Integrated Waste Treatment Unit
Overview and Status
Defense Nuclear Facilities Safety Board

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Topics of Discussion

- Background Information
- Denitrination Mineralization Reformer Issues—Resolved
- Demonstration Run 2 Accomplishments
- Process Gas Filter Issue Resolution
- Facility Enhancements for Radiological Controls
- Demonstration Run 3 Objectives
- Summary
Main process issues associated with the DMR and Auger-Grinder resolved in Run 2

New issues identified with the Process Gas Filter (PGF)

Granulated solids are transferred to stainless steel canisters

The stainless steel canisters are then moved into concrete vaults each holding 16 canisters.
Objectives:
Close Knowledge Gaps
Confirm Operational Strategy & Implement Fixes
Plant Mods & Confirm Fixes
Conduct System Performance Test

The focus has been to resolve technical issues to get the plant operational. Emphasis is continuing on preparations for Rad Ops.
National Resources to Resolve Issues

Richland, WA
- Columbia Engineering
- Canister Decon Modification

Idaho Falls, ID
- IWTU Project Office
- INL-PGF Material Evaluation

Golden, CO
- HAZEN Pilot Plant Testing

Chicago, IL
- Particulate Solids Research Inc.
- PGF Material Selection
- Fluidization Support

Dearborn, MI
- Oakland Automation
- Robotic Decon Arm

Morgantown, WV
- NETL-DMR
- CFD Analysis

Arlington, VA
- Dominion Engineering
- PGF Metallurgy

Wilmington, NC
- IKA Inc.
- Colloidal Mill Mig

Aliso Viejo, CA
- Fluid Bed Analysis
- Plant Reliability Model

Irving, TX
- Flowserve
- Wet and Dry Decon Valves

Erwin, TN
- Erwin Resin Solutions
- Ceramic Filter OE
- Fluid Bed Support

Aiken, SC
- SRNL- Chemical Studies
- PGF Metallurgical Support
Excellent Progress - Underpinned by Engineering and Scientific Principles

Denitration Mineralization Reformer
Issues--Resolved
Phases 1/2 Accomplishments—
Denitration Mineralization Reformer Modifications

Water Jet Cut of Denitration Mineralization Reformer,
Fabricated Manway and Installed

Developed and Validated New Auger-Grinder
During Demonstration Run 1

Denitration Mineralization Reformer Double Plenum

Waste Feed Nozzle Tests to Confirm Performance
Approximately 30-day Demonstration Run July 22, 2018 – August 22, 2018

- 53,380 gallons of sodium bearing waste simulant processed
  - 107,700 pounds of product transferred to 48 canisters

New Denitration Mineralization Reformer Conical Distributor with dual plenum successful
  - No sand-castling or agglomerations
  - Minimal wall scale

Achieved stable fluidization

Increased Process Gas Filter differential pressure observed during Demonstration Run led to shutdown
Approach / Status

- Formed data analysis team with members from
  - Particulate Solids Research Institute (PSRI)
  - Porvair Filtration Group Inc.
  - Dominion Engineering, Inc. (DEI)
  - Savannah River National Laboratory/Idaho National Laboratory (Battelle Energy Alliance)

- Charter
  - Identify additional potential causes of the Process Gas Filter plugging
  - Identify data, testing and analyses to be performed to identify the cause(s)
  - Make recommendations for issue resolution

- Short term goal – perform Demonstration Run 3

- Long term goal -- determine best strategy and modifications needed to complete mission
Radiological Control Enhancements

- Enhancing in-cell canister decontamination capabilities
  - Canister surveying and cleaning will utilize robot suction, and wiping
  - Plan to install and test decontamination system during next outage

- Designing wet and dry decontamination systems
  - Reduces source term prior to maintenance of process vessels and piping
  - Wet Decontamination system collects nitric "wash" from process vessels
    - To be returned to Waste Feed Tank or NWCF
  - Dry Decontamination system removes product material from DMR dual plenum
    - To be returned to solids handling system
Demonstration Run 3

- **Primary Test Objective**
  - Verify that the plant can be operated reliably
  - Remains within operating ranges
  - Able to recover from operating at or near the operating range limits

- **Secondary Test Objectives**
  - Perform “dry-run” off-gas emissions testing
    - Validate off-gas emissions testing procedures
  - Denitration Mineralization Reformer manway seal evaluation
  - Verify Product Receiver Cooler cross-connect duct
  - Assess solid product characteristics and storage requirements

- **Feb 6 - Startup for Demonstration Run 3 initiated**
  - Feb 20 – momentary power outage caused plant shut-down
  - Indications of Off Gas Filter hold-up during plant shutdown; cause was jet erosion

- **Recovery actions are complete**
  - Off Gas Filter jet repaired
  - Off Gas Filter to be evaluated during Demonstration Run 3
Demonstration Run 2 verified process flow sheet viability
- Stable Denitration Mineralization Reformer temperature
- Stable product particle size control
- Effective product transfers
- No Denitration Mineralization Reformer sand castles with minimal and manageable wall scale

Process Gas Filter path forward
- Expert based evaluation (PSRI, Porvair, National Lab, etc.)
- Extensive pilot plant testing to confirm corrective actions

Demonstration Run 3
- Define plant operational boundaries
- and conduct System Performance Test dry run

Continued focus on radiological readiness and plant improvements