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TO UNCLASSIFIED

August 1, 1956

By Authority of

MEMORANDUM TO FILE

FROM: V. R. THAYER

TRIP REPORT - JULY 1956

ADD

2/9/89

A visit was made to the Hanford Plant July 11, 12, and 13; to the Radiation Laboratory, University of California, July 17; and to Los Alamos Scientific Laboratory, July 23 and 24.

HANFORD

Discussions at Hanford were arranged through C. A. Priode. General comments by Priode include the following: (1) Hanford is making some hollow slugs for experimental irradiation; (2) Limiting condition for reactor operation is 105°C tube temperature.

Research on heavy isotope separation was discussed with W. H. Reas and E. E. Voiland. Two methods of separation are showing some promise. These are (1) liquid thermal diffusion, and (2) electro migration in fused salt.

The "cold" separations semi-works was inspected under the guidance of R. E. Smith and Robert Geier. Items noted include:

1. A multi-pole motor used for agitator drive, the purpose being to eliminate the need for gear reducers.
2. A continuous calciner for uranium nitrate. This unit was used to develop the commercial calciners now being installed in the "U" Plant.

The Purex Plant was inspected under guidance of E. R. Irish, G. J. Raab and G. L. O'Neill. The plant was shut down at the time of inspection in order to flush out and recover material which has been irradiated to a low level, preparatory to running a campaign on

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material irradiated at a high level. Improved decontamination of plutonium has recently been achieved in the Purex Plant by using a low acid flowsheet in the third cycle, arranging the pulse columns so that the liquid interface is at the end opposite to the product outlet, and using a separate solvent system on the third cycle. A solid compound which has caused plugging of continuous evaporators was identified as a complex of iron and TBP. It was found that this material could be removed by flushing with a 5% water solution of NaOH. The large continuous evaporators have recently been operated by controlling feed and steam flows to produce a calculated rate of accumulation of concentrated residue in the receiving tanks. A monitoring device is being routinely used for alpha radiation. This device, which operates by collecting a few drops of solution on aluminum foil which is then dried and counted, is set up to operate automatically.

A tour of the "U" Plant was made with M. J. Szulinski. New continuous calciners are being installed in this plant. There are six of the units, each 14 feet long by 26 inches wide, electrically heated. The body of the unit is a level trough with round bottom, equipped with rotating scraper blades. The feed is 100% UNH. The expected capacity of each unit is six tons of UO_3 per day. Hanford is already using continuous vertical tube evaporators for concentrating uranium nitrate solution up to 100% UNH. General discussions on the Purex process were held with R. B. Richards, O. F. Hill and W. M. Harty. A study of nuclear safety in annular resin columns is reported in HW-43463.

A tour of the metal recovery line (234 Bldg.) was made with O. F. Hill.

A brief discussion of the biological effects of tritium was held with O. F. Parker. Parker expressed the opinion that the control of the tritium hazard could be done satisfactorily by monitoring the level in body water, and adhering to the published standards of the International Committee on Radiological Protection.

UNIVERSITY OF CALIFORNIA - RADIATION LABORATORY

A general tour of the Radiation Laboratory was arranged by I. Perlman, J. O. Rasmussen and B. G. Harvey. An extensive program of radiation spectrometry, particularly of the alpha and beta radiation, is being carried out.

Perlman mentioned a possible useful by-product that might be recovered from irradiated U-235. This by-product is neptunium 237. Perlman suggested that neptunium 237, after recovery, could be further irradiated to neptunium 238, which then decays to plutonium 238. The latter would be a long life source of alpha radiation, free from gamma radiation. It would thus be a gamma free substitute for radium, for use as a source of alpha radiation.

LOS ALAMOS SCIENTIFIC LABORATORY

Arrangements for the various discussions at Los Alamos were made through M. F. Roy.

The biological effects of tritium were discussed at some length with W. H. Langham. Langham has just completed assembling information on this subject in a memorandum entitled "Physiology and Toxicology of Tritium in Man" by E. A. Pinson and W. H. Langham. Langham was kind enough to give the writer a copy of this (unclassified) memorandum.

Langham expressed the opinion that tritium health hazard control can be based on monitoring of the body water. This checks the opinion, previously quoted, given by Parker at Hanford. Langham stated that, based on extensive tests with animals, no significant build-up of tritium in the tissues has been observed. In order to produce a barely detectable level in non-aqueous body tissues, there is required a level of tritium in the body fluid so high as to be intolerable. On this basis, the accepted procedure of controlling tritium in body fluids by flushing with a normal intake of water is considered a satisfactory control of the hazard.

A general tour of the medical building at Los Alamos was made in company of Langham. Animal experimentation using mice, rats, dogs, and monkeys was observed.

An inspection of the cryogenic laboratory was made in company of R. L. Mills and F. J. Edeskuty. Edeskuty showed and described a three-stage gas compressor which was made in the local shops and successfully used. This machine operates by mercury displacement via mechanical pistons. Pistons are packed against mercury leakage by commercially available chevron rings. Gas is fed to this compressor by a home-made booster pump employing an eccentric rotor equipped with sliding vanes.

Preparation of special metal shapes was discussed with R. D. Baker. The discussion included the manufacturing procedure now being used and simplified procedures being tried experimentally.

VRT:hw

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