Hanford Tank Integrity Project

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Overview of Tank Integrity

- Tank History
- Double-Shell Tank Integrity Project
  - Objectives
  - Inspections
  - Chemistry Control
- Single-Shell Tank Integrity Project
  - Objectives
  - Structural Integrity and Leak Monitoring
  - SST Integrity Panel

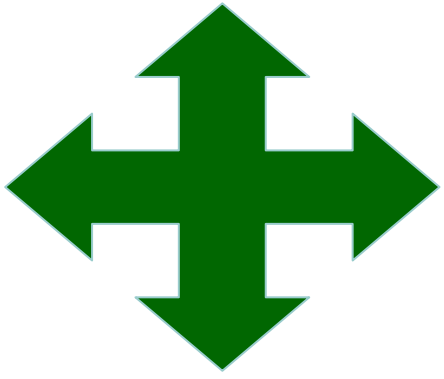
Double-shell Tank Integrity Program (DSTIP)

- Regulatory Certification of DST System
- Expert Panel Recommendations
- Structural Analysis using Finite Element Analysis

LIFE CYCLE MANAGEMENT

- Chemistry Additions
- Chemistry Sampling
- Corrosion Testing
- Corrosion Probe Data Collection and Analysis

CHEMISTRY CONTROL



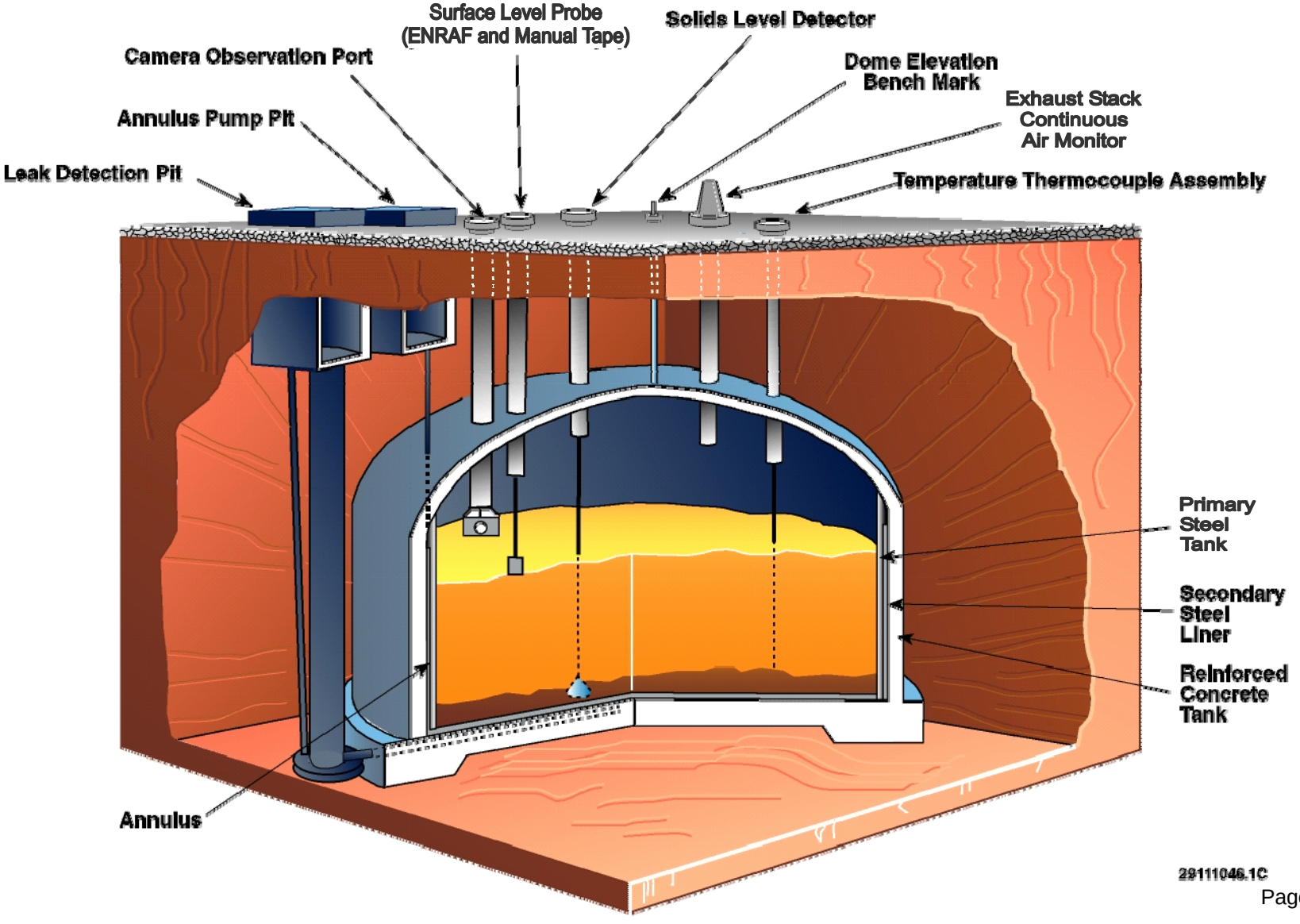
INTEGRITY ASSESSMENTS

- DST UT/Visual
- DST System Videos
- DST System Line Tests
- DST Pit Inspections
- DST Facility Integrity Assessments

CORROSION MITIGATION

- Technical Safety Requirements for Chemistry Control
- Annulus Ventilation System Operation
- Corrosion Probe Development
- Laboratory Testing

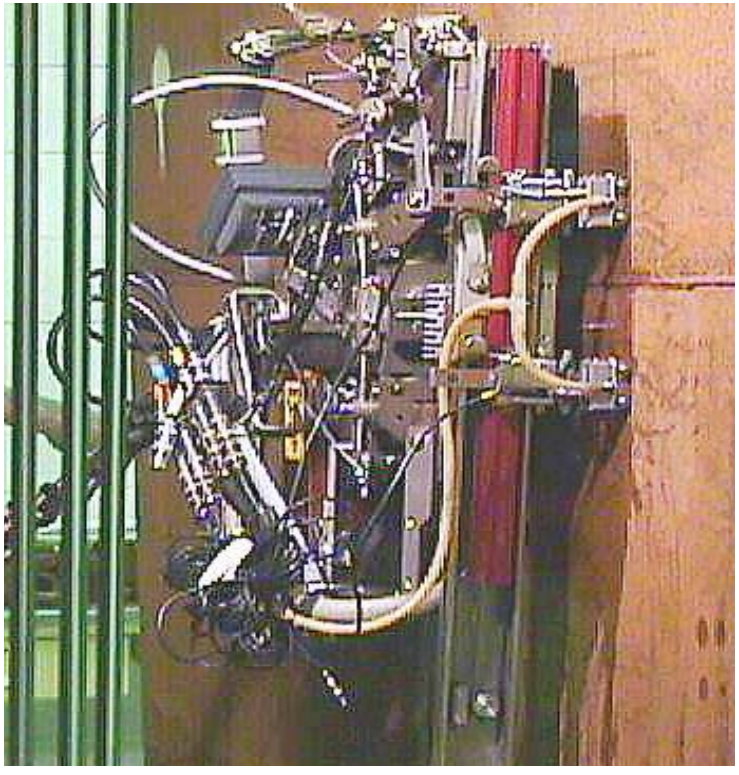
Double-Shell Tank Design and Construction



DST Integrity System Objectives

- Assure continued tank integrity
  - Maintain 28 Double-Shell Tanks to safely store and transfer 53 Million gallons of highly radioactive chemical waste for treatment
  - Extend DSTs lives from 20 to 50 years to 100 years
  - Provide sufficient assurance of tank integrity to allow for repair and replacement
  - Prevent the need for additional tanks (up to $100 M per tank).
- Tank corrosion monitoring
  - Ultrasonic testing, visual inspections, and corrosion probe monitoring to project tank corrosion rates to facilitate corrosion minimization and safe operations
  - Provide advanced notice of repair or replacement requirements
- Comply with RCRA monitoring legal requirements
- DST System Infrastructure
  - Piping and pits to support transfer system
  - Piping cathodic protection system
  - 242-A Evaporator, AZ-301, and 204 AR

- UT examinations on 8 to 10 year cycle
  - Scan four 15 inch wide swaths
  - Inspection 10 foot sections vertical and horizontal welds
- Inspection areas of liquid air interface



- Conduct additional scans based on tank use (e.g., Tank 241-AY-101)

Ultrasonic Testing

- Uncertainty testing
  - Impact of temperature
  - Influence of Operator
  - Difference between point source measurements and scanning
- Riser-to-Riser evaluation
  - Evaluation of Tank 241-AY-101 indicated riser-to-riser difference
  - Two evaluations that have occurred since have not shown the difference
- Electro-Magnetic Acoustic Transducer (EMAT)

- Types of Visual Examinations
  - Interior Inspection
    - Primary tank above the waste examined as part of the integrity visual examination in one riser located in the primary
  - Annulus Inspection
    - Integrity
      - Conducted on a five to seven year interval
      - Examine entire height of annulus in four risers with one located in each quadrant of the tank
    - Water intrusion
      - Conducted in one tank in each farm every two years
      - Examine convergence of primary tank and secondary liner in four risers in at least three quadrants

Double-Shell Tank Chemistry Control

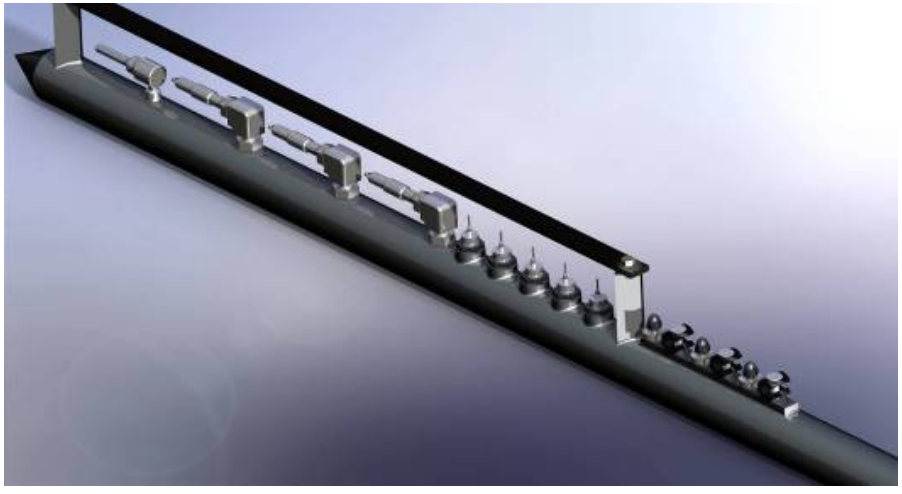
- Control the chemistry as defined in OSD-151-T-00007
- Optimizing chemistry to protect the DSTs
  - Maintain established pH and nitrite ranges
  - Implement refined pH and nitrite ranges as they are proven
  - Implement carbonate ranges for applicable environments
  - Define requirements for corrosion probe surveillance
- Reduce treatment costs of unnecessary sodium hydroxide additions
- Optimize use of tank space by eliminating unnecessary chemical additions

New Corrosion Specification

- Adopt nitrite based control
  - Above pH of 11
  - Nitrite to nitrate ratio of 0.2
  - Minimum nitrite concentration
- Hydroxide depletion occurs by
  - Models for CO_2 absorption at supernatant surfaces
  - Model for oxidation of organic species
  - Models for reaction with aluminum solids
- Mechanistic Hydroxide Demand Model and empirical Hobbs model require ventilation air flows to estimate absorption of CO_2 by waste
  - Flows for most tanks are individually controlled
  - Aging waste tanks (AY & AZ Tank Farms) have shared primary ventilation system

Double-Shell Tank Corrosion Monitoring

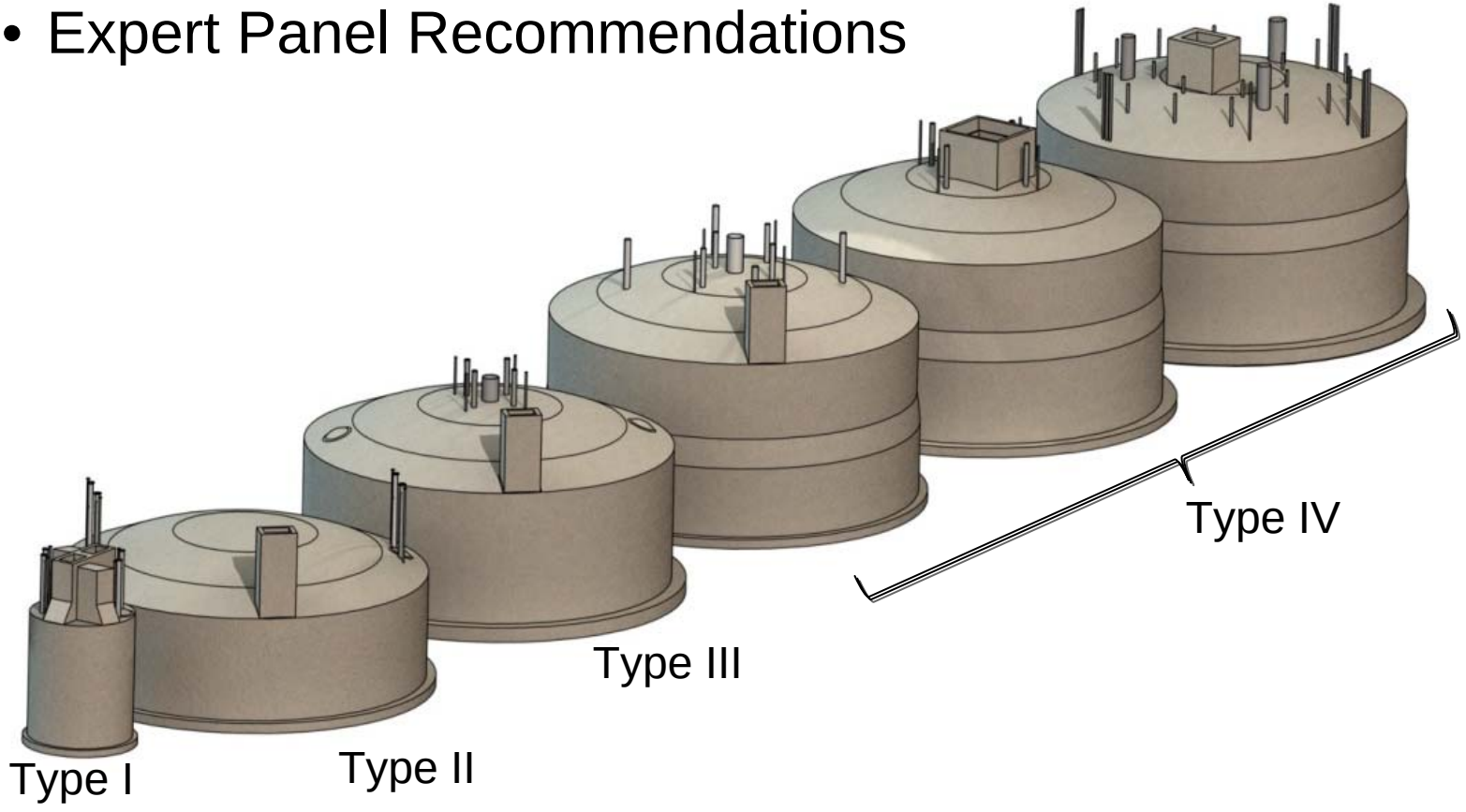
- Developed and installed multiple generations of corrosion monitoring probes
- Current probes installed in five DSTs:
  - Corrosion monitoring sensors transmit tank Corrosion Potential (E_{corr}) and Electrical Resistance (ER)
  - Metal coupons for destructive verification
- Provides critical support for Waste Chemistry Optimization



Probe contains three reference electrodes, three secondary reference electrodes, ER, and metal coupons.

Single-Shell Tank Integrity

- Background
- Single-Shell Tank Integrity Project Expert Panel
- Expert Panel Recommendations



Construction of 241-BX Tank Farm

Single-Shell Tank Integrity Panel

Mike Terry - Chair
Todd Martin - Co-Chair
Mike Rinker - Analysis Lead

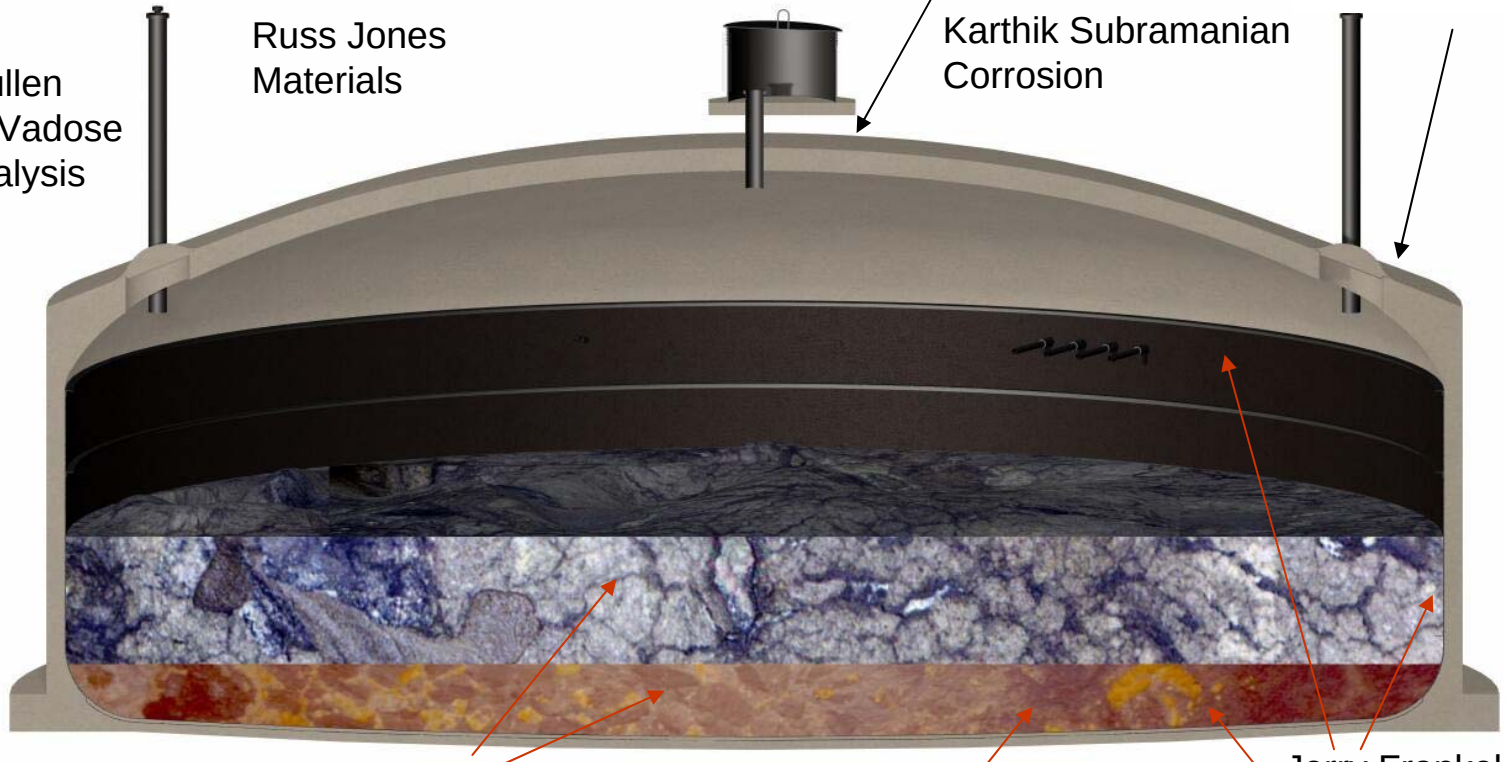
Steve Cullen
Soil and Vadose Zone Analysis

Russ Jones
Materials

Bruce Thompson
Non-Destructive Evaluation

Karthik Subramanian
Corrosion

Bob Kennedy
Structural and Seismic Analysis



Glen Washer
Concrete Non-Destructive Evaluation

Leon Stock
Waste Chemistry

John Beavers
Stress Corrosion Cracking

Jerry Frankel
and
Bruce Wiersma
Electrochemistry

Background

- In FY 2009, the SSTIP commissioned the Single-Shell Tank Integrity Expert Panel (SSTIEP)
  - Two workshops held in FY 2009
- Result was RPP-RPT-43116, *Expert Panel Report for Hanford Site Single-Shell Tank Integrity Project*
  - 10 primary and 23 secondary recommendations
  - Four categories of recommendations:
    - Eight Structural Integrity (SI)
    - Eleven Liner Degradation (LD)
    - Twelve Leak identification and prevention (LIP)
    - Two Mitigation of Contaminant Migration (MCM)

SSTIP Implementation Plan

- Third EP workshop was held in January, 2010
  - Resulted in RPP-RPT-45921, *Single-Shell Tank Expert Panel Report,* which included 12 recommendations related to future use of SSTs (ST)
- The SSTIP released RPP-PLAN-45082, *Implementation Plan for the Single-Shell Tank Integrity Project*
  - Addresses the EP recommendations that the SSTIP is planning to implement, or has already implemented
  - Covers the top 10 EP recommendations, as well as six secondary recommendations from RPP-RPT-43116
  - Includes the ST recommendations from RPP-RPT-45921 for informational purposes

- Analysis of Record, SI-1
  - Criteria Document
  - Preliminary Calculation
  - Analysis of the Type II Tanks
    - Included dead and seismic loads
    - Review by independent experts
- Visual Inspection, SI-2
- Side Wall Coring, SI-3
- Chemistry Testing, LD-3, LD-5
- Grouping Study, LD-6

Questions?

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