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MONTHLY REPORT – PROCESS SECTION

MANUFACTURING DIVISION

JANUARY 1955

[redacted]

February 15, 1955

E. I. du Pont de Nemours & Co. (Inc.)
Explosives Department - Atomic Energy Division
Wilmington, Delaware

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MONTHLY REPORT - PROCESS SECTION - MANUFACTURING DIVISION

JANUARY 1955

SAVANNAH RIVER PLANT
HEAVY WATER - 400 AREA

E-PROCESS

Deuterium Production

The AEC Savannah River Operations Office has requested that an authorization request be initiated for provision of an additional 15% reserve deuterium capacity in the 400 Area. An evaluation is currently being made as to whether Building 421-1D or Building 421-2D should be expanded.

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SAVANNAH RIVER PLANT

100 AREA - REACTORS

ASSEMBLY AREA

1. Quatrefoil Design

The final design of quatrefoil top fitting to prevent cross-leakage among the four channels will comprise 4-3/4" long aluminum sleeves welded in place. Four reactor charges are currently being fabricated that incorporate aluminum sleeves for improved flow monitoring. These charges are as follows:

K-2 - Blind Bottom Fitting - 4-3/4" long aluminum sleeves
P-5 - Flow Splitter - 4-3/4" long aluminum sleeves
R-5 - Flow Splitter - 2-1/2" long aluminum sleeves
C-1 - Blind Bottom Fitting - 2-1/2" long aluminum sleeves

The two charges with shorter sleeves resulted from preliminary testing that indicated some erosion at the bottom end of the longer sleeves. Subsequent tests have not confirmed this effect.

Some difficulty was experienced in fitting the piston assemblies into the first charge of quatrefoils with welded-in sleeves. This was traced to faulty alignment between the piston stem and the perforated can of one vendor's product only. Changes in the specifications have been made to assure freeness of piston fit.

2. Quatrefoil Procurement

A total of 856 finished quatrefoils were produced by Alcoa during the month of January. Of these, 431 were processed twice; i.e., cross-flow sleeves added after fabrication of the weldment. Other reasons for low production compared with the desired 1500 per month were shortages of cross-flow sleeves and of extrusions of proper length.

Approximately 2500 quatrefoil weldments currently at SRP will be sent back to Alcoa for addition of aluminum cross-flow sleeves in the top section. These weldments have the old style 8/12 and 0/8 bottom fittings which will not be replaced by newer design fittings because of the high cost of reworking. Experience to date does not justify this additional expenditure at current power levels.

3. Monorail System for Component Handling

All orders have been placed and deliveries have begun for revision of the component handling systems of all five areas. The

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revisions include: longer turning radii in the most frequently used trackage; turntables to replace switches where hangers are directed to final storage; electrically powered pushers wherever hangers must be moved in a backward direction; a powered transfer bridge in the final storage; new operating platforms at the inspection and transfer point; and a completely redesigned presentation conveyor. Of this last item, the conveyor installation in Building 105-C has been completed, tested, and all details proven before fabrication of conveyors for other areas.

CHARGE AND DISCHARGE MACHINES

1. Improved Cable Conveyor

Because of excessive loss of operating hours on the C and D machines, a program for improvement of the X-direction cable conveyor has been instituted through trial of a number of alternatives. On this conveyor the power and control cables are carried through a 180° turn. The use of deep groove sheaves in place of a drum at the reversal point has been tested and found successful, but because of its high cost, simpler means are being tested. A roller type comb to space the cables on the drum has also been successful. Spacer fins on the conveyor rollers are being fabricated for one conveyor and will be tested in the near future. The use of a tensioning device to keep cables taut has been abandoned as an alignment device, but it does serve the important function of insuring correct tension to assist the functioning of other alignment devices. The final selection of an alignment device will involve considerations of cost as well as of performance.

REACTOR CONTROL

1. Latch Hoist Safety Brake

Following tests conducted in November, components of the safety brake for the latch hoist were installed in Building 105-C. This installation has been completed and was placed in operation on January 15, 1955. The design of the brake is now being reviewed to effect a reduction in loss of operating hours when the installation is made in an operating building.

2. Transducer By-pass Switch

Flow monitoring circuits are arranged in such a way that test work or checking of the transducer is only possible during a nuclear shut-down of the reactor. A by-pass switch has been designed at the Plant and installed in Building 105-C to permit switching to a holding circuit during test or adjustment of the transducer. This switch is of the jack-plug type to by-pass the alarm circuit while the transducer is being tested.

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REACTOR COMPLEX

1. Thermal Shields

The replacement of staybolts in tanks 1, 2 and 3 of the C thermal shield has been completed and hydrostatic testing is the next step in the procedure. The top row of staybolts has been omitted in tanks 1 and 2, since these bolts are not needed for lateral support of the tank inner and outer walls. They, however, would have been highly stressed by virtue of the differential thermal expansion of the inner and outer walls.

During hydrostatic testing, strain gages and dial gages will be used to determine the stresses developed in the tank due to hydrostatic pressure. Additional thermocouples and motion measurement facilities are to be installed prior to pouring the concrete shield. These will be used to determine the stresses due to temperature during operation.

The concrete shielding will be replaced by pumping concrete of the original non-shrink mix into the forms to a level 18 inches below the bottom of the zero level slab. It is planned to fill the last 18 inches with a grout of the same mix as the original, but with finer aggregate. Vent pipes will be inserted through the forms to carry off air from the high points under the zero level slab. Prototype test pourings are being made to determine the adequacy of the proposed concrete replacement method.

2. Main Pumps - Protection Against Reverse Rotation

Two Formsprag clutches having a fail-safe torque arm and protection against bearing failure have been under test in the Con-Struction Central Shops for over a month. One unit has been running almost continuously with no sign of trouble. The other unit, after a short period of running normally, has been exposed to a series of abuses. The oil supply was stopped for a week, the oil was drained and the clutch run for a week, and then the stationary race was heated to develop a temperature difference between the bearing races to reduce the clearance. No troubles were experienced. The clutch will now have particles of foreign matter introduced into it to try to induce bearing failure.

Three modified Formsprag clutch assemblies have been installed in Building 105-C for test during the dummy runs. On the basis of the success to date it is planned to have all six pumps in the building equipped with clutches before start-up.

3. Increased Moderator Circulation

Preliminary specifications for a moderator pump with nominal 25,000 GPM capacity have been sent to pump manufacturers for their comments. It is planned that they will be discussed

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with the manufacturers, after which final specifications will be prepared, quotations will be requested, and an order placed for a prototype.

PURIFICATION

1. Moderator Purity - R Area

The unidentified source of isotopic dilution in 105-R had in early January reduced the moderator concentration to 99.33%. On January 7, after successful trial operation, water cooling of the blanket gas blower seals was discontinued. Previous tests had indicated small but erratic leakage of water into the blanket gas at the seals. By January 22 the concentration had increased to about 99.39%, which is the expected rate of improvement with no in-leakage. However, there has been little improvement since then, so that in-leakage is still suspected. Plant investigation is continuing, with the shield cooling system receiving major emphasis.

DISASSEMBLY

1. LM Shipment

The design of tote box or bucket for storing and shipping exposed LM slugs has been approved with minor modifications. Prototype buckets have been fabricated and shipped to ORNL for criticality studies of cask design.

2. Q-Foil Dumping Machines

A Q-foil inverter like the one in L Area has been installed in 105-R, and is expected to be in operation in February. Similar units are now planned for K and C, and the prototype will remain in P.

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SAVANNAH RIVER PLANT

SEPARATIONS PLANTS - 200 AREA

SOLVENT EXTRACTION PLANTS

1. 200-F Area - Production

The average operating rate during the month of January was 2.4 batches per day or approximately 80% of design. As operational difficulties were overcome, the operating rate during the course of the month was incrementally increased until it was averaging 130% of design. In general, product quality and losses experienced have been satisfactory.

2. 241-H Building - Additional Waste Storage Tanks

At the currently predicted operating rates for H Area, additional waste storage will be required in the third quarter of 1956. Design studies have shown that four (4) one million gallon tanks serviced by a waste pumping facility will provide the most satisfactory and economical solution to this problem. The tanks, as visualized, will be 85' in diameter and 27' high, installed between grade and the underground water table. At this elevation, gravity filling of the tanks is not possible and a pumping station is required. Design of these new facilities is proceeding.

3. 221-F Building A-Line - Equipment Corrosion

Operating experience with regard to iron contamination during processing indicates corrosion of hydrate evaporator coils is taking place at a higher rate than design predicted. Acid content of the aqueous uranyl nitrate, evaporator temperature, and residence time are variables affecting the rate of corrosion.

The Engineering Department has been requested to study the suitability of the hydrate evaporator system for vacuum operation. This would permit reduced operating temperatures. If the basic components of the evaporator system are suitable, a scheme for operating in this fashion will be prepared. Acid content of the aqueous uranyl nitrate and evaporator residence time will be adjusted within the limits of the process requirements.

4. 200-H Area - Pre-Startup Status

Calibration of equipment has started in all areas except B-Line and cold feed preparation, with the third level complete, hot canyon 6% complete, warm canyon 44% complete, and 211 and outside areas 54% complete.

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SOLVENT EXTRACTION PLANTS (CONTINUED)

5. 221-F Building - Heat Load Study

At the recommendation of the Engineering Department a canyon heat load test has been conducted. This test was recommended because it is felt that there is reasonable doubt concerning the adequacy of the refrigeration equipment to meet our summer ventilation requirements. Data obtained will also have value in demonstrating the adequacy of the 221-H refrigeration system. The information gathered has not yet been evaluated.

6. 221-H Building - 1DS Metering System

It is now planned to replace the spare circulating pumps in the new 1DS metering system with canned rotor pumps to permit a performance evaluation of this type of pump which eliminates shaft seal problems. They will be placed in continuous service soon after startup and torn down for inspection after a suitable operating period.

7. 221-H Building - Head End Ruthenium Trap

A ruthenium trap identical to the one installed in 221-F is being made up for 221-H. This is a 6' x 6' converted cell tank equipped with a stainless steel mesh pack. Other designs not requiring canyon space appeared unattractive.

8. 221-F & H Buildings - Caustic Scrubbers

These units are ready for installation except for the caustic recirculation pumps which required alterations to reduce vibration. Heavier, shorter shafts and new balanced impeller castings are to be installed. A 100-hour run-in test will be made on the altered pumps which were promised for delivery by February 1.

It is planned to install and test the complete caustic scrubber system in 221-H Building before making the installation in 221-F. This test cannot be made in 717 Mock-up Building because the crane capacity is insufficient to handle the packed column.

9. 200-F - Steam Utilities

The average steam consumption rate to date has been approximately as predicted. The peak rate has been lower. The data includes periods of operation at design capacity. An additional boiler will be required at throughputs above six batches.

10. 200 Area - Extra Machinery

The extra machinery requirements are being reviewed.

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SOLVENT EXTRACTION PLANTS (CONTINUED)

11. 221-F and H Buildings - Continuous Solvent Recovery

A flow diagram has been proposed using continuous solvent washing agitators in the 1EW run and hold tanks which will permit use of these tanks for either their normal function or as a two-stage continuous washer. Such a system requires internal modifications to the two tanks in which the special agitators are installed but permits the existing batch washing system to function as originally designed.

Engineering is presently preparing a scope of work for such a process and studying the timing and procurement. Tank modifications are being planned such that pumps may be added to the system at a later date to eliminate the undesirable effects of jet dilution in the continuous washer.

12. 221-H Building - Increased Capacity

All design is complete for the canyon modifications required to attain a six-batch per day rate.

13. 221-F Building - Increased Capacity

Scopes of work have been received from the Engineering Department for eight and ten-batch per day canyon capacities. Studies are in progress to define the necessary A-and B-Line additions required to accommodate the higher canyon throughputs. Comparisons of the F and H Areas are being made to determine what ultimate capacity should be provided for each area.

14. 221-H Building - Cold Laboratory

The Engineering Department has been requested to design a cold laboratory in the cold feed preparation area of Building 221-H. By handling the samples from Building 211-H, A-Line, B-Line and the cold feed area, this laboratory is expected to reduce the transportation of H Area samples and the number to be processed in the F Area laboratory.

15. 221-F and H Buildings A-Line - Continuous 1EU Evaporator

The decision has been made to complete the continuous evaporator installation first in the H Area in order to release the batch evaporator for mock-up and installation in the canyon before hot startup. H Area continuous evaporator is now scheduled for completion by April 15 with the F Area to follow by about one month.

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221-F and H Buildings A-Line - Continuous 1EU Evaporator (Cont'd)

The corrosion allowance on the continuous evaporator has been increased from one-sixteenth to one-eighth inch in view of the indicated high corrosion experience in the hydrate evaporators. This change involves only a minor cost increase and will permit the unit to withstand full vacuum, eliminating the need for vacuum protection. Provisions will be made for washing the demister screen in the evaporator separator and for detecting and removing organic in the feed tank.

16. 221-H Building - Continuous Solvent Feed to the Mixer-Settlers

Design has been requested to install continuous solvent feed headers in the second level center section to eliminate storing large quantities of contaminated solvent for the mixer-settlers in the third level feed gallery tanks. The original batch system will be retained but separated by physical disconnects from the continuous system. Integrating meters will be provided on each branch line to the canyon for checking the existing flow control devices. The use of a canned rotor type pump for feeding this system is being investigated as a means of eliminating the separate pump tank and long shaft submerged pump.

17. 221-F and H Buildings - B-Line

A mock-up of the prototype Hynec (hypodermic needle, evacuated container) sampler was demonstrated by Works Technical personnel and operation was encouraging. An improved model will be fabricated and installed on a process vessel, probably the Peroxide Catch Tank in 221-F "B" line, to determine its reliability when used in conjunction with a crank-up type sampler. Safer operation is expected since transfer from a pipette to a sample bottle in the process room will not be required.

18. 221-H Building - B-Line

A Design Data Report for the revised 221-H "B" line has been prepared and will be issued next month.

TRITIUM PROCESSING FACILITIES

1. 232-F Building

Volume calibration of the process equipment is now better than 50 per cent complete. Heating tests have been successfully completed on the sorbers and diffusers and are now in progress on the decomposer.

The thermal diffusion column electrical controls have cycled badly using a dummy load in place of the actual column. Adjustments to the system are in progress and appear to have improved

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232-F Building (Continued)

the control to the extent that the system will be operable. The electrical resistance of the top half of the heater wire in the column now closely approaches the calculated value. Resistance through the bottom half of the wire continues to be variable and of the order of five times theoretical. This may result in the column having to be disassembled since this resistance must be accurately known to give proper column temperature control.

The furnace handling equipment in the south room has been operated for a week and found adequate. The north furnace room equipment will now be assembled without further modification.

THORIUM PROCESSING FACILITIES

1. Thorium Reduction Pilot Plant

A project has been submitted for authorization of funds to erect a permanent pilot plant building in the TNX area for demonstration of electrolytic reduction of thorium nitrate. Funds to provide the process facilities are being requested by Indirect Repair Order. Goal completion of the building and services is April 1955. Detailed design is also under way on those areas of the pilot plant where technical information is relatively firm.

2. Thorex

A description of the work required to convert the Purex processing equipment to handle thorium has been prepared by the Engineering Department. This scope of work has been transmitted to the Estimating Section for preparation of an order-of-magnitude estimate.

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SAVANNAH RIVER PLANT

METALS FABRICATION - 300 AREA

GENERAL

1. U-Al Production

The two U-Al development programs consisting of 200 cores each have been completed by Carbide. Purpose of these programs is to evaluate new slug size (thus eliminating swaging) and to evaluate the effects on reactivity by using different grades of high purity aluminum in the alloy. At month's end, 341 of these cores had been successfully canned by hot pressing.

Shipments of new alloy cores from Carbide have not materialized as anticipated, principally because of difficulties in meeting the proposed chemical limitations on impurities.

2. U-Al Canning

Sylvania has hot pressed to date a total of 20,312 slugs of which 19,386 or 95.4% have met Sylvania's inspection. This is a 0.4% increase in over-all yield as compared with last month.

A proposal from Sylvania to AEC-SROO to increase Contract AT(30-1)1293, the present LMF program, has been approved. This increase covers the installation of increased capacity equipment and the hot-press canning of 335,000 units, either U-Al and/or thorium by June 30, 1956.

3. Thorium Production

Production of thorium slugs made by the arc melted-extruded process was started during the month. A cursory examination of the first batch of extruded rod showed improved metal structure (less porosity) and a decrease in the hardness, both of which are favorable for the hot-press canning process. The indications of progress in the extrusion of thorium billets under FMPC direction has curtailed further planning by the Plant to make ready for extrusion there.

4. Thorium Canning

A final evaluation of the 1166 hot-press canned and 224 AlSi canned thorium slugs showed that only 203 assemblies were acceptable if both clean welds and good metal structure were considered. Principal cause for weld rejects was the presence of carbon particles of varying size; the exact relationship of these particles to the slug and the canning process has not yet been established. An extension of autoclave tests may justify using additional assemblies.

[redacted]

Thorium Canning (Continued)

Development of a hot-pressing process for canning the Mark IV thorium slug is currently under way at Sylvania. Approximately 100 thorium slugs made from chemically rejected FMPC material will be used in this development program.

Sylvania Contract AT(30-1) Gen. 366 has been extended to include the hot-press canning of 200 slugs made from powdered thorium metal to be used for evaluation at SRP.

5. Experimental Facilities - Pneumatic Pressing of Extended Surface Elements

Installation of the two autoclave pits and backfilling of the excavation have been completed. Current Construction schedules call for completion of the building structure during February. Completion of the ERL autoclave installation by May 1 and completion of the full length autoclave installation by May 15 are forecast.

Difficulties encountered in design of the full length autoclave head have extended the design time for this unit beyond original expectations. The autoclave is the limiting delivery item; it may yet delay completion of the interim unit beyond the estimated May 15 date.

BUILDING 313-M - URANIUM FABRICATION BUILDING

1. Uranium Canning Line

Activity during the month was related to the use of induction canning furnaces as replacements for several of the existing resistance type units. A Project has been approved to replace the present B3 bronze furnace with the surplus induction unit originally obtained from Oak Ridge. Also, firm specifications have been determined for the proposed four new AlSi induction furnaces and a Project is being prepared.

BUILDING 320-M - PRODUCER ALLOY BUILDING

1. Draw Bench

The unused 5,000 lb. capacity draw bench originally intended for the LM rod assembly programs was shipped to Pratt and Whitney's Fox Project as a result of their need for a unit of this design.

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SAVANNAH RIVER PLANT

UTILITIES AND GENERAL SERVICES

ADMINISTRATIVE, TECHNICAL AND GENERAL SERVICES

The supplementary contract with the South Carolina Electric and Gas Co. providing for 20,000 KW additional power became effective January 1, 1955. Fourteen thousand (14,000) KW demand of this amount was scheduled during the month. This was in addition to the 30,000 KW firm power obtained with the first contract.

The third quarterly progress report on Engineering Studies being carried on under AEC directives was submitted to AEC.

A Project Status Report was issued covering all projects authorized to date for Savannah River Plant and for projects authorized during Calendar Year 1954 at the Dana Plant.

The following projects were authorized during the month:

S8-2008, Part II, Open Grating Floor at 20'-0" Level and Ventilating Fans in the High Bay Area, Bldg. 679-G, $2,500 reduction. Total now $13,500.

S8-2015, Modification of Pump Houses for Lower River Level, Bldgs. 681-1G and 681-5G, $11,500.

S9-1004, Replacement of Sedans, $49,000.

S9-1005, Purchase Ska-Paks, Bldg. 411, 412, and 413-D, $32,800.

C-61 (Dana), Additional Gas Mask Equipment, $37,200.

The following projects were approved and forwarded to the Plant for transmittal to AEC for authorization:

S8-2, Part II, Allocation of Funds for Small Projects, SRP, $300,000 increase. Estimated total now $550,000.

S8-1015, Pilot Plant Building 677-G, $425,000.

S9-1006, Purchase Stainless Steel Drums, Bldg. 421-D, $70,000.

Final Acceptance Papers (with exceptions) for the 100-R, P, L Areas were approved and returned to the Engineering Department for transmittal to the Plant for signature.

The Design Division has an authorization for preliminary design work required in the proposed installation of Military facilities at the Savannah River Plant.

[redacted]

The following "P" Work Orders were authorized during the month:

6002-C, Supplementary Safety System, Bldg. 105-C, $110,000.

6275-G, Bridges and Culverts for Secondary Roads, $47,000.

"P" Work Order 6006-H, Increased Power Facilities, 200-H Area, $1,530,000, was approved and forwarded to AEC for authorization. Engineering was requested to proceed with procurement of long-term delivery equipment.

Project S8-1010, Additional Soot Blowers, Bldg. 484-D, $260,000, previously authorized by AEC for design and procurement only, was authorized for the installation of the soot blowers in all four boilers. Authorization for remaining work, relating to the provision of a dry source of steam for the soot blowers, was withheld pending further study.

Direct Repair Order G-12006, Part I and II, Repair Water Damage at River Pump House, Bldg. 681-1G, $81,800, was authorized.

Indirect Repair Order X-15209, Temporary "88" Reduction Pilot Plant Facilities, Bldg. 677-G, $800,000, was approved and forwarded to the Plant for transmittal to AEC for authorization.

100 Area Utilities

As mentioned in the December report, a program has been established to replace the four and one-half inch chill tube in each of the 100 Area boilers with mechanical type grate seals. The function of the horizontal tube located at the rear of the furnace is to absorb the high furnace temperatures encountered at the rear of the boiler grate so as to thermally protect the lower 48-inch boiler drum. Failure of these tubes necessitated their replacement with a proven mechanical seal designed to provide the same kind of protection. During January, this work was completed on four of the eight identical 100 Area boilers. The remainder are scheduled for similar installations.

200 Area Utilities

At the request of the Engineering Department, a heat balance was run on the 221-F Building canyons in an effort to determine the adequacy of the refrigeration equipment provided for the 221-F and H ventilation systems. The data is currently under review.

400 Area Utilities

The re-worked generator rotor for the No. 1 7500 KW Westinghouse generator has been found to have a capacity of 7310 KW at rated design conditions. To avoid the expense and outage incurred in returning the rotor to the vendor for further alteration, the vendor has agreed to build sufficient extra capacity in the remaining rotor now in their shops to compensate for the small deficiency in this unit.

[redacted]

Installation of additional soot blowers in the No. 1 boiler started on January 15 and will continue until all four boilers will have had in turn these additional facilities installed. This should permit more sustained operation at loads substantially above name plate rating.

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