

Utah FORGE– 2025 Annual R&D Workshop

PetroQuip Energy Services
Thermo Resettable Straddle
System - #003627
Robert Coon
September 10, 2025



PetroQuip Energy Services - 003627

- Principal Investigator and Presenter: Robert Coon
- Organization: PetroQuip Energy Services
- Total Project Funding \$6,648,858
- Project Duration – April 2024 to Dec 2027
- Sept 30th, 2026

This presentation does not contain any proprietary, confidential, or restricted information.

Objectives and Purpose

Technical Objective

- Develop a straddle system incorporating a lower packer, a port to pump through, and an upper packer. The system will pressurize a section of Open hole up to 100 ft long. The system can be un-set and re-set in another position 2 more times, before returning to the surface.

Impact on the Geothermal Industry

- Once developed, this technology will provide a simple and repeatable means of testing multiple sections of the open hole to 5000 psi and 450°F.

Objectives and Purpose

Milestone Table														Original Contractual Due Date
10-3627 PetroQuip Energy Services PI: Robert Coon														Active R&D
	Budget Year	Year 1				Year 2				Year 3				Adjusted Milestone Due Date
	Actual Qtr.	Q2 24	Q3 24	Q4 24	Q1 25	Q2 25	Q3 25	Q4 25	Q1 26	Q2 26	Q3 26	Q4 26	Q1 27	Final (Completed)
Project Milestones	Project Qtr.	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Deliverable (Report required)
Task 0 – Project Management and Planning	Deliverable													
Task 1 – Develop the ROHP Resettable Straddle System (RSS)		•												
Sub Task 1.1 – Revised PMP		•												
Sub Task 1.2 – Define the ROHP & RSS, then create the EDSD		•												
Milestone 1.1 Submit the signed EDSD	📄	•												
Sub Task 1.3 Design the ROHP & RSS			X	•										
Milestone 1.2 – Submit the completed and signed Design Review	📄		X	•										
Phase 1 Go/No-Go decision point - design review	📄		X		•									
Task 2 – Manufacturing, Testing Prep, and Testing														
Sub Task 2.1 – Manufacture the ROHP & RSS					X		•							
Sub Task 2.2 – Design and Manufacture the Test Fixtures					X		•							
Sub Task 2.3 – Manufacture the Test Fixtures					X			•						
Milestone 2 – Submit the Doc showing the manufacturing of the tools and fixtures	📄				X					•				
Task 3 – Testing														
Sub Task 3.1 – Manufacturing									•					
Sub Task 3.2 – Element Testing #1						X			•					
Sub Task 3.3 – Element Testing #2						X			•					

Objectives and Purpose

Gantt Chart bottom half

Sub Task 3.4 - Element Testing #3						X			•				
Sub Task 3.5 - Element Testing #4						X				•			
Sub Task 3.6 - Element Testing #5						X				•			
Sub Task 3.6.1 - Element Testing #5.1											○		
Sub Task 3.6.2 - Element Testing #5.2											○		
Sub Task 3.7 - Straddle Test							X		•				
Sub Task 3.8 - Slip Test Thread Test							X				○		
Sub Task 3.9 - RIH Test							X				○		
Sub Task 3.10 - Straddle Test							X				○		
Sub Task 3.11 - Long Term Test Round Casing								X				○	
Sub Task 3.12 - Long Term Test Oval Casing									X			○	
Sub Task 3.13 - Test Review Meeting									X			○	
Milestone 3 - Submit all of the test reports									X			○	
Phase 2 - Go/No-Go Decision Point- The criteria for a Go decision for the Go-No-Go will be the successful testing of the Straddle Packer according to the specifications set forth in the EDSD. The Straddle packer must pass the pressure differentials and temperature ratings outlined in the EDSD. The Straddle packer will be									X			○	
Task 4 - Field Installation													
Sub Task 4.1 Define the Installation										X		○	
Sub Task 4.2 - Manufacture all Components										X		○	
Sub Task 4.3 - Perform a FAT										X		○	
Phase 3 Go/No-Go decision point - Is everything ready for the field installation										X		○	
Sub Task 4.4 - Transportation and Check Equip										X			
Sub Task 4.5 - Install in the Utah FORGE test well											X		○
Task 5 - Final Report													
Sub Task 5.1 Test Report												X	○
Milestone 4 - Submit Final Test Report												X	○

Methods/Approach

- **Engineering Design Specification Document (EDSD)**
 - The document contains applications and specifications for the system
 - Approved by all parties
- **Conceptual Designs**
 - Layouts (skeleton of the different designs) are created to discuss the product and modify the design as needed through multiple iterations
 - Completed
- **Internal Design Review**
 - Discuss the designs from the conceptual design layout and modify the design as needed.
 - Completed
- **Formal Design Review**
 - Approved by Go-No-Go document – March 31,2025
- **Detail Prints**
 - All prints are checked and approved by multiple engineers

Methods/Approach

Method of Manufacturing & Testing

- **Manufacturing & Inspection**

- After manufacturing, all components will be 100% inspected as per our API Q1 quality management system.
- Most parts are still in manufacturing

- **Component Testing**

- Function testing of individual components at temperature. The testing will help to qualify complete system.
- Some Component testing is completed

- **Re-iteration and re-testing**

- Modify any part that doesn't qualify during testing and re-test to the specifications in the SOPO.

- **System Integration Testing**

- Test the system utilizing all components previously tested in wellbore environment conditions.

- **Field Testing**

- Install the system in the Utah FORGE well

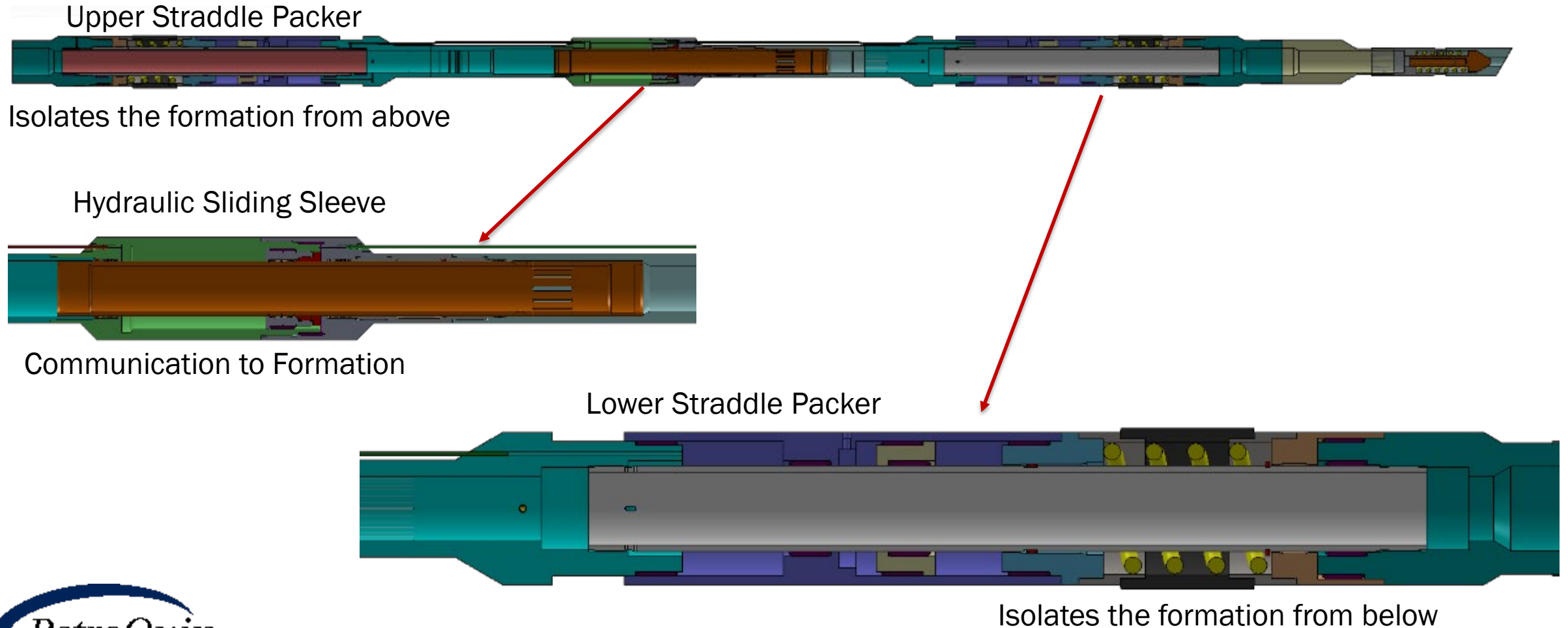
Methods/Approach

Milestones/ Scientific Approach/ How well we have done

- **Milestones**
 - We had successfully finished Milestone 1.1 (EDSD document approved)
 - Milestone 1.2 (design review) completed in Dec 2024
 - First Go-No-Go point approved – March 31,2025
 - Milestone 2 completed - Q2 of 2026
 - We are currently in task #3, Testing different element designs and providing out the other components
- **Scientific Approach**
 - We have tracked very closely to the scientific approach laid out in the SOPO and this presentation. This focus on the scientific method will continue through all testing phases and continue into the field trial at Utah FORGE.
- **Key Issues**
 - Element System – holds 5,000 psi at 450°F, then releases and reset to again hold 5,000 psi at 450°F
 - Mechanism to easily un-set and re-set the straddle

Technical Accomplishments and Progress

Complete Straddle System



Technical Accomplishments and Progress

- Twelve 3rd party tests so far, 9 reports



- March 31st of 2025 received Go decision for the first Go/No/Go

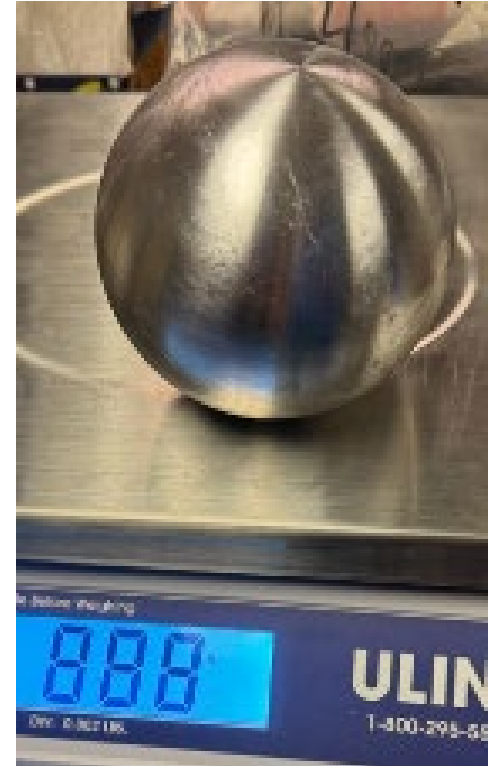


Technical Accomplishments and Progress



Straddle element getting loaded into the fixture for testing.

Contingency dissolvable ball testing



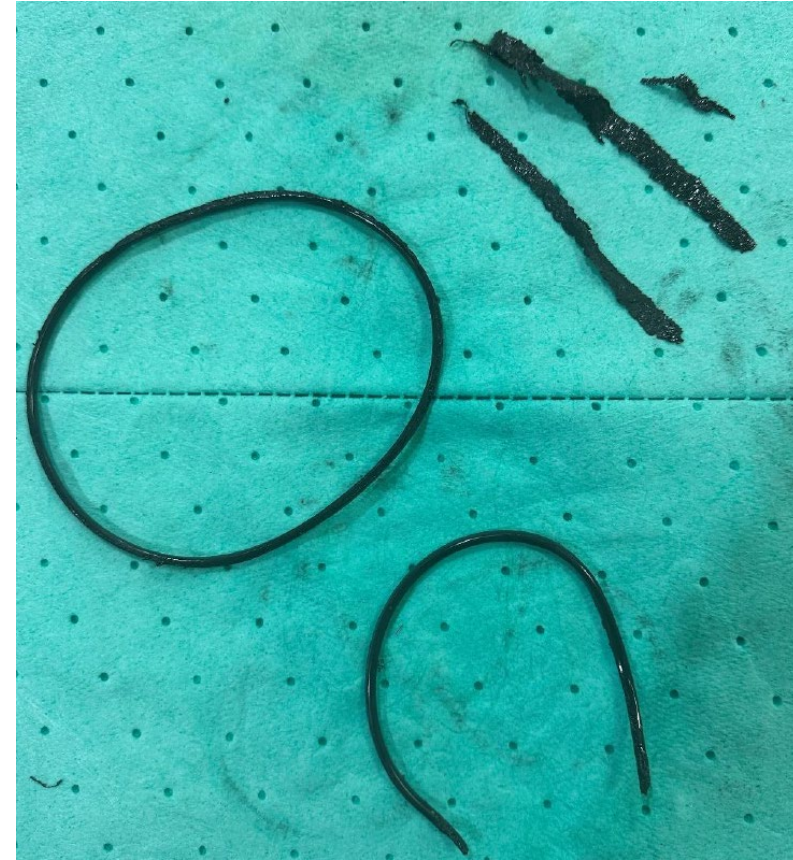
3.75" OD ball held against a 3.50" seat 10,000 psi at 450°F. Then held 6000 psi at 450°F for 48 hours until it dissolved enough to pass through the seat.

Technical Accomplishments and Progress

We tested different O-ring materials and found that Viton-Extreme was the best. Since standardizing on the Viton-Extreme we have not experienced a single o-ring failure.

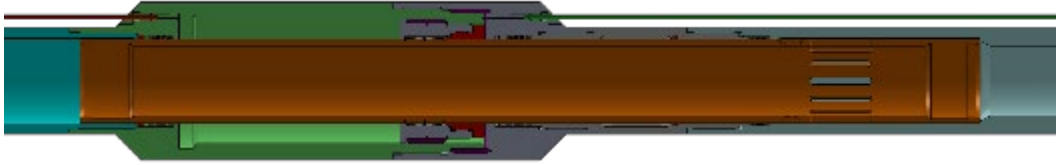


Viton-Extreme O-ring after testing

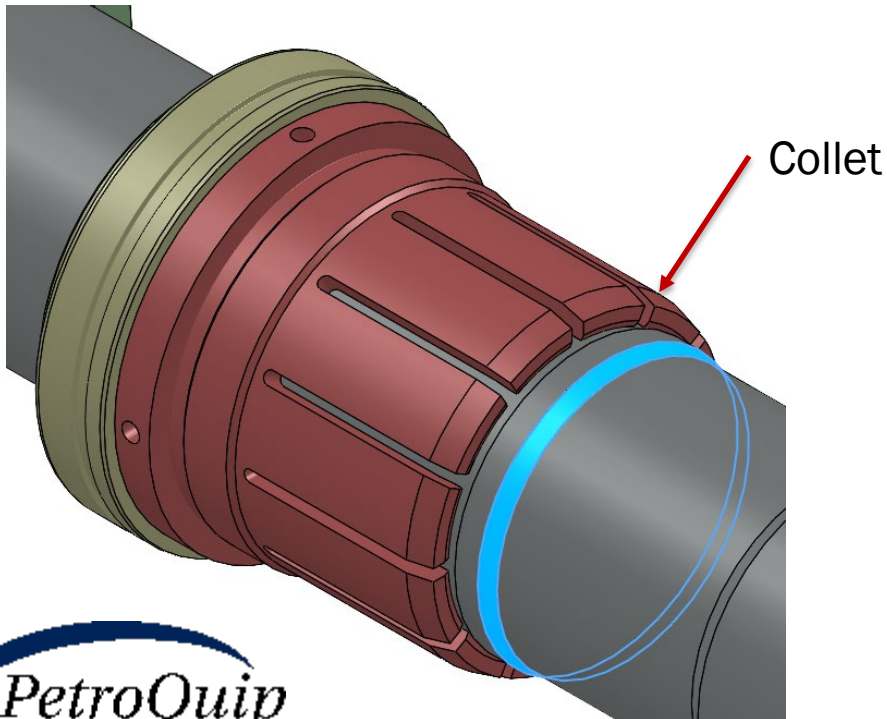


Aflas O-ring after testing

Technical Accomplishments and Progress



Proved out the threads to a load of 355,000 tensile before completing the design of the sleeve. They have to take the full boosted tensile when the area between the packers is 5000 psi.



The Collet provides an activation pressure; below this the system does not set. Allows low pressure testing and prevents unintended setting of the Straddle due to unplanned pressure/temperature fluctuations.

On the first design the collet didn't fully re-set. This was solved by reducing the wedge angle and increasing the spring force.



Technical Accomplishments and Progress

Element Testing – We have accomplished a 5K differential test but need to repeat it and make it more reliable.



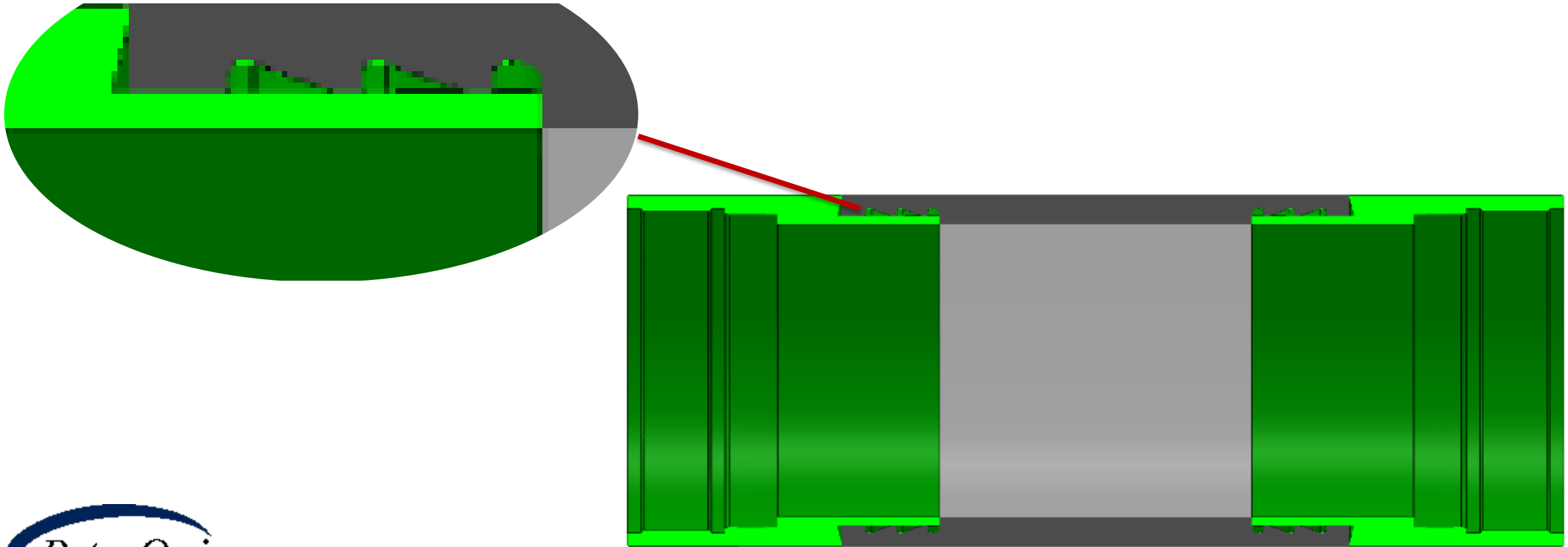
Before the 5K test



After one 5K differential test

Technical Accomplishments and Progress

Current design show how we have designed the element and end ring interface to keep them contained.



Summary

- We are about a quarter behind because of the lack of support or inability from seal companies, and another quarter because of the incorrect specifications when we started the project.
- We have qualified the following: High load threads, O-rings (instead of chevrons), the body design (over 38 sets on the original), and releasing collet/latch,
- All Test fixtures are manufactured; we are currently testing different element designs with varying material stiffnesses.
- We have the design finished, now all we have is testing and re-iteration.
- Sliding sleeve designed and in manufacturing, Testing next month,

THANK YOU

Funding provided by DOE EERE Geothermal Technologies Office to Utah FORGE and the University of Utah under Project DE-EE0007080 Enhanced Geothermal System Concept Testing and Development at the Milford City, Utah Frontier Observatory for Research in Geothermal Energy (Utah FORGE) site with additional support from Utah Trust Lands Administration, Beaver County, the Governor's Office of Energy Development, and Smithfield Foods.