largest of these is an \$8,000 quench tank which is believed to have been cannibalized. Previously unrecorded additions to plant have not yet been determined, but are also anticipated to be nominal both in quantity and value.

The transfer of EWIP and CWIP accounting functions to C&AO has been completed. C&AO will have basic responsibility for record maintenance and reporting of capital expenditures. The Department will retain responsibility for internal liaison and establishing reporting requirements.

Concurrent with the transfer of certain maintenance groups, nearly a third of the Department's movable property will be transferred to HLO. This will involve about 550 items valued at \$230,000. Preparations are under way to execute the transfer.

Issuance of the Department Policy Letter binder, Policy Letter number one, which establishes the system, and Memorandums from Council will be accomplished in August, 1962. Issuance of subsequent policy letters, several of which are also scheduled in August, 1962, will be on an individual basis.

Revisions to FPD OPG's on Delegation of Routine Authorities, Procurement Procedures, and Travel and Living are substantially complete. Issuance is anticipated during August, 1962.

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July travel expenses totaled \$493 covering six trips with a total of fifteen days in travel status. All concerned regular business. There were no expenditures for professional meetings or off-site courses.

Two cost improvements plus suggestions with estimated annual savings totaling \$109,258 were received in July, bringing the year-to-date figure to \$573,038, 64% of the \$900,000 CY 1962 goal.

Feasibility of establishing a work simplification course for FPD monthly salaried personnel is currently being explored. The idea has been received enthusiastically, leaving the main items of course material and instructor availability yet to be determined.

Rough draft of a new "Guide to Cost Improvement" has been completed and is currently being reviewed. Publication in final form is anticipated during August, 1962.

Certain problems have been encountered in the EDP program for production forecasting due to the need for leveling of production and bare core requirements. It appears the solution is at hand. However, positive determination cannot be made without further exploration. The July forecast was produced by means of the existing program and necessary adjustments made manually.

A procedure for coordination of systems applications involving data processing is being developed. Purposes of such coordination are to avoid duplication of effort, provide assignment of responsibility, and assure sound budgetary control.

No reports of unusual significance were issued during the month.

The Financial Section had no security violations during July.

for Manager - Finance

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PLANT FACILITIES OPERATIONJULY, 1962I. RESPONSIBILITY CHANGES

None

II. ACHIEVEMENTSA. Statistics

<u>Utilities</u>	<u>July</u>	<u>June</u>
Average steam generated (M lbs/hr)	35	42
Maximum steam generated (M lbs/hr)	61	69
Total steam generated (M lbs)	26,024	30,494
Coal consumed (tons)	1,539.07	1,588.25
Evaporation rate (steam/# coal)	8.45	9.60
Efficiency - Actual	58.0	64.5
Efficiency - Theoretical	67.9	69.4
No. of Boilers on: 2		
Date of Change : None		
Sanitary water from 3000 Area (M Gals.)	142.56	146.76
Total water from 3000 Area (Avg. rate gpm)	3,193	3,397
Total water from #3 and #4 wells (M Gals.)	14.59	18.38
Total water from #2 well (M Gals.)	.30	.30
Peak water consumption for 24 hours (M Gals.)	5.2	5.6

Stockpiled coal was utilized during the major part of the month due to the "miners" holiday during the month of July. The evaporation rate and the actual efficiency dropped because no adjustment was made for the lower BTU value of the coal used.

B. Operating Experience

Overhaul work continued on the No. 6 Boiler and its associated equipment. Tube repair was completed and the required papers are being prepared to send to Travelers Insurance Company. Along with the boiler overhaul, the coal crusher and reciprocating feeder are both being overhauled. This required the use of the bulldozer to get stockpile coal into the reclaiming hopper.

The control system for all the heating and ventilation equipment in the 308 and 309 Buildings has been reviewed by the designer and the operating groups to determine what revisions should be made to prevent potential failure of the system.

A number of outages were scheduled in the 325 Building to permit utility tie-ins to existing services.

A short outage of the instrument air control system in the 326 Building was required to resolder a loose tube fitting. This work was completed on swing shift to keep equipment outage to a minimum.

A contractor working north of the 340 Building broke the sanitary sewer line. Repairs are currently underway. On the same day, another contractor excavating west of the 325 Building broke the retention basin waste line; this was repaired the same day.

A near serious incident occurred in the area south of 300 Area when an AEC contractor was preparing to drill a test well directly over the 12" water line. The drilling rig was observed before drilling had started and was relocated to another location.

At the 321 Building, the caustic line from the roof tank to the nitric acid destruction column was completely plugged. It was necessary to remove, clean and replace the line to provide for a free flow of caustic.

Polyvinyl chloride sponge was used as gasket material in the scrubber and ductwork of #1 and #2 etch machines in 313 Building. This is the first time that this material has been used on these machines. This material has been found to provide an excellent, acid-proof seal on duct flanges that are uneven or rough.

Requirements for pipefitters and weldors during the extended outage for PRTR has resulted in delays of other HLO work needing these particular crafts. Only emergency work and the continued installation of prototype equipment in A cell in 325-A Building were accomplished for HLO during the month.

Thirty new transistorized portable BF₃ neutron detection instruments were received from the manufacturer during the month. These units were made according to HAPO drawings and a prototype fabricated in the Portable Shop. Very little adjustment has been required on these instruments. Savannah River personnel inspected this instrument and subsequently requested our complete specification package in anticipation of purchasing a number of these for their plant.

Requests for temperature calibration of resistance thermometer and thermocouples for the 100 Area reactors has been unusually high during July. Some problem has existed in providing below ambient temperature certification due to lack of adequate calibration equipment. The need for this equipment had been anticipated and funds budgeted for in FY 1963.

The cause of recurring false fire alarms in the Plutonium Fabrication Pilot Plant has been located and eliminated. An unused relay, jumpered out during the original installation, had been insulated with cellophane tape which had burned through permitting the relay contacts to make contact intermittently. The criticality alarms in this building were inspected and calibrated to alarm in a gamma field of 5 roentgen.

C. Equipment Experience

Major revisions of instrument and electrical equipment and systems has been started in the 314 Building for making PRTR corrosion tests.

A new Gas Chromatograph was received and placed in service for the Chemical Research Operation in the 325 Building. This equipment is to be used currently to analyze gas samples from PRTR. A new spectrometer,

including a strip chart recorder and a Tally paper tape punch system, was assembled and placed in operation. This unit is to be used to determine the plutonium absorption of various fused salts.

A sequence counter was received for installation with the numerically controlled drill press in the 328 Building. There was evidence of what appeared to be rough handling during shipping. Reassembly and testing is awaiting receipt of circuit diagrams requested from the drill press manufacturer.

A prototype alpha-beta coincidence counter was fabricated for the Instrument Development group to be used for rapid determination of plutonium in the air.

Modification of the Vande Graaff accelerator in 3745-A is complete. Some trouble was experienced with leaks, a new target bellows was required, and satisfactory mounting of the new ion type vacuum pump was difficult. The 256 multichannel analyzer was relocated from the whole body counter in 700 Area to the 3745-B Building. Considerable trouble is being experienced getting it into operating condition.

Considerable scale buildup has been noted in the ventilation units on 3707-A Building and the heating and ventilation units "E" and "F" in 3706 Building. It is planned to use sulfamic acid to remove the scale and, if successful, avoid dismantling the units.

Contamination of distilled water storage tanks was experienced this month. Although a full inspection has not been completed, it is believed the trouble may have been caused by back-flooding from the overflow drain lines.

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 July 1962.

E. Cost and Savings

One Cost Improvement item of \$2,080 was approved and the \$2,015 in annual savings from suggestions brought the July total to \$4,095. Total savings calendar year to date are \$54,574 or 47.5 percent of the Section's goal.

F. Status of Projects and Major Jobs

Auxiliary Instrument Panel, 384 Building - Calibration and run-in of the hardness analyzers is continuing. Conduits from the 382 Building are laid and pneumatic impulse lines are scheduled for completion in August.

Modification of No. 5 Sanitary Water Pump - All work has been completed and the equipment is in service.

Intercommunication System, 384 Building - The installation of the power-house telephone system was completed and as-built drawings and BPF's are being formalized.

Emergency Power System - A re-survey of all area loads was completed and a formal report issued detailing need and justification. This report justifies the procurement of a 1500 KVA generator to operate split loaded instead of a 1875 KVA generator with split loaded not required. CE&UO Electrical Design is providing assistance on the procurement specifications which are ready for final preparation. An additional report is currently being prepared detailing the effects of a normal power outage and the resultant savings to be realized by the proposed emergency power supply.

Compressed Air Expansion - Design for installation of the No. 6 compressor is 90 percent complete. Fabrication of the new step control panel revisions to starters and total installation will be performed by J. A. Jones. Delivery of the compressor and starter is now scheduled for mid-August.

Service Piping, 382-384 Buildings - Field work is approximately 90 percent complete with removal of old lines scheduled early in August.

Process Sewer Extension - Field work is about 30 percent complete.

West High Tank Inspection - The formal report covering the inspection of the tank has not been received from the consultant, Chicago Bridge and Iron Works.

Outside Storage Facilities, 303 Area - Authorization was issued to J. A. Jones Construction Company for paving and related work. Site preparation has been started with paving scheduled for August.

Laboratory Area Steam Loop - The AEC directive is awaiting the availability of funds.

Building Roof Repairs - The inspection report by CE&UO consultants is being evaluated preparatory to negotiating a contract through J. A. Jones.

4th Expansion Steam Generation Plant - Two formal reports, one covering hazards and the other reliability, were issued in support of the project. The consulting engineer from Sverdrup and Parcel Associates, Inc. issued his report on the proposed expansion. His findings essentially concurred with the proposed plans. The project proposal was prepared and submitted to the Department General Manager for his approval.

G. Special Reports Issued

HW-74292, Emergency Electrical Facility Expansion, 300 Area, by T. D. Gibbs, N. L. Jones, and D. G. Bowman, dated July 13, 1962.

HW-74166, Natural Gas and Oil, Fire and Explosion Hazards, by R. G. James, dated July 5, 1962.

Reliability of Installed Boiler Capacity, by R. G. James, dated July 26, 1962.

H. Visitors

Mr. Hank Nielsen, Field Engineer for American Mill and Foundry Company, Greenwich, Connecticut, visited the 300 Area, July 23-27, 1962, to provide instruction to craftsmen on the maintenance of master slave manipulators.

Mr. D. L. Christafferson, Consulting Engineer, Sverdrup & Parcel and Associates, Inc., St. Louis, Mo., visited the 300 Area, July 9-11, 1962 to inspect the steam generating plant and review proposed modification.

Mr. L. R. Boyd, General Electric, Co., APED, San Jose, California, visited the 300 Area, July 26, 1962 to discuss BF₃ neutron detection tube fabrication.

III. PERSONNELA. Safety, Security and Radiation Experience

Medical Treatment Injuries	19
Frequency Rate	4.53
Disabling Injuries	0
Serious Accidents	0
Security Violations	0
Radiation Incidents	0

B. Meetings

Round Table - Staff	14
Safety and Security	18
Information	4

FOR
Manager
Plant Facilities Operation

E Hilgeman:GA Huff:RTM:jse

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12 / 14 / 92