UNION CARBIDE

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REGULATORY FILE CY

STERLING FOREST
RESEARCH CENTER

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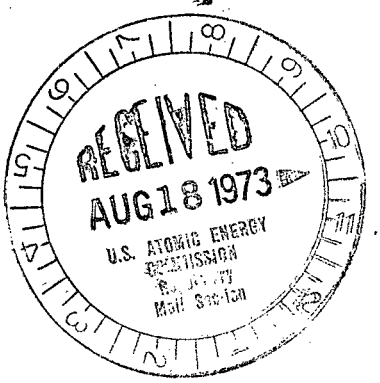

U. S. Atomic Energy Commission
Division of Materials Licensing
Fuel Fabrication & Transportation Branch
Washington, D. C. 20545

Attn: Mr. Ferman Stubblefield

Dear Ferman:

As you requested in our communications regarding our latest ammendment to our SNM license, I am writing this letter to give you some background information on the program in which we use the material under this license.

The largest market or application for radioisotopes, other than ^{60}Co and ^{137}Cs in teletherapy sources, is in nuclear medicine. Many radioisotopes are used as agents for diagnosis of deseased organs and to a lesser extent for therapy.

The most important isotope used in nuclear medicine today is ^{99m}Tc. It has very desirable nuclear properties for it to be used as a diagnostic medicine. Relatively large doses can be administered so that vivid scans or radiographs can be made without high exposure of the patient to radiation. The low gamma ray photon energy also affords easy columnation so a high degree of resolution can be obtained.

The technetium is made available to the hospitals or clinics either thru the Mo/Tc Generator or in the instant, ready to use form. The generator is a chromatographic column which is loaded with ^{99}Mo, and by passing saline thru this column the Tc is separated from the Mo. The instant form of ^{99m}Tc is delivered to the hospital in solution as pertechnetate ready for injection.

The only source of technetium is thru decay from its parent isotope of ^{99}Mo. Union Carbide used to produce ^{99}Mo by irradiating the naturally occurring target of Mo (as MoO_3) with thermal neutrons. We were the only producers of ^{99}Mo by this method for a couple of years in the mid 1960's. It has always been evident in the radiochemical business that when you have a good thing it doesn't stay that way for very long. There has always been an over abundance of isotope production facilities seeking ways to defray costs. Most of the radiochemical producers have not yet had the luxury of worrying about profit margins.

General Electric, who has a 50 MW test reactor at Valecitos, California, which can produce ^{99}Mo of much higher specific activity than our 5 MW reactor, thereby make a superior product for manufacturing the Mo/Tc generators, entered the market and promptly took the bulk of this business away from Union Carbide. In an effort to stay in this business, we investigated an alternate method of producing ^{99}Mo which had been developed at Brookhaven and Oak Ridge national laboratories. These processes involved separating ^{99}Mo from the fission products of ^{235}U. The initial investigation took place in 1967. The processes being used at these national laboratories were not considered compatible with the facilities available at the Union Carbide Sterling Forest site. Liquid waste management was deemed to be the most difficult problem connected with these processes. In addition, there seemed to be a yield difficiency that would require more development and the processing time was extremely long.

Since this was Union Carbide's only hope of remaining a serious competitor in the Radiochemical field, alternate processes were considered and in 1968 serious work was started to develop a new process which had more desirable characteristics for our facilities.

The production processes developed at the national laboratories utilized a Uranium/Aluminum target for irradiation. This target required that the Aluminum be dissolved along with the Uranium in order to make the fission products available for separation. If the target could be made so that only the Uranium had to be dissolved in order to put the fission products in solution, it would greatly reduce the volume of solution required to be handled in the separation process and ultimately reduce the volume of waste to be disposed of.

We solved this problem by developing a technique for electro-plating UO_2 on the inside surface of stainless steel tubing. This tubing, containing a uniform coating of UO_2 on the inside surface, is then made into an irradiation target and also a dissolution vessel for the UO_2 after the neutron irradiation has been completed.

There has been much work performed on the separation of ^{99}Mo from mixed fission products. We chose one which required a minimum processing time and was compatible with remote manapulations in a hot cell. I have enclosed a description of the irradiation procedure which is in the form of a hazards analysis. This is mainly to give you a better idea of the type of target we use. I have also enclosed a copy of the fission product separation process procedure.

In general we require 10 grams of ^{235}U to produce 60 curies of ^{99}Mo at calibration time. This amounts to approximately 270 curies at processing time. We are presently producing approximately 150 Cis/wk. at calibration time (540 curies at processing time). We expect that we will be producing approximately 500 Ci/wk. for sale within the next 12 months. The Union Carbide product has been received very well in the market place. If we can retain a good share of the market, we will be required to produce greater than 500 Cis/wk. within 2 years.

I hope this gives you the information you need for your work. If I can be of more help, please call me. The information in this letter is business confidential and therefore, I request that it be treated as proprietary information. Thank you again for your cooperation.

Very truly yours,

J. J. McGovern
Superintendent
Nuclear Operations

JJMcG:js
Enclosures

P. S. - I just reread my notes on our last telephone conversation and I see where you requested a written statement about double absolute filters in our exhaust ventilation system. It doesn't seem to fit in this letter, so I have enclosed a separate letter concerning these filters.