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Ceramics

March 8, 1954

Dr. John H. Roberson, Area Manager
U. S. Atomic Energy Commission
P. O. Box 66
Miamisburg, Ohio

Subject: Status of Work on Thermonuclear Component Fabrication

Dear Dr. Roberson:

Since our last report, January 15, 1954, several new facts have been discovered which lead to a reconsideration of the recovery phase of the project. Work is progressing according to schedule on the preparation and fabrication portions of the project.

Recovery

Following the course of action described in the memorandum of January 15, 1954, three request for directives have been submitted to you: electrolysis development facility, thermal column development facility, and Modification #2 of DAY-24 for a thermal column production facility.

	Date of Request	Estimated Completion Date	Estimated Cost
Electrolysis Dev. Fac.	2-8-54	2-28-55	$ 78,700
Thermal Column Dev. Fac.	1-28-54	12-31-54	95,500
Thermal Column Prod. Fac.	2-8-54	10-31-54	1,036,800

Study of cryogenic distillation as a recovery device was to be continued.

As of February 8, 1954 the feeling was that because of schedules that had to be met, the operating experience at other sites with thermal columns, and the lack of experience with any of the other methods, steps should be taken to get a thermal column installed as soon as possible. It was felt that continued study of thermal columns, electrolysis, and cryogenics would allow a choice to be made in time for the installation of a full scale recycle recovery unit. In the case of cryogenics the study has now progressed at such a rate and with such favorable results that it appears logical to expedite the installation of a low-temperature distillation unit for the first process recovery unit.

Two meetings have been held with R. B. Scott of the National Bureau of Standards Boulder Laboratory to discuss cryogenics. He expressed confidence in being able to design and fabricate the hydrogen refrigeration equipment and distillation equipment in a maximum of nine months. In addition, he would be able to train some of our Mound staff in the low-temperature techniques required to operate the installation efficiently. The fact that Mr. Scott, recommended to us by eminent men in the field, as the man best qualified to design a low-temperature distillation facility, showed such confidence in being able to design and fabricate the required facility has overcome many of the reservations previously associated with this method. His estimate of $64,000 for this work and equipment was considerably below other estimates of the cost of cryogenic equipment. We would engage the services of Mr. Scott for an additional year to assist in the development of modified stills of improved characteristics.

The recovery area consists basically of two areas. In one area the hydrogen isotopes are liberated from whatever compounds they are combined chemically and then separated from other gaseous elements. In the second area the hydrogen isotope is removed from the tritium by an isotope separation process. The first area, aside from the requirement of having the necessary capacity, could be used with any device or possibly several devices installed for isotope separation. Our request for directive Modification #2 of DAY-24 called for the installation of the auxiliary equipment for gas preparation and a thermal column for isotope separation. Because of the advantages which it offers the low-temperature distillation should be added as a second isotope-separating unit but using the same auxiliary gas preparing area. The thermal diffusion column would be installed as a standby unit and would be positioned to allow use of the auxiliary equipment installed as part of the cryogenic recovery process. To accomplish this goal a further modification of DAY-24 is being requested to cover the installation of the low-temperature distillation equipment.

The major point of difference between the two methods of isotope separation is the much larger capacity of the cryogenic unit. However, to achieve this high capacity it must have a large quantity of tritium in one container at a time. The maximum capacity of a single still would be fixed by the strategic value, by the monetary value and by the limitations on the quantity of tritium which, if liberated through the stack in a short period of time by a catastrophe, would cause residents adjacent to the plant to be exposed to an environment of tritium that would not cause a body burden greater than the maximum permissible level (10^{-4} μC). The health restriction above places the maximum still size at not greater than 500 cc of liquid whose composition is half tritium. The auxiliary equipment for the cryogenic installation would be sized to supply the equivalent of about 300 cc of liquid hydrogen isotopes per shift. A still having a capacity of 500 cc liquid hydrogen isotopes, but operated with not greater than 200 cc of liquid tritium per batch, should be able to handle the expected recovery and recycle load through 1957 on a one shift basis.

The cryogenic equipment, the auxiliary equipment, and the standby thermal column would all be placed in the 1-C area of the SW-Building. The thermal column would be mounted in a silo addition to the side of the building. The refrigeration equipment for the low-temperature distillation would be housed in a small building exterior to the SW-Building to remove the high pressure system from the area where tritium is being handled.

It is felt that installation of the cryogenic distillation equipment at this time will meet the needs for immediate recovery and at the same time provide an installation capable of handling a large portion of the anticipated recycle load without incurring additional expense or objectionable delays. After the equipment is installed and operating procedures established, it should be possible to process wastes or P-10 material from other sites by operating the auxiliary equipment and cryogenic equipment on a three shift basis.

Schedules

It appears that it may be possible to have the preparation and fabrication lines installed by October 10, 1954 and in full-scale operation by December 31, 1954. The low-temperature distillation recovery facility may possibly be installed by December 31, 1954, assuming a starting date of March, 1954.

Some work has begun on design of electrolysis equipment. The electrolysis development facility should be completed by February 28, 1955. The thermal diffusion development facility should be completed by December 31, 1954. Ability to meet these schedules will depend upon being able to proceed with contract work for the design and installation on a negotiated contract basis.

Very truly yours,

J. Burbage

Joseph J. Burbage
Director

DLT: glm

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