



World Oil[®] **HPHT**

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Investigating the Collapse Resistance of Casings at Elevated Temperatures – Phase 1

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Road Map

- SwRI and Personal Introduction
- Current State of Testing
- Issues with Elevated Temperatures
- Phase 1 Results
- Future (Phase 2)

SwRI and Personal Introduction

- Founded 1947
- 501(c)(3) nonprofit corporation
- Located in San Antonio

- Started in 2007
- I get paid to break stuff
- I'm also located in San Antonio



Current State of Testing

- Long established procedures
- Proven techniques
- Low risk to personnel

Issues with Elevated Temperatures

- Personnel Safety Concerns
 - Change in fluids
 - New Procedures
 - Changes in patterns
- Equipment Concerns
 - Fluid compatibility issues
 - Unexpected consequences



Phase 1 - Plan

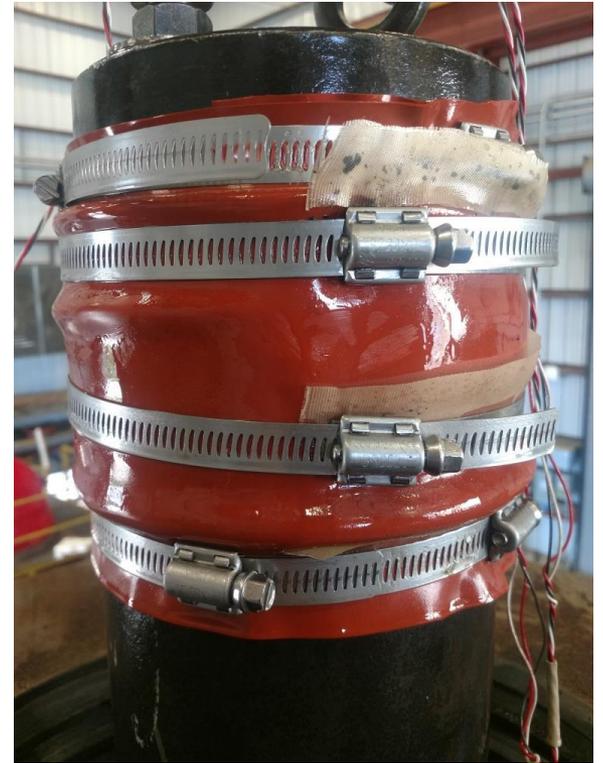
- Specimens – 5.5” 23# with 0.415” wall, P110 Grade
- Plan
 - Test at 350°F with strain gauges
 - Test at 500°F with strain gauges
 - Test at ambient with Fiber Optic strain sensing
 - Test at 350°F with Fiber Optic strain sensing

Phase 1 - Actual

- Test at 350°F with strain gauges
 - New Sealing technique 1



Phase 1 - Actual



Phase 1 - Actual

- Test at 350°F with strain gauges
 - New Sealing technique 2



Phase 1 - Actual

- Test at 350°F with strain gauges
 - New Sealing technique 3 – it worked



Phase 1 - Actual

- Test at 350°F with strain gauges
 - New Sealing technique 3 – it worked...but it wasn't pretty



Phase 1 - Actual

- Test at 350°F with strain gauges
 - New Sealing technique 3 – strain gauges didn't read...



Phase 1 - Actual

- Test at 500°F with strain gauges
 - New Sealing technique 3 – strain gauges didn't read again...



Phase 1 - Actual

- Test at ambient with Fiber Optic strain sensing
 - Old Sealing technique

Future

- Monitor strain real-time
 - Over temperature and pressure transients
 - Fiber strain sensing capabilities
 - Embedded possibilities in composites
- Safety procedures
 - Developments/Improvements
 - More complex tests closer to service conditions
- Phase 2 – 500F sample, Fiber at temperature

Special Thanks

- RDT – Donating casing samples to play with
- Luna Technologies – Donating fiber optic equipment
- SwRI employees – performing tasks I couldn't (or shouldn't have)

