Defense Waste Processing Facility (DWPF)

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July 26, 2022
Discussion Topics

- Liquid Waste Program Snapshot
- DWPF Background
- DWPF Mission Requirements
- Quick Facts
- Glass Waste Storage Buildings (Canister Storage/Double-Stacking) / Shielded Canister Transporter
- Challenges
- Optimization and Ongoing Improvement Initiatives
- Looking ahead
Liquid Waste Program Snapshot

- Retrieve, process, treat, and dispose of legacy tank waste
- 43 active waste tanks, 35 Mgals of high-activity radioactive waste

Key processing and treatment facilities
- Defense Waste Processing Facility (DWPF)
- Salt Waste Processing Facility (SWPF)
- Saltstone Production Facility (SPF)

Three End States
- Vitrified high-level waste canisters stored in Glass Waste Storage Buildings (GWSBs) 1 & 2
- Decontaminated salt solution mixed with grout, stored in Saltstone Disposal Units (SDUs)
- Operational tank closure
DWPF Background

• Nation’s only operating radioactive waste vitrification plant

• Groundbreaking for DWPF, November 1983

• Facility operations began March 12, 1996

• To date, DWPF has poured more than 4,300 canisters
  - More than half the forecasted ~8,000 canisters for the life of the liquid waste program

• Since 1996, DWPF produced more than 17 million pounds of glass waste
  - Incorporating more than 62 million curies
**DWPF Mission Requirements**

- Reduce liquid through evaporation
- Feed slurry to a joule-heated, 65-ton melter to 2,100 degrees Fahrenheit
- Slurry is melted into a borosilicate glass form (frit)
- Glass is poured into stainless steel canisters, blasted with frit to remove surface contamination then welded to permanently seal the canister
- Vitrification immobilizes the waste
- Waste becomes **suitable for safe, long-term disposal** in stainless-steel canisters
  - Safely stored in the interim in Glass Waste Storage Buildings 1 & 2

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**Quick Facts**

**Melter Facts**
- Melter 3 (Current) in service since December 2017
- Melter 2 lasted 14 years
- Melter 4 is fabricated and available
- Melter 5 is in planning stage

**Canister Facts**
- Anticipated Melter life span is 3-5 years
- Melter remains heated 24/7 @ 2138 degrees F.
- 220 KW power, 1.5” thick stainless-steel shell
- 10’9” high, outside diameter, 8’-4 ½”
- Estimated replacement cost ~ $36 Million
- Replacement down time is ~6 months

**Materials:** 304L Stainless Steel
**Size:** ~ 10’ Height, 2’ Diameter
**Empty Weight:** 1,150 lbs.
**Glass Weight:** 4,000 lbs.
**Heat Load:** <180 watts
Glass Waste Storage Buildings (GWSB) 1 & 2

- Additional canister storage is needed onsite
- Original combined storage capacity for GWSBs 1 & 2 is 4,602 canister positions
- Based on the Liquid Waste current forecast, a total of \(\sim 8,000\) canister storage positions are needed
- Without double-stacking canisters, cost to build two additional GWSBs would be \(\sim \$150M, \sim \$300M\)
- GSWBs originally designed to store canisters one to a slot
- Double stacking provides up to 4,602 additional spaces (9,204 total)
  - Eliminates need to build new GWSBs
  - To date, 1,670 canisters double-stacked
- Estimate At Completion to modify GSWB1 for double stacking is \(\sim \$19M\)
  - Avoids capital cost project and allows funds to be redirected to support completion of the liquid waste mission
Canister Double-Stack Modifications

- Plug Replaced
- Crossbar Removed
- Tapered Plug
- Floor Plate Added

Single Stack (Current)

Double Stack (Modified)
Shielded Canister Transporter

One-of-a-kind vehicle
- 235,000 pounds
- 18’ tall, 25’ long
- Speed: 3 mph
- Diesel engines
- Shielding cast/canister
- Lifting equipment
- 164 hydraulic hoses
Challenges

• Highly integrated system: An extended outage in one facility can affect all liquid waste facilities

• Procuring spare parts/equipment to address aging infrastructure and unique and long-lead item spare parts items

• Reviewing and adjusting preventive maintenance on equipment used for mixing waste and making waste transfers

• The Shielded Canister Transporter (SCT) was designed and constructed in the 1980s and has been in continuous radiological service since 1996

• Double-stacking project requires additional SCT operating time
Scheduled Optimizations (next 6 months) Defense Waste Processing Facility

Throughput & Attainment

• Glycolic Acid Flowsheet (Throughput)

• Main Process Crane Reliability (Attainment)

• Increase Critical Spares (Attainment)
**Formic Acid Flowsheet**
- Formic acid to chemically adjust sludge slurry prior to vitrification in the melter
- Very hazardous chemical produces hydrogen and ammonia

**Solution**

**Glycolic Acid Flowsheet Implementation (Current Outage)**
- Reduction in hydrogen and ammonia generation
- Provides chemical stability during vitrification process
- Reduction of the process vessel purge air to prevent flammability concerns
- Favorable flow in the resultant melter feed stream
- Safer operations
Ongoing Improvement Initiatives

- **DWPF Main Process Cell (MPC) Crane Camera Controls & Reliability Improvement Project**
  - MPC crane is critical to DWPF Operations
  - Subcontract awarded (new PLC controls, cameras and operator consoles)
  - Fiber Optic cabling infrastructure to support this new equipment
  - MPC crane critical spare parts availability
  - Wholistic evaluation and root cause analyses to improve the reliability and availability of the crane

- **Training and Procedures Proficiency**
- **Building additional Failed Equipment Storage Vaults (FESVs) 3 and 4 to house equipment, such as Melters**
- **Performing activities to reduce cycle time in DWPF to eliminate system bottlenecks**
- **Developed process for double-stacking in GWSB 2**
- **Evaluating current critical equipment System Health, availability, and reliability**
Looking Ahead

- Safe and disciplined operations
- DWPF continues to support liquid waste mission
- Meeting liquid waste mission requirements through waste vitrification
- Continuous process improvements/optimizations
- Aggressive critical spare parts procurements
- Infrastructure sustainment
- Safe and successful acceleration and completion of the liquid waste mission in 15 years
Questions?