

**FIU**

Applied Research  
Center



## DOE-FIU Cooperative Agreement Annual Research Review – FIU Year 1

# Development and Deployment of the Miniature Rover for Inspection of Hanford's Double Shell Tank (DST)

Sebastian Story (DOE Fellow)

Worlds  
Ahead

Advancing the research and academic mission of Florida International University

## Overview

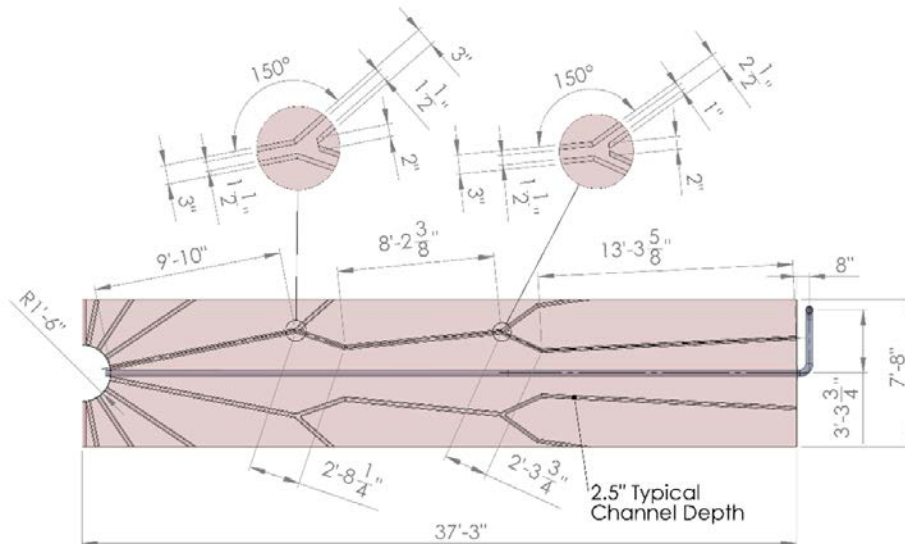
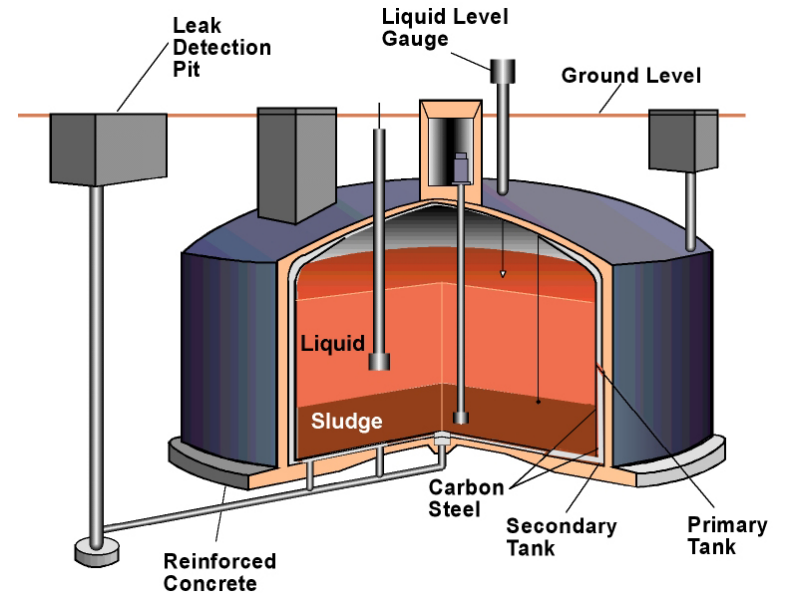
- Hanford in the cold war era
- Millions of gallons of hazardous chemical waste
- Degrading integrity calls for attention to current conditions
- Response to problem is a specialized inspection tool
- Robotic platform capable of gathering visual data for further analysis



Shelled-Tanks located in Hanford, Washington

## Overall Needs:

- Visual Inspection of primary liner
- Navigation over 3/8<sup>th</sup> inch weld seams, corrosion, and debris in primary liner channels
- Access to refractory pad cooling channels via primary tank wall



## Objectives:

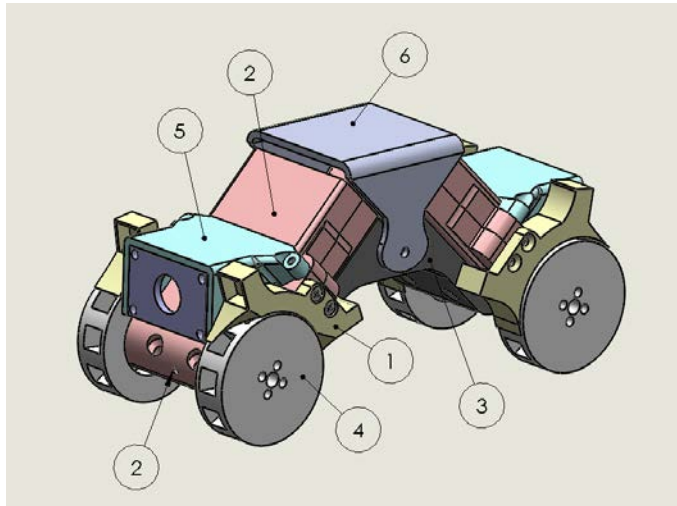
- Maneuverability within cooling channels and tank walls
- Compact, efficient design for 2 1/2" x 1" channels with obstacles
- Quality visual inspection via 2 analog cameras
- Improve existing unit

## FIU Year 1 Highlights:



## Design Implementations to existing unit

- Magnetic attachment changes
- Compliant spine
- Gearbox improvements
- Manufacturing & assembly improvements
- Cable management
- Steel wire for emergency retrieval



1. Passive rust removal mechanism
2. Steel cable tether entry
3. Compliant TPU member
4. Magnetic wheels
5. Camera cover/cable concealment
6. Wiring protective covering

## FIU Year 1 Highlights:

### Rover testing:

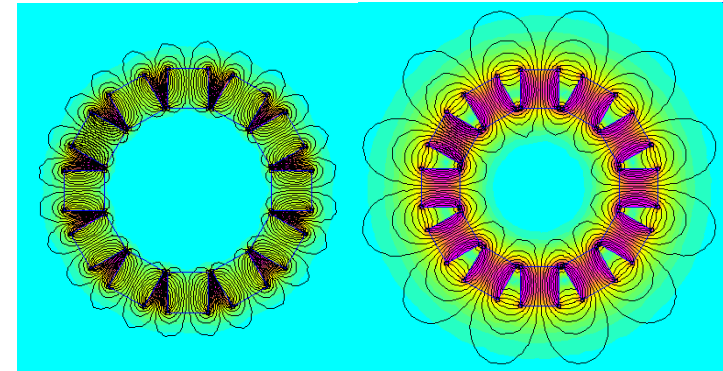
- Worst-case corrosion testing
- Effective Pull/Pull-off force
- Magnetic wheel FEA
- Weld-seam and mockup runs

### Challenges & Future Improvements

- Rust removal system
- Increased traction for wheels
- Implementation of sensors & increased data collection capabilities



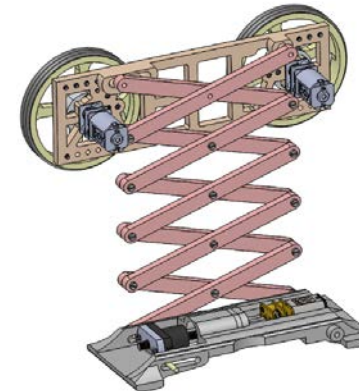
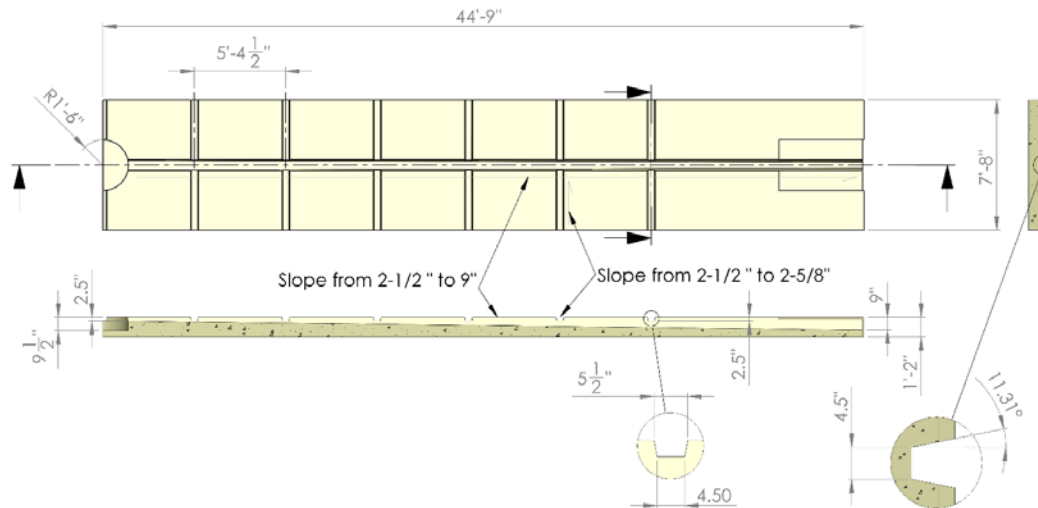
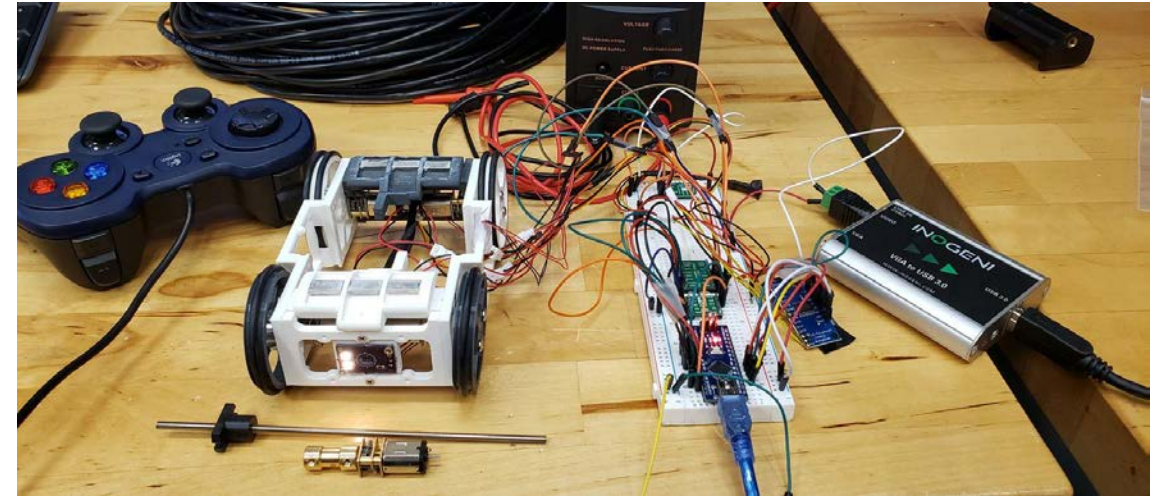
Corrosion Testing



Magnetic Flux Simulation of Wheels

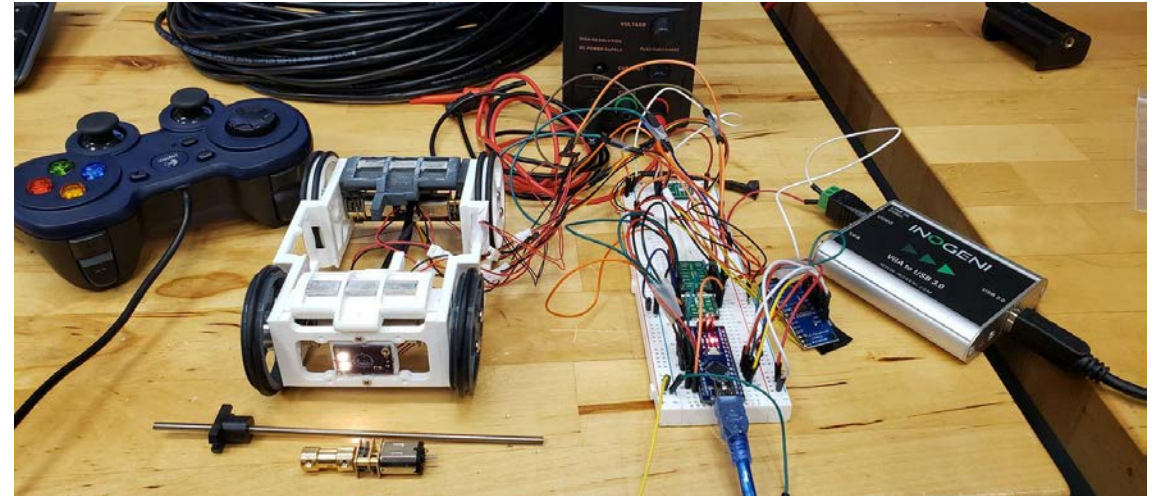
## Instrumentation rover

- Secondary Liner deployment
- Visual Inspection
- Scissor lift mechanism
- Microcontroller-based with stacked PCB's for cameras/motors
- Marsupial System

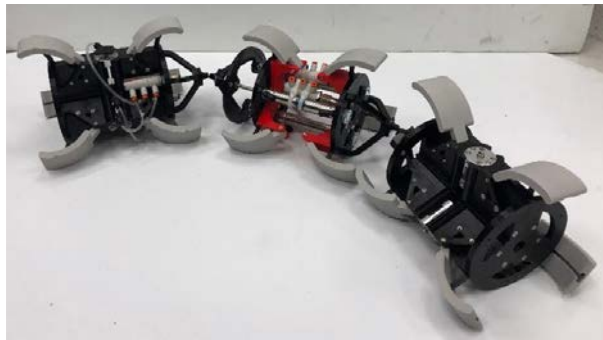


## Instrumentation rover

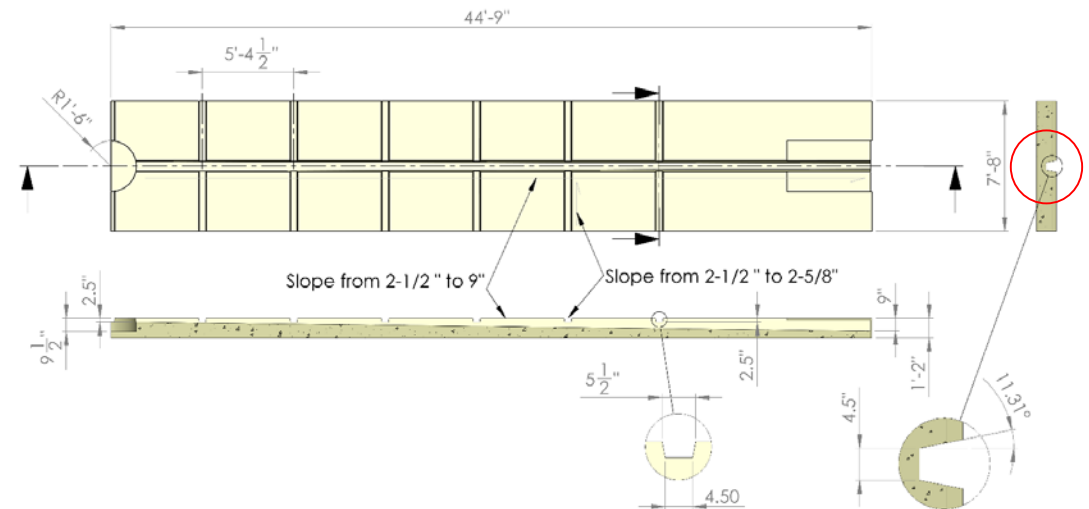
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Instrumentation rover prototype (Above)



"Mother" 6" Pipe Crawler



Secondary Liner Channels

## Acknowledgments

- **DOE-FIU Science and Technology Workforce Development Program**
- **Sponsored by the U.S. Department of Energy, Office of Environmental Management, under Cooperative Agreement #DE-EM00005213.**







Thank You. Questions?