Hanford Tank Waste Operations Simulator (HTWOS): A System Planning Tool

Ted Hohl
Linda Bergmann
Jeremy Belsher
Tom Crawford
Tony Waldo
System Planning & Modeling

September 11, 2013
Agenda

- System Planning Process (12 min)
- Hanford Tank Waste Operations Simulator Model (15 min)
- Demonstration (30 minutes)
- Q&A (25 min)
SYSTEM PLANNING PROCESS
Mission Flowsheet – Simplified Process Flow Diagram
System Planning Inputs

How do system models guide System Planning

Future TOC Performance Measurement Baseline

Technical Basis

RPP System Plan

- Technology Development Roadmap
- ORP-Approved System Plan Assumptions
- Modeling Results (HTWOS, LCM)
- Risk Management Plan
- Regulatory Considerations
- RPP System Description
- RPP System Status and Plans

- ORP-Approved Modeling Assumptions
- TWINS Database
- Waste Feed Delivery Projects Plan
- SST Waste Retrieval Plan

- TOC Performance Measurement Baseline
- Tank Operations Contract
- TOC Technical Baseline

Other Inputs

WTP Contract
WTP PMB
WTP Flowsheet and Design

Generated Information

Collection of Information

Standalone Document

Future TOC Performance Measurement Baseline

sp017
**Hanford Tank Waste Operations Simulator Model**

**General Input**
- Best Basis Inventory
- Historic Waste Transfers and Retrievals
- Radioactive Decay Data
- Integrated Solubility Model
- Total Operating Efficiency
- Flowsheets (Tank Specific & Process)
- Other Partitioning Assumptions
- HLW and LAW Glass Models

**Case-Specific Input**
- Customer’s Key Planning Assumptions
- Equipment & System Constraints
- DST Tank Usage Allocations
- Available Treatment Processes and Interconnection
- Capacities, Rates, & Schedules
- Near-term Waste Transfer Plans
- SST Retrieval Strategy, Logic and Constraints

**Simulates Waste Treatment Mission**
- Partition Streams (Evaporator, IX, S/L Separation, Wash & Leach factors, Splits or DFs)
- Rule Based
- Dynamic (time-varying flows and compositions, discrete events)
- Mix Streams

**Subject to Constraints**
- Tank Space
- Production Rates
- Transfer Rates
- Equipment Availability
- Simultaneous Transfers
- Other Relevant Constraints

**Results (some require post-processing)**
- Overall Mission Mass Balance
- WTP Feed Vector (Comp., Quantity, & Dates)
- Production vs. Time
- DST Space Usage and Volume vs. Time
- Projected Waste Transfers
- SST Retrieval Sequence and Timing
- Feed Envelope Assessments & Screening
- HLW Glass Drivers
- End Dates (SST Retrieval, Waste Treatment)
- Equipment Need Dates
- Input For Funding Profiles
- Projected 242-A Evaporator Use

**Not Directly Addressed**
- Reaction Kinetics (except boemite leaching)
- Speciation
- Heat Transfer
- Certain Flowsheet Details
- Reliability (Point in time and start-ups)

September 2013
Examples of Results

DST Space Utilization

SST Retrieval Progress

Combined LAW Production

Cumulative DST Transfers

March 23, 2011
For Discussion Use Only
Hanford Tank Waste Operations Simulator

HTWOS MODEL
HTWOS Model Purpose

- Tank Operations Contract specifies use of the HTWOS model:
  - *The Contractor shall maintain the Hanford Tank Waste Operation Simulator (HTWOS) model and use the model to evaluate alternative cases to optimize RPP system performance and provide a technical basis for the approved Performance Measurement Baseline described in Section C.3.1.2, Project Scope, Schedule, and Cost Baseline.*

<table>
<thead>
<tr>
<th>Near-Term</th>
<th>Long-Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Near-term transfers</td>
<td>System Planning</td>
</tr>
<tr>
<td>Evaporator operations</td>
<td>Baseline Change Requests</td>
</tr>
<tr>
<td>Process flowsheets</td>
<td>Project Planning and Integration</td>
</tr>
<tr>
<td>DST space management</td>
<td>Issue Identification and Risk Management</td>
</tr>
<tr>
<td>Support operational planning</td>
<td>Operational research model input</td>
</tr>
</tbody>
</table>
HTWOS Model Software

- HTWOS model uses the Gensym (G2) software platform
  - Dynamic discrete event simulation modeling tool
  - Used to simulate the full duration of the RPP Mission
    - Movement of waste through Tank Farms
    - Feed delivery and WTP operations
    - TRU waste processing
    - Supplemental treatment systems

- HTWOS is compliant with WRPS software quality requirements, plans, and procedures
Hanford Tank Waste Operations Simulator

HTWOS DEMONSTRATION
QUESTIONS?