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REPORT AT PRODUCTS OPERATIONS - RICHMOND, WASHINGTON

TITLE

PRELIMINARY STUDY
MINT RECOVERY FACILITIES

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April 12, 1961

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PRELIMINARY STUDY
MINT RECOVERY FACILITIES

- References: (1) HW-31702 RD, "Design Study, P10 Purification Facilities - Project CG-575, Hanford IX Program," by LC Koke and WP Ingalls, dated April 13, 1954 (Secret)
- (2) HW-61685 RD, "Mint Processing Studies - 1958," by GP Kesel, dated March 3, 1958 (Secret)
- (3) TID-5583, "Conceptual Design for a Commercial Tritium Recovery Plant," by ME Calkins and BC Mitchell of AEC-SROO, dated August, 1959 (Secret)
- (4) HW-58400, "Process Study On Purification Facilities at Purex," by LR Michels and JM Gerhart, dated December 31, 1958 (Secret)

In accordance with your recent request, we have made a cursory review of the technology and cost for a new tritium recovery facility to support several IPD reactor loading programs being studied. Capacity of the new plant was established at 20 Kgs per year based on the maximum data obtained from Production Operation. This capacity is consistent with the "Combined Extraction and Purification Facility" in Reference 1 and "Case V" in Reference 2.

Previous studies in 1954, Reference 1, and 1958, Reference 2, extend the technology used in the 108-B Building tritium recovery facilities to larger production units using furnaces for releasing the gases from the slugs, hot uranium beds for reduction of H₂O and removal of miscellaneous oxides, palladium black beds for separation of helium and hydrogen components, thermal columns for isotope concentration and below atmospheric pressure gas shipment of product. Two production units of 50% capacity each were considered to assure continuity of operation. Based on these studies and estimates with reasonable escalation, a new facility should cost in the vicinity of \$9,000,000.

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A further review of the literature and available technology revealed several possible avenues which might lead to a lower cost facility.

1. Reference 3 discusses a small simplified commercial recovery facility to be located adjacent a reactor. This unit would have about 1/2 Kg annual production rate on a one-shift, five-day per week basis. When adjusted for continuous operation, the instantaneous capacity of the equipment would be about one-tenth that of the Hanford studies. The cost of the small unit was quoted at under \$1,000,000.

The cost factors quoted in Reference 3 are comparable to Hanford direct cost data and must be factored up to include our project and contingency factors before direct comparison. However, when considering this and scale-up for capacity and isolation from the reactors, a 5 to 6 million dollar facility is indicated if a single line of equipment and the process simplification indicated are assumed.

2. Adaptation of the cryogenic principles of gas separation similar to those used in Reference 4 might reduce the facility costs. It appears the recovery could be accomplished with furnace evolution of the gas followed by removal of contaminant in regenerative heat exchangers. The hydrogen-helium mixture could be fractionated for separation followed by either thermal diffusion or gas centrifugation for isotopic concentration of tritium. Although there are not specific estimates on which to base cost data, the tritium recovery system is comparable if not simpler than Case III in Reference 4 estimated at 5.9 million dollars in 1958. This estimate with escalation would indicate a 6 to 7 million dollar range for a new facility.

Before these later facilities estimates could be considered firm, an extensive process and operability study must be undertaken. The ease with which tritium diffused through materials combined with the extreme toxicity of tritium require careful consideration when investigating new processing methods and equipment.

W/111
Extraction Design and Development

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