MONTHLY REPORT - PROCESS SECTION
MANUFACTURING DIVISION
FEBRUARY 1955

E. I. du Pont de Nemours & Co. (Inc.)
Explosives Department - Atomic Energy Division
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TABLE OF CONTENTS

100 Area - Reactors .................................................. 4-8
200 Area - Separations Plants ........................................ 9-12
300 Area - Reactor Fuels Fabrication .............................. 13-14
400 Area - Heavy Water ............................................... 15
Utilities and General Services ................................. 16-17

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ASSEMBLY AREA

1. Quatrefoil Procurement

A total of 1132 quatrefoil weldments were produced by Alcoa during the month, approximately equal to average monthly requirements. All of these incorporate aluminum sleeves welded into the top section for prevention of crossflow among channels.

The first quatrefoil extrusions produced experimentally by Harvey Machine Co. have been inspected at SRP. Surface of tubes and ribs is satisfactory but closer control will be required on uniformity of wall thicknesses and rib dimensions.

The possibility is being investigated of fabricating finished Q-foils at SRP from Harvey and/or Reynolds extrusions. The gains from such a program would be experience in welding that would be applicable to future processing of extended surface elements and to plant repairing and modification of existing weldments. Alcoa is the only vendor presently equipped to weld Q-foils. A detailed description of the present fabrication procedure and description of equipment has been prepared.

2. Extended Surface Elements

A preliminary scope of work on tubular and flat fuel elements has been submitted to the Engineering Department, covering receipt, assembly area processing, C and D machine handling, reactor operation, and disassembly. The assembly area process will utilize existing equipment as much as possible and will consist of unloading the fuel via the tipping table, loading the fuel in machines yet to be designed, and processing and storing the assemblies on existing equipment. C and D handling will be done on the existing machines with only minor equipment revisions. Cutting of long elements in 105 Building disassembly areas for shipment to 200 Areas will be investigated on a high-spot basis.

CHARGE AND DISCHARGE MACHINES

1. L and K Recharges

The L-2-3 and K-1-2 discharges were accomplished in 82 and 85 hours total elapsed time and 53 and 58 hours actual operating time, respectively. Downtime due to mechanical trouble amounted to approximately 10 hours in each case and difficulties were
relatively minor. The balance of the lost time was derived from auxiliary equipment and operational problems.

2. Improvement Program

The present conveyor in K Area is the first of the redesigned conveyors to be used through a regular plant shutdown. With minor exceptions, the conveyor performed satisfactorily. Active study continues on approximately 25 major items toward reduction of lost time and improvement of operation reliability.

REACTOR CONTROL

1. Major Revisions - R, P, L and K

Preliminary schedules have been made on installation of the following major design changes in each of Areas R, P, L and K. Installation has already been accomplished in 105-C.

a. Remote span adjustment of flow transducers
b. Safety brake on latch hoist
c. Tie shaft on latch hoist drive
d. Jaw guides on telescoping latches
e. Supplemental safety device.

Procurement is under way and plans are being made to install these facilities in 105-R.

REACTOR COMPLEX

1. Thermal Shields

Repairs to the two leaking tanks in 105-C annular shield have been completed. The leaking tanks were the first two of twelve sections fabricated for C design. Investigation with the vendor disclosed that fabrication procedures had been modified and improved after completing the first two tanks, and examination of welds in the third tank confirmed this. Tensile and bending tests with typical welds indicated the revised fabrication procedure was adequate for expected stresses. During hydrostatic testing of the repaired tanks, motion and strain gage measurements were made which confirmed assumptions made in calculating stresses induced by hydraulic pressure. The replacement of concrete shielding removed for the repairs was accomplished satisfactorily.

As a result of the recent studies of thermally induced stresses the Engineering Department has confirmed previous estimates that the annular shields are limiting on reactor power level. Proof of the adequacy of the annular shields for higher power levels will require further stress analyses, measurements in operating reactors, and perhaps tests of scale models. Installation of
2. Vacuum Breaker for Reactor Tank

Tests of the new design of vacuum breaker located at the zero level in C Area proved the adequacy of the device to protect the reactor during a moderator dumping. Replacement of the vacuum breakers at the -20 ft. level with the new design at the zero level has been recommended for all areas.

3. Larger Moderator Pumps

In developing specifications for a new moderator pump of higher capacity, the Engineering Department has been requested to allow for a future possible increase in discharge head to consume 4000 HP per pump. This can be accomplished in the pump either by sizing the casing to accommodate a larger impeller, or by providing for future speed increase in the gear reducer. This is being done because it is believed possible to obtain increased horsepower from the present 3000 HP motors by refrigeration of the cooling air.

4. Moderator Pumps - Protection Against Reverse Rotation

The shop test program on the Formsprag clutches has been completed by the Engineering Department. The tests were run to establish that design changes to the clutches would reduce the chances of bearing failure and that the modified bearing seizure protection would "fail safe". Only the most severe type of abuse in the form of grit and metal chips injected into the bearings was able to cause the bearing to fail, and the test clutch operated four hours with audible evidence of trouble before seizure occurred. After bearing seizure, the protective device allowed the normally stationary member to rotate freely without excessive vibration.

On the basis of these successful tests, the installation of modified Formsprag clutches on all six pumps in C Area has been authorized for observation under actual operating conditions. The installation of automatic motor tripping in other areas as an alternate to Formsprag clutches has been deferred pending the results of operation of the clutches in C.

5. Moderator Pumps - Motor Cooling Alarm

The alarm devices installed on the main pump motors to indicate low cooling water flow have proven inadequate for operation over the wide range of flows encountered under various supply conditions. A thermostat in the exit air of the motor cooler is being installed to provide a signal if the cooling of the motors becomes inadequate.
PURIFICATION

1. Moderator Processing Facility

A high-spot estimate has been received for installation in 105-P of central facilities to remove oil, dirt and ionized impurities from recovered moderator. The principal equipment includes a filter, a decanter, and a resin bed. Collection drums will be vented to the stack, but no additional ventilation is contemplated since existing general ventilation is considered adequate. The proposed installation would supplement the normal clean-up facilities of each area.

DISASSEMBLY

1. Fuel Shipment to 200 Area

Excessive turbidity of the water in the transfer tanks in which casks are shipped on railroad cars has made unloading difficult at the 200 Area because of poor visibility in underwater operations. The major source of turbidity is iron rust from parts of the cask and tank where Amercoat was not applied or has worn off, and especially from the tubes that communicate between the inside and outside of the cask for water cooling. It is planned to plug these tubes, which have been found unnecessary, and to apply Galvicon zinc paint as a protective coating for the casks and tanks. Galvicon is considered superior to Amercoat for this purpose since it affords some anodic protection even after partial wearing off.

2. Sorting Station for Exposed LM Slugs

Preliminary design has been completed of the sorting facilities to be installed in the monitor basins. The contemplated procedure is to dump the contents of four Q-foils upon a sorting tray, hand-tong the LM slugs into the specially designed basket, hand-tong the spacers into a scrap bucket, and sweep the remaining target slugs into a standard fuel bucket. Detailed design is under way.

3. Long Element Handling

Engineering Department has been requested to study the mechanical and structural problems involved in providing facilities for cutting long fuel and target elements into short pieces, and for storing and shipping the cut elements. This method of handling is to be compared with shipping whole elements to the 200 Area for cutting there or for dissolving in full length. The decontamination and ventilation requirements are under investigation at SRL.
4. Slug Storage in Buckets

The Hanford type of bucket was provided for storage of exposed uranium slugs in the disassembly basins. In pre-design tests the buckets readily accommodated 240 new slugs, corresponding to 3 Q-foils. Irradiated slugs, however, do not pack as well. In practice a large amount of hand-tonging has been required to keep them below the top of the bucket and thereby avoid dropping slugs or crushing them with the lid of the shipping cask. A recent test at SRP using a vibrator attached to the side of a bucket produced good packing after 30 to 40 seconds of vibration. The impact of the slugs against one another produced an "orange peel" surface on some slugs, but no real damage was observed. Further tests are planned to establish the optimum frequency, amplitude and duration of vibration before designing permanent facilities.

GENERAL

1. Sealing Air Openings in 105 Buildings

Following a preliminary investigation of the magnitude of the problem, detailed design has been requested for sealing major openings in the center section of the 105 Buildings. The objective is to confine vapors and gases in the center section sufficiently to permit safe shutdown and evacuation in the event of a major accident which might release large amounts of radioactivity. The principal items involved are doors, ventilating ducts, and louvers.
SAVANNAH RIVER PLANT
SEPARATIONS PLANTS - 200 AREA

SOLVENT EXTRACTION PLANTS

1. 200-F Area - Production

At current feed rates, difficulties have been encountered with increased losses, organic entrainment, and evaporator foaming. Each of these problems is receiving detailed attention to firm present rates and to explore higher throughput.

2. 221-F "A" Line - Increased Capacity

Recent time cycle studies of hydrate evaporator and denitrator operation have shown the inadequacy of the existing equipment to meet currently predicted operating rates in the separations plants.

The Engineering Department has been requested to install three additional denitrators and two hydrate evaporators to ensure the ability to handle H Area output as it comes into production. Auxiliary equipment will be examined for its adequacy. To provide scheduling flexibility, a new storage tank for hydrate evaporator product will be installed and consideration is being given to continuous operation of the hydrate evaporators. Design of the new additions and procurement of long delivery items was started upon receipt of an emergency AEC authorization for $140,000.

Preliminary equipment arrangements have been reviewed. Installation of the new equipment is being organized on a priority basis so that those components most urgently needed will be installed first.

3. 241-H Building - Additional Waste Storage Tanks

As reported last month, additional waste storage will be required in the third quarter of 1956. Design for the storage is proceeding and as presently visualized, will consist of four (4) one million gallon tanks serviced by a waste pumping facility.

4. 200-H Area - Pre-Startup Status

Vessel calibration is essentially complete. Water flushing of some equipment has started.

5. 211-H Building - Office Space

The lack of office space for 211-H supervision has been recognized and is being corrected by adding a 10' x 28' extension...
to the east side of the 211 control house. This was not needed in F Area because the A-line facility provided the required space.

6. **221-F Building "A" Line, 211-F and H Buildings - Air Cooling**

Approval has been given for air cooling the instrument control room and adjacent offices in the A-line facility. Air cooling will also be provided for the 211-F and H control house.

7. **221-F Building "A" Line - Produce Shipping Container**

The scope of work for conversion of the shipping facility to handling oxide shipments in 5-ton containers has been given to the Engineering Estimating Section for an order-of-magnitude estimate. It is anticipated that this will be available for review March 15.

8. **281-5F Building - Segregated Cooling Water Delaying Basin**

Tests have shown that the use of compressed air to mildly agitate the water as it flows through the segregated water delaying basin reduces temperature stratification to a negligible amount so adequate delay time is obtained. Design is proceeding, and a system for supplying approximately 25 scfm of air will be installed.

9. **221-H Building - Sampling of 2A Mixer-Settler for Criticality Control**

Standpipes are being added to the fourth and fifth settling stages of the 2A bank. The standpipe at stage 4 is to be used for monitoring and the one at stage 5 is to be used for sampling. Both standpipes are to be tied into the mixer-settler vent line.

The standpipes installed earlier to permit specific gravity determination at the ninth stage of all 221-H mixer-settlers also are to be tied into the mixer-settler vent line.

10. **221-F and H Buildings - Additional Service Elevator**

Design was requested to issue a "P" Work Order to cover installation of the additional elevator in the existing hoistway shaft at the north end of the building. Design, procurement, and installation will take approximately five months after approval of the "P" Work Order.

The proposed 15,000 pound capacity elevator will service all floors and have a platform of nine feet two inches by nine feet nine inches. An access and unloading dock just north of the hoistway shaft is required.
11. **221-F and H Building - Caustic Scrubber**

The vibration defects of the circulating pumps have been corrected. The caustic scrubber performance test that is being carried out in 221-H hot canyon should be completed by the middle of March. At this time the details of the 221-F installation can be decided upon.

12. **200-F Area - Cooling Water System**

Preliminary plant operating data indicate that the present cooling water system (3 towers, three 5,000 gpm pumps and 1 spare) should be adequate for 4-batch operation.

13. **221-F and H Buildings - Continuous Solvent Feed to the Mixer-Settlers**

The Engineering Department has been requested to install continuous solvent feed from the cold feed area to the mixer-settlers in the F Area as is being done in H. This eliminates the need for the third level tanks with their attendant radiation hazard.

14. **221-F and H Buildings "A" Line - Continuous 1EU Evaporator**

All design work for the H Area continuous evaporator is now complete. The F Area design will be sufficiently complete and equipment has been expedited to have the new evaporator feed tank in operation by May 15, thus releasing the present feed tank for its intended use of receiving concentrated material from H Area.

Since the supply of condensate in F Area is inadequate when the general purpose evaporators are not in use, the Engineering Department has been requested to install equipment to utilize condensate from the continuous 1EU evaporator.

15. **221-H Building - Cold Laboratory**

A scope of work, cost estimate, and equipment layout have been received from the Engineering Department for the cold laboratory installation in the feed preparation area of Building 221-H. All laboratory furniture and equipment is to be furnished from plant excess or by the plant laboratory group. The major cost items are therefore the ventilation and services and a hoist for bringing samples from the ground level.

16. **221-H Building - Process Modifications**

Operating experience in F Area indicates the need for continuous decanters to remove entrained organic in aqueous streams, more holding capacity between the major operating steps in the canyon and the desirability of continuously washing used solvent.
The Engineering Department has therefore been requested to prepare designs for:

1. Installing continuous two-stage warm solvent washing while retaining the existing batch washing features as back-up. Provision will be made for the future use of pumps rather than jets for continuous organic transfer.

2. Modifying two tanks for the future installation of continuous washers and pumps in the hot solvent system.

3. Installing continuous decanters in place of the 1EU, 1CU, 1AW and 2BP run tanks.

4. Installing a continuous decanter as an additional vessel in the low activity waste evaporator feed system.

5. Providing additional 2BP holding capacity.

6. Providing a feed tank for the high activity waste evaporator.

7. Installing larger vessels in the 1AF and 1DF feed systems for use as mixer-settler feed tanks only. These tanks would replace one of the combination feed-adjustment tanks used in each of these systems.
SAVANNAH RIVER PLANT
REACTOR FUELS FABRICATION - 300 AREA

GENERAL

1. U-Al Production

Preliminary evaluations of Oak Ridge U-Al production received recently have shown improved dimensional and surface quality as well as slightly higher reactivity, as compared to the original slugs. At month's end 4,500 of these new slugs had been successfully canned by hot pressing. Still under study, however, are U-Al slug specifications, particularly as related to impurities.

2. U-Al Canning

Sylvania has hot pressed to date a total of 25,598 slugs, of which 24,586 or 96.0% have met Sylvania's inspection. This is a 0.6% increase in over-all yield as compared with last month.

Sylvania is now designing increased production facilities adaptable to both U-Al and thorium hot-press canning. It is anticipated that these facilities will provide sufficient capacity for canning 335,000 slugs by June 30, 1956.

3. Thorium Production

A review of the production of thorium slugs was held with Fernald during the month and it was agreed that all phases of production are on schedule. Actual slug production at Fernald started again on February 27 with indications that the production rate of machined slugs may average 325 pieces per day. (Fernald's present distilled derby to acceptable bare slug yield is 30%.)

4. Thorium Canning

During the month, Sylvania hot-press canned the initial batch of thorium slugs made by the arc melted-extruded process. Of the 1310 bare slugs produced by Fernald, 1094 were successfully canned and shipped to SRL for cap welding and further evaluation. About 954 of these assemblies are available for 105-R tests.

Major processing improvements eliminated the weld area black spots which resulted in increased welding yields. This improvement in weld quality is probably related to: (1) greater care toward elimination of the MoS2 lubricant from entrapment during assembly, and (2) the better quality bare slugs (less porosity) which afford less chance for cutting oils and cleaning solutions to be absorbed and subsequently vaporized during the hot pressing.
Sylvania is now developing a method of hot-press canning the Mark IV thorium slug. Major consideration is the minimum thickness of aluminum can wall permissible with the larger cross section of the low thermal expansion core material.

5. **Irradiated U-Al**

Six hundred seventy-six canned U-Al slugs were loaned to ORNL for studies relating to criticality of discharged assembly shipments.

6. **Experimental Facilities - Pneumatic Pressing of Extended Surface Elements**

As of the end of February, design is about 90% complete for the autoclave installations. Piping and the interim autoclave headplug drawings remain to be issued in final form. All equipment has been ordered except the head plugs. Building foundations and side walls are in place and installation of the roof is in progress.

Material for ERL creep tests has been received and fabrication of the small test autoclaves is currently under way.

**BUILDING 305-M - TEST PILE**

1. **Nuclear Test Gauge**

Installation of the NTG was completed during the month. Twenty-four bare U-Al slugs having varying U content were obtained from Oak Ridge and used for calibrating and testing the NTG.

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

1. **Canning Line**

Activity during the month was related to the following Projects:

a. The installation of the spare induction furnace as a replacement for the B3 resistance type bronze unit has been approved and the installation is scheduled for completion in less than two months.

b. Revisions to the "Semi-Works Canning Line" Project eliminated the third furnace so that the facility as now approved will be suitable for either alpha canning (with certain minor equipment additions), or use in recovering tin from the current triple dip procedure.

c. Specifications for the installation of four new induction furnaces as replacements for the AlSi resistance type canning units were firmed up during the month and a Project has been prepared.
SAVANNAH RIVER PLANT
HEAVY WATER - 400 AREA

E-PROCESS

Deuterium Production

A scope-of-work for 15% expansion of the 400-D Area deuterium production facilities has been transmitted to the Engineering Department. The Design Division was requested to prepare a project estimate for installation of the required additional equipment in Building 421-1D.
SAVANNAH RIVER PLANT

UTILITIES AND GENERAL SERVICES

ADMINISTRATIVE, TECHNICAL AND GENERAL SERVICES

The 681-3G Pump House was taken out of service on a scheduled basis February 19, to check for the tensile stress level in the 66-inch discharge header. The check was prompted by an earlier failure of the 683-1G header. One flange of the header was unbolting and the resulting gap between the flanges was found to be 0.284 inch. The header was jacked in compression an additional 0.085 inch and a 1/8-inch steel filler and an additional 1/8 inch gasket were inserted. This placed the header at zero longitudinal stress at 59°F, thereby providing a satisfactory stress condition throughout the entire water temperature range. The 681-1G Pump House was similarly corrected in December 1954.

A meeting was held with SRP Works Engineering and Accounting Department personnel to discuss progress to date on the revisions to Project Procedure WE-4 and to obtain agreement on format and the extent of details to be included.

Additional funds in the amount of $30,000 (total now $55,000) were authorized by AEC for the design work required by the military program.

A report covering specifications, maps and drawings for Manufacturing Building 232-H was prepared and forwarded to AEC in accordance with their request.

A review was made of the existing arrangement for process waste disposal from the 211-F and -H Buildings and the Engineering Department has been requested to provide facilities for rerouting the drainage of this waste from Upper Three Runs to Four Mile Creek. In F Area, this will be accomplished by the installation of an 18 inch vitrified, acid-proof sewer terminating south of the area. In H Area, the present 221 building sewer will be tied into the existing 232-H sewer through an 18 inch vitrified, acid-proof sewer.

The following Projects and "P" Work Orders were authorized during the month.

S8-2012 - Platform and Valve Handle Extensions, Bldgs. 411, 412, 413-D, $6,150
S8-2016 - Replace Resistance Furnace B-3, Bldg. 313-M, $18,300
S9-1004 - Replacement of Sedans, $49,000
S9-1005 - Purchase Ska Paks - Buildings 411, 412, 413-D, $32,800
S9-1006 - Purchase Stainless Steel Drums, Bldg. 421-D, $70,000
"P" Work Order 6006-H, Power Facilities Increase, 200-H Area, $1,530,000. A final decision has been made that the new deep well and associated piping included in the "P" Work Order will not be required and they will be deleted from the facilities to be installed.

Project S8-1013 - Additional Scott Air-Paks for Bldgs. 411, 412, 413-D, $47,000, was approved and forwarded to AEC for authorization.

200 Area Utilities

A meeting was held with Design on February 22 to select the new 60,000 #/hr boiler for the 200-H Area power facilities expansion. A Riley boiler of the same basic dimensions as the existing Combustion Engineering boilers was selected. This decision was based on lower initial cost, higher efficiency, and improved stoker dependability.

400 Area Utilities

The No. 1 boiler in the 484-D Power House was returned to service on February 3 after completion of its annual overhaul and the installation of the new sootblowers. The No. 2 boiler was taken out of service on February 6 for this same work. Work will commence on the remaining two boilers as they become available during scheduled outage.