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20 February 1958

Mr. Lyall Johnson
Licensing Division
U. S. Atomic Energy Commission
Washington, D.C.

SUBJECT: Special Nuclear Materials License SNM-33

Dear Mr. Johnson:

This communication is a request for approval of a new production facility to produce uranium oxides for assays up to greater than 90% U^{235} content.

At the present time we have two production facilities licensed, one for unlimited assay material and the other up to 5%. In order to increase our production capacity and add to the flexibility of our operations, it appears desirable to design an additional plant for higher assay material.

The experience we have gained in more than a year's operation in our current facilities have been drawn upon substantially in designing this new facility and we believe many improvements, principally in the area of dust control, have been incorporated herein.

Basically, the process is identical to those previously licensed and involves hydrolysis of UF_6, precipitation with ammonia, filtration, followed by decomposition of the ammonium diuranate (ADU).

The hydrolysis operation and precipitation will be carried out in an especially designed hood and the hydrolysis equipment will consist of two units. One unit will be used for material up to approximately 7% U^{235} content. Safety control for assays up to 7% will be provided by securing the "limited safe" batch quantity of uranium for the particular assay in the 5" safe geometry cylinders from Oak Ridge. It should be pointed out at this time that this particular production line is designed for use with the 5" cylinders only. Up to approximately 5% U^{235} assay, a full 5" cylinder will contain less than the safe batch quantity and at 7% will be approximately 50% of capacity when filled with a safe batch. The second hydrolysis unit will be used for materials from approximately 7% up to 90% and is essentially a duplicate of the current high assay licensed facility. Safety control in this area will be accomplished by utilization of safe geometry equipment with a minimum spacing of 2 ft. edge to edge. The hydrolysis and precipitation will be accomplished in a 5" I.D. pipe reactor as in the case of the currently licensed facility.

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The filtering equipment will be pressure type filters of 5" I.D. Two filters are installed in parallel with a total capacity of 24 lbs. of wet ADU cake. The wet cake contains approximately 50% moisture so that the two filters completely loaded will contain a maximum of 9 lbs. of uranium. This quantity of uranium represents a safe batch up to approximately 12% assay. When operating the equipment at assays higher than 12%, one of the filters will be removed from the line so that nuclear safety will then be achieved by the safe geometry of the single 5" diameter filter.

Following filtration, the material will be dropped directly from the filter into 1-1/4" deep trays. These trays will then be directly introduced into driers followed by transfer to retorts for the decomposition of ADU and the production of UO_2.

The filtration, drying, and decomposition equipment are all housed in a single hood especially designed with low air flow to minimize dust generation. All equipment is spaced so that there is a minimum of 2 ft. between batches throughout the length of the hood. Following the final operation, the product in the trays will be passed through a small rotary grinder, also located inside the hood, and passed directly from the grinder into an approved shipping container when product is ceramic grade UO_2.

When the product to be produced is to be high fired crystalline UO_2, the product will pass through the above described route to a final package. This package will then be transferred to the high fired hood where the product will be loaded into 1" deep molybdenum trays and introduced into the high fired sintering furnace. Product from the furnaces will be returned to the same hood for grinding, screening, and packaging. The high fired hood design is essentially a duplicate of the hood currently licensed in our high assay production area.

In general, we have incorporated in this new design all the improvements that have been indicated through operation of similar equipment for approximately eighteen months. We believe that these improvements in design and operating technique will give us a plant which will have inherently lower material losses and will also achieve a greater degree of airborne dust control. In all cases, nuclear safety will be achieved either by using "limited safe" batches properly spaced one from the other, or "always safe" geometry considering that the uranium density of the product will not exceed 3.5 g U_{235}/cc for any compound in the process. The exhaust air from all hoods will pass through HSA filters to protect the surrounding area from airborne contamination.

We are currently preparing to submit this production line design for construction bids and expect to have the plant in operation sometime in May 1958. We are requesting, therefore, your early consideration of this application so as not to delay the actual production operations in this facility.

If we can be of further assistance to you in your consideration of this application, do not hesitate to call upon us.

Sincerely yours,

MALLINCKRODT CHEMICAL WORKS

W. M. Leaders
Technical Director
Special Metals Division

WML:dj

City of St. Louis)SS
State of Missouri)

Subscribed and sworn to before me this day of 1958

Notary Public