Summer 2019 Internship WRPS Test Bed Initiative (TBI)

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DOE-FIU Science and Technology Workforce Development Program
Applied Research Center
Florida International University

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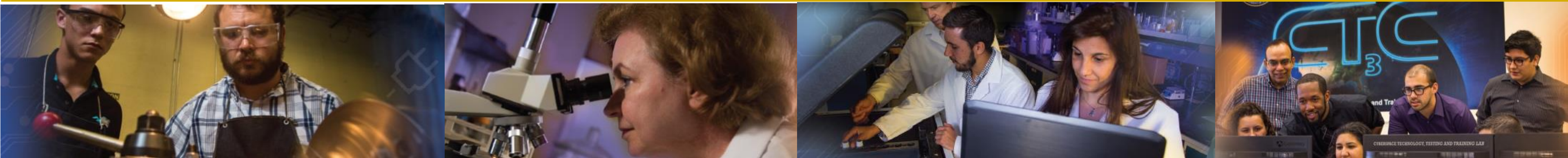
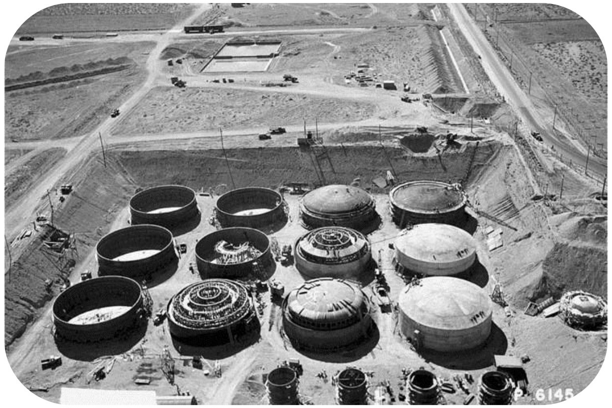


Background

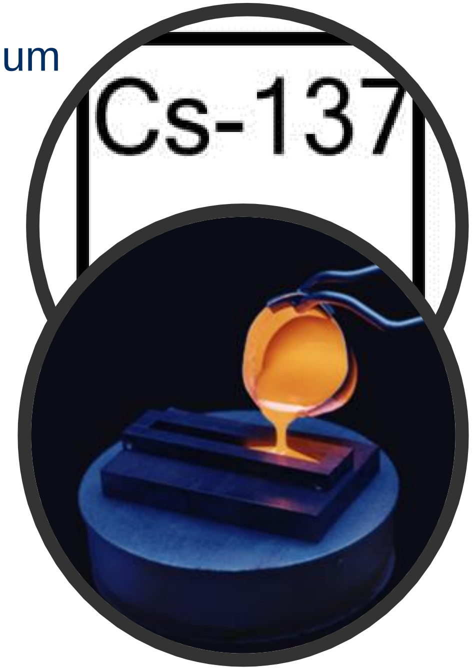
- Goal of Hanford Cleanup
  - Prevent the release of nuclear waste into the environment
  - Convert the Hanford Site into a nature reserve and national park.
- Role of WRPS
  - Safely and efficiently manage the waste stored in the underground tanks



washington river protection solutions
an AECOM-Led Company

Project Description

- Problem
  - Tank waste contains substantial amounts of Cesium
  - Inefficient to vitrify
  - Affects glass properties
  - Problematic to grout
- Cesium 137
  - Radioactive isotope
  - Half life of 30 years
  - Chemically active
  - Gamma rays



Scope/Objective

- Develop a tool to extract cesium from tanks
  - More waste can be vitrified at a time
  - Speeds up cleanup process
  - Lowers overall costs

- My role
  - Design Engineering Intern
  - SolidWorks Design

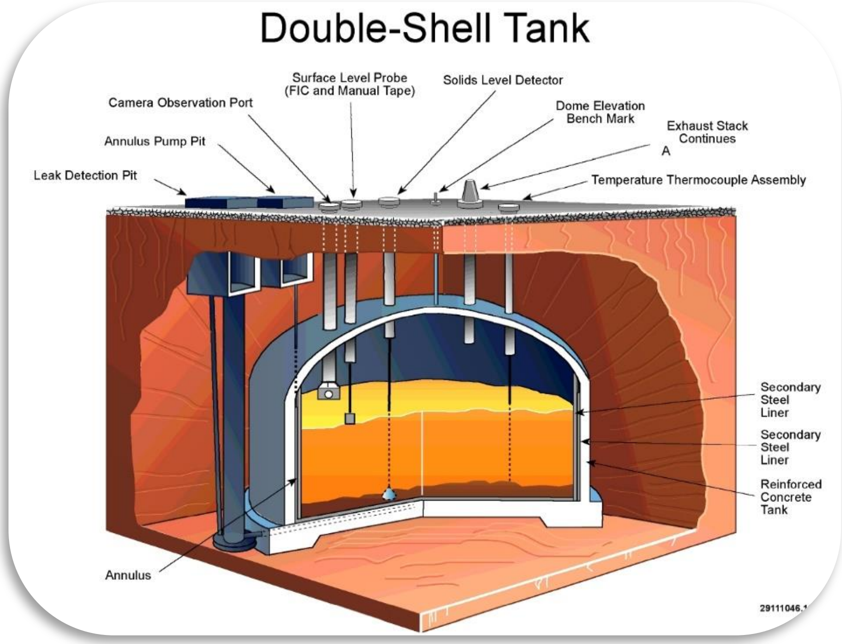


Figure 1.
Diagram of a Double Shelled Tank

Method / Approach

Waste Process

- Waste pumped through the Ion Exchange Column (IXC).
- Cesium reduced waste is destined for vitrification or grouting.
- Cesium saturated filter encapsulated in storage cask.

Project Stages

- Stage1 - Completed
  - Experimental test
  - 3 gallons of waste treated
- Stage2 - In Design Phase
  - Scaling test
  - 2000 gallons of waste treated
- Stage3 - Future
  - Full scale operation

Figure 2.
Hanford Vitrification Canisters

Method / Approach

Design Requirements

- Shielding
  - Cesium decay produces gamma rays.
  - Based on expected concentration of Cesium, 8” of steel plate or 10” of steel shot required to protect workers.
- Shine Paths
  - Overlapping components prevent radiation from shining through cracks.
- Manufacturing
  - All the parts must have a manufacturing method in mind.
- Venting
  - Radioactive materials produce hydrogen, which must be vented.

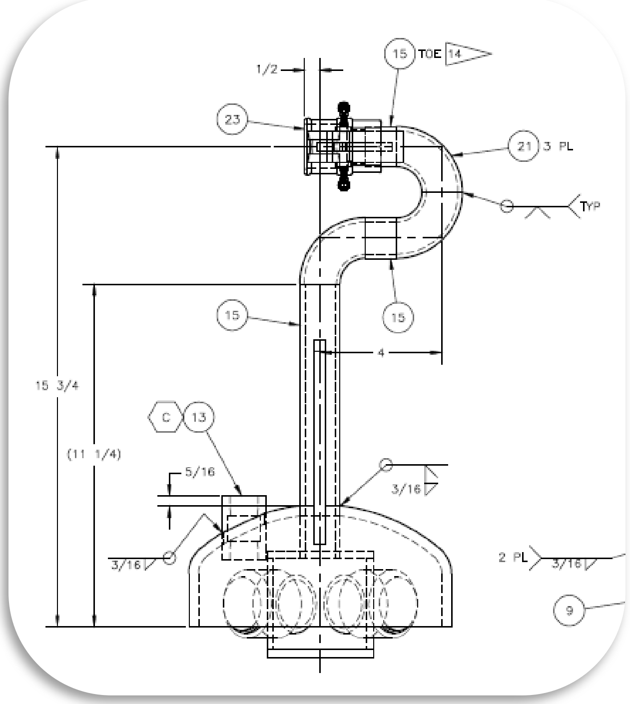


Figure 3.
Engineering drawing of IXC endcap

Preliminary Results/Discussion

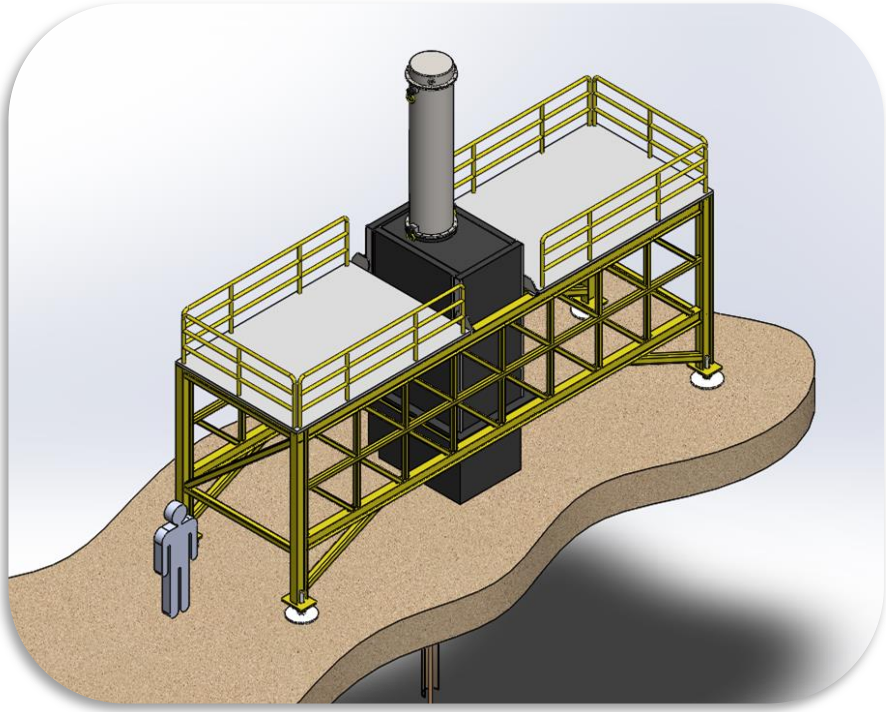


Figure 4.
Conceptual Design of IXC Extraction Tool

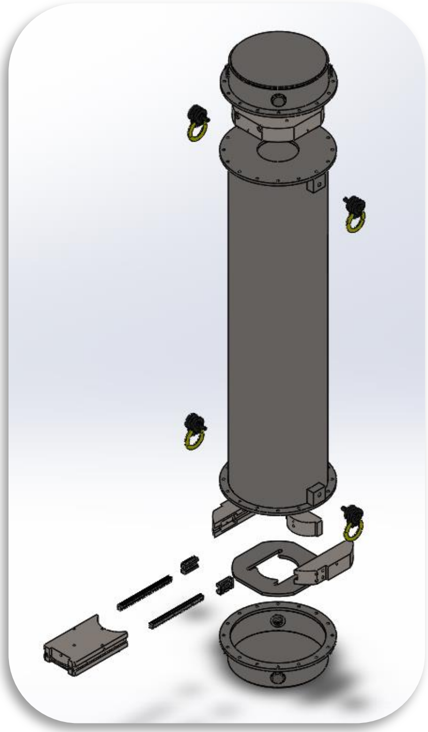


Figure 5.
Detail Design of IXC Storage Cask

Preliminary Results/Discussion

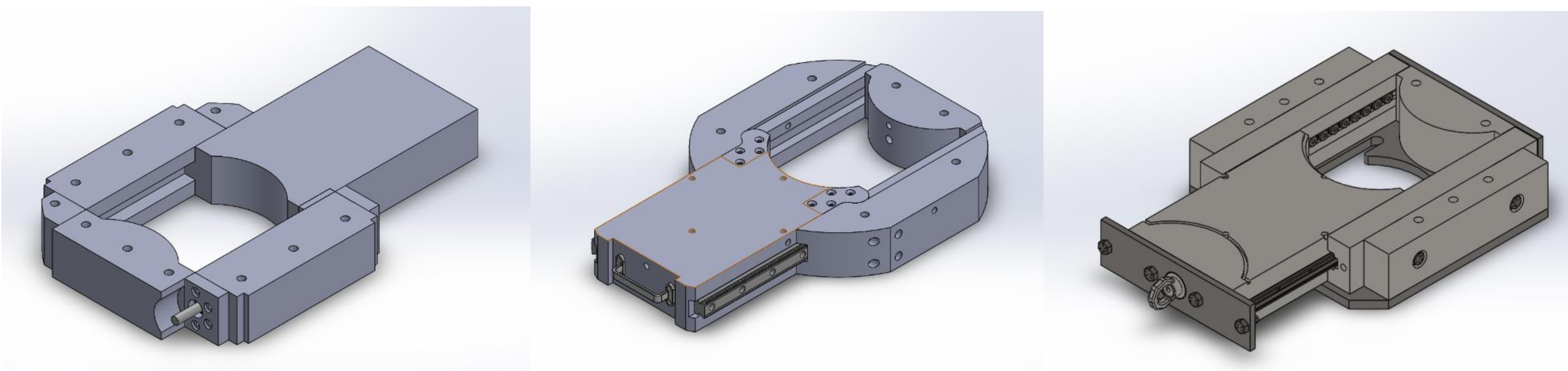


Figure 6. Detail Design Showing Cask Door Iterations

Conclusions

- Cask design has advanced considerably
- Other engineers are working on the various components
- Design work is more challenging when split up
- Stage 2 will be taken to 90% completion

Future Work

- Stage 2 Design
  - Finalize design
  - Tolerances/Clearances
  - Structural analysis
  - Approval
- Stage 2 Testing
  - Dry runs
  - Problem scenarios
- Stage 3 Designs
  - More Integral Approach
  - Cask swapping system

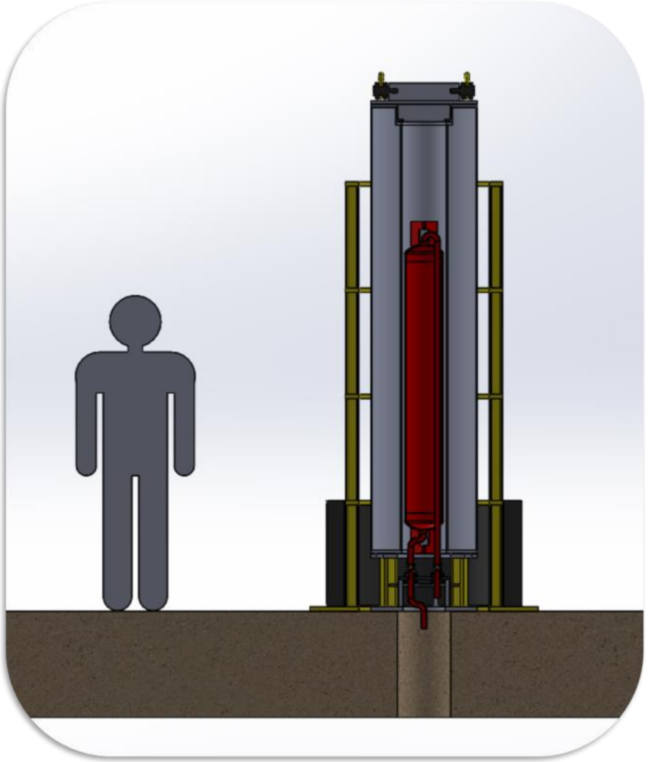


Figure 7.
Early Concept of Stage 3 Design

Acknowledgements

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  - Matthew Garlick
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