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Presentation to the Citizen's Advisory Board
Nuclear Materials Subcommittee

Plutonium Storage and Consolidation

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CAB Nuclear Materials Subcommittee Meeting

The DOE Meeting Center

Purpose

To fulfill the CAB Nuclear Materials Subcommittee work plan regarding Plutonium Consolidation, Storage and Surveillance; as well as provide an update on the Purification Area Vault (PAV) project.

Acronym List

CC	Convenience Can
DE	Destructive Examination
IC	Inner Container
ISP	Integrated Surveillance Plan
KAMS	K Area Material Storage
LANL	Los Alamos National Laboratory
LLNL	Lawrence Livermore National Laboratory
MOX	Mixed Oxide Fuel Fabrication Facility
NDE	Nondestructive Examination
PAV	Purification Area Vault
SRNL	Savannah River National Laboratory

Pu Consolidation Status

- **Pu Consolidation (EM)**
  - Rocky Flats
  - Hanford
  - FB Line (SRS)
  - Los Alamos National Laboratory (LANL)
  - Lawrence Livermore National Laboratory (LLNL)
- **Additional NNSA 3013s for MOX feed**

3013 in 9975

Pu Storage

- **K Area Material Storage (KAMS)**
  - Pu metals & oxides stabilized & packaged per DOE-STD-3013
  - ~ 5300 drum capacity
- **910-B**
  - Miscellaneous materials
  - 3013 Surveillance “daughters”
- **Purification Area Vault (PAV)**
  - Project in progress
  - Operability scheduled in FY12

K Area Storage Capacity Expansion Project

- **Purification Area Vault (PAV)**
  - Adjacent to KAMS
  - Former Reactor Process Area
  - Allows 3013s & 3013 Surveillance “daughters”

SRNS
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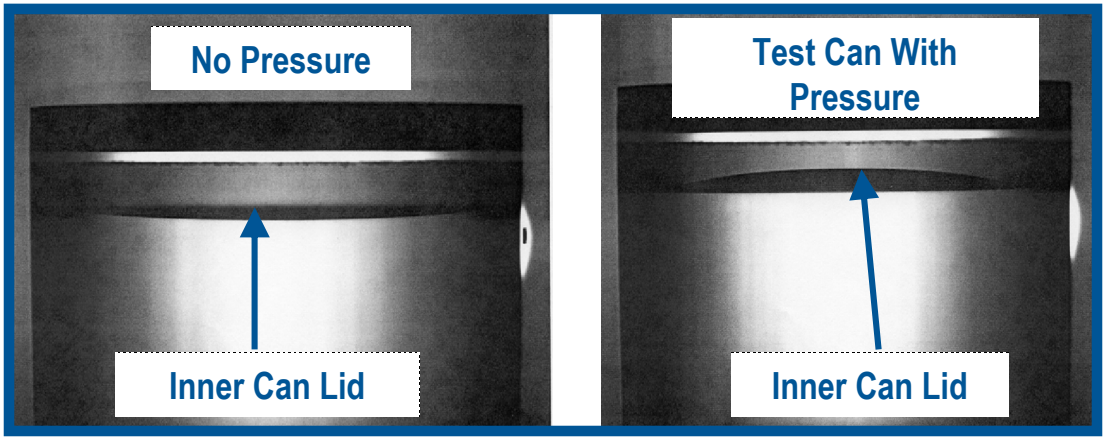
Pu Surveillance Program

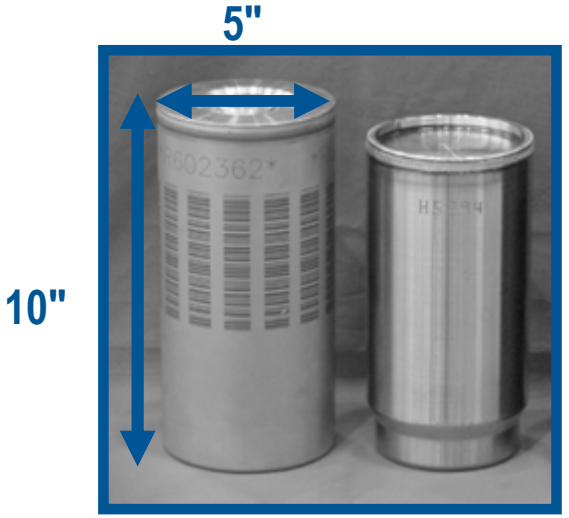
- **Integrated Surveillance Plan (ISP) ensures confidence**
  - Materials are being stored safely for 50 years
- **Primary elements of the ISP**
  - Nondestructive Examination (NDE)
  - Destructive Examination (DE)

Pu Surveillance Program (cont.)

- **3013 Surveillance Program**
  - Required per DOE-STD-3013
  - 207 Nondestructive Examinations (NDE) since 2005
    - Digital Radiography
    - Container Surveys
    - Visual Inspection



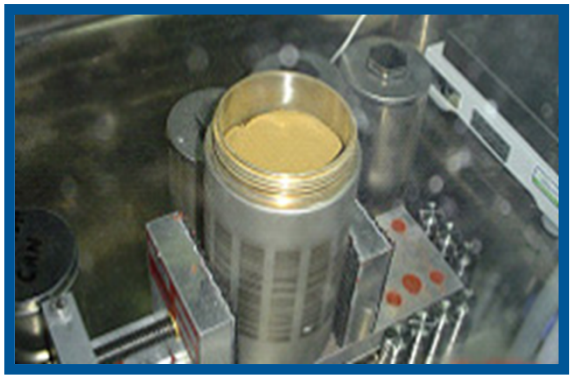
Digital Radiography Images



3013 Container
(~30 lbs.)

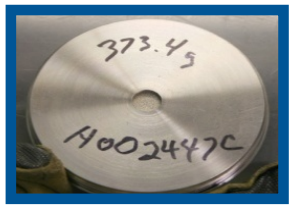
Pu Surveillance Program (cont.)

- 73 Destructive Examinations (DE) since 2007
  - Can puncture
  - Draw 2 gas samples
  - Can cutting of outer & inner cans
  - Package 3 oxide samples
  - Package & transfer samples to SRNL
    - Pressure measurement & gas sampling
    - Metallographic exam of container
    - Material chemical composition
    - Material physical characterization
    - Material moisture content
  - Package & transfer remaining oxide to 910-B



Results

- Destructive Examinations (DE) primarily focus on corrosion
- Gas pressure observed to date has been less than 30 psig
- No containers have had significant corrosion (see containers below)
- No stress corrosion cracking seen
- No reason to believe 50 year package at risk



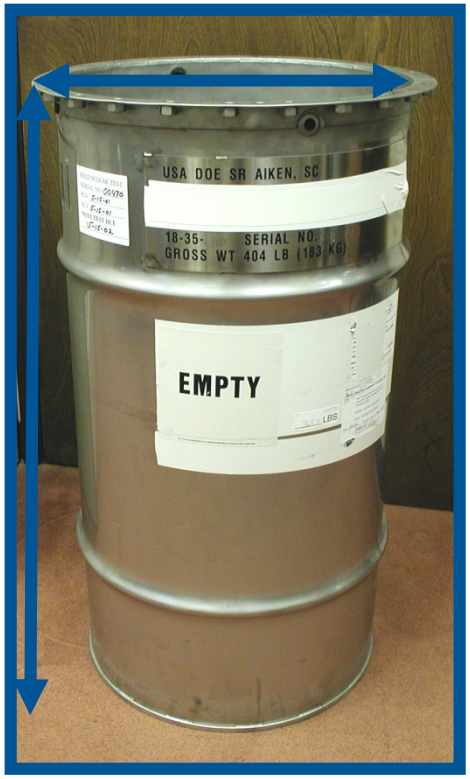
Hanford CC

IC Wall (headspace)

9975 Container Surveillance

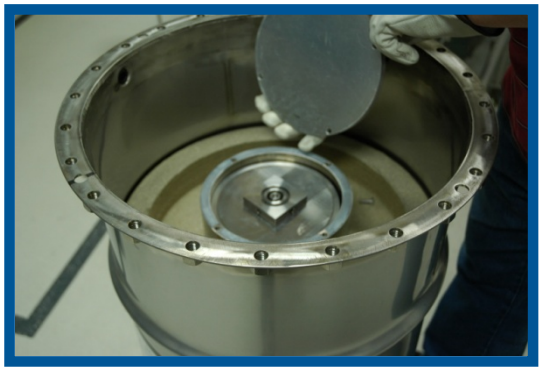
18"

35"



9975 Shipping Container
(~400 lbs.)

- **Verify 9975 component integrity during storage—serves to protect 3013 container**
- **Field data & laboratory tests**
  - Container integrity
  - O-ring performance
  - Celotex® (insulation)



Pu Surveillance Program (backup)

- **ISP specifies a process for selecting which containers in storage to examine.**
  - Bins developed for packaged materials
    - Innocuous, pressure (P), and pressure & corrosion(P&C)
  - Statistical sampling criteria for P and P&C bin
    - *99.9% probability that sample contains at least one of the "worst" 5% of population*
      - "worst" for P Bin – defined in terms of pressurization
      - "worst" for P&C Bin – defined in terms of corrosion and/or pressurization
  - Engineering judgment
    - Focused surveillance resulting from emerging data from shelf life and surveillance results – targets containers with potential for greatest degradation and data gaps

Pu Surveillance Program (cont.) (backup)

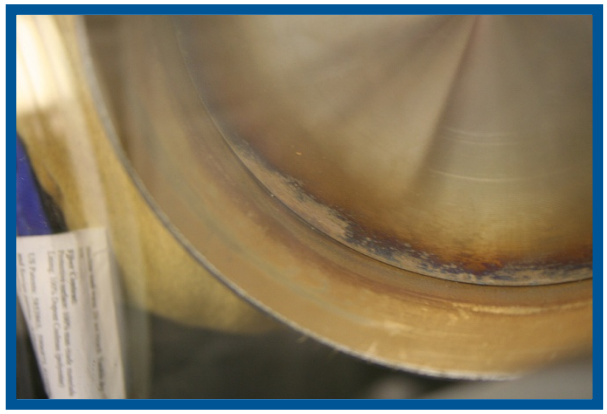
- **Shelf-Life tests set up to evaluate gas generation and corrosion**
  - 9 Full scale and 45 small scale (1/500 scale) cans with representative material
  - Bounding moisture content (0.5 wt. % moisture)
  - Instrumented to measure gas pressure and composition
- **Integrated Surveillance Program Database**
  - Contains packaging data for all 3013 containers in complex
    - Process history for contents
    - Processing and packaging information
    - Baseline surveillance information from packaging sites
  - SRS maintains the controlled database
    - Uploads DE, NDE, and Shelf Life results

DE Results (cont.) (backup)

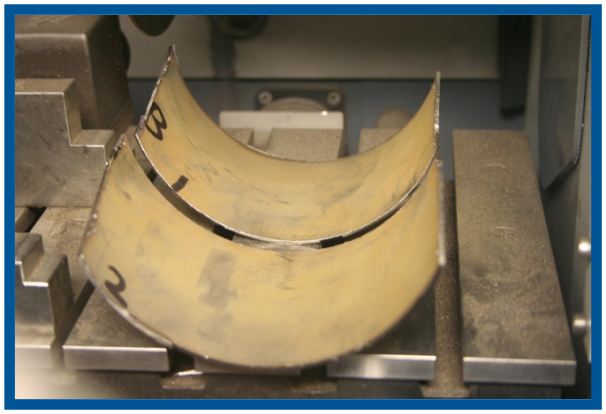
- A few containers (primarily chloride salt bearing oxides with elevated moisture content) have had minor corrosion of the convenience container(headspace) and very minor corrosion on the inside of the inner container

CC headspace

CC oxide interface



IC lid (headspace)



IC wall (headspace)