ARP/MCU Operating Performance and Lifecycle Enhancements

Presented to the SRS Citizens Advisory Board’s Waste Management Committee
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• Update the SRS Citizens Advisory Board’s Waste Management Committee regarding:
  
  - Operating Performance of the “Interim Salt Disposition Project (ISDP)”, also known as the “Actinide Removal Process (ARP) / Modular Caustic Side Solvent Extraction Unit (MCU)”
  
  - Lifecycle Enhancements to the ARP/MCU process
Agenda

- Process Overview
- Mission Timeline
- Integrated Processing Facilities
- Operational Performance
- Lifecycle Enhancements
- Summary
Process Overview: Interim Salt Disposition

SRR Mission: Store, Treat and Stabilize Legacy of Radioactive Waste
• Interim Process to Pretreat Salt Solution for Disposal:
  - Remove Actinides and Strontium through the Actinide Removal Process (ARP)
  - Remove Cesium with the Modular Caustic Side Solvent Extraction Unit (MCU)
• Extend Operational Life-Mitigate Impact of Delay in SWPF Start-up:
  - Implement Life Extension Modifications (complete)
  - Deploy The Next Generation Solvent in 2013
• Provide Operational Experience for the Salt Waste Processing Facility (SWPF):
  - Process Chemistry
  - Equipment Reliability
  - Operational/Maintenance Experience and Lessons Learned
ARP/MCU Mission Timeline

- Complete Start Up Testing
- Integrated Demonstrations
- Cold Runs Complete
- Conduct Management Self Assessment
- Final Operational Readiness
- Initiate Salt Processing
- Complete Control Room / Simulator
- Conduct Operational Readiness Reviews

Key dates:
- Feb / Mar 2007
- Jul 2007
- Sep 2007
- Dec 2007
- Jan / Mar 2008
- Mar 2008
- Apr 2008
Integrated Processing Facilities

Actinide Removal Process (ARP)
Modular Caustic Side Solvent Extraction Unit (MCU)
Saltstone Facility
Tank Farm
Evaporator
Defense Waste Processing Facility (DWPF)
Cumulative Gallons of Salt Processed From Tank 49
Since Start-up of ARP/MCU*

* Note: In addition to ~2,800,000 gallons of De-liquidification, Dissolution, and Adjustment (DDA)
Operational Performance

- Better removal of cesium than the original design basis
- **Salt Batch #1**: improvements reduced precipitation of solids
- **Salt Batch #2**: increased salt feed flow rate, reduced ARP process cycle times by more than 50%
- **Salt Batch #3**: improved solvent monitoring, controls and process performance, reduced salt batch preparation cycle-time
- **Salt Batch #4**: improved the instantaneous salt feed flow rate by more than 2X, restored “used” solvent performance, increased process attainment, set processing records
- **Salt Batch #5**: Continuing to optimize the process and increase process attainment
**Objectives:**

- Extend salt processing capability until the Salt Waste Processing Facility (SWPF) starts up:
  - Replace high risk equipment
  - Improve equipment reliability and maintainability
  - Improve process operations and attainment
  - Life-cycle savings

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**Increase Attainment**

- Optimize the Process Flow-sheet
- Upgrade Key Process Pumps to Improve Reliability
- Modify Equipment to Facilitate Routine Maintenance
- Rebuild MCU Centrifugal Contactors (Cesium Removal)
- Improve Equipment Monitoring & Diagnostic Capability
- Increase Preventative Maintenance
- Procure Spare Parts & Equipment
Lifecycle Enhancements: MCU Process

We do the right thing.
Lifecycle Enhancements: Contactor Cross Section
- DOE is pursuing the development of a modified extractant (MaxCalix) which is more soluble in an improved 4 component solvent.
- A significant amount of research, development, and testing has been completed (ORNL, SRNL, MCU, SWPF)
- The new solvent improves organic-aqueous phase separation in the process (more efficient and equipment neutral)
- Testing results show significant improvement in the removal of cesium (levels for MCU comparable to the Salt Waste Processing Facility)
- Sets the stage for potential increased throughput (with some facility modifications)
- Initiate scheduled outage (in 2013) to implement the “Next Generation Solvent” at MCU.
• The ARP/MCU process continues to provide successful interim salt processing since start-up in 4/08:
  - Helps reduce the lifecycle of the Salt Processing Program
  - Helps bridge the gap until the Salt Waste Processing Facility starts up
  - Enables continued optimization of the process flowsheet
  - Provides valuable process, equipment and operational experience for the Salt Waste Processing Facility

• The Lifecycle Enhancements sets the stage for extended ARP/MCU operations

• Implementation of the “Next Generation Solvent” at MCU will:
  - Provide a lower curie cesium waste stream (Salt Waste Processing Facility comparable) to Saltstone for the extended life of MCU.
  - Provide valuable experience to support implementation and subsequent lifecycle reductions for the Salt Waste Processing Facility.