HANFORD ATOMIC PRODUCTS OPERATION
RICHLAND, WASHINGTON

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MONTHLY REPORT
FUELS PREPARATION DEPARTMENT
FOR
FEBRUARY, 1959
Compiled by
Fuels Preparation Department
March 18, 1959
Richland, Washington

DISTRIBUTION

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MANUFACTURING OPERATION

Four hundred fifty-seven and one-half (457.5) tons of acceptable uranium fuel elements were produced. This was 101% of forecasted production. Manufacturing yield for eight inch I & E fuel elements increased to 85.5% from 82.6% in January. This was the fifth consecutive month of yield improvement for eight inch I & E elements. Operating efficiency continued high at 95.6% compared to a forecast of 93%.

At month end there were seven hundred ninety-seven (797) tons of bare uranium cores in storage. Finished fuel element inventories in combined 100-300 Area storage were adequate throughout the month. The high month end total of 771 tons is expected to be reduced by March usage.

Two autoclave failures occurred in February. These were the first failures since the adoption of the spire etch process. Preliminary investigations indicated that the failures were caused by pin holes in the weld beads.

Irradiation Processing Department requested that production of revised "K" size I & E fuel elements be delayed until more thorough investigation of potential problems involving reactor coolant systems can be made.

ENGINEERING OPERATION

The lower trend in fuel element failures continued with a total of five ruptures. The cumulative rupture total for January and February is nine failures. Failure rates for both of these months are lower than any month since June, 1957.

Uranium, zircaloy-2, and copper components for 22 billets were prepared for extrusion at Nuclear Metals, Incorporated. Ten of these billets were successfully assembled, evacuated, sealed and non-destructively tested at HAP0. The balance were assembled and tested at NMI. An extrusion run utilizing these billets will be started March 3 at NMI. Several engineers from the Department will participate to develop techniques and to gain experience.

A visit has been scheduled with the Magnetermic Corporation to explore the use of their facilities for testing the induction heat treating of uranium cores. Studies indicate that induction methods may be more economical and efficient than the salt bath methods presently scheduled for the Extrusion Pilot Plant.
Development work is underway with the Oregon Metallurgical Corporation for the provision of centrifugally cast uranium tubes. Significant incentives exist in this process since these tubes can be cast directly from melting stock into finished billets. Chill casting with steel molds is planned in an effort to obtain a fine grain size not requiring further beta heat treatment.

A spot welder has been ordered (due 4/13/59) and it will be equipped with semi-automatic welding fixtures fabricated on site. This welder will provide enough elements to satisfy IPD requirements for self-supported and bumper elements until CY-1960.

Work in many areas of non-destructive testing proceeded successfully. Optimum results were obtained with the eddy current zircaloy cladding thickness/integrity tests and a prototype tester is now under construction. The first phase of the basic analytical studies of broadband electromagnetic methods was completed and a report drafted. Mathematical proofs were derived which agreed with a number of experimental Lamb wave observations.

A number of projects for customers outside the Department were carried out. Some of these included: revisions to 105-C basin bondtesters; testing of plutonium specimens for voids and inclusions by ultrasonics; testing of graphite bars for flaws; provision of information and components to CPD for the fabrication of a resin level indicator for separations columns; carrying out of experiments utilizing high intensity ultrasound to compact uranium oxide powders. A very promising increase of about 5% was obtained in the compacting experiments; work will be continued in this area.

The in-reactor production test of nickel plated fuel elements for evaluation of reactor-effluent contamination was charged February 18. Accumulation of reliable data regarding possible contamination will take about six weeks. Preliminary evaluation of the effects of the nickel plating on corrosion reduction will be made upon discharge several months later.

The purchase order for a Loewy 2,750 ton extrusion press was issued February 12. Shipment is scheduled for mid-October, 1959. All other design, project and construction work is proceeding on schedule and within costs.

FINANCIAL OPERATION

In accordance with revised AEC Manual Chapter covering our Internal Audit Program, and at the request of the AEC Finance Division, a long-range detailed audit schedule was developed for the Department.

Work continued on work simplification projects and two presentations were made on simplification of office procedures to those currently participating in the FPD Work Simplification course.
All preliminary planning and scheduling was completed for commencement of a physical inventory of fixed plant on March 14.

Personnel estimates for the FY-61 budget and revised FY-60 estimates were developed and submitted to Contract Accounting. The budget for Equipment not Included in Construction Projects was also submitted. All other budget submissions will be completed in March.

MAINTENANCE & POWER

Sand in the water supplied by the City of Richland has been a serious problem during the month. Clarification of the water in 300 Area has been delayed due to the failure of the new ground storage tank. Consideration is being given to modifying the old ground storage tank to use as a sand trap.

The new boiler was operated "on the line" for short periods during the month.

EMPLOYEE RELATIONS

Six personnel development programs were initiated, in progress or concluded during the month. These programs included PBM-I, Creative Approach Seminar, Interviewing and Counseling Course, Work Simplification, Union Relations Information Meetings and refresher course in Solid State Physics. In addition, 41 people enrolled and began participation in the Department-sponsored, off-the job First Aid Course.

The General Manager's Annual Report to Employees was mailed to all employees' homes on February 27.

Seven grievances were processed at Step I during February. Of these grievances four involved jurisdiction and one each concerned overtime, absence plan, and transfer consideration. Two of these grievances were answered satisfactorily at Step I.

The Department had one serious accident during February. The medical frequency rate increased from 2.83 in January to 4.34 in February.

Communication plans were initiated for promoting the Department's annual clean-up campaign, Operation New Broom, 1959.

PERSONNEL STATISTICS

Number of employees January 31, 1959 750
Number of employees February 28, 1959 761

<table>
<thead>
<tr>
<th>OPERATION</th>
<th>EXEMPT</th>
<th>NON-EXEMPT</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>54</td>
<td>279</td>
<td>333</td>
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<tr>
<td>Engineering</td>
<td>51</td>
<td>24</td>
<td>75</td>
</tr>
<tr>
<td>Financial</td>
<td>15</td>
<td>16</td>
<td>31</td>
</tr>
<tr>
<td>Maintenance &amp; Power</td>
<td>39</td>
<td>262</td>
<td>301</td>
</tr>
<tr>
<td>Employee Relations</td>
<td>10</td>
<td>9</td>
<td>19</td>
</tr>
<tr>
<td>TOTAL</td>
<td>170</td>
<td>591</td>
<td>761</td>
</tr>
</tbody>
</table>

LLGerman/jak

GENERAL MANAGER
FUELS PREPARATION DEPARTMENT
### I. CURRENT OPERATIONS

#### A. Production and Productivity

1. Statistics

<table>
<thead>
<tr>
<th></th>
<th>NORMAL</th>
<th></th>
<th>ENRICHED</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8&quot; I &amp; E</td>
<td>6&quot; Water</td>
<td>6&quot; I &amp; E</td>
<td>6&quot;</td>
</tr>
<tr>
<td></td>
<td>Solid C K K O</td>
<td>Rev. Mix C K O</td>
<td>Solid Tot</td>
<td></td>
</tr>
<tr>
<td>Current Month's Production</td>
<td>82.4 2.6 44.9 14.2 248.4 4.1</td>
<td>29.7 17.6 13.6 0 457.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acceptable Fuel Elements Produced (Tons)</td>
<td>111 - 62 51 116 137</td>
<td>115 110 85 0 101</td>
<td></td>
<td></td>
</tr>
<tr>
<td>As % of Forecast Production</td>
<td>515 7 29 118 126 82</td>
<td>66 - 124 0 95</td>
<td></td>
<td></td>
</tr>
<tr>
<td>As % of Past 3 Months' Average Production</td>
<td>42 3 48 473 232 205</td>
<td>85 - 192 0 87</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% of Forecast Achieved-Last Fiscal Quarter</td>
<td>158 79 89 - 116 75</td>
<td>106 - 119 0 103</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% of Forecast Achieved-Last 4 Fiscal Quarters</td>
<td>113 87 110 - 103 117</td>
<td>100 - 104 85 105</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Operating Efficiency

<table>
<thead>
<tr>
<th></th>
<th>Current Month (%)</th>
<th>Forecast (%)</th>
<th>Previous Month (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>95.6</td>
<td>93.8</td>
<td>93.8</td>
</tr>
</tbody>
</table>

#### Manufacturing Yield

<table>
<thead>
<tr>
<th></th>
<th>Current Month(%)</th>
<th>Forecast(%)</th>
<th>Previous Month(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>86 76 78 84 87 73</td>
<td>84 79 83 0 84 79 79</td>
<td></td>
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<tr>
<td></td>
<td>83 79 79 79 70 79 79 79</td>
<td>79 79 83</td>
<td></td>
</tr>
<tr>
<td></td>
<td>87 82 81 81 85 74</td>
<td>88 - 82 78</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Bare Uranium Available for Processing (Tons)</th>
<th>Finished Products in Storage (Tons)</th>
<th>Uranium Utilization (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>152 126 83 219 155 7 14 27 8 4 797</td>
<td>32 132 50 291 8 61 17 27 9 771</td>
<td>95.4</td>
</tr>
</tbody>
</table>
2. Activities

a. Production

February fuel element production was four hundred fifty-seven and one-half (457.5) tons, 101 percent of forecast (HW-58930-RD). Continued high manufacturing yields and operating efficiency enabled the plant to slightly exceed production commitments. About 87 percent of February production was I & E type fuel and 13 percent solid type fuel. Eight canning lines were operated each day throughout the month.

The first production run of six-inch new "K" size I & E fuel elements was made during the month. This is the first enriched product to utilize components of the X-8001 (higher nickel content) alloy. This material will provide limited charges for the K reactors for the next two months.

b. Yield Control

<table>
<thead>
<tr>
<th></th>
<th>January Yield</th>
<th>February Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>8&quot; I &amp; E</td>
<td>82.6%</td>
<td>85.5%</td>
</tr>
<tr>
<td>8&quot; Solid</td>
<td>86.5%</td>
<td>86.1%</td>
</tr>
<tr>
<td>6&quot; I &amp; E</td>
<td>86.2%</td>
<td>82.2%</td>
</tr>
<tr>
<td>6&quot; Solid</td>
<td>78.7%</td>
<td></td>
</tr>
</tbody>
</table>

This was the fifth consecutive month of yield improvement for eight-inch I & E pieces from a low of 73.3 percent in September 1958. Reductions were made in external thin wall and bond test reject rates primarily due to improved control of non-destructive testers and to rapid feedback of quality information to the canning crews. Rapid exchange of quality data enables quicker and more accurate operating adjustments for optimum assembly results.

The surface reject rate remained at the low level of 0.3 percent, substantiating gains in control of cleanliness at component preparation and final etch made in January.

The yield for six-inch enriched I & E fuel elements dropped from 86.2 percent to 82.2 percent, due primarily to alsi running too far down the outside can surface during the assembly operation. Grooves cut in the disposable portion of the cans failed to stop the alsi flow. It was theorized that insufficient upset metal existed at the edges of the groove to provide an adequate barrier. The severity of the problem was reduced by cold crimping cans to the inside surface of the sleeve.

Two autoclave failures occurred late in February. Both were "K" size natural I & E fuel elements and investigation of the failure mechanisms is not fully complete. However, both failures involved water entry through minute pin holes in the weld beads and along braze layer defects to the uranium core. In one case water entry was through the base end weld and along a non-wet can base. In the other case the pin hole in the cap end
b. Yield Control - continued

weld was associated with a large braze layer void. These were the first autoclave failures since December 2, 1958 when the cap etch process was adopted to assure aluminum silicon wetting of the I & E cap wafer. The cap wafers were completely wet in both defective fuel elements.

c. Other Activities

Five tons of six-inch water mix pieces were transferred to finished storage. An adequate finished inventory of this material has been established.

The following material was reclaimed by machining off the original weld and successfully rewelding.

<table>
<thead>
<tr>
<th>Pieces</th>
</tr>
</thead>
<tbody>
<tr>
<td>8&quot; I &amp; E</td>
</tr>
<tr>
<td>6&quot; I &amp; E</td>
</tr>
<tr>
<td>8&quot; Solid</td>
</tr>
</tbody>
</table>

Recovery of reject enriched fuel elements which have been accumulated in the past two months began in the latter part of February. Meanwhile normal uranium rejects are being temporarily backlogged.

The following pieces were processed through the Fuel Recovery Operation.

<table>
<thead>
<tr>
<th>Pieces</th>
</tr>
</thead>
<tbody>
<tr>
<td>8&quot; Solid</td>
</tr>
<tr>
<td>8&quot; I &amp; E</td>
</tr>
<tr>
<td>Water Mix</td>
</tr>
<tr>
<td>6&quot; Enriched Solid</td>
</tr>
<tr>
<td>6&quot; Enriched &quot;C&quot; I &amp; E</td>
</tr>
<tr>
<td>6&quot; Enriched &quot;K&quot; I &amp; E</td>
</tr>
<tr>
<td>6&quot; Enriched &quot;O&quot; I &amp; E</td>
</tr>
</tbody>
</table>

34,038

Bare uranium inventories generally were adequate during February with seven hundred ninety-seven (797) tons in total on hand at month end. About two hundred twenty (220) tons of this is revised "K" size metal which is inactive because of a temporary delay in that production program. The inventory of "O" size I & E metal is presently lower due to February production runs and further production of this type will be integrated with National Lead Company of Ohio deliveries.

Finished uranium inventories in combined 300 - 100 area storage were adequate during February but attained higher than normal levels at month end due to low reactor consumption. Forecasted reactor consumption in March is expected to restore an appropriate finished inventory balance.
B. Plant Problems and Incidents

1. General

Operating efficiency was 95.6 percent compared to a forecast of 93 percent. Cooperative efforts of both maintenance and operating personnel particularly in integrating production and maintenance schedules are responsible for this fine performance which is very near a maximum achievable level.

2. Revised "K" Size Fuel Elements

At mid-month the Irradiation Processing Department indicated that significant reactor operating problems involving corrosion and hydraulics may be encountered with the use of the revised "K" size fuel element. It was requested that the production program be delayed to provide time for a more thorough investigation. The National Lead Company of Ohio was contacted and requested to substitute regular dimension cores for both normal and enriched new "K" size cores. They were able to delay production of normal material but the enriched commitment for March had already been produced. Approximately 220 tons of revised "K" size I & E material will be temporarily inactive.

3. Component Quality

In order to gain the advantages for HAPO of alternate sources of supply of caps and cans, a new-vendor development program has been in operation for the past several years. Three aluminum fabricators, Hunter Douglas Aluminum Company of Riverside, California, Harvey Aluminum Corporation of Torrance, California, and Cliff Manufacturing Company of Wickliffe, Ohio have successfully passed the first stages of the program which consisted of extensive evaluation of both the rod stock to be used in fabrication and of samples of the components themselves. All three are now entering the reactor test stage which consists of pile charging 5,000-piece lots of fuel elements clad in their respective components. Good performance of these three lots in reactor will qualify the three companies as approved routine vendors. Harvey "O" size cans have been received and inspected and spires are currently being fabricated by the vendor. Cliff "O" size caps and cans are expected to be delivered within the next month, and the first Hunter Douglas "O" size components are expected in about two months.

Purchase orders for boss type I & E spires have been converted to regular spire orders for all deliveries through mid-April. Vendors are continuing to have difficulties in fabricating boss type I & E spires. One test sample of 1,000 pieces received in January was rejected due to thin walls on the boss. Another sample received in February showed the crazed metal condition that has been a major problem in producing these spires.

Correlation between the use of old sleeves and certain types of quality problems in fuel assemblies has led to establishment of a maximum life of 25 cycles for all steel sleeves. An unfavorable counter balancing result, improved quality of the finished fuel element, is an increased consumption of sleeves which in turn makes desirable the development of additional reliable vendors of this essential item. Further complicating this picture
3. **Component Quality** - continued

is the proof, found in process data, that sleeves which have been cold-sized to the correct internal diameter distort and become unusable much more rapidly than do those which were fabricated by a boring or machining process. Cold-sized sleeves are now no longer being procured but their exclusion has emphasized the need to develop new vendors of sleeves fabricated by an approved process. In addition to receiving sleeves from the present two approved vendors, HAPO has an order of sleeves from two other vendors seeking full approval. Their samples are being evaluated.

4. **Core Quality**

Use of fuel cores heat treated by the supplier in blank form in chloride salt instead of heat treated in rod form in carbonate salt was started in November 195. Production experience to date confirms expected gains in reduced porosity and greater dimensional stability.

Complete conversion by the supplier to this heat treating method has been delayed because of equipment difficulties. The present heat treating furnace has steel liners which fail frequently, and installation of an improved ceramic liner cannot be achieved before May. Since the supplier cannot assure continuity of supply of chloride heat treated cores while using the steel liners, permission has been granted to revert to carbonate heat treating until the ceramic liner has been installed.

The pickle reject rate for seams and striations on recovered cores has increased in recent months to as high as 20 percent in some groups of material. To determine the effect of core recovery process variables on this problem and to develop better controls, all first run recovered material is now being lotted prior to processing through the recovery operation. The stripper and treater information, plus statistical weight and pickle reject rates are then plotted for each lot. It is hoped that this will provide information which could be used to develop controls for Fuel Recovery. These controls should minimize the loss due to this operation.

5. **CG-713**

The horizontal welders are essentially complete and ready for full operation except for handling problems on the conveyors leading to and from the welders. These welders are fully automatic and should result in manpower savings as well as greater weld uniformity. They also will produce a weld with better mixing than the semi-automatic welders.

Pre-production runs totaling about 2,000 fuel elements have demonstrated that sound quality welds can be produced. Some initial control problems are expected from over-correction of the welding machines when adjustments are needed. Oxide in the weld has been the predominant source of trouble.

The welders are more precise in their movements and require more careful set-up techniques. The horizontal layout does not permit the variance in electrode length and gas flow that the operators are used to. To control these problems training programs for operations and Quality Control personnel have been initiated by Process Engineering.
6. Non-Destructive Testing

Initial operating experience with non-destructive bond testers in the 313 Building soon pointed out the need for limiting the maximum size of each unbonded area rather than limiting only the total unbonding per fuel element. Thus, Testing Methods developed a discriminator circuit to automatically reject voids greater than 1.0 cm. in circumferential length. As reactor fuel element requirements became more demanding it was felt desirable to impose a more critical test. This was accomplished in April of 1958 by reducing the reject void dimensional limit from 1 cm. to 0.75 cm. in circumferential length. In addition, a total count circuit was added when testing six-inch solid enriched fuel elements to also establish a total unbond limit per fuel element; it was later extended to all external testing.

During this time Testing Methods was developing an improved discriminator circuit which has since become known as the "long memory" test. It enabled the bond tester to remember and reject long narrow unbonds, and clusters of small unbonds, as well as those which were greater than 0.75 cm. in circumferential length.

This proved to be a more selective test limit and was applied to all enriched fuel elements beginning June 10, 1958. By November 4, 1958 this had been extended to all fuel elements. Throughout this period Quality Control developed methods for manufacturing finite unbond standard fuel elements for tester calibration, to keep pace with these limit changes.

However, even with these improvements, individual testers at times have exhibited unexplained response variations to brittle bonding, non-wet cans, and voids. It is in this field which Quality Control and Testing Methods personnel are now concentrating. Since bond testing was begun in the 313 Building, canning improvements have tended to reduce the original as-received can dimensions, as well as the AlSi braze layer and associated void depth. These changes may possibly explain some of the differences which have occurred. However, it is hoped that additional improvements can be made in the near future to eliminate the present variations in reject rates between bond testers. It appears these may be possible through modifying the electronic circuitry, providing a new set-up procedure, and changing the mounting technique.

8. Operating Plans

1. Fuel Material

A program for the disposition of the 65 tons of ingot material on hand has been initiated. Several pilot tubes will be charged next week. Based upon the experience gained, the rest of this material will be charged incrementally into one reactor and irradiated to an exposure of at least 200 MWD less than current goal. As the ingot cores are consumed our bare core requirements for the eight-inch "O" size I & E will be reduced proportionately, in order that we may, in effect, return the excess uranium to the feed stream.

2. External Cladding Thickness Control

In October a plan was initiated to remove all canning sleeves from service after 25 cycles. Previously they had been allowed to go as long as 100 cycles. Since the supply of sleeves was not adequate at that time to discard all types of
2. **External Cladding Thickness Control** - continued

sleeves at the designated time, this plan took until the end of the year to get fully implemented although its effect was felt almost immediately. The reduced sleeve life resulted in always canning the fuel elements in essentially distortion-free sleeves which in turn resulted in more even AlSi flow and reduced abrasion of the can with the core during assembly.

On November 3, 1958 a new canning cycle was started which provided for more assembly time and thus reduced the tendency of the operators to push the core into the can. This resulted in reduced rate of AlSi flow along the can and thus less erosion of the can.

During this entire period closer control has been maintained over the addition of 20 percent AlSi to the furnaces. At present these additions are only being made during breaks and have resulted in a more uniform silicon concentration in the furnaces. The result is more uniform erosion of the can during assembly. Recently a system of estimating can erosion by using an optical comparator after facing has been used with good results. This coupled with non-destructive tester information relayed to the lines at least every two hours has resulted in a general lowering of canning temperature and reduced erosion of the can.

3. **Internal Cladding Thickness Control**

The cycle change indicated above appeared to have even more effect on the internal thin wall reject rate than on the external. The big effect was probably due to the fact that the large majority of internal rejects are not actually thin but are wrinkled tube walls. These wrinkles cannot be distinguished from actual thin walls by the tester. The reduced tendency to push associated with the longer assembly time has resulted in significantly fewer wrinkles.

In January two additional automatic quench machines were placed in service, bringing the total to three. The plungers on these machines were designed to provide closely controlled and vertical pressure on the spire. This has improved the wrinkling problem since the old manual quench baskets have neither controlled nor vertical pressure. These pressure variations have caused cocking of the cap and wrinkling of the tube.

All of the changes which have been made to the process to effect these improvements have been carefully evaluated and found to result in no deleterious effects. In fact, some improvement in bond porosity and wetting have apparently resulted from the more uniform and slower assembly.

4. **Reactivity Testing**

The method of reactivity testing currently in use for canned fuel elements gives a degree of precision considerably higher than is necessary to obtain the desired information. A new method for canned metal testing is currently being investigated, and it shows promise of reducing the testing time to slightly more than a third of that presently required. This would result in an over-all savings of Test Reactor testing time of approximately 10 percent. The new test method utilizes the fact that the control rod can be set close enough to "hold" the reactor at nearly perfect equilibrium, thus reducing the correction necessary
4. Reactivity Testing - continued

For "drift" to a value sufficiently low that drift measurements need not be taken. To date, thirty tests have been run by both methods and compared statistically. The results show that at the 95 percent confidence level, 95 percent of the reactivity values obtained by this method will be within ±.080 in-hours of the value obtained by the present method. This is sufficiently accurate to meet present requirements.

5. Receiving Inspection of Cores

The incoming virgin uranium core lots have historically shown a degree of dimensional control in excess of acceptance quality levels. This, coupled with the knowledge of the vendor capability, has enabled adoption of a reduced sampling plan for all uranium fuel element receipts. This has resulted in an estimated 30 percent reduction in receiving inspection work load while assuring the same quality levels, and has enabled handling of the increased Pre-Irradiation Measurements work load without additional personnel.

6. Materials Warehouse

The new materials warehouse is complete and ready for occupancy. Inclement weather together with additional work by the contractor to caulk joints in the roof prevented the moving of essential materials into the building until the end of February. It is expected that all moving operations will be complete within the next two weeks.

7. Reduction of Overtime

One of the benefits expected as a result of the adoption of the new operating plan, that of utilizing extended production runs of each product model, was a smoother operation involving less overtime required for changing from one product model to another. An analysis of the overtime worked by the Finishing and the Manufacturing Maintenance Operations for the past six months shows a reduction of 95 percent and 96 percent, respectively, in the amount of overtime directly chargeable to changes in the product mix. Improvements in the reliability and flexibility of equipment together with better planning have made this accomplishment possible.

8. Scrap Aluminum

Arrangements have been made to sell damaged or obsolete X-8001 F aluminum components to Alcoa, as scrap aluminum for 20 cents per pound, FOB, Vancouver, Washington. Because of the nickel content, the material is undesirable for converting into Alsi, so the scrap of this alloy was a complete loss.

D. Employee Relations

1. Safety Performance

Members of the Operation were treated for 21 medical treatment injuries for a frequency of 4.11.
2. Radiation Control

<table>
<thead>
<tr>
<th></th>
<th>January</th>
<th>February</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greater than 300 mrad</td>
<td>No badges</td>
<td>2 badges</td>
</tr>
<tr>
<td>Combined Manufacturing Operation exposures</td>
<td>5,301 mrad</td>
<td>4,382 mrad</td>
</tr>
</tbody>
</table>

A problem has arisen from shipping pallets contaminated with high level specks of fission product being returned from the reactor areas. An extensive survey program is now under way to survey all shipping pallets in the building to decontaminate or remove from service those which are seriously contaminated. All pallets returned from the reactors are also being surveyed on arrival to try to determine the source of the difficulty. Radiation Monitoring personnel in Irradiation Processing Department are also cooperating in attempting to eliminate the problem.

3. Security Violations

No security violations were reported in February.

II. PERSONNEL MATTERS

A. Reports of Invention

Members of the Operation 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 February 1959.

B. Meetings

Members of the Operation attended 12 staff meetings, 15 safety and security meetings and 13 informational meetings.

C. Visits and Visitors

During the weeks of January 23 through February 6, R. H. Sather attended the National Plant Maintenance and Engineering Show and Conference in Cleveland, Ohio; visited with Harold McCue of Sunstrand Company, Rockford, Illinois and Mr. A. Gunderson of the George Gorton Company in Racine, Wisconsin to discuss the feasibility of machining fuel elements. Mr. Sather also visited the Bridgeport Brass Company in Adrian, Michigan and Mallinckrodt Weldon Springs Plant, Weldon Springs, Missouri for information on the extrusion press.

L. M. Mathis and D. G. Kern visited with J. Frankel, Harvey Aluminum Corporation, Torrance, California and R. Quadt of Hunter Douglas Aluminum Company in Riverside, California during the week of February 2 to discuss the manufacture of aluminum components for FPD.

On February 20, R. I. Beaver visited the Phelps Dodge Copper Products Corporation in New Brunswick, New Jersey to observe the plant layout and the operation of a 4,000 ton extrusion press. He visited with D. M. Day, Plant Manager and R. B. Gigure, Plant Engineer to discuss extrusion operating problems with them, and on February 23-25 Mr. Beaver attended an American Management Association Meeting in Chicago, Illinois.
C. Visits and Visitors - continued


D. Significant Reports Issued

1. Routine

<table>
<thead>
<tr>
<th>Number</th>
<th>Title</th>
<th>Author</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>HW-59094</td>
<td>Monthly Report Quality Control Operation, FPD</td>
<td>KV Stave</td>
<td>2-2-59</td>
</tr>
<tr>
<td></td>
<td>January 1959</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Non-Routine

<table>
<thead>
<tr>
<th>Number</th>
<th>Title</th>
<th>Author</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>HW-59101</td>
<td>A Report of Uranium Accountability in Manufacturing Processes for the Quarter Ending December 31, 1958.</td>
<td>WG Jolley</td>
<td>2-3-59</td>
</tr>
</tbody>
</table>

WM Mathis: RWM: rhs
# Engineering Operation

**February, 1959**

## Visitors

<table>
<thead>
<tr>
<th>Name</th>
<th>Company</th>
<th>Contact</th>
<th>Date</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>PR Morris</td>
<td>NLO, Cincinnati</td>
<td>RS Paul</td>
<td>2-16/17</td>
<td>Discuss nondestructive testing.</td>
</tr>
<tr>
<td>EC Wanner</td>
<td>Engineering Services G.E., Schenectady</td>
<td>HF Zuhr</td>
<td>2-19</td>
<td>Discuss technical education</td>
</tr>
</tbody>
</table>

## Trips

<table>
<thead>
<tr>
<th>Company Visited</th>
<th>Date</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>Savannah River Lab.</td>
<td>2-17/18</td>
<td>Attend FEDC meeting.</td>
</tr>
<tr>
<td>NLO, Fernald, Cincinnati, Ohio</td>
<td>2-16</td>
<td>Discuss fuel fabrication problems</td>
</tr>
<tr>
<td>Sundstrand Co., Rockford, Ill.</td>
<td>2-2</td>
<td>Observe factory machines and tooling techniques</td>
</tr>
<tr>
<td>Geo. Gorton Co., Racine, Wis.</td>
<td>2-3</td>
<td></td>
</tr>
<tr>
<td>Warner &amp; Swasey Co., Cleveland, Ohio</td>
<td>2-4</td>
<td></td>
</tr>
<tr>
<td>Jones &amp; Lamson Co., Springfield, Vt.</td>
<td>2-5</td>
<td></td>
</tr>
<tr>
<td>APED San Jose, Calif.</td>
<td>2-16</td>
<td>Attend technical conference on radiation</td>
</tr>
<tr>
<td>Vallecitos Lab., Pleasanton, Calif.</td>
<td>2-17</td>
<td></td>
</tr>
<tr>
<td>Oregon Metallurgical Corp., Albany, Ore.</td>
<td>2-26/27</td>
<td>Liaison on procurement of centrifugally cast uranium tubes</td>
</tr>
<tr>
<td>Bridgeport Brass Co.</td>
<td>2-27</td>
<td>Discuss coextrusion tests.</td>
</tr>
<tr>
<td>Adrian, Mich.</td>
<td></td>
<td>Discussions on purchase of extrusion press</td>
</tr>
<tr>
<td>Loewy Hydropress</td>
<td>2-16</td>
<td></td>
</tr>
<tr>
<td>New York, N.Y.</td>
<td>2-16/18</td>
<td></td>
</tr>
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</table>
PERSONNEL

<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>Operation</th>
<th>Nature of Change</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>LA Hendenstrom</td>
<td>Eng'g. Designer</td>
<td>4480</td>
<td>Transferred from CPD</td>
<td>2-2</td>
</tr>
<tr>
<td>DD Parker</td>
<td>Draftsman</td>
<td>4480</td>
<td>Transferred to HLO</td>
<td>2-2</td>
</tr>
<tr>
<td>JP Lennon</td>
<td>Tech. Grad.</td>
<td>4470</td>
<td>New hire</td>
<td>2-5</td>
</tr>
<tr>
<td>LG Faust</td>
<td>Tech. Grad.</td>
<td>4450</td>
<td>Rotation</td>
<td>2-2</td>
</tr>
</tbody>
</table>

INVENTIONS

All Engineering Operation personnel 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 February, 1959 except as listed below. Such persons further advise that for the period therein covered by this report, notebook records, if any, in the course of their work have been examined for possible inventions or discoveries.
Regular Production Rupture Experience

Five I & E fuel elements (3 normal and 2 enriched) failed in the reactors during February. A summary of these ruptures is as follows:

<table>
<thead>
<tr>
<th>Fuel Element</th>
<th>Exposure (MWD/T)</th>
<th>Rupture Classification</th>
<th>Jacket Alloy</th>
</tr>
</thead>
<tbody>
<tr>
<td>I &amp; E Normal KE</td>
<td>653</td>
<td>Internal</td>
<td>X-8001</td>
</tr>
<tr>
<td>KE</td>
<td>735</td>
<td>*</td>
<td>X-8001</td>
</tr>
<tr>
<td>KE</td>
<td>813</td>
<td>Internal</td>
<td>X-8001</td>
</tr>
<tr>
<td>I &amp; E Enriched H</td>
<td>893</td>
<td>Side Hot Spot</td>
<td>C-64</td>
</tr>
<tr>
<td>H</td>
<td>801</td>
<td>Internal</td>
<td>C-64</td>
</tr>
</tbody>
</table>

*Stuck in process tube.

No significant change was observed in rupture trends during this period. Internal failures continue to be the major I & E rupture category.

IPD Liaison

IPD has temporarily delayed the large scale charging of the revised "K" size I & E normal (KIIIN) and enriched (KIIIE) fuel elements pending further study to assure adequate steps are taken to avoid potential cavitation problems in the event of coolant pump failures.

The CY 1959 Category I production testing schedule for fuel element evaluation was issued in cooperation with IPD and HLO.

No additional stuck charges were experienced on "O" size I & E normal uranium fuel elements during this period. Ingot numbers have been obtained from the ends of cores showing maximum warp in the stuck charges sustained during January to facilitate an investigation of the uranium fabrication history. Recent data on four tubes of "O" size I & E normal uranium fuel elements, irradiated to an average exposure of 850 MWD/T in D Reactor, shows an average and maximum warp of 7 and 30 mils, respectively.

Further evidence of groove pitting was observed on X-8001 alloy clad I & E normal fuel elements discharged from D Reactor at goal exposure. This material was from production lot KL-018-D and the degree of surface pitting ranged from slight to severe. An investigation of component history indicated the cans were supplied by the vendor prior to the super (1/2") scalping of X-8001 alloy bloom stock to minimize nickel segregation.

Because of the higher rupture frequencies observed for I & E production lots
made up of internal penetration tester rejects and core transformation test rejects re-heat treated at HAPO, a decision has been reached with Manufacturing to reject this material beginning in March. Penetration tester rejects, which result from the inability of the testers to distinguish between slight spire wrinkles and/or braze porosity and can wall penetration as subsequently determined by statistical caustic stripping, will be chemically recovered for recanning at an estimated yield loss of 2-3 per cent. Core transformation test rejects, which involve 0.5 - 2.5 per cent of the cores received, will be re-turned to Fernald for reprocessing until the rupture mechanism is known and corrective changes are made in the re-heat treating process to assure irradiation performance will be comparable to other I & E production.

Uranium Technology

Findings to date indicate the increase in metal quality rejection rate for recovered cores may be the result of more severe recovery conditions at HAPO and/or the fact that a larger quantity of briquetted scrap is being used in the remelt operation at FMPC.

The rejection rates for porosity type defects continue to favor chloride over carbonate heat treating.

During the initial evaluation of the recent shipment of 65 tons of dingot cores, the following were the areas in question concerning the acceptability of this material for reactor usage.

1. Grain size and resultant bumping.
2. Crystallographic orientation and resultant stability.
3. Hydrogen content and resultant braze layer porosity.
4. Internal extrusion defects.

On review of the above findings, it was felt that the first two quality problems could be compensated for by irradiation to some low goal exposure. The second would possibly result in a high processing rejection rate but could be tolerated on the quantity involved. It was felt the fourth problem, extrusion defects, could be overcome by non-destructive testing and visual examination. However, on review of the capabilities of present test equipment and the reliability of visual inspection in detecting such defects, it was decided that the test equipment did not provide the necessary assurance and that the defects were not of such nature that detection visually could be assured. Therefore, the final decision was to return all dingot cores to FMPC for remelt. It is felt that the processing of this material with the possibility of ruptures resulting from such defects being inadvertently passed would place greater restrictions on the dingot utilization program than will exist by the rejection of this material.

Process Technology

Horizontal agitation in the duplex furnace was written into the Process Specifications as an alternate process. One line will be operated on a sustained
run to confirm the improved quality previously found in development studies.

A Sciacky spot welder has been ordered (due 4/13/59) and is to be equipped with semi-automatic welding fixtures fabricated on-site. The expected output of this welder will be about 250 fuel elements per shift or enough to satisfy IPD requirements for self-support and bumper elements until 1960.

Perfect wetting of the cap-spire wafer has been obtained on initial tests by using a vibrating cap wafer abrader to remove the bubble from under the wafer. This device can be put into use almost immediately if large scale testing appears feasible, and could be used until a simpler method of cap wafer non-wetting can be developed.

Temperature profile measurements of line 1 and 5 canning furnaces have been completed and it was recommended on the basis of the study that the line 4 canning furnace be replaced and the furnace overhauled.

A few cases of spire-cracking have been found in X-8001 and C-64 alloy capspires. The spires were cracked just below the cap-wafer-spire radius and AlSi had leaked into the spire. At this location it is now impossible to detect these cracks with the penetration tester and some of the internal reactor failures could be due to spire-cracks. The mechanism of spire-cracking is presently unknown but tests are being developed to determine the cause. Methods for non-destructive testing for spire-cracks are also being investigated.

Sectioning of OIIN spire tips showed that none of the solutions after degreasing had contacted the area where the male end is found and welded on forty to sixty per cent of the cap-spires. This lack of cleaning may be one of the causes of male end weld rejects.

Basic design of a handling system to be used with the new 100 KVA spot welder to weld self-supports on fuel elements is essentially complete. Detail design is in progress. The feasibility of electrode plating is being studied to eliminate the necessity of frequent brushing.

The three remaining dip quench machines have been received and are being installed. The three previously installed have been fitted with an inlet pipe designed to reduce water consumption and increase agitation. The machine on #4 canning line has been modified to provide two-step quenching.

The installation of stainless steel rails on #2 sleeve machine this month completes the program for replacement of the brass rails on all the Udylite machines. It also completes the program for all brass elimination from both the cap and can and sleeve cleaning machines.

**Pilot Plant Activities**

About 5300 uranium cores were canned in the Pilot Plant for process development purposes. The major items of process development were:
1. Tests to reduce the aluminum non-wet problem:
   a. Aluminux etching of cans and cap-spires.
   b. Using a vibrating cap wafer abrader to remove the bubble under the wafer and to aid wafer wetting.
   c. Determine effect of immersion plates of Zn, Ni, Sn, and Fe on cap-spires and cap wetting.

2. Ultrasonic intensity measurements were made at various positions in the cleaning tank with and without a baffle to determine if the ultrasonic intensity can be increased by baffling.

3. Statistical tests to determine the optimum can-sleeve preheat and submerge times, silicon concentration, and temperature to reduce bottom freeze-out, non-wetting, braze porosity, and AlSi penetrations.

4. Wetting tests on empty cans to:
   a. Determine if vibrational methods can improve can wall wetting.
   b. Check effect of statistical canning condition tests on can wetting.
   c. Check positions on single jack canning basket for can wetting.

5. Improved can preheating tests to reduce the bottom freeze-out problem:
   a. Determine effect of vibrating the supplemental preheat basket when using a 45 second cycle with an 85 second preheat and 35 second submerge.
   b. Use of contoured base cans which have about 40% less metal in the can base.

6. Preheat measurements of:
   a. I & E cores when using a horizontal duplex basket.
   b. AlSi inside can during submerge period when using various can-sleeve preheat and submerge times.

7. Effect of canning on warp of carborute and chloride heat treated cores before and after being reheat treated at HAPC.

8. Determine if an HCl or HNO₃ - H₂SO₄ etch will aid in core surface inspection and improve bonding.

9. Nickel plated cores were canned to determine effect on bonding.

10. Normal canning of fuel elements:
    a. Cores with known surface defects were canned for undercutting tests.
    b. Control pieces for PT-IP-45A.
    c. Can 7.5" long KIIN dingot cores to check for core warping.
    d. Provide KIIN fuel elements for weld development studies.
MATERIALS ENGINEERING

Coextrusion of Uranium and Zircaloy-2

Off-Site Extrusions

Extrusion Run #1

Description

Uranium, zircaloy-2 and copper components for 22 billets were prepared for extrusion at Nuclear Metals, Inc., starting March 3, 1959. Ten billets were assembled, evacuated, and sealed by Materials Engineering Operation personnel at HAPO. Twelve billets will be assembled by Materials Engineering Operation personnel at Nuclear Metals, Inc.

Pertinent information about these billets and the extrusion product to be produced is tabulated as follows:

<table>
<thead>
<tr>
<th>Extrusion Product</th>
<th>Uranium Core</th>
<th>Zircaloy-2 Clad</th>
<th>Billet Length</th>
<th>Total Number of Billets</th>
<th>Number Assembled at HAPO</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.593&quot; Dia. of Clad Rod</td>
<td>Ingot-3 beta heat treat</td>
<td>Hot Worked</td>
<td>8&quot;</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Dingot-3 beta heat treat</td>
<td>Hot Worked</td>
<td>8&quot;</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>0.790&quot; Dia. of Clad Rod</td>
<td>Ingot-3 beta heat treat</td>
<td>Hot Worked</td>
<td>10&quot;</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Ingot-3 beta heat treat</td>
<td>Spun cast cold</td>
<td>10&quot;</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Dingot-3 beta heat treat</td>
<td>Hot Worked</td>
<td>10&quot;</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Dingot-as extruded</td>
<td>Hot Worked</td>
<td>10&quot;</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>0.800&quot; Dia. of Clad Rod</td>
<td>Ingot-3 beta heat treat</td>
<td>Hot Worked</td>
<td>10&quot;</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Ingot-3 beta heat treat</td>
<td>Spun cast cold</td>
<td>10&quot;</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Dingot-3 beta heat treat</td>
<td>Hot Worked</td>
<td>10&quot;</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Dingot-as extruded</td>
<td>Hot Worked</td>
<td>10&quot;</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Billet Preparation Experience

Cleaning - Copper, zircaloy-2 and uranium components were cleaned and etched for off-site extrusion billet assemblies. The processes
and equipment used appeared to be very satisfactory. Copper components were etched in the 306 HLO plating facility. A one-half minute etch period proved satisfactory. The uranium cores were cleaned and pickled in the regular FPD pilot facility in 306. Zircaloy components were cleaned in the component cleaning line 306 pilot plant. The process used for zircaloy was a trichlor degrease followed by Duponol washing and water rinses, and a final drying by immersion in the vapor phase of the degreaser. This was actually a final cleaning step as well. Drying was complete within seconds after removal from the vapor.

Assembly - No problems were encountered in component dimensions or other conditions which interfered with assembly. As larger billets and tubular types are assembled, handling equipment and assembly jigs will be required. These are presently being fabricated.

Welding - The temporary setup for assembling copper cans, caps and closures is complete. The first cans and caps were assembled on 2-17-59. All solid billet assemblies have been completed on schedule. Development of the copper canning closure techniques was uneventful.

Billet Assembly and Leak Detection

Some difficulty was experienced in sealing the evacuated billet. Initially, sealing was attempted by flattening the evacuation tube for a length of about 1½" with a hammer while still connected to the vacuum pump. This did not prove reliable as leaks were indicated. This system was supplemented by running a weld bead across the flattened portion of the tube. No trouble was encountered after this process was used.

A helium background or concentration of helium in the atmosphere was utilized to assure completeness of the vacuum produced. The background value is measured at the beginning of the evacuation and as pumping proceeds this value decreases to zero. From this it may be concluded that the desired vacuum is obtained.

Extrusion Run #

Uranium, zircaloy-2, copper component and press dies and mandrel are presently being fabricated in Tech. Shops for the second off-site extrusion run. The work is proceeding satisfactorily.

Cold Extrusion

A series of ten zircaloy-2 uranium billets were cold extruded at Hunter Douglas Division of Bridgeport Brass Company to hollow clad bars and returned here to HAPO for evaluation. Of these ten, six were welded mechanical assemblies and four were fabricated by vacuum casting a uranium core into preformed zircaloy-2 components.
As the cold extrusion process does not readily promote bonding the cladding to the core, a technique for fabricating extrusion billet initially bonded would be extremely useful. To exploit this possibility, HLO was requested to prepare several billets using vacuum casting techniques to produce a bonded assembly. Four billets were fabricated in this way and sealed by an electron beam welding process.

The other six billets were simple welded mechanical assemblies.

Non-uniform cladding, both inside and outside, is a characteristic of the extruded mechanical assemblies. This situation can be attributed to two factors, (1) too heavy cladding, and (2) a higher mechanical strength clad than core.

A small area where the uranium core meets the rear zircaloy-2 plug appears to be bonded; an investigation to prove or disprove this observation is under way. No bonding was expected.

Also, an experiment to see if fuel elements fabricated in this way can be bonded after extrusion is contemplated.

Uranium for Coextrusion

Procurement

A purchase order has been placed with the Oregon Metallurgical Corporation for centrifugally-cast uranium tubes. These tubes can be made with a high yield of metal from melting stock to finished billets ready for coextrusion. It is hoped that chill-casting by use of steel molds will affect a fine grain size that needs no further refinement by beta heat treating.

A heat poured at Oregon Metallurgical Corporation on February 27, 1959, froze in a one-inch diameter gate feeding the mold for a casting at 3.585" O.D. by 1.490" I.D. by 42" long.

Metallography

Metallographic examination of the grain size of the uranium cores in the coextrusion billets (March coextrusion, NMI) has been completed. Metal in a triple beta quenched condition is uniformly fine grained. Metal in a gamma-extruded plus alpha-extruded condition is fine grained (micro-scale) but there is a pattern that indicates slight referential clustering of grains (macro-scale).

The object of testing alpha-wrought structures is to determine if the beta heat treating for grain refinement can either be eliminated or the number of cycles of treatment be reduced.

Heat Treating

Arrangements have been made to visit the Magnetcrmic Corporation, Youngstown, Ohio on Friday March 13, 1959. We are seeking test facilities at that plant for induction heat treating tests.
Zircaloy-2 Cladding Coextrusion

All machining of zircaloy-2 tubing for cladding the outside of the small rod and small tube extrusions has been completed. Material for cladding the inside of the small tube extrusion should arrive shortly for machining in ample time to meet small tube extrusion schedules.

Bids were solicited for large diameter zircaloy-2 shells suitable for cladding the outside of KER prototype outer tubes but supply conditions and/or price caused rejection of all bids. The cladding shells for this extrusion are to be supplied on a development contract we hold on Bridgeport Brass Company's Adrian plant. This contract was negotiated through AEC-OR00 to expedite NPR development processes.

Aluminum Components

In order to improve the quality of our aluminum components, particularly the newer dispersion type alloys such as X-8001, a program is being pursued to produce and evaluate components fabricated from direct cast individual extrusion fuel elements. An order for 10,000 "O" size component sets was made and scheduled for delivery March 1, 1959. Currently, we have been forced to revise our expected receiving date to March 13, 1959. These components are to be used for a medium scale reactor test to detect any gross differences between these and normally produced material.

Equipment

Electron Beam Welding - All components for the assembly of this unit are on site, with the exception of the cathodes and instrument mounting panels. Installation has started with operation planned for the last part of May. The wiring diagrams are in progress.

It is planned to use Wyman type cathodes for startup with close liaison on a contract issued by Bush to GEL on a simple plug-in prefocused mass-produced cathode.

Ziess Electron Beam Welding - Eighteen specimen fuel elements have been prepared with one-third each being a cap over the end, plug and plug with wafer type to be welded at Bettis (WAPD). It is planned to use those successfully welded for metallurgical and corrosion studies.

KER Test Loop

A request for the fabrication of 25 thick wall (1/8") aluminum clad "doe" fuel elements was received from Reactor Fuels Operation-IPD. Work on these is now in progress.
TESTING METHODS

Process Fuel Element Testing

Internal Penetration Test

Analyses of fuel element failure data indicate a significantly higher than average failure rate among Internal Penetration test "rejects" which were released for use on the basis of statistical destructive examinations. Effective 3/2/59, the Internal Penetration Test rejects will be true rejects.

Some evidence has been found of internal spires breaking or cracking just below the cap. One example was used to demonstrate that the Internal Penetration Test can detect this condition if the defect is manually positioned beneath the probe. However, with the automatic testers, the tester must be shut off just before reaching that location to avoid a false reject signal at the end of the element. Attempts will be made to revise the control system to permit testing for cracked spires.

External Bond Test

The process testers have been found to have insufficient sensitivity to reproducibly detect unbonds which occur under certain cladding thicknesses. Some circuit and alignment changes for improving this situation have been developed and are being applied to the process testers as soon as satisfactorily demonstrated.

Internal Bond Test

Machined phenolic inserts have been used in the internal probes to position the quartz crystals. A plastic molding technique for making these small parts has been examined as a possible way to reduce probe costs and provide more uniformity. The plastic molding has been successful for both purposes. In addition there has been an unexpected dividend in that a larger signal return is obtained with the plastic inserts. This makes the tester more sensitive to brittle bonds.

Transformation Test

Eight more cores were fabricated by HLO for possible use as partially transformed standards. Two of these appear to have defect areas close to the desired small size. Identical ones will have to be fabricated for confirmation by destructive tests. Since there are some strong differences of opinion among metallurgists on whether it is possible to make a piece of uranium which is "partially" transformed, these cores were also examined by sonic resonance and sectioned for x-ray diffraction tests. The x-ray results on the one piece examined showed that the large grains immediately surrounding the small grained alpha region retained an alpha
orientation texture. However, the large grained metal farther away definitely exhibits the beta heat treated orientation. The sonic resonant frequencies measured with SORT fell in between those for alpha rolled and for beta heat treated metal.

NPR and Category II Development

Optimum results with the eddy current zircaloy cladding thickness/integrity tests have been obtained with a frequency of 360-400 Kc for defect detection and 20 Kc for thickness measurement. A two frequency prototype tester is under construction. A prototype internal probe for 1.38" internal diameter tubular elements has been built and operated.

Twenty-four zircaloy billets were tested for internal flaws with an ultrasonic method. One was found to have a suspect region.

Six experimental fuel elements were tested, including two of the tubular type.

New Methods Development

Cap-Core Bondtest

Dye penetrants were used in an attempt to better correlate ultrasonic unbond indications with visual indications after cap breaking. Inconsistent results were obtained with the dye penetrants. These and other tests showed that a test frequency lower than 20 Mc may be less subject to interference from the surface condition of the weld bead. Lower frequency tests will be made next month.

Ultrasonic Attenuation Test

Testing of large quantities of uranium cores to determine grain size distributions has been delayed due to mechanical difficulties and instrument drifts. Most of the troubles from air bubbles in the testing water have been eliminated by placing baffles in the inlet to the automatic test tank. An overall instrument stability of 5% has been achieved for periods up to one hour. Longer term drifts and temperature effects are being studied.

Ultrasonic Surface Test

Experiments were made to determine the stability and reproducibility of the transistorized prototype. The need for some minor circuit changes was indicated. It is believed that these plus a better choice of pulse repetition rate and fuel core rotation speed will give a reproducibility in the range of 1-3%.

Work was started to determine if a variation of this test can be used to detect uranium surface defects in canned fuel elements. This would have application in the program for slug recovery by can melting.
Weld Bead Test

Encouraging results were obtained from a preliminary study of ultrasonic detection of weld bead pinholes. It was decided to continue this program with increased emphasis and with the objective of developing a prototype tester for pilot plant or production use.

Bondtesting Spot Welded Projection Ribs

Unsuccessful results were obtained with all of a number of ultrasonic methods which were tried to obtain a measure of the bonded area. Further ideas will be explored, but it appears that this may be a difficult problem if the welding process demands a 100% nondestructive test.

Sonic Orientation Resonance Test

The observed differences in resonant frequencies among uranium cores with the same and different beta heat treatments may be largely explained by the variations in density due to different impurity concentrations. However, the SORT differences between alpha rolled and beta heat treated metal are large compared to these density effects. The frequency changes observed for some cores with internal seams were also larger than the density effect. Further studies are in progress to determine the effect of the density variable and also that of internal stresses on the utility of SORT.

Ultrasonic Velocity Test

Discussions were held with Mr. P. R. Morris of the National Lead Co. regarding his work on this method of discriminating alpha rolled and beta heat treated uranium. Recommendations have been made to the MPC that a larger scale evaluation of the velocity test be made at Fernald to parallel the HAPO programs on SORT and ultrasonic attenuation.

Hanford Test Reactor

Metal testing continued routinely. Special tests included: graphite tests for HLO, irradiations of the KAPL loop mockup for IPD, and preliminary measurements on an IPD experiment to determine the temperature coefficient of reactivity of uranium oxide.

A shorter method, which was proposed by R. Budd, for routinely testing canned metal is being investigated. This method uses 50% less time and appears workable if the accuracy is satisfactory to all concerned.

Needed improvements to the reactor control console have been determined and cost estimates prepared for budgeting purposes. Detailed design will start in about a month.
Customer Work

105-C Basin Bondtester

Revisions were made to make this tester more like the 313 building testers. This has resulted in improved stability, reliability, and defect size resolution.

Plutonium Testing

Testing of plutonium tensile specimens for macroscopic voids and inclusions by ultrasonics was briefly investigated with simulated test specimens. Promising results were obtained and the HLO Plutonium Metallurgy Operation is proceeding with the fabrication of mechanical tester components for installation in glove boxes.

Graphite Testing

At the request of R. W. Benoliel, IPD, ultrasonic tests were made on two graphite bars, one of which contained a crack visible from the end. It is probable that flaws of this type can be reliably detected. However, the test would have to be performed at a stage in the graphite manufacturing process where there would be no objection to using a coupling medium between the graphite and transducer such as oil or water with detergent.

Resin Level Detector

A new transducer was supplied which permits operating with a 100 foot cable to the instrument. A request has been received from CPD to consult on the design and fabrication of a model for 200 area installation.

Compacting Uranium Oxide Powders

Experiments were performed to determine the effect of high intensity ultrasound on compacting uranium oxide powders of different particle sizes. A very promising density increase of about 5% was obtained with a short irradiation by 20 Kc high intensity ultrasound. The HLO Ceramic Fuels Operation has requested a continuation and expansion of these studies.

Washington Designated Nondestructive Testing Program

Broadband Electromagnetic Testing Studies

The draft of the report on the first phase analytical studies was completed. This will be issued as a formal report and will also be submitted to a technical journal for publication.

The second phase of this study was started. This is a combined analytical and experimental approach to the synthesis problem, that is to determine the
extent to which specific variations in the network simulating an
electromagnetic test can be determined from observed changes in the
input impedance of the network. Equipment is being assembled for the
display of the output signals of a swept frequency type test, an impulse
type test, and as step function type test. The swept frequency equipment
is nearly ready for test, but as yet no significant results have been
obtained.

Ultrasonic Lamb Wave Studies

Equations have been derived which agree with experimental observation in
predicting the particle displacement caused by Lamb waves traveling along a
plate. These equations thus explain why some modes attenuate at much faster
rates than others.

Experiments were made which observed the effect of various types of loading
on both "$u$" and "$v$" type vibrations. It is found that these vibrations
behave differently under some conditions. Experiments with phenolic blocks
stuck to aluminum plates with resin "glues" indicate the "$v$" vibrations do
give some measure of the force required to break the joint.

The effects of flaws in plates have been investigated. It was found that a
hole drilled into a plate grossly attenuated Lamb waves flowing through the
plate in the vicinity of the hole. Further tests are planned to determine
the minimum size hole that can be detected for a given plate thickness.

A good butt-weld joining two aluminum welds has been tested and compared
with a similar weld that contained a known crack. The presence of the crack
was very evident, but more so with "$u$" vibrations as compared to "$v$".
These tests will be continued on welded pipe samples that are now being
prepared.
DESIGN & PROJECTS

CG-759 - Additional Steam Generating Facility - 300 Area

Installation of the boiler is essentially complete and the boiler is on the line. Testing and debugging is under way. Painting and insulation work are the major items remaining. Major installation of the condensate return line is also complete with housing of the 313 tank and insulation remaining.

The main steam header from the #6 boiler is being extended to the 303 steam loop. This will improve the steam distribution to the 313 and 306 Buildings, and will provide adequate capacity for proposed installations in the 303 Area.

An underrun of approximately $50,000 is anticipated on this project.

CAF-774 - 300 Area Sanitary Water System Modification

Work by the fixed price contractor is complete except for repair of the 225,000 gallon reservoir. Proposals for repair of the tank are still under consideration by the AEC.

Excavation of the concrete drain line from the tank revealed leaks at several points. The line was removed and reinstalled with exceptional care and still leaked at several points. The leaks which remained after the second installation were stopped by the application of concrete. The drain line leaked near the tank, and it is possible this leakage caused the initial undermining of the tank. This newly discovered possible cause of failure brings the total to four: (1) failure of the sump seal, (2) failure of the copper seal at other points, (3) settlement not caused by tank leakage, and (4) drain leakage. Any or all of these could have caused the failure, and it does not seem possible to determine which it might have been.

The HOO has requested an extension of two months on the project completion date.

CAF-792 - Warehouse Space - Manufacturing

This project is complete with one exception. The Physical Completion Notice was issued on February 14, and most of the material from 3722-A has been transferred to the new building. The exception is the moving of sprinkler pipes which partially block the north doorways. The sprinkler contractor will be in the area during the week of March 15 and will move the pipes at that time.

CG-810 - 306 Pilot Plant Expansion

The purchase order for a Loewy 2,750 ton press was issued on February 12. Shipment is scheduled for October 19, 1959. Shipment will require approximately four weeks, and installation will require from 6-8 weeks.

The project proposal is being revised to extend the completion date to March 15, 1960 and eliminate the nickel plating facility and electron beam welder from the scope.
Purchase requisitions, or purchase orders, have been placed for all major equipment except the recovery facility, etch facility and billet and die furnaces.

The leak detector and heliarc welder have been installed and are in service.

**CAF-820 - Additional Storage Space**

Design is 60% complete. The building will be located 30 feet from the north side of the 306 Building.

**DRAFTING & FILES**

**Major Jobs in Drafting**

- **306 Building:**
  - Electron Beam Welder
  - NPR External Tester Coil and Crystal Assembly
  - NPR Internal Probe

- **313 Building:**
  - Fully Automatic Welder Revisions
  - Misc. Tooling and Gaging Fixtures
  - Automatic I & E Stamper
  - Sleeve Machine - Electrical As-Built

- **384 Building:**
  - Compressor Wiring Diagram - As-Built

- **3709 Building**
  - Miscellaneous As-Builts

- **Miscellaneous:**
  - Palm Olive Project Study
  - As-Built Maps, Steam, Water, Sewers
  - Miscellaneous Budget Studies
  - Coextrusion Billet

**Drawings Produced:**

- New: 76
- Revised: 38
- Large Charts: 2
- Small Charts: 27
- Miscellaneous: 38

**ADVANCED ENGINEERING**

**Nickel Plating**

The in-reactor production test for evaluation of reactor-effluent contamination associated with nickel-plated fuel elements, was charged in 105-C on February 18.
The test includes two tubes each of chemical plated, electroplated, and unplated (control) fuel elements. Accumulation of reliable data may require about six weeks, depending of course on the amount of effluent contamination experienced, and the observed effect of time.

Concurrently, ex-reactor flow-tube tests are being carried out to further explore aluminum corrosion at the site of defects in the nickel plate. These tests include exposure to 120°C and 60°C once-through reactor cooling water, and 300°C recirculating deionized water. Visual examination of fuel elements exposed to 60°C and 120°C reactor coolant for two weeks indicated no accelerated attack at the site of defects. These tests are continuing, and a fourth flow-tube test employing 160°C once-through reactor cooling water will be started shortly.

Destructive testing of several cans plated with nickel by chemical deposition confirmed an earlier indication that a pore-free plating can be produced in the range of 0.1 to 0.2 mils thick. The tests included exposure to sodium chloride with "Aluminon Reagent" as an aluminum-ion color indicator, and immersion in 90°C caustic solution. Whereas the external surface of cans plated with 0.1 to 0.3 mil thick nickel was porous, the internal surface was virtually or completely pore-free. The pores on the external surface did not appear to be particularly associated with rough or marred areas; hence it is believed that minute surface inclusions plus some minor post-plating damage may account for the gross difference in porosity. It is planned to further test this assumption by plating some deeply-etched cans.

Preliminary tests indicate that AlSi wets and adheres to chemical plated nickel at immersion times of one minute at a temperature of 590°C. Under these conditions an integral layer of nickel (0.3 mils thick) is retained. Hence it may be feasible to plate both the internal and external surface of the aluminum components, thus minimizing the effect of pores in any one layer, and in addition, minimizing or eliminating AlSi penetration of the aluminum, and wash-out of the can wall. Further exploratory tests are planned.

JW Talbott
Manager - Engineering

JW Talbott: mbs
FINANCIAL OPERATION

FEBRUARY, 1959

AUDITS AND PROCEDURES

Auditing - During the month a uniform plan for handling material passes was developed. The plan has been accepted by representatives of both Security and Patrol, and by the Commission. Effective date of implementation is dependent upon procurement of necessary new forms.

At the request of Insurance Plan Accounting in Schenectady, a verification was made of selected health benefit payment checks received from the Insurance Company during 1958. All payments test checked were determined to have been received as listed and forwarded to the applicable payee.

A complete revision of the AEC Manual Chapter, Internal Audit Program, was reviewed and at the request of HOO-AEC Audit Branch a longer range and more detailed FPD audit schedule was developed in accordance with the revised chapter.

Office Procedures - Work continued on a number of Integrated Procedures Council projects. As requested by various employees in the Department, notices were sent to 16 offices, in two other departments as well as FPD, to discontinue routine distribution of 85 copies of 42 different reports or routed material. A report was issued on the findings and recommendations of the Council concerning product identification and production paperwork systems. A summary of the status of all Council projects was prepared for the General Manager.

Two meetings were held during the month with HAPO Office Procedures Specialists. Considerable information on procedures progress within each department was exchanged and agreements were reached on coordination of projects of mutual interest.

In addition to individual counselling on specific work simplification projects, two formal presentations on Office Procedures Simplification were made to members of the present FPD work simplification course.

Other procedures work included preliminary steps in providing for three additional services to be obtainable from the EDP personnel source file; evaluation of formal office practices suggestions; assistance in design of a suggestion plan keysort record form; and coordination of responses on the effect of several new AEC administrative requirements within the Department.

GENERAL ACCOUNTING OPERATION

During February a spot inventory was conducted of property assigned to the Instrument and Electrical Maintenance Operation. No discrepancies were noted.

Preliminary work for the physical inventory of installed plant is nearing completion. The inventory will start as scheduled on March 14, 1959.
GENERAL ACCOUNTING OPERATION (continued)

The Budget for FY 1961 and Revised Budget for FY 1960 Equipment Not Included In Construction Projects was completed and forwarded to Contract Accounting on schedule.

During February a total of 83 days were spent in travel status. Travel costs reported aggregated $6,244.

The Department Vacation Plan Policy was revised to promote and insure orderly planning and scheduling of deferred vacations.

A complete analysis of all results of the integrated ledger system study is being embodied in a report to Management. The report will in essence present a picture of what has been accomplished to date and all that can be accomplished if recommendations are accepted.

MEASUREMENTS

Work in the area of measuring individual productivity is continuing with emphasis on contacts outside the Department. Contacts have been made with Measurement Services, Engineering Services, and General Purpose Control Department. Progress to date indicates that the value of an objective measure of a simple output/input ratio is highly questionable. It appears that subjective appraisal based on position guide accountabilities, goals, and accomplishments will provide a more useful tool for measuring individual productivity. This, however, is the subject of further investigation.

The Relations and Utilities Operation have recently adopted the FPD Program and Goal format for their use. CPD adopted the format during the 3rd quarter of 1958.

PERSONNEL ACCOUNTING OPERATION

Word was received from the State that individual employee account cards for State U. C. Tax mailed January 26, 1959, were not received. Efforts made to trace the cards through plant mail and the U. S. mail were unsuccessful. Duplicate cards were prepared and forwarded March 3, 1959.

Employee contributions to the Pension Plan for 1958 were reconciled and a final annual report made to Employee Trusts Accounting. There were no reconciling items carried forward to 1959.

Considerable time was devoted to review and storage of payroll and benefit plan records. Records audited were sent to permanent storage.

At the request of Legal and Union Relations, time cards for weeks including Thanksgiving Day 1957 and 1958 and New Years 1958 were reviewed to determine holiday payment practice for employees absent a partial day preceding or following the holiday.
PERSONNEL ACCOUNTING OPERATION (continued)

Work in connection with the consolidation of files in Personnel Accounting, Personnel Practices, and Salary and Wage Administration is being deferred pending realignment of work within the Financial and Employee Relations Operations at HAPO.

PRODUCT COST OPERATION

Meetings were held with area foremen to explain and update present work order procedures. Procedure manuals and code books were updated and will be issued on March 16, 1959. Cross orders have been eliminated and a referral order system installed to simplify procedures and eliminate internal problems. The work order form is being redesigned to include check blocks for referral orders, fixed price, or accumulated notices. In regard to code changes, Area Maintenance Level 5 cost codes were eliminated as future emphasis will be on foreman code reports rather than organizational suffixes.

A new coding method was installed in Manufacturing Maintenance to allow grouping of foremen purchases on the Stores report. Previously, purchases were intermingled within the Level 4 primary code.

A recast of the FY 1959 Midyear Budget Review reflecting the recent change to responsibility reporting was completed. Operating statements for the month of January, 1959, reflect the recast budget. No changes were made to the Department's original budget for production cost or to research and development costs.

Personnel forecasts for FY 1961 and revision for FY 1960 were received from the Level 3 components on or before the scheduled due date. The approved estimate, together with justifications, was submitted to Contract Accounting on February 13.

A report on estimates of "Charges to and From Other Departments" is due to Contract Accounting on March 13. No problems are anticipated in reconciling charges with other departments or in meeting the due date. All other cost budget schedules are due on April 1, 1959.

Considerable time was devoted to calculating process material costs to be incorporated in the Budget for FY 1961 and Revision of Budget for FY 1960. Material requirements were determined and unit prices applied. Current work includes the determination of material cost by product and the completion of required inventory budget reports.

The Commission requested reasons for the Department's desire to transfer zirconium from the Special Reactor Materials account to the Process Material Inventory account. Reasons were compiled and presented as requested.
PRODUCT COST OPERATION (continued)

A request for zirconium requirements for FY 1960, 1961, and 1962 was received from the Commission in order that they can forecast requirements of the AEC zirconium inventory at Pittsburgh. Material estimates are being computed by the Engineering Operation.

Manager - Finance

WS Roe: mh
MAINTENANCE AND POWER OPERATION

FEBRUARY 1959

GENERAL

There was one cost reduction completed, representing an annual savings of $307. Total savings for the year were $9,517 or 13% of budget.

AREA MAINTENANCE

Duplicating

<table>
<thead>
<tr>
<th>Process</th>
<th>No. of Impressions</th>
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</thead>
<tbody>
<tr>
<td>Multilith</td>
<td>503,336</td>
</tr>
<tr>
<td>Verifax</td>
<td>4,171</td>
</tr>
<tr>
<td>Ozalid</td>
<td>13,226</td>
</tr>
<tr>
<td>Total</td>
<td>520,733</td>
</tr>
</tbody>
</table>

There were 11 Formal Reports issued with a total of 5,504 copies and 161,994 pages.

General Maintenance

The painting of structural steel in the 313 Building, in those areas having a corrosive atmosphere, was completed. The structural members were painted with Amercoat, after suitable cleaning. This work was performed without interference to production.

A high pressure and temperature loop was fabricated for use in the 314 Building. This loop will be used to test PRTR jumpers. Fabrication included approximately 100 welds, which were X-ray inspected. No faulty welds were found.

An exhaust system and filter unit was installed in the 321-A Building. The system exhaust Zirconium dust from a cutoff saw. This system passed fire prevention inspection.

Three large caustic storage tanks were installed on the roof of the 321 Building. These tanks permit the direct purchase of caustic rather than obtaining the material from the 200 Areas in 55 gallon drums.

A Millwright and Pipefitter were assigned to each shift on the XYZ schedule in support of PRTR development work in the 314 Building.

INSTRUMENT & ELECTRICAL MAINTENANCE

The Portable Shop repaired a total of 984 radiation detection instruments. Average time per instrument was 0.96 manhours.
Modifications to the overhead crane in the 314 Building were completed. Preliminary work was done without shutting down the crane. The crane was out of service for only one week; total conversion period was approximately two weeks.

All instrumentation for the Burst Test Facilities has been moved to the new location on the west end of the 314 Building.

Two completely automatic counting systems were assembled for the Chemical Research Operation, 325 Building. The system consists of the linear amplifier, pulse height analyzer, decade scaler, and a digital recorder.

Modifications and revisions to the 300 ton press installed in the 325 Building Annex were completed. Additional work is still required to rewire the control panel.

The G. E. X-ray machine in the 327 Building was completely overhauled. The wiring for the remote panel was completed. This panel permits the various cells to be tied in to the machine to control processes in the various cells.

The 256 Channel Analyzer in the 329 Building Counting Room was overhauled. Tube replacement ran about 35 per cent. Downtime experienced on this instrument has been very good, being less than 6 per cent despite continual usage.

The transistorized pulse amplifier was built for the Radiological Physics Group. This unit utilized only two transistors; however, it indicates a trend to the increased use of these components.

A low background four channel anti-coincidence counter was assembled for the 329 Building Counting Room. This unit can be used to count very low energy samples. The sample and detector head are enclosed in heavy shielding and surrounded by a ring of cosmic ray tubes. The cosmic rays, as background, are not recorded as counts by the sample detector after they pass through the ring of tubes.

The positive ion accelerator in the 3745-B Building was given extensive attention during the month. In the process of making modifications to this machine, the radiation incident discussed below occurred. (See Radiation Experience).

An instrument man was assigned to each shift of the XYZ schedule in support of work in the 314 Building.

POWER

There were no efficiency figures available for the month due to the operation of No. 6 Boiler periodically. Steam generated by this boiler was utilized in the Area's distribution system for a portion of the time as well as being discharged to the atmosphere during certain phases of the shakedown operation.
POWER (CONTINUED)

Statistics

<table>
<thead>
<tr>
<th>Statistics</th>
<th>February</th>
<th>January</th>
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</thead>
<tbody>
<tr>
<td>Average steam generated (M lbs/hr)</td>
<td>66.8</td>
<td>71.8</td>
</tr>
<tr>
<td>Maximum steam generated (M lbs/hr)</td>
<td>86.0</td>
<td>112.0</td>
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<tr>
<td>Total steam generated (M lbs)</td>
<td>44,931.0</td>
<td>53,418.0</td>
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<tr>
<td>Coal consumed (Tons)</td>
<td>3,032.20</td>
<td>3,676.64</td>
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<tr>
<td>Evaporation rate (steam/#coal)</td>
<td>7.41</td>
<td>7.26</td>
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<tr>
<td>Efficiency - Actual</td>
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</tr>
<tr>
<td>Efficiency - Theoretical</td>
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<td></td>
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<tr>
<td>No. of Boilers on:</td>
<td>4 5 4 3 5 4 5 3 4 3 4 3 2</td>
<td></td>
</tr>
<tr>
<td>Date of Change:</td>
<td>1 5 6 7 9 10 11 12 18 20 24 27 28</td>
<td></td>
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<tr>
<td>Sanitary water from 3000 Area (Million Gals.)</td>
<td>73.18</td>
<td>78.7</td>
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<tr>
<td>Total water from 3000 Area (Average rate GPM)</td>
<td>1,815</td>
<td>1,767</td>
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<tr>
<td>Total water from #3 and #4 wells (Million Gals.)</td>
<td>14.4</td>
<td>11.9</td>
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<tr>
<td>Total water from #2 well (M Gallons)</td>
<td>.30</td>
<td>.30</td>
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<tr>
<td>Peak water consumption for 24 hours (Million Gals.)</td>
<td>2.9</td>
<td>3.0</td>
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</table>

Productive Maintenance Program

- Outstanding orders as of 1/31/59 - 67
- Orders issued in February - 67
- Orders completed in February - 5
- Orders outstanding as of 2/28/59 - 129

PLANT ENGINEERING

There were 29 training classes held for craftsmen of HLO and FPD, representing 359 manhours of training.

Sand in the water supplied by the City of Richland has been a serious problem during the month. The problem was investigated and has been associated with the use of Well 3000-F in North Richland. This pump has apparently been picking up sand and discharging it directly to our system. Due to the delay in placing the new ground storage tank in operation, no facilities are presently available to serve as a sand trap. However, modifications to the existing ground storage tank are being considered to determine if this can be used as a sand trap.

FIRE PROTECTION, PREVENTION AND CIVIL DEFENSE

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<th>Fire Responses</th>
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<tr>
<td>HAPO</td>
<td>3</td>
<td>None</td>
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<tr>
<td>Construction</td>
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<td>---</td>
</tr>
<tr>
<td>Private</td>
<td>0</td>
<td>---</td>
</tr>
<tr>
<td>Outer Area</td>
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FIRE PROTECTION, PREVENTION AND CIVIL DEFENSE (CONTINUED)

<table>
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<th>Fire Prevention Activities</th>
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<tbody>
<tr>
<td>Investigations</td>
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</tr>
<tr>
<td>Property Damage Incidents</td>
<td>0</td>
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<tr>
<td>Fire Inspections</td>
<td>49</td>
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<tr>
<td>Hazard Recommendations</td>
<td>14</td>
</tr>
<tr>
<td>Fire Surveys, Pre-Fire Planning</td>
<td>2</td>
</tr>
</tbody>
</table>

Significant Fires

None reported.

Three sprinkler systems were tested, inspected and placed in service -- two to protect the north section of the 313 Building (Fuels Preparation Building) and one to protect the 3715 Building (Manufacturing Warehouse). These systems were inspected and approved by the Washington Insurance Rating Bureau.

INVENTIONS

A possible invention has been made by F. A. Wilcox, Area Maintenance Operation. This device is a quartz gas control cup for use in welding Titanium. It is now being determined if this is an invention.

SAFETY, SECURITY AND RADIATION EXPERIENCE

| Medical Treatment Injuries          | 28  |
| Frequency Rate                      | 6.08|
| Disabling Injuries                  | 0   |
| Near Serious Accidents              | 0   |

There were no Security Violations reported.

On February 27, 1959, G. M. Allen, W-8053-4550, was involved in a radiation incident classed as a Technical Overexposure. Mr. Allen was doing maintenance work on the positive ion accelerator in the 3745-B Building and, in the course of this work, it was necessary to operate the accelerator to break in a new belt. Inadvertently, the machine generated electrons instead of positive ions. Mr. Allen received 600 MR as a penetrating dose to the abdominal area and local skin exposure to the right side of the body at 1.8 Rads. These amounts are estimated maximum dose as the individual was not wearing his badge or pencils at the time of the incident. He was kept from radiation zone work for two days following the incident.

MEETINGS: Round-Table Staff, 28 Safety & Security, 31 Information, 8
PERSONNEL DEVELOPMENT

Six personnel development programs were initiated, in progress or concluded during the month.

1. Sixteen employees continued PBM-I.
2. Six employees completed the Creative Approach Seminar.
3. Eight employees completed the Interviewing and Counseling course.
5. Eighteen employees continued the Work Simplification course.
6. Forty-five employees participated in Labor Relations Seminars.

Arrangements were completed for tuition refunds to be made to 13 FPD employees eligible for tuition refunds for their participation in the Fall semester at the University of Washington Center for Graduate Study.

A total of 41 people enrolled and began participation in the Department-sponsored off-the-job first aid course.

Additions were made to the Profile Method of Personnel Inventory system to help clarify its potential uses by individuals and management.

Plans were completed for presenting a new depth course in Self-Understanding by the R&U psychologist starting in March.

During the month two tech grad assignments in Fuels were occupied. Tech grad requirements through June were discussed with assignment supervisors, and availability of appropriate educational disciplines within the program was analyzed.

COMMUNICATION

A printed "Progress Report to Employees - 1958 - FPD" was developed and mailed to all employees' homes on Friday, February 27. Plans were laid for measuring employee reaction.

The General Manager conducted one information meeting with nonexempt employees during the month.

During the month four Management News Bulletins, two FPD Newsletters and one message from the General Manager were distributed. Other communication activities included preparation of the Safety Topic and distribution of one reading rack booklet.

GE News coverage of FPD activities and employees totaled 188 inches during February. Of this number, all but two inches were devoted to planned communication programs. The weekly average was approximately three-quarters of a GE News page per issue.
Included was a full-page GE News spread covering the work of the Analytical Laboratory Operation and employees.

Communication plans were initiated for promoting the Department’s annual clean-up campaign, Operation New Broom, 1959.

A group of science students and teachers toured the Area on Edison Day, February 11. The Analytical Laboratory and Testing Methods Operations acted as hosts to two groups of students during the afternoon.

**SALARY AND WAGE ADMINISTRATION**

Analysis and interpretations of appraisal and pay zone comparisons for FPD exempt personnel indicate the possible existence of a tendency toward "central" appraisals of a magnitude warranting continued efforts toward managerial understanding of appraisal numbers and definitions.

The compensation of FPD college graduates in a technical field was compared with Company data for 22,129 graduates by age and by year of initial degree. Reasonably satisfactory relationships were evidenced by both criteria.

A review of the pay differentials between first line supervisors and members of their crews has just been completed. Improved relationships in salary rate differentials are indicated despite almost constant position rate to job rate differentials.

Due to increased work load in the Area Maintenance Operation, a general rearrangement of duties is being made. The proposed organization as of March, 1959 and the previous organization of December, 1957 have been detailed to show these changes. One new position titled Foreman, Janitorial and General Maintenance has been established. Two new and six revised position guides have been reviewed and accepted. Evaluation of one remaining position is scheduled for completion during March.

Establishment of a temporary position as Inspector, Pressure Systems in the Plant Engineering Operation has been approved by the General Manager.

Forty-three of the 44 Plant-wide benchmark jobs have been received and evaluated. Of approximately 75 FPD job descriptions requested in the Study, 29 have been received as of March 3, 1959.

Due to an increased work load in the Analytical Laboratory, a new nonexempt job--X-Ray Diffraction Analyst--is being prepared. Preliminary classification data for this job were provided the supervisor.

By means of a new job description and analysis utilizing the new form, a job presently classified a Cost Clerk D was found to be more properly evaluated as Cost Clerk C. HAPO-wide concurrence was obtained in this matter.
## UNION RELATIONS

### Grievance Statistics

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Received this month</td>
<td>7</td>
</tr>
<tr>
<td>Received since 1/1/59</td>
<td>19</td>
</tr>
</tbody>
</table>

### Step I

- Answer satisfactory: 2
- Answer unsatisfactory: 5
- Pending time limit to close: 7
- Settled this month: 7

### Step II

- Discussed this month: 4
- Pending time limit to close: 4
- Settled this month: 6
- Pending arbitration: 4

### Subject of February Grievances

(Total 7)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Overtime</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Jurisdiction</td>
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<td>4</td>
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<tr>
<td>Absence</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Transfer</td>
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<td></td>
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</tbody>
</table>

### Subject of Grievances Since 1/1/59

(Total 19)

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Vacation</td>
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<td></td>
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<td>1</td>
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<tr>
<td>Jurisdiction</td>
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<td>11</td>
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<tr>
<td>Transfer</td>
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<td></td>
<td></td>
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<tr>
<td>Responsibility</td>
<td>1</td>
<td></td>
<td></td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Absence</td>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Overtime</td>
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F-3
HEALTH AND SAFETY

<table>
<thead>
<tr>
<th></th>
<th>February</th>
<th>January</th>
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</thead>
<tbody>
<tr>
<td>Disabling Injuries</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Serious Accidents</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Medical Treatment Cases</td>
<td>51</td>
<td>36</td>
</tr>
<tr>
<td>Medical Treatment Frequency Rate</td>
<td>4.34</td>
<td>2.83</td>
</tr>
<tr>
<td>Employee Hours of Exposure</td>
<td>117,523</td>
<td>127,056</td>
</tr>
<tr>
<td>Orientation Presentations</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Attendance</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td>Inspections</td>
<td>39</td>
<td>32</td>
</tr>
<tr>
<td>Suggestions Evaluated</td>
<td>8</td>
<td>6</td>
</tr>
</tbody>
</table>

Department performance during February resulted in 1 Serious Accident and 51 Medical Treatment Injuries. Of the 51 Medical Treatment Cases, 24 were sustained to the hands. Gloves may have prevented 66% of all hand injuries for the month.

There were 8 eye injuries reported that were caused by windblown particles.

Industrial Medical examinations were scheduled to complete 142.9% of quota during January.

Program

The regular monthly safety meeting for office personnel was held on February 18. G. B. Hansen conducted the meeting and presented a talk on, "A Laboratory Approach To Office Safety."

Plans for "Operation New Broom 1959" are complete. Publicity items for the GE News, posters for 300 Area posting, and a large sign mounted on a pole near the plant entrance were introduced during the last week of February.

First Aid classes sponsored by the Health and Safety Program Council were started in February with two classes totaling 40 participants.

Thirty-nine Department facilities were inspected during February.

Activities

Job contacts with Medical, Manufacturing, Maintenance & Power, and Engineering personnel during February included requests for information or assistance on problems concerning the following items: Noise, respiratory protection, electrical shock, welding, work restrictions, traffic, machine hazards, ladders, safety meetings, hazardous chemicals, metal fumes, solvents, Job Hazard Breakdowns, insecticides, pressure vessels, control devices, medical procedures, reporting requirements, housekeeping, orientation, streets and walks, eye protection, investigations, materials handling, electrical safeguards, storage, conveyor hazards, coal handling, high work, painting, vehicular safety, sandblasting, ventilation, protective equipment, acids and caustics, explosives, inspections, power tools, lock and tag procedures, safety showers, suggestions, flame cutting, piping, lighting, flammable gases, guarding, compressed gas manifolds, railroad equipment, and crane safeguards.
PERSONNEL PRACTICES

Employment

Personnel added: 16
Removed: 5

Reduction of force:
By seniority bumping 0
By FPD 0

Transfer requests active at month end: 50

Procurement:

Offers: 7
Interviews: 11
Requests for personnel: 11
Transfers (all): 4

Upgrades within FPD: 1

Attendance Awards: 19

Service Pins: 0 - 10 year; 5 - 5 year

Employee Benefits and Service

Benefit Plans participation:

Pension: 100%
Insurance: 100%
Stock Bonus: 48.30%

Savings and Security: 94.9%

Nonveteran employees subject to selective service:

13 in 1-A; 5 in 2-A; and 17 others. In addition there are:
5 technical occupational deferments active; 18 standby and
34 ready reservists; 2 employees on military leave.

Suggestion Plan

<table>
<thead>
<tr>
<th></th>
<th>February 1959</th>
<th>Year to Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eligible employees</td>
<td>591</td>
<td>587</td>
</tr>
<tr>
<td>FPD suggestions received</td>
<td>45</td>
<td>107</td>
</tr>
<tr>
<td>Annualized rate per 1000 eligible employees</td>
<td>913</td>
<td>1093</td>
</tr>
<tr>
<td>No. of suggestions adopted</td>
<td>13</td>
<td>17</td>
</tr>
<tr>
<td>Net annual savings</td>
<td>$891</td>
<td>$42,210</td>
</tr>
<tr>
<td>Amount of awards</td>
<td>$310</td>
<td>2,015</td>
</tr>
<tr>
<td>Percent of total awards to savings</td>
<td>34.79%</td>
<td>4.8</td>
</tr>
<tr>
<td>Average amount of awards</td>
<td>$23.84</td>
<td>$118.52</td>
</tr>
</tbody>
</table>
# Technical Personnel Placement

<table>
<thead>
<tr>
<th>Openings referred to FPD</th>
<th>February</th>
<th>FY 59</th>
</tr>
</thead>
<tbody>
<tr>
<td>FPD candidates offered</td>
<td>8</td>
<td>337</td>
</tr>
<tr>
<td>PhD candidates referred to FPD</td>
<td>2</td>
<td>35</td>
</tr>
<tr>
<td>Other candidates referred to FPD</td>
<td>11</td>
<td>30</td>
</tr>
<tr>
<td>Active transfer cases of FPD people</td>
<td>6</td>
<td>49</td>
</tr>
<tr>
<td>Permanent assignment from Rotational Program</td>
<td>0</td>
<td>4</td>
</tr>
</tbody>
</table>

## General

Security Violations in the Department this month: 0

[Signature]

Manager - Employee Relations
END

DATE FILMED

8/25/92