

Processing of Neptunium Oxide

Sam Wheatley
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Neptunium

- Pu-238 and Np-237 weak gamma-emitters
- Np-237 decays to Pa-233
- Pa-233 higher energy gamma emitter
- The in-growth of Pa-233 reaches equilibrium in approximately 200 days
- It reaches about 90% of equilibrium in about 90 days

Assumptions

- Pa at full in-growth when received until Columns.
- Pa is at 40% in-growth after Columns.
- Time-motion data based on Pu operations with knowledge of process changes for Np processing.

Low Dose Areas

- Column Feed
- Ion Exchange Column Operations
- Concentrate Vessels
- Precipitate Operations

<1 mrem/hr @ 5 cm and 30 cm

Dose Rates

Feed Receipt and Adjustment Tanks

- 410N General area: 30 mrem/hr
- JT-71/72:
 - Cabinet at Floor - 200 mrem/hr @ 30 cm
30 mrem/hr @ 8 feet
 - Catwalk - 50 mrem/hr
- JT-72 Samples:
 - Sample vial - <1 mrem/hr @ 5 cm
<1 mrem/hr @ 30 cm

Dose Rates (cont.)

Mechanical Line Operations

- **Filterboat Operations:**
 - 400 mrem/hr @ 5 cm (in cabinet)
 - <1 mrem/hr @ 30 cm (outside)
- **Interim storage can (1 kg):**
 - 1300 mrem/hr @ 5 cm (in cabinet)
 - 2.5 mrem/hr @ 30 cm (outside)
- **Bagout inner can (2.5kg):**
 - 4000 mrem/hr @ 5 cm
 - 135 mrem/hr @ 30 cm

Dose Rates (cont.)

Packaging and Inerting

- **Outer Crimp Sealed Can (two 2.5kg cans):**
 - 3500 mrem/hr @ 5 cm
 - 211 mrem/hr @ 30 cm
- **Primary Containment Vessel (PCV):**
 - 1600 mrem/hr @ 5 cm
 - 128 mrem/hr @ 30 cm
- **PCV in Transport Cart:**
 - 150 mrem/hr @ 5 cm
 - 30 mrem/hr @ 30 cm

Dose Rates (cont.)

Packaging and Inerting (cont.)

- **PCV Shielded in Inerting station:**
 - 1500 mrem/hr @ 5 cm
 - 40 mrem/hr @ 30 cm
- **Secondary Containment Vessel (SCV):**
 - 800 mrem/hr @ 5 cm
 - 78 mrem/hr @ 30 cm
- **Loaded 9975 container for transport:**
 - <1 mrem/hr @ 5 cm
 - <1 mrem/hr @ 30 cm

Existing Facility Protection

- **Shielded Resin Columns**
- **Gloveboxes**

Existing Facility Protection

- Transport Cart



Facility Upgrades

- Can Bagout Shielding



Facility Upgrades

- Shielded Can Storage at Can Crimper



Facility Upgrades

- Hoist for PCV and SCV



Facility Upgrades

- Shielded Wells on Inerting Table



Administrative Measures

- Procedures written to minimize valving in the field
- Training emphasizing ALARA and expected areas of elevated dose

Additional Change

- Another shield for the can.



Additional Dosimetry

- EPD's
- Finger Rings

Campaign Results

- Total cumulative dose
 - 11.3 man-rem whole body
 - 142.7 man-rem extremity
- Average cumulative dose
 - 225 mrem/person whole body
 - 3000 mrem/person extremity

Average conservatively based on 50 people
- Radiation Transition Plan - confirm dose rates