MONTHLY REPORT - PROCESS SECTION
MANUFACTURING DIVISION
APRIL 1955

MAY 15, 1955
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SAVANNAH RIVER PLANT

100 AREA - REACTORS

ASSEMBLY AREA

1. New Fuel Elements

Flow diagrams and a preliminary arrangement drawing have been prepared for the handling of Mark III and Mark IV elements in a typical assembly area. Also, the modifications necessary in storage, handling, inspection, and loading equipment have been evaluated to assess future needs for redesign of equipment and possibly for minor effects in the design of the elements. These studies are now being translated into high-spot cost estimates of new facilities.

2. Quatrefoil Procurement

Alcoa production of finished weldments has reached a new monthly high of nearly 1500 Q-foils shipped to SRP, which is more than current requirements.

Harvey Machine Co., in its development of Q-foil manufacture, has completed over 20 Q-foils of slightly varying dimensions and shipped them to SRP for inspection.

REACTOR CONTROL

1. Dual Valve Strainers

In recent charge-discharge shutdowns it was determined that most of the strainers in the monitor pin dual valves were plugged. The flow through the strainers serves the dual purpose of collecting slug rupture products to permit locating the rupture, and of cooling the monitor pin. Plugging of the strainers interferes with both functions. All strainers were replaced with strainers having degrees of modification varying from bunching out the end of the standard screen to a new type of screen having about four times the original area. At the same time, a program was begun to develop a device less sensitive to plugging and, if possible, more retentive of slug rupture product. A practical settling chamber accomplishing both these objectives has been developed by SRL and SRP Works Technical Department. It is anticipated that it will ultimately replace the present strainer.

2. Pressure Tap Tubing on Monitor Pins

At the time that the strainers referred to above were being replaced in at least three reactors, the tubing from the
2. Pressure Tap Tubing on Monitor Pins (Contd.)

monitor pin to the dual valve developed leaks at cracks in the tubing. Metallurgical examination of two pins has revealed severe intergranular corrosion of the tubing. The history of the fabrication of the pins has been reviewed to permit determining the cause of the corrosion and the probable extent of the defect. In the meantime, special care will be taken in working on dual valves.

REACTOR COMPLEX

1. Increased Moderator Circulation

In connection with studies of new fuel elements, the feasibility of increasing moderator circulation to as much as 150,000 GPM has been established, both from the piping and pumping standpoints. Quotation requests have been issued for a 25,000-GPM pump with a potential operating range from the present 15,000 GPM to 28,000 GPM. The larger pump will operate at a lower speed, requiring a gear reducer. By changes in speed through gear replacement, additional flexibility in plenum pressure can be obtained at the various flow rates. C Area already has larger process piping and 12 heat exchangers so the increase in moderator volume would be small, but in all other areas the piping size would be increased and 6 heat exchangers added, resulting in about 25% increase in moderator volume.

It is anticipated that a prototype pump can be delivered and tested in about a year. If installation in the reactors were authorized, the C Area installation could be complete about 15 months after authorization, including a 9-week shutdown for installation and testing. The other areas would require about the same time after authorization, including about 13 weeks for installation and testing. The areas could succeed one another in conversion by four month intervals, the limiting factor being equipment delivery.

PURIFICATION

1. Isotopic Stills

The R Area columns have been in almost continuous operation during April, with removal of 14 to 15 lbs. of light water per day. Moderator purity improved from about 99.37% to about 99.42%, indicating a net reduction of light water in the system of 6 to 8 lbs/day.

The P Area columns were tied into the main moderator system on April 18 after a period of isolated operation during which performance was checked and suitable concentration throughout the columns were established. The rate of light water removal has been set at 8 to 10 lbs/day. Since P Area has no apparent inleakage of light water, moderator purity has
improved from 99.58% to about 99.60%.

2. Deionizers

The first of the 22 spare deionizers being fabricated by Artisan Metal Products Co. of Waltham, Mass., was delivered to the Savannah River Plant and tested in the mock-up shop in order to detect any difficulties before proceeding with the assembly of the remaining 21 units. Certain minor design changes have been found necessary, and the drawings are being altered accordingly. Otherwise, fabrication was satisfactory, with dimensions within tolerance. The program of new deionizer design is thus essentially complete.

DISASSEMBLY

1. Shipping Long Elements

A preliminary study of the problems involved in shipping whole elements versus size reduction before shipping has been completed by the Engineering Department and AED. The analysis of these problems and the high-spot cost estimates will be combined with similar information being developed by the 200 Area, in order that a decision may be made regarding which alternative to pursue in detail.

2. Scrap Casks

Initial difficulties with scrap shipment to the burial ground has indicated a need for additional casks, which reduced handling time would probably be of the large size provided for C Area. However, a plant study indicates that with improved procedures present casks are adequate. This item is, therefore, being eliminated from the Project 8980 Exceptions List. The economic justification for larger casks may be reconsidered at some future date.

3. Bucket Vibration for Slug Packing

Tests in P and L Areas have shown that bucket vibration will permit loading four foils (320 slugs) per bucket versus the design number of three foils (240 slugs), with at most a small amount of hand tonging. Since there is also no noticeable difference in behavior when charging into the 200 Area dissolver, four foils per bucket has been adopted as a tentative standard. Advantages include (a) reduced dissolver charging time; (b) reduced transportation time; (c) reduced requirements for buckets, casks and railroad cars. Temporary vibration equipment, not designed for underwater use nor for greatest ease of application, is now being used. The plant has undertaken the design of permanent equipment for all areas.
4. **LM Shipment.**

The principal criticality tests in regard to the proposed shipment of 480 slugs per cask have been completed at ORNL. For the most unfavorable configuration (a hexagonal array 1.6 inches on centers) the minimum critical number of canned slugs in light water was found to be 155, compared with the previously reported 134 for uncanned slugs. The proposed array of four buckets each containing 120 slugs, averaging about 1.15 inches on centers, was found to have negligible neutron multiplication. In another experiment, three buckets were loaded normally with 120 slugs, while the fourth had 60 slugs with 1.6 inch spacing. Sixty more slugs were arranged on top of the two upper buckets with 1.6 inch spacing. This arrangement was intended to simulate an accident where, after loading three buckets into a cask, the fourth would be spilled on top. Even this test showed a neutron multiplication of only three.

The hazards involved appear to be of such a low order that design is now proceeding on the basis of 480 slugs per cask. However, one additional test at ORNL has been requested to indicate the margin of safety by determining, for the accidental spilling case, how many more slugs at 1.6 inch spacing would be required for criticality.
SAVANNAH RIVER PLANT
SEPARATIONS PLANTS - 200 AREA

SOLVENT EXTRACTION PLANTS

1. 200-F Area - Production

Operation continued at a high level with the throughput: averaging approximately 140% of design. The purity of the UO3 product has been improved by use of a water scrub on the ID bank.

2. 200-F Area Acceptance

The Plant has completed the acceptance papers for the 200-F Area and these papers are now being reviewed by the Engineering Department before presentation to AED management in Wilmington.

3. 221 Building - Jigs and Fixtures

Half of the nozzle support jigs and all of the fixtures (templates and gauges) are to be retained for possible future construction work involving a nozzle pattern similar to that of the 221 Buildings. This equipment is to be weather protected and stored outdoors. These items would be used in the proposed 241-H waste pumping station and possibly for future diversion boxes.

4. 221-F&H - Additional Service Elevator at the North End

The "P" Work Orders have been approved. The design alteration to allow for level unloading at the first level is being completed.

5. 221-F&H - Extended Surface Element Dissolving

A design study including cost analyses has been in progress to better define the relative merits of handling long fuel elements by cutting in the 100 Areas or by dissolving full elements in the 200 Areas. A study concept of a horizontal dissolver has been reviewed with Engineering. This differs from earlier proposals insofar as three 2.5-ton bundles of long elements would be charged directly into the dissolver without contaminating the crane hook and without dropping the heavy load into the dissolver. The method of packaging appears adaptable to the 100 Area. Also, by locating the condenser to one side of the dissolver, the whole unit would fit into the two modules required by one present dissolver plus charger.
5. **221-F&H - Extended Surface Element Dissolving (Contd.)**

Assuming equivalent dissolving rates for plates and slugs, total dissolving capacity should be increased because the total charge to the proposed dissolver is greater than the present and the number of dissolvers in the available space would be the same.

Deflection of the cover under vacuum would be used to load an attached "teflon" gasket to effect the dissolver closure seal.

6. **221-H - Cold Feed Sample Handling**

Construction is now working on the sample handling facility in the cold feed preparation area of 221-H. The floor, walls and roof have been installed, and piping has been started. It is expected that the scheduled completion date of June 1 will be met.

The original scope of work for this facility was modified by deletion of the sample elevator, access hole through the building wall, unloading dock and access road. The samples will be carried by hand directly from the warm canyon sample aisle and Building 211. This procedure will be less expensive than trucking, and samples will reach the laboratory quicker.

7. **221-F&H - Caustic Scrubber**

The caustic scrubber performance test has been completed in the 221-H hot canyon and the unit is ready for its intended service. These facilities will be left in 221-H and the second identical unit will be installed in 221-F Area during some future shutdown. The caustic recirculating pumps for 221-F Area have been thoroughly tested and run in.

During the course of the 221-H testing, the column loading point was established to be 170 GPM. Instead of recirculating at 150 GPM for which the columns were designed, it has been agreed to recirculate at 125 - 135 GPM in order to increase the margin of safety with respect to column loading.

8. **221-F&H - 1DU Water Scrub**

Engineering was requested to design and install permanent facilities for the 1DU water scrub which is now being accomplished on a test basis with manual control. The water scrub will be added at stage one while the acid and ferrous sulfamate will be added at stage four. The water scrub decreases the acidity in the 1DU and 1EU streams by a factor of 6 to 10. Lower iron in the product indicates reduced corrosion of the hydrate evaporator.
9. **221-F&H - Additions to Loading Platforms at Southwest Corner**

Engineering was requested to estimate the cost of the requested platform additions.

This platform will serve as storage space for chemicals and gases shipped in returnable containers. Without the platform it would be necessary to handle these containers in a regulated area with all the inherent monitoring difficulties and expense. This platform will also be used for loading and unloading "B" line shipments from one area to the other.

10. **Building 221-H - Process Modifications**

All design information for the process modifications to provide continuous decanters and solvent washers has been transmitted to the Construction Division. Two tanks have been modified as continuous decanters and three as solvent washers. Mock-up of modified vessels is in progress but has been slowed by a shortage of connector blocks.

11. **Building 232-F - Tritium Processing Facilities**

The metal diffusion pumps have been installed in the mass spectrometers and both instruments restarted with revised mass markers. The material handling equipment in both furnace rooms is now operable. New valve splines of larger capacity have been installed in the thermal column feed and drawoff system and are being tested.

The plant Projects Department has started work on a product container degassing and leak testing facility.

12. **241-H - Additional Waste Storage**

Part 1 of the "P" Work Order covering this work has been approved and construction has started. Agreement has been obtained on all basic tank design features. It is expected that the tank contract will be placed the week of May 2.

Design of the pump pit which is required for the new tanks has been proceeding. The problem of eliminating a pocketed section of piping is receiving study. A low point in the piping exists because the present design concept includes the use of an existing diversion box and pipe line encasement. Other locations for the pump pit are being studied.

13. **241-F&H - Scheduling of Waste Storage**

Agreement has been reached to store coating waste in at least one uncooled tank in each area. This implies that the tank selected will not be adaptable to the storage of fresh high
activity waste. However, it is felt that at least one tank in each area will be required as a surge tank to feed any future unit for treating coating waste.

In H Area #10 tank has been selected for this use and in F Area #5. The Engineering Department has been advised of the filling schedule on these tanks and requested to provide the necessary diversion box jumpers, instrumentation, and vent filters. All other coilless tanks (three in "F" and one in "H") will have cooling coils added.

**241-F&H - Scheduling of Waste Storage (Contd.)**

Construction of the new facilities has started.

Design, procurement and construction schedules are being studied for the new facilities with a July 1 start-up goal. Some procurement and some design work is limiting.

**221-F "A" Line - Increased Capacity**

The availability of additional pots is being studied in the event the pot sag situation indicates the desirability of stocking EM equipment. This study includes evaluating the feasibility of installing larger pots when it becomes necessary to replace those now in operation.

**221-F "A" Line - Denitrator Pot Distortion**

The availability of additional pots is being studied in the event the pot sag situation indicates the desirability of stocking EM equipment. This study includes evaluating the feasibility of installing larger pots when it becomes necessary to replace those now in operation.

**241-F&H - Diversion Box Maintenance**

To better define the maintenance problems involved in performing diversion box jumper changes, a demonstration of this type of maintenance was made April 27 and 28 at the 241-H diversion box.

A 25-ton Moto-Crane with a 40" boom holding two hooks was used. A mirror on the end of the boom and another at the edge of the diversion box were used for viewing work in the box. With sufficient crane operator training and a few simple additions, such as a jib monorail, maintenance of a diversion box in this fashion seems feasible. It is significant to note that the diversion box jumper change to be accomplished in F Area in
16. 241-F&H - Diversion Box Maintenance  (Contd.)

June (changing from #1 tank to #2) was demonstrated in H Area's box in 1-1/2 hours time.

The findings of this demonstration will be considered in the maintenance facilities being developed for the waste pumping pit in 241-H.

17. B-Line - Additional Tankage

Design of the additional coupling column feed and elution facilities for 221-H "B" line is proceeding on schedule, with completion of design expected about the middle of May. Construction started work on these facilities late in the month, using preliminary design issued as marked drawings and sketches. Although tight, it seems likely that this job will be completed prior to hot start-up. These changes are intended primarily to ensure continuity of operation.

THORIUM PROCESSING FACILITIES

1. Thorium Reduction Pilot Plant

Erection of the pilot plant building, No. 677-G, is in progress. Interior partitions and floor will not be installed until a decision is reached as to what equipment will be placed in the building.

The Technical Division plans to use the north end of the building as a shops and storage area. A preliminary arrangement of this area has been submitted to the Engineering Department for use in preparation of design and an estimate.
SAVANNAH RIVER PLANT
REACTOR FUELS FABRICATION - 300 AREA

GENERAL

1. U-Al Canning

Sylvania has hot press canned to date a total of 30,464 U-Al slugs, of which 29,417 or 96.6% have met Sylvania's inspection standards. This is a 0.2% increase in yield as compared with last month. Production canning of U-Al slugs occurred during one week of this month. It was necessary to limit production to U-Al due to a temporarily inadequate supply of thorium slugs.

Still available for canning are 5,500 U-Al slugs.

2. Thorium Production

By month's end Fernald had shipped 11,723 acceptable bare thorium slugs to Sylvania for hot press canning. All of these slugs were from arc melted - extruded metal.

Several process changes expected to increase the rate of production at Fernald are being evaluated by Fernald, Sylvania and SRP. Examples of such changes are (1) less restrictive slug surface finish, (2) variable hardness, (3) effects of blending remelt metal, etc.

3. Thorium Canning

Sylvania has hot press canned to date a total of 9,774 thorium slugs, of which 9,606 or 98.3% have met Sylvania's inspection standards. This is a 1.2% increase in yield as compared with last month. With SRP welding plus other processing yield running greater than 90%, this quantity of canned pieces will be adequate for the first CM type of loading in 105-R reactor.

The thorium hot press canning costs at Sylvania thus far are as follows:

<table>
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<th>Cost Item</th>
<th>Amount</th>
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<tr>
<td>hot pressing</td>
<td>$7.32</td>
</tr>
<tr>
<td>depreciation of equipment</td>
<td>$1.36</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$8.68</strong></td>
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The installation of a mechanized canning line at Sylvania's Hicksville plant is progressing according to schedule; completion is expected within the next several months.
3. **Thorium Canning (Contd.)**

Nineteen hot press canned induction melted thorium slugs of the Mark IV design have been sent to SRL for initial flow tests of the design of the target assembly. One hundred and fifty of these larger slugs made from arc-melted recycle metal are scheduled for extrusion early in May. The impact extruded cans likewise will be available at that time thus permitting delivery of the first batch of arc-melted slugs by the end of May. Additional quantities of more closely controlled (remelt - virgin blended) metal quality will depend on allowable interference with production of the regular size thorium slugs. (Sylvania has been advised that the mechanized canning line currently under construction at Hicksville should be modified to accommodate the Mark IV components.)

4. **Component Drawings**

Detail drawings of the various components for both the U-Al and thorium hot pressed assemblies have been redrawn to conform with current specifications.

5. **Experimental Facilities for Pneumatic Pressing of Extended Surface Elements**

Essentially all materials and equipment required for start-up are now on hand and over-all construction is about 75% complete. Delivery of the interim autoclave furnace was delayed approximately one week, which may extend final building completion beyond the May 15th goal start-up date.

Creep tests on samples of autoclave material have been in progress at ERL for about one week. A total test period of 1000 hours will be necessary before results are available.

**BUILDING 313-M - URANIUM FABRICATION BUILDING**

1. **Semi-Works Canning Line**

The Project for installation of two resistance furnaces as a "semi-works canning line" in Building 313-M has been cancelled on the basis that reasons originally used to justify approval of the Project (interest in development of alpha canning and thorium dip canning) no longer exist.
HEAVY WATER

DANA PLANT

Registration of Flare Tower

In response to an Atomic Energy Commission inquiry concerning registration of the Dana flare tower with the Civil Aeronautics Administration, copies of correspondence on file in Wilmington were forwarded to Dana. These records confirm that CAA registration requirements were complied with during initial plant construction. Supplementary information supplied by the Engineering Department on the elevation datum point references used for the initial Wabash River Ordnance Works survey was also forwarded to Dana for use in satisfying this AEC inquiry.

SAVANNAH RIVER PLANT - 400 AREA

Expansion of Deuterium Production Facilities

Preparation of a detailed cost estimate covering 100% expansion of deuterium production facilities in Building 421-1D has been completed by the Engineering Department. Project preparation work has been discontinued, as advised by the AEC. The present plan is to install a plant at another site.

GENERAL

Stainless Steel Storage Drums

U. S. Steel Products has finished the manufacture and testing of our 55-gallon stainless steel storage drum order. Four hundred drums were shipped to Dana during the last week in April, completing the order for 1000.
It has been agreed with the Atomic Energy Commission to purchase coal for the SRP stoker fired boilers and Dana boilers on an annual contract basis. SRP pulverizer coal, however, will continue to be purchased on a monthly spot basis. It is expected that the yearly contract for Dana will start in July, 1955 and for SRP stoker coal in August, 1955.

The April 1955 Review of Base Program Allowances, for future work to be accomplished on either Project 8980 or as major "S-8" projects, was forwarded to the Atomic Energy Commission.

Modifications to existing AEC Directives covering Project 8980 were received. Funds now allocated for Project 8980 total $1,066,000,000. The new total represents a reduction of $18,000,000 from the previously allocated total of $1,084,000,000.

Additional funds were allocated by AEC for the Military Program at SRP. Total allocations to date are:

<table>
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<th>Description</th>
<th>Amount</th>
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<tr>
<td>Alterations to Bldg. TC-2 and Cafeteria Bldg. TC-7</td>
<td>$541,000</td>
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<tr>
<td>Provide access roads to and site preparation of 4-90 MM gun sites</td>
<td>200,000</td>
</tr>
<tr>
<td>Provide initial telephone installation</td>
<td>25,000</td>
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<tr>
<td>All design work authorized to date</td>
<td>212,700</td>
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<td></td>
<td>$978,700</td>
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</table>

The following projects, "P" Work Orders, and Indirect Repair Orders were authorized during the month.

**Savannah River Plant**

- S9-1007 - Replacement of Light Trucks, $150,000
- PWO 6007-F - Additional Elevator Facilities, Bldg. 221-F, $150,000
Savannah River Plant (Contd.)

PWO 6008-F - Part I, Increased "A" Line Capacity, Bldg. 221-F, $500,000

PWO 6009-H - Additional Elevator Facilities, Bldg. 221-H, $102,000

PWO 6010-H - Part I, Waste Storage Tanks and Pump Pit, Bldg. 241-H, $2,000,000

IRO X-15177 - Part II - Temporary Facilities for Penumatic Pressing, Bldg. 773-A, $70,000 increase (new total $285,000)

Dana Plant

C-63 - Chlorine Injection to Extraction Area Cooling Water, Bldgs. 201-206, $19,500

The following Projects were approved and returned to the plants for transmittal to the Atomic Energy Commission for authorization.

Savannah River Plant

S8-1012, Part II - Additional Flow Test Facilities, Bldg. 679-G, $29,000 reduction (new total - $46,000)

Dana Plant

C-52 - Facilities for pH Adjustment of Stripper Feed, Bldgs. 201-206, $67,300

C-59, Part II - Additional Precipitator - Boiler Feedwater Treatment, Bldg. 401-A, $6,294 reduction (new total - $21,966)

100 Area Utilities

On April 15 the No. 1 turbo-generator in the 184-L Power House was taken out of service on an emergency basis. All four main bearings were found to be damaged and had to be replaced. The electric solenoid in the 125 Volt D.C. throttle valve trip circuit was also found to have been burned out. The generator was returned to service on April 2 after repairs to the bearings and replacement of the solenoid. It is planned to inspect the bearings of the remaining seven generators on a scheduled basis as soon as it can be arranged, consistent with plant load requirements. Heavier duty electric solenoids are to be obtained for replacement in all eight Elliott turbo-generators.

The turbine spindle from the No. 1 unit in the 184-P Power House was received from the Elliott Company's Jeannette, Pa. shops on
100 Area Utilities (Contd.)

April 3 after the completion of repairs to the inter-stage shaft seals and miscellaneous items, as reported in March. It was discovered, however, that the turbine half of the coupling was cracked and it was necessary to effect these repairs and to replace a faulty bearing. The repairs were near completion at the end of the month. The unit has been out of service since February 14 when excessive vibration was encountered, and most of the main bearings and spindle seals were found to be damaged and the exciter bedplate grouting defective.

The continuous capability test on the No. 2 boiler in the 184-R Power House was stopped on April 19. As reported in March, this test had been running since March 7 at a load of 150,000#/hr. The design capability of these boilers is 140,000#/hr. Continued difficulties, especially with the cinder return system, were experienced at the higher load. Improvements are being studied before further high load testing will be resumed.

The program of replacement of the four and one-half inch chill tube with a mechanical type grate seal in the 100 Area Riley boilers was completed during the month. This was done after failure of the chill tubes was experienced on several of the units. This program was started in December, 1954, and reported in the December and January reports. Performance to date on all eight boilers has been favorable.

200 Area Utilities

Preliminary reports on the long duration load test of the No. 2 boiler in the 284-F Power House at the design rating of 60,000#/hr, which was completed in March, indicate that the test section of Meehanite-SC alloy grate keys appeared to be a definite improvement over the lower heat resistant alloy keys originally installed. More conclusive results should be apparent upon completion of the 70,000#/hr test which was started on April 6 and is currently in progress.

Work on the 200-H Area additional power facilities consisting of a boiler, cooling tower sections and auxiliaries is proceeding according to schedule. Orders have been placed, or are in the hands of Purchasing, for all major equipment. Engineering Department plans schedule the equipment for service in January, 1956. Meehanite-SC grate keys are being purchased for the new boiler based on information that they can withstand 100-200°F higher temperatures than Riley's standard alloy keys. This decision is backed by the superiority experienced to date with the test installation of Meehanite-SC grate keys in the 200-F Area.