# Operational Pigging Programs

## Stuck Pig Recovery

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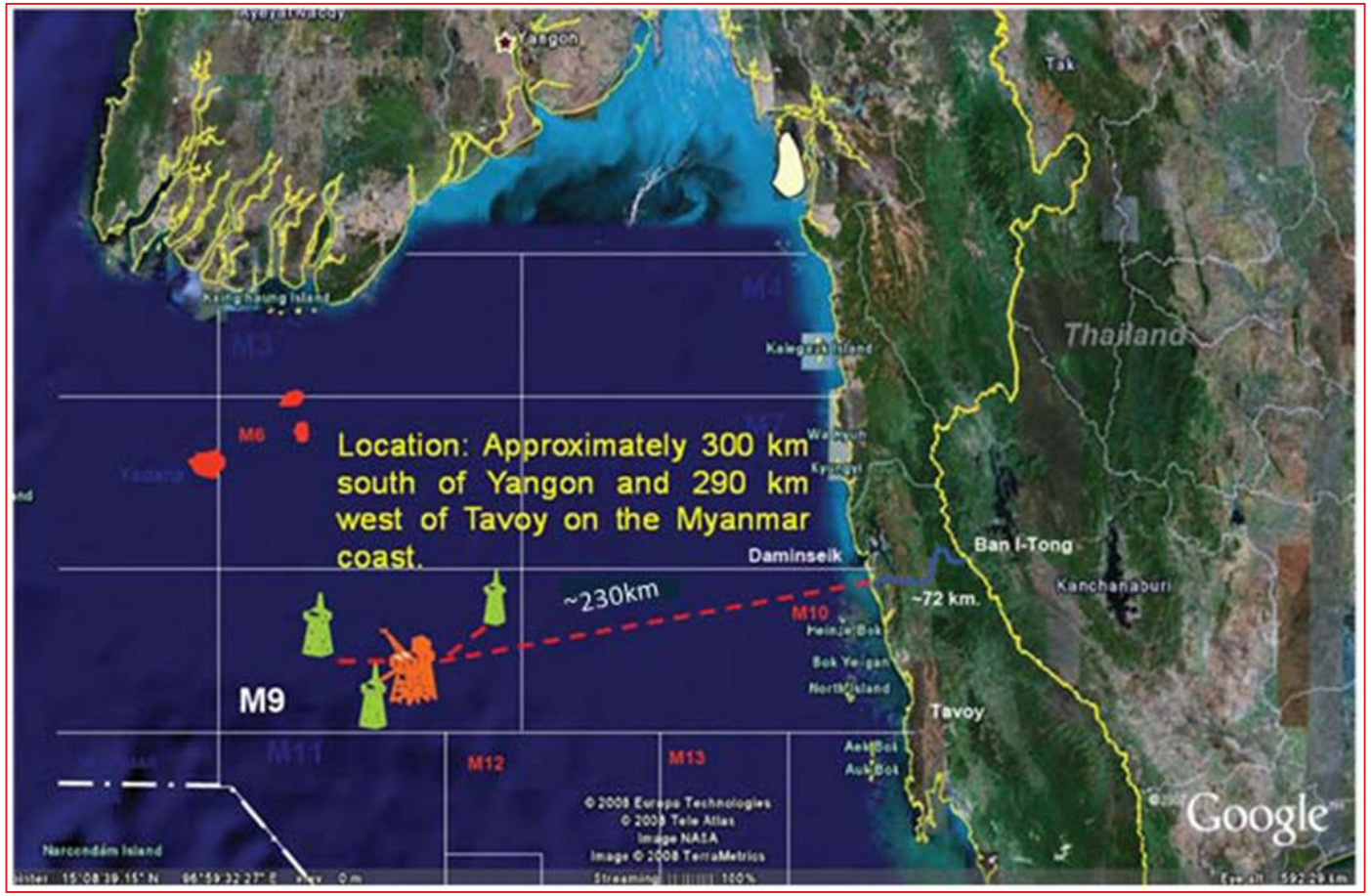
# Operational Pigging Programs

## TDW 100 Years


# Project Overview

## Geography

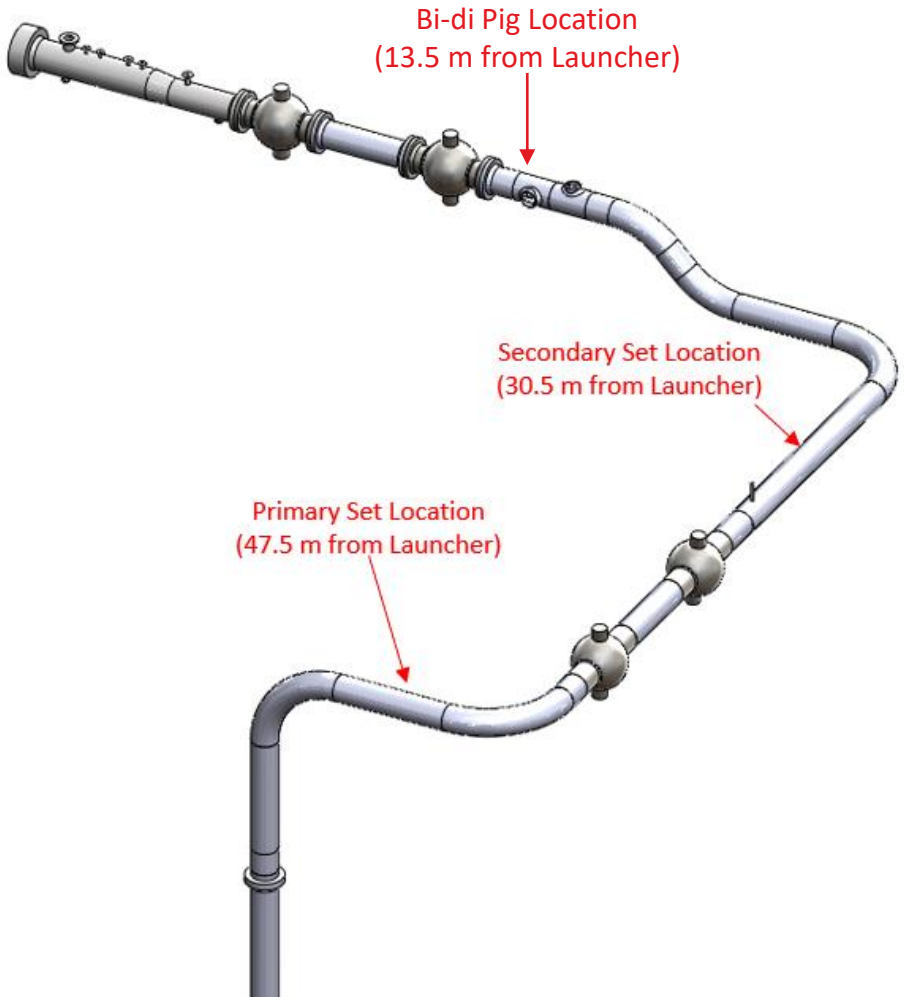
- 28 Inch Gas Export Pipeline
- Southeast Asia



# Project Overview

## Situation

- 28in Bi-directional pig stuck in production Tee **~13.5 m into the line**
- Production could still continue
- Concern pig would move further into the line and block production completely
- Passing Launcher Valves
- Removal of stuck pig prior to SmartPlug® tool isolation

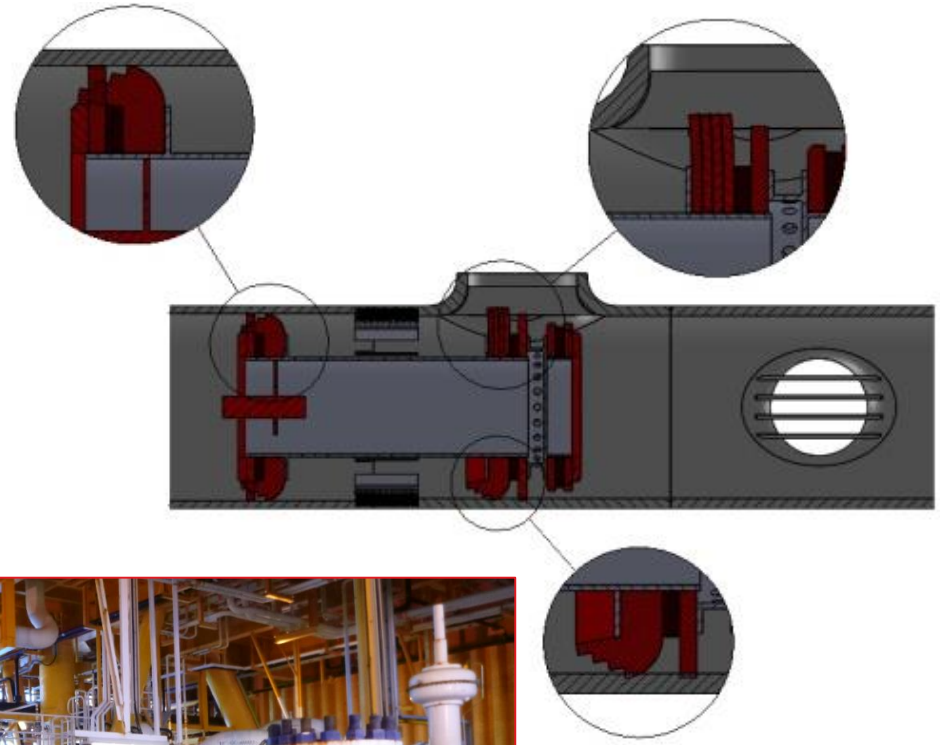


# Engineering Study

## Evaluating Alternative Solutions

Understanding why the pig stalled and became stuck:

- Large bypass allowed due to expected high level debris
- Heavy stacked disc setup for wear resistance due to type of debris and pipeline length

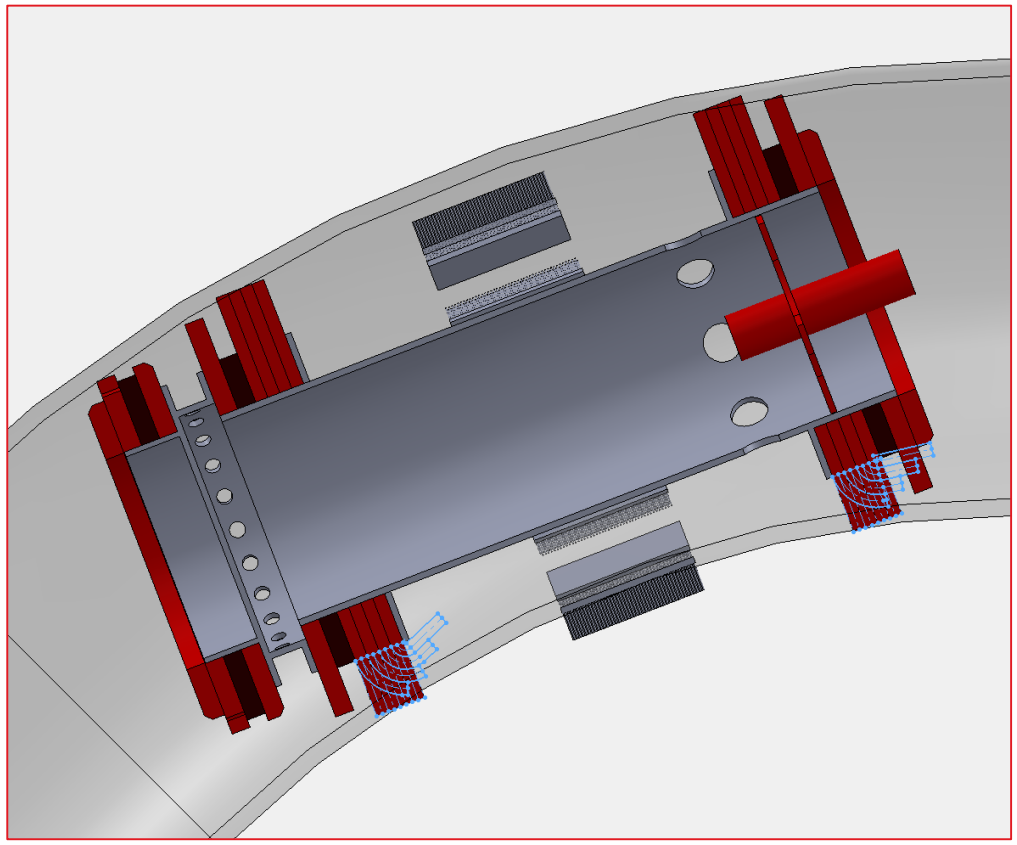


**Large bypass + High differential pressure = Stalled pig**

# Engineering Study

## Evaluating Alternative Solutions

- Launch another Bi-Di pig to push the stalled pig back to the onshore receiver
- Recover the Bi-Di pig back to the platform launcher

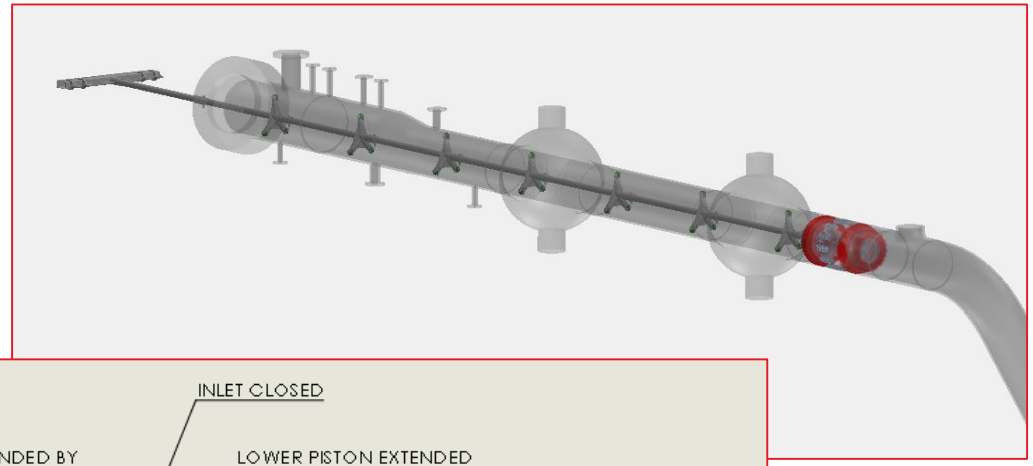


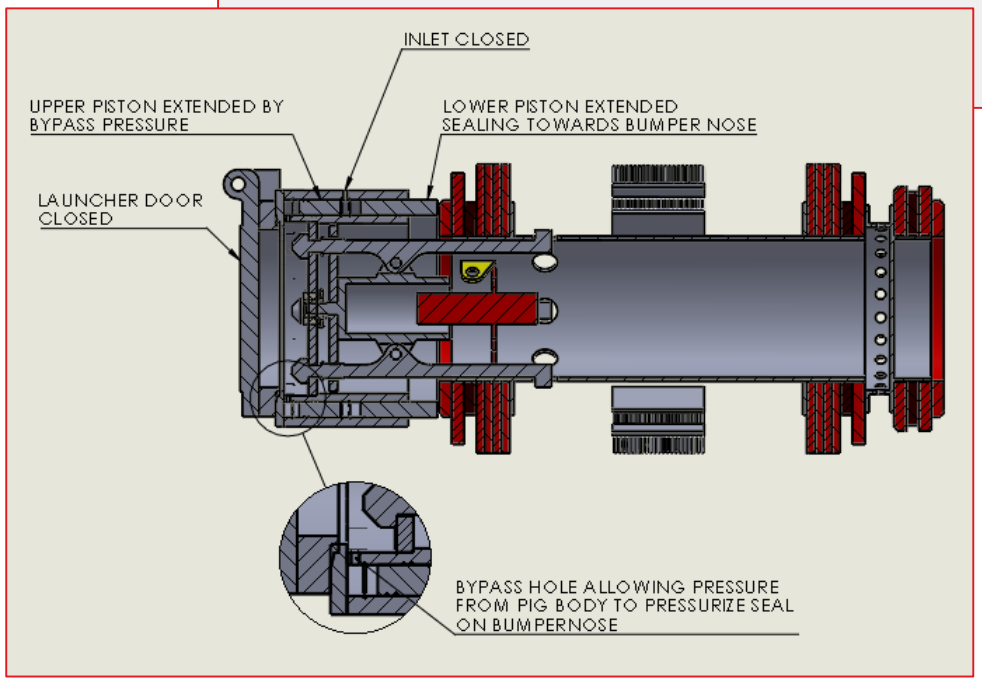
# Engineering Study

## Evaluating Alternative Solutions

Recover the Bi-Di pig back to the launcher:

- Pigging: Installing a sealing cap to block the pigs bypass & pig it back into the launcher
- Mechanical pull: Attach a pulling arrangement to the pig & pull it back into the launcher using hydraulic pull force





# Tool Development

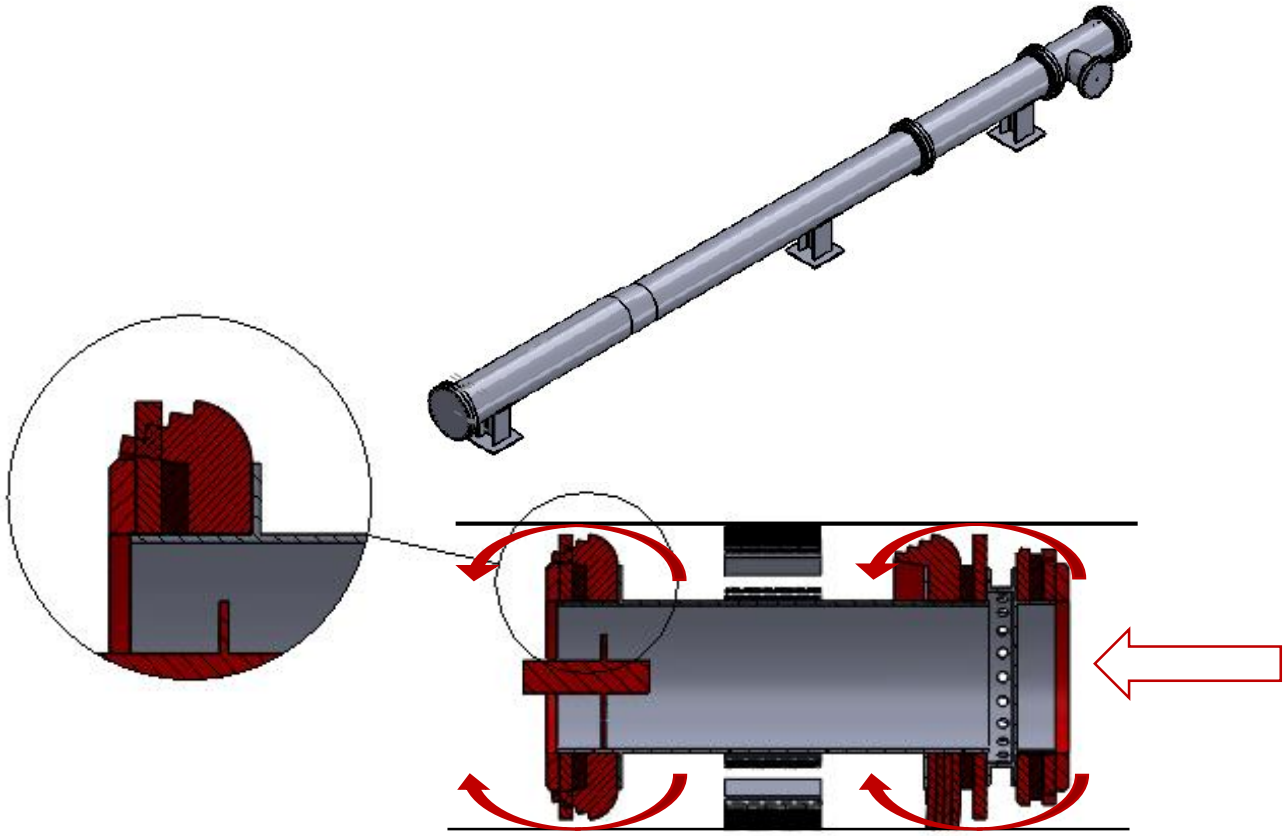
**Pigging Test – Disc Flip Straight Section**

Pigged test pig into minor barrel:

- ~ 3 bar differential pressure
- As expected from offshore pigging

Pressurized from downstream side:

- Built ~ 3.5 - 4 bar
- Leakage across outer disc perimeter
- Pig did not move



**Water pressure and bypass**

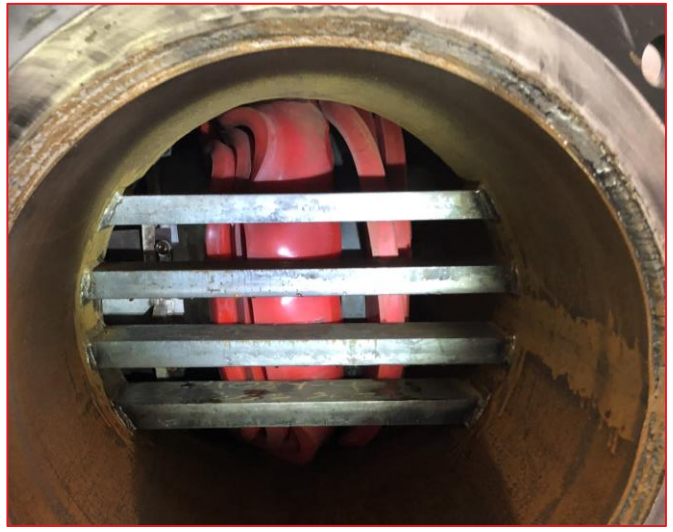
# Tool Development

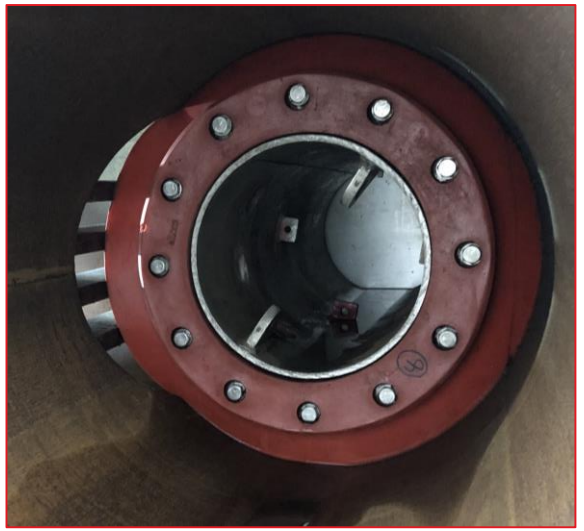
## Pigging Test – Disc Flip Tee Section

Pigged test pig with Bypass Cap into Tee; stalled in Tee section

Pressurized from downstream side:

- Built ~ 3.5 - 4 bar
- Pig with cap moved ~ 1 m & stalled; leak path similar to straight section test
- Front pack, first seal disc flipped; No flip on rear disc pack

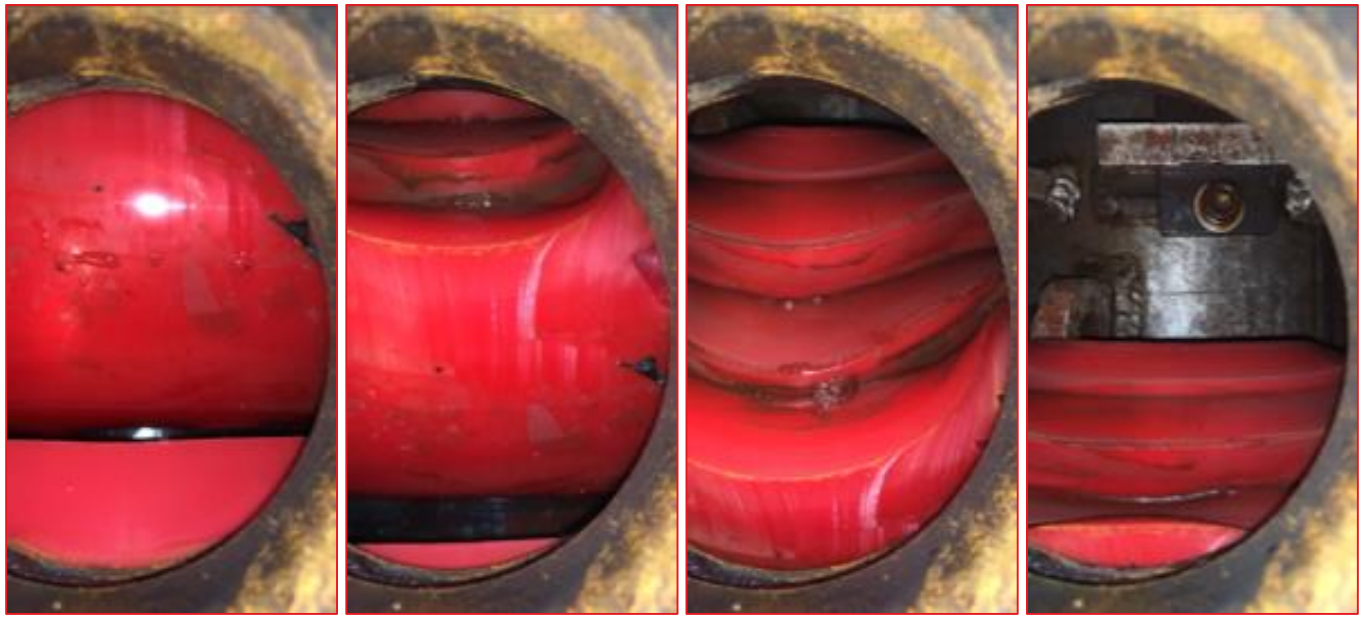




# Tool Development

## Pigging Test – Recovery Force

- Recovery force: 13 tons
- All discs flipped: 1st  seal disc on each  pack stretched over the following 3 discs
- Left to right through 28in straight section:

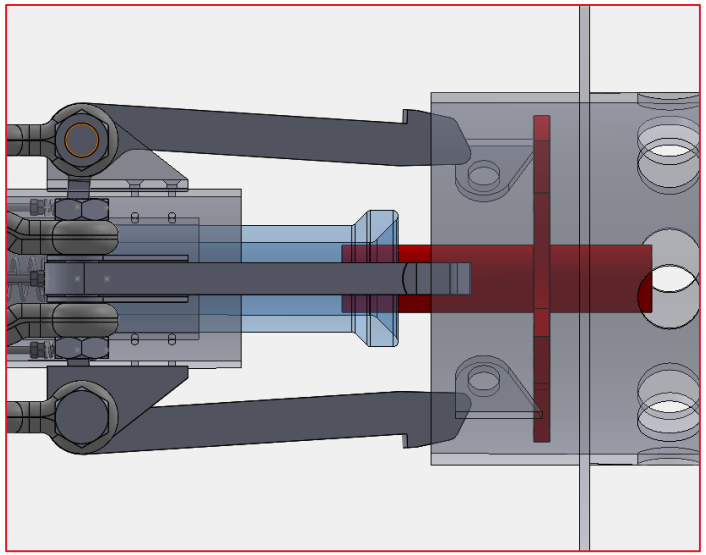


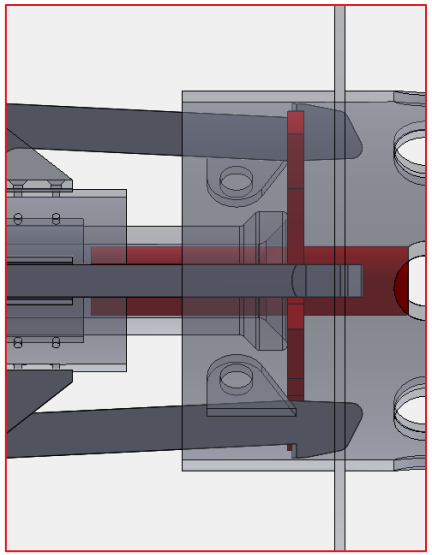
# Tool Development

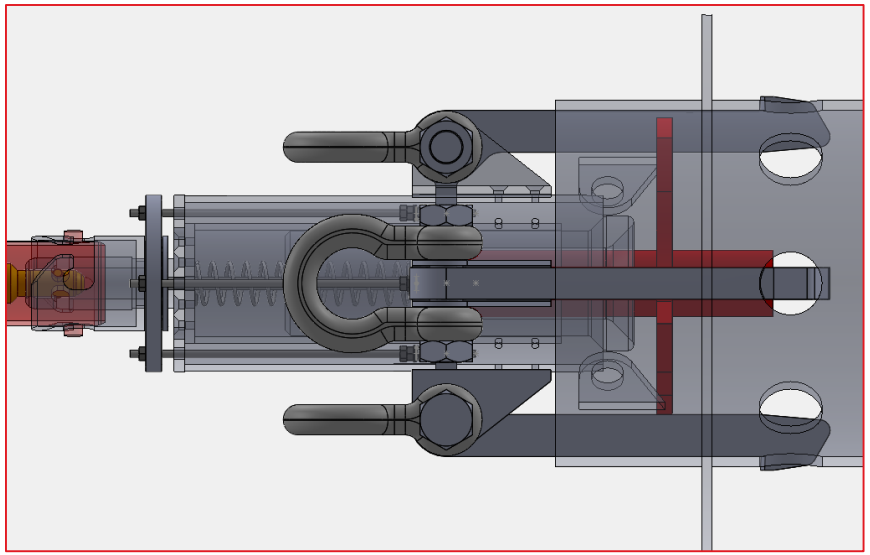
## Pigging Test – Design Impact

Leakage over disc packs during testing:

- Piggable recovery option eliminated
- Optimize retrieval solution for machinal pull



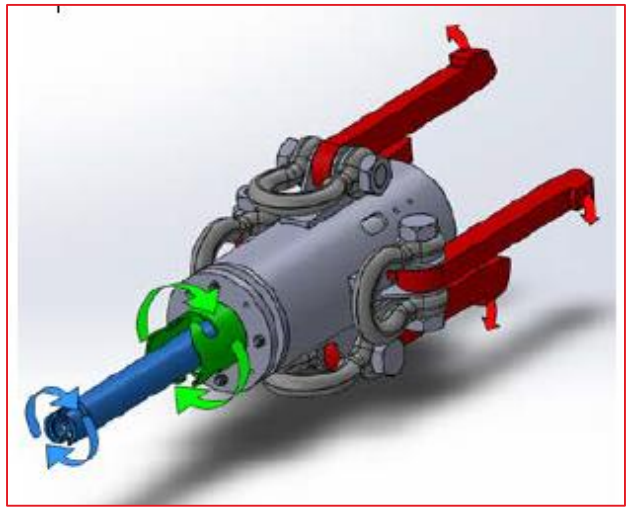


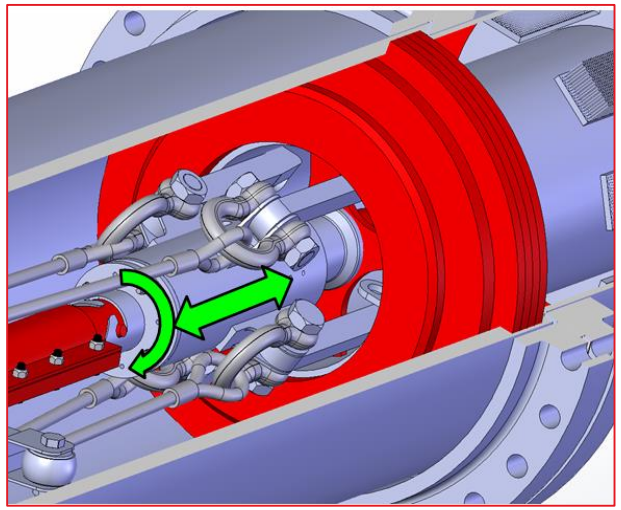


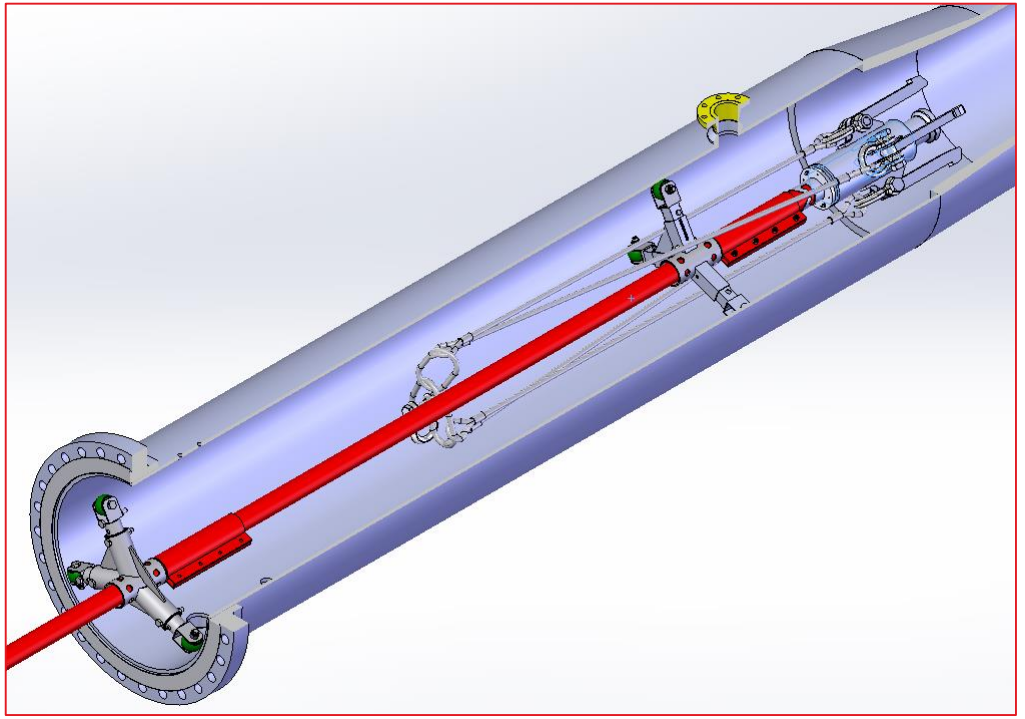
# Tool Development

## Pigging Test – Design Impact

- Optimize retrieval solution for machinal pull
- Minimizing duration the launcher door is open







# Tool Development

## Tool FAT – Acceptance Criteria

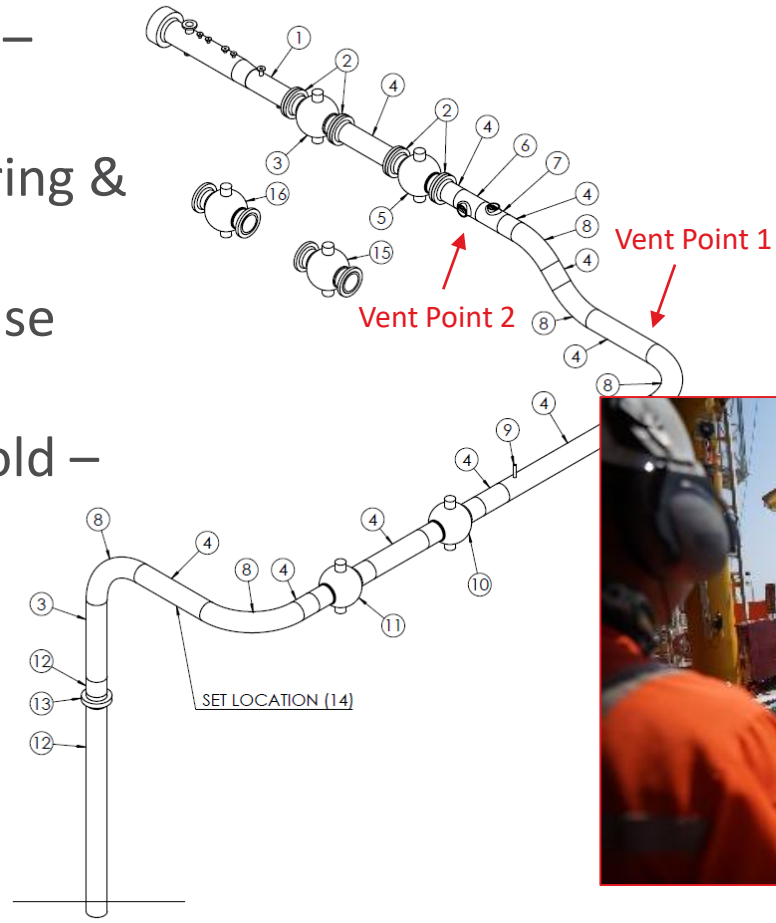
1. Demonstrated ability to locate pig & engage retrieval tool
2. Determine force required to retrieve pig using the Tool
3. Integrity of the pig body & Tool is maintained during retrieval
4. Offshore planning; recorded time for lance assembly, Tool/pig engagement & retrieval




# Offshore Execution

## Preparation Activities

- Passing Launcher Valves – Ongoing monitoring
- Passing ESDVs – Monitoring & vent point required
- Scaffolding built – Increase working area
- Preassembly of Stronghold – Time reduction





# Offshore Execution

## Retrieval Activities

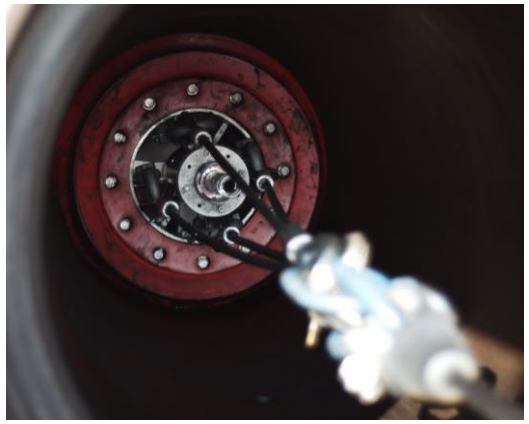
1. 09:20 Launcher door opened
2. 11:15 Complete Tool assembled & inserted in pipe
3. 11:20 Tool & pig engagement confirmed
4. 13:00 Pulling wire tensioned, start pulling operation
5. 16:15 Pig retrieved from launcher & door closed

1.

2.


3.


4.



5.

# PROJECT COMPLETE

**PIG RECOVERED SUCCESSFULLY**
**TOTAL DURATION LAUNCHER DOOR OPEN = 7 HOURS**