

Archer



**SPE ABERDEEN WELL DECOMMISSIONING 2023
WELLS IN THE FUTURE -
LATE LIFE & DECOMMISSIONING**
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Casing Back-Side Cleaning and Recovery System pulled up
to 400m of casing from settled barite in one trip
Casing Cleaning & Recovery system (CCR)

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Technical Business Development - Archer

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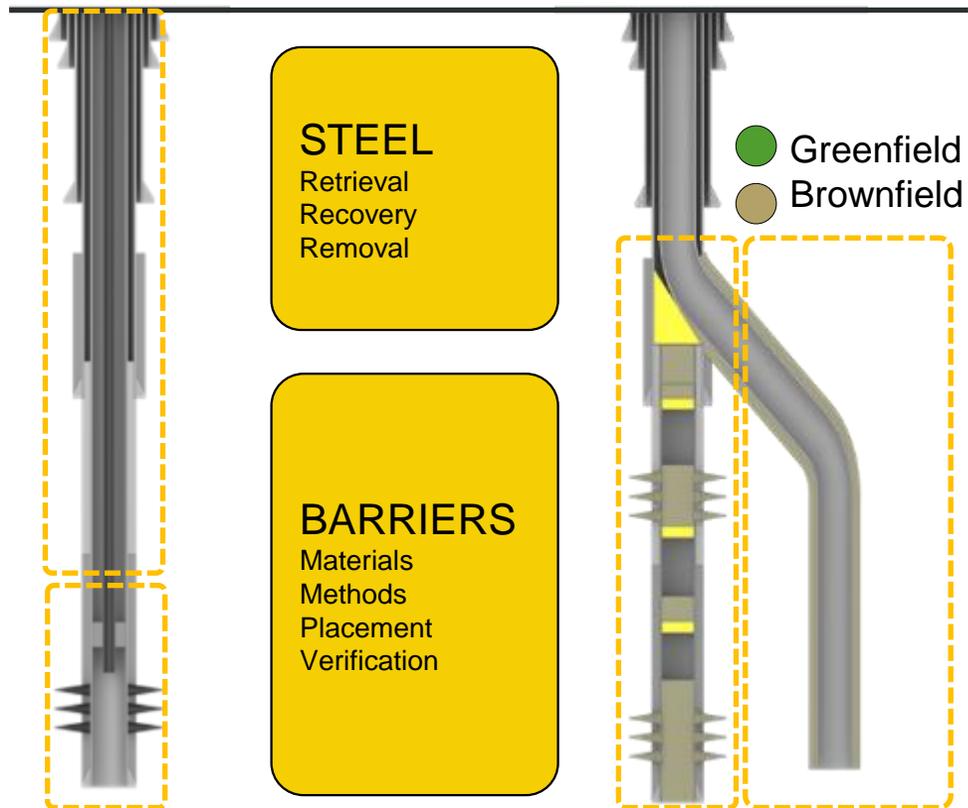


Agenda

1. P&A and Slot Recovery Basic Introduction
2. Casing Recovery – The Challenge
3. STEP 1 : Casing Cut & Pull System
 - a) Cut & Pull Running Procedures
 - b) Multi Function Casing Cutter – SAMURAI®
 - c) Combinable Spear – ACS®
4. STEP 2 : Casing Cleaning & Recovery (CCR)
 - a) CCR – Running Procedure
 - b) CCR – Cleaning casing with THOR® System
 - c) CCR – LOCK® plug used as Spearhead and other applications
5. Case Studies x 2
6. Conclusions

P&A and Slot Recovery

Basic Introduction



PLANNING & DESIGN

MEASUREMENTS

STEEL

BARRIERS

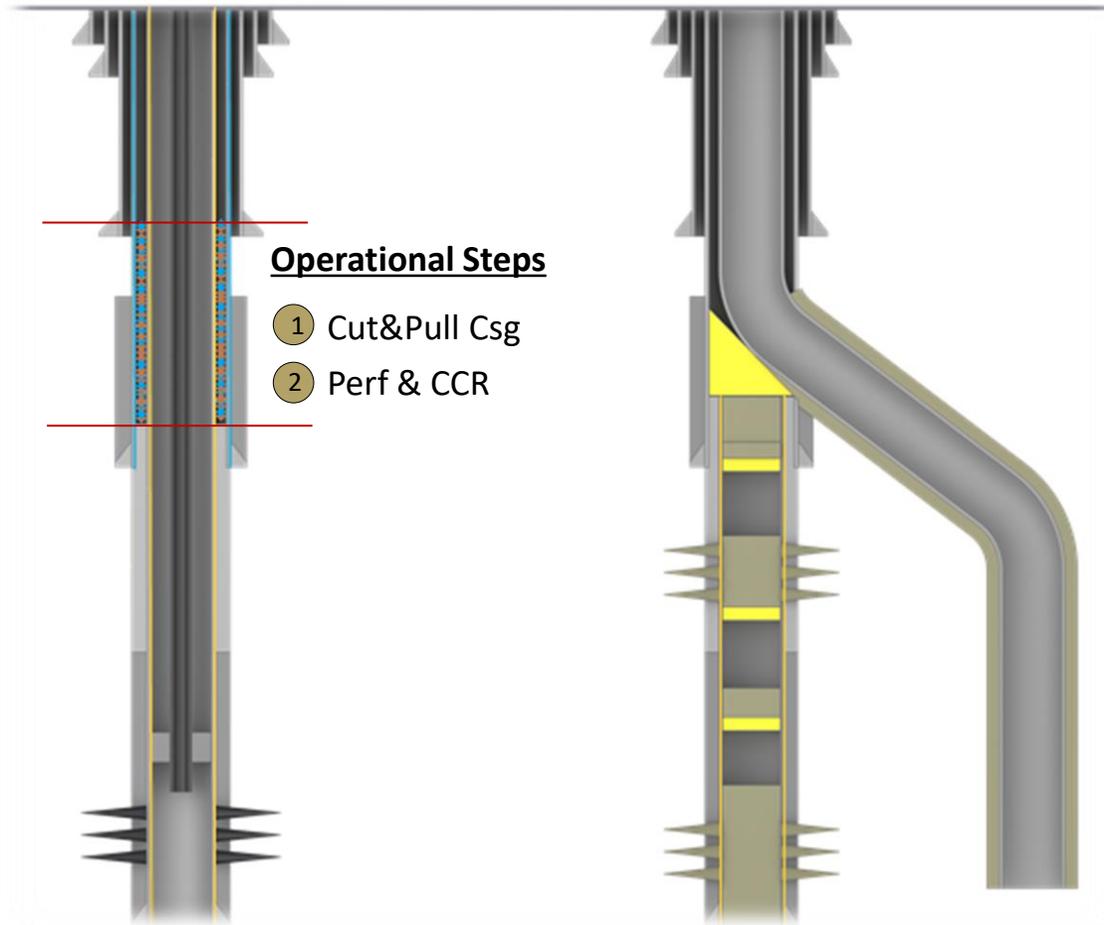
COMPLETION

OTHER (Niche & Novel)

MONITORING

Casing Recovery

The Challenge



- It is a major benefit to log the casing to select the right interval to cut&pull and to assess the annular conditions for sag barite,
- With significant barite settlement it is very time consuming to pull casing and multiple cuts of small sections of casing will be required if the back side is not properly cleaned.
- Up to 30 days may be spent on recovering casing to the required kick-off depth with multiple cuts
- Downhole Hydraulic Casing Jack is a popular solution to achieve high pull forces
- Casing milling is an option but entails significant swarf handling and time

Casing Cut & Pull System

LOCK[®] SAMURAI[®] & ACS[®]



STEP 1

1-Trip Set plug, cement, cut&pull, and retrieve csg

Step 1: Casing Cut & Pull System Running Procedure

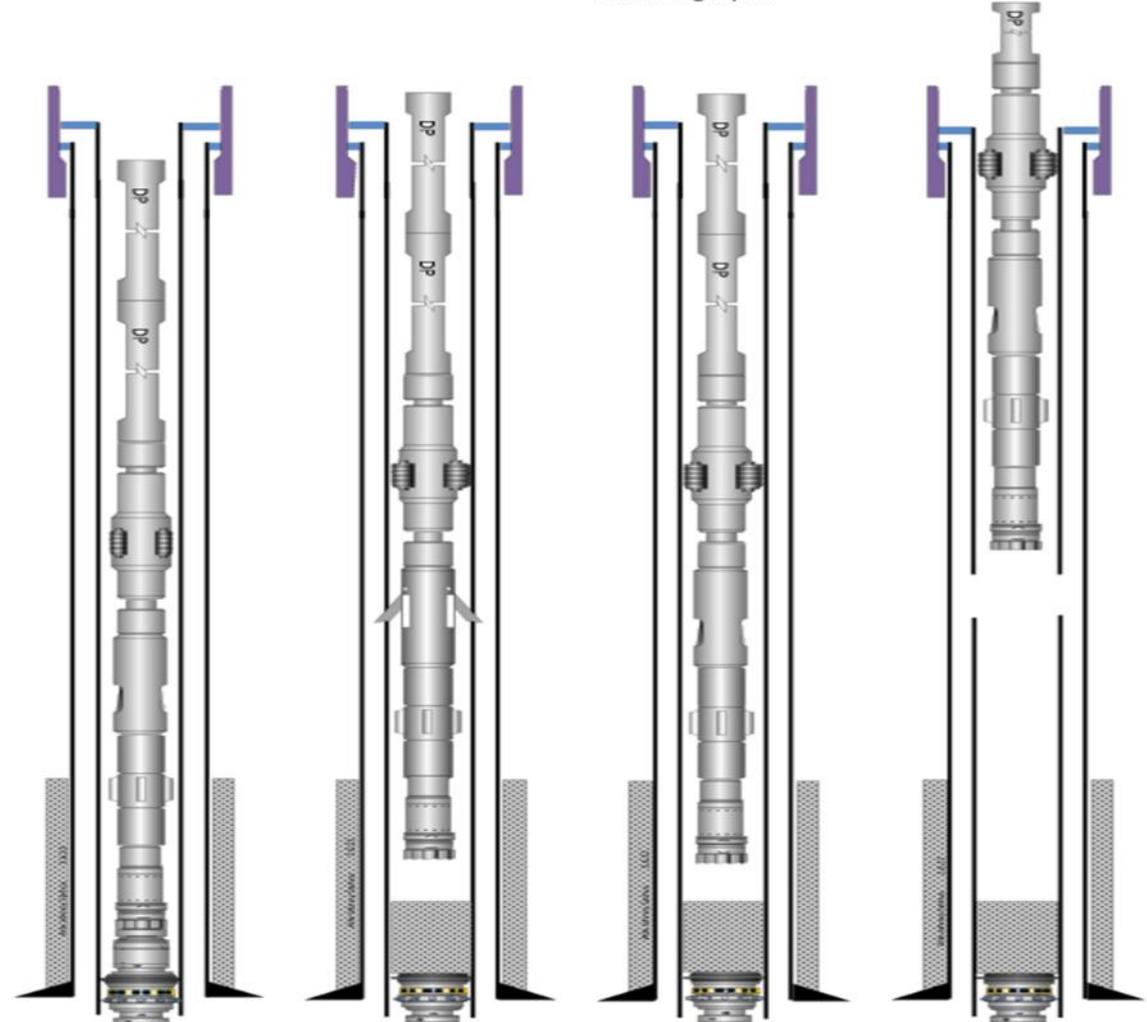
1. RIH with BHA assembly (LOCK[®] + SAMURAI[®] + ACS[®])
2. Set Plug (LOCK[®]), Pressure test it and perform cement job
3. Cut Casing (SAMURAI[®]) based on cement logs at strategic depths.
4. Attempt top pull casing fish to surface with the Archer combinable Spear (ACS[®])
5. If unable to pull free the casing , perform a second cut with the multi-cutter SAMURAI[®]
6. Attempt to cut & pull second casing fish
7. If still unable to pull, prepare the THOR[®] System for Casing Cleaning and Recovery

Set plug, test same, release running tool, perform cement job

POOH to desired cutting depth. Activate spear and cutter, take overpull and cut casing.

When casing is cut, stop rotation. Take overpull to check if casing is free. If not release spear and POOH to next cutting depth.

When casing is free. Release spear and POOH to hanger. Set spear below hanger and retrieve casing



SAMURAI® Multi Function Casing Cutter

Step 1: Casing Cut & Pull System

Features and Benefits

Big Bore 2 ¼" ID balanced piston

- Allowing cementing and high circulation rates

5000 psi internal pressure integrity

- Accommodates pressure activation/testing

Knife arms stay dormant until activation by ball

- Can be part of other operations prior to cutting

Combinability

- Samurai® cutter can be run together with a mechanical plug or Spear to establish permanent cement barrier, make multiple cuts and retrieve casing in same operation.



ACS[®] Combinable Spear with 300Ton-Load pulling capacity

Step 1: Casing Cut & Pull System

Features and Benefits

300-ton tensile rating @ 120degC with

- Combinable for Cut&Pull operations

Combinability for a 1-Trip system Cut & Pull

- Part of the cut, spear and jack system

Flow area through the tool at 3.14 in²

- Allow cementing operations

Up to 2 ¼" tool ID through-bore

- Allow ball dropping for activation

Ball activation

- Stays dormant in string while performing other operations



Casing Cleaning & Recovery (CCS)

THOR[®] Barricade[®] & LOCK[®]



STEP 2

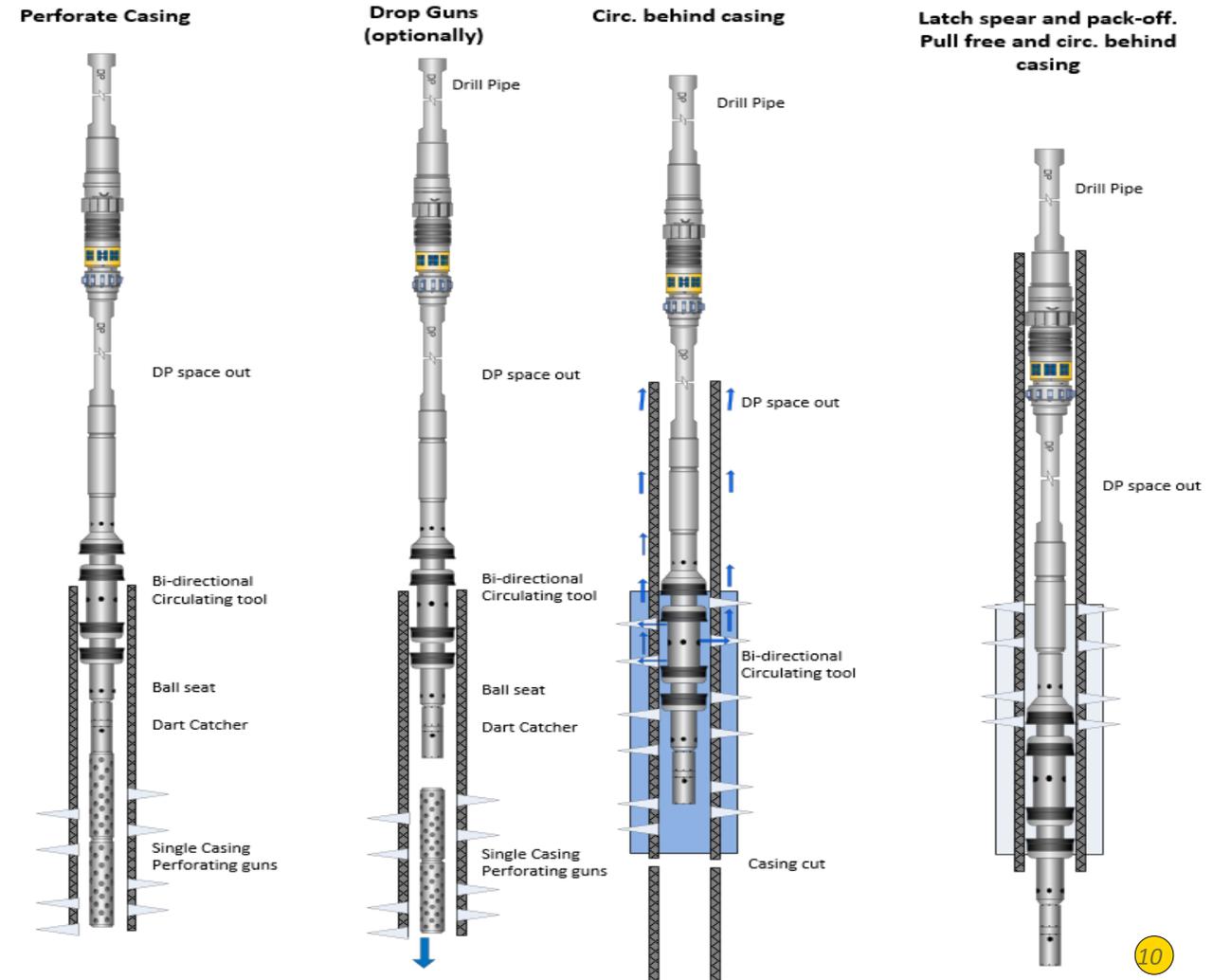
1-Trip Perforate, Clean & Recover Casing

Step 2: Casing Cleaning & Recovery (CCR) Running Procedure

1. RIH with BHA assembly
2. Fire TCP to perforate casing and drop guns
3. Use Barricade® Tool to wash casing annulus to remove barite. Washing efficiency for the closed loop system is monitored on the SPP and solids returns at surface



4. Once washing is completed, engage inline spear (LOCK® plug) and pull to retrieve casing. Tensile rating up to 300MT



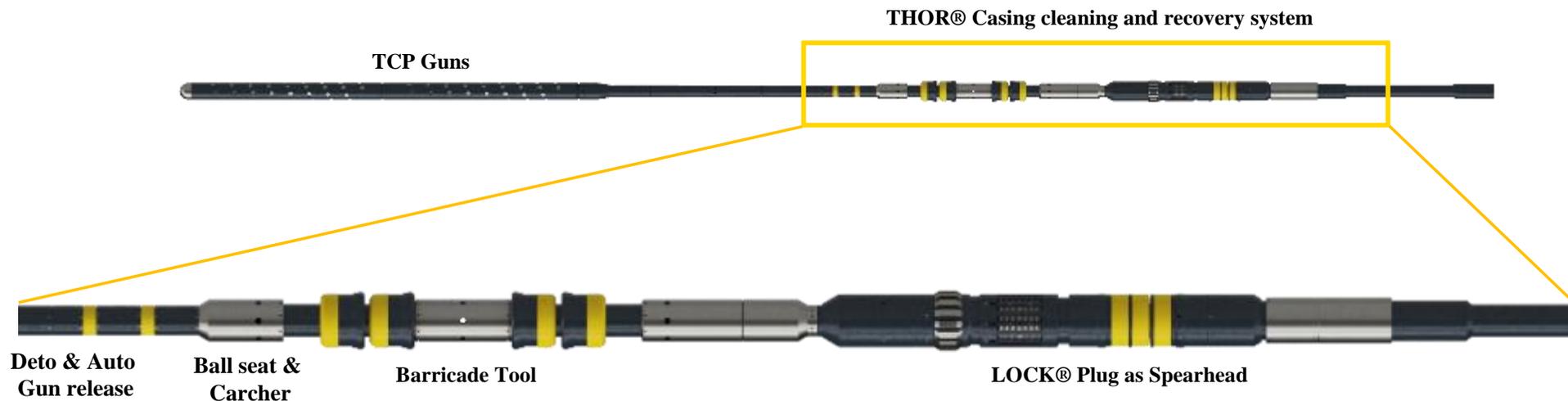
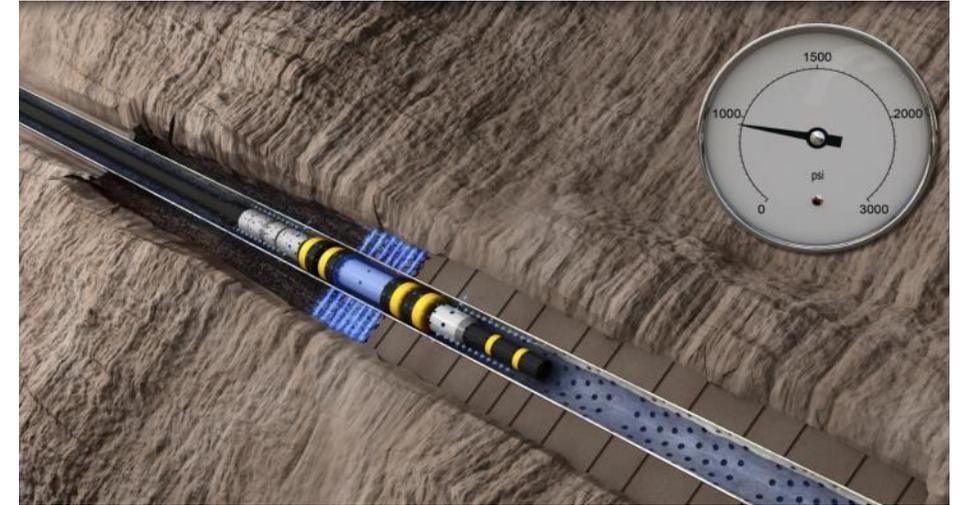
System available on Casing Sizes: 7", 9 5/8", 10 3/4", 13 3/8"

THOR[®] System

Step 2: Casing Cleaning & Recovery (CCR)

Features and Benefits

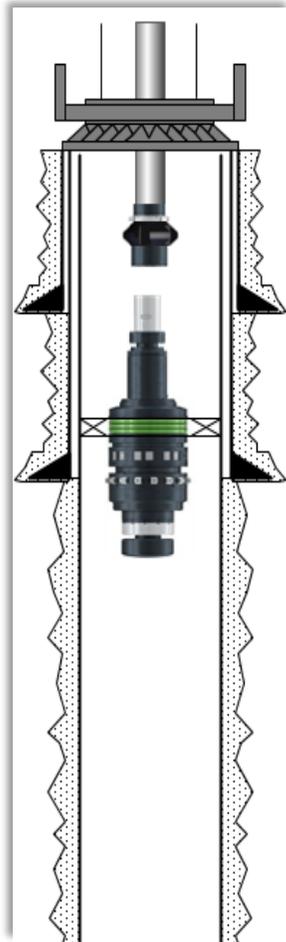
- Efficient one-trip system with tubing conveyed perforation (TCP)
- Washing out barite to reduce resistance between casings based on the Barricade Technology
- No swarf handling



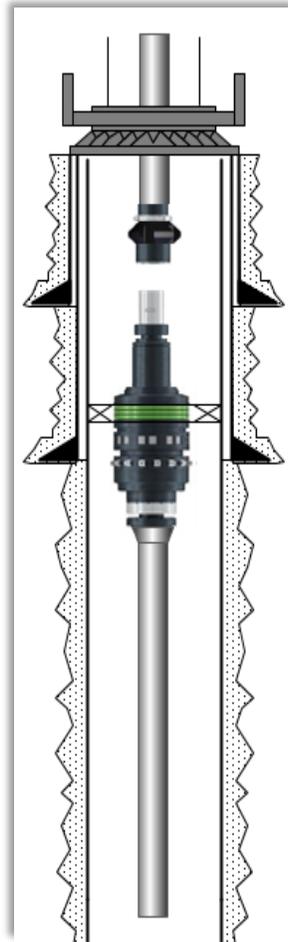
LOCK[®] Plug Solutions

Step 2: Casing Cleaning & Recovery (CCR)

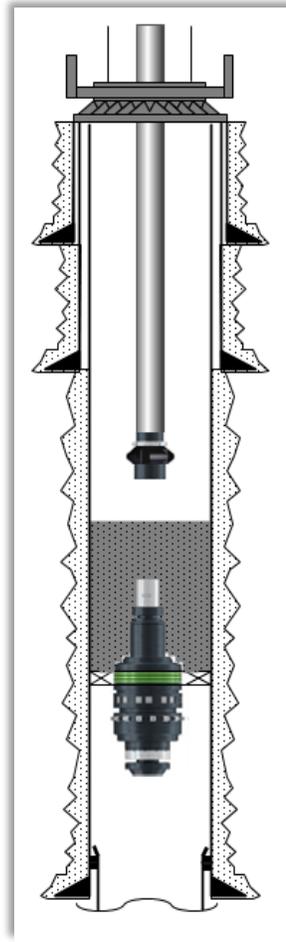
Standard barrier



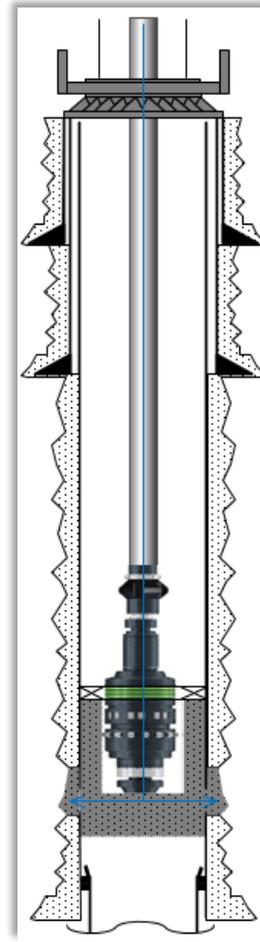
Barrier with DP below



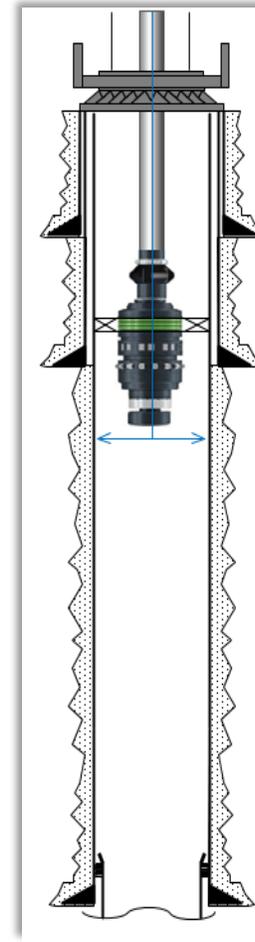
Permanent Cement base



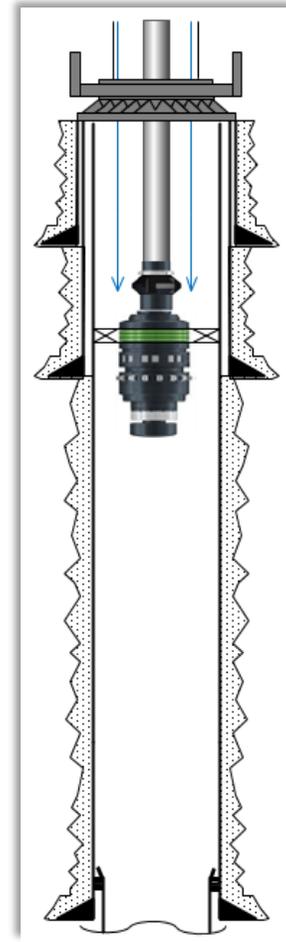
Squeeze operation



Pressure testing



Pressure testing





CASE STUDY 1:

Pull 9 5/8" in Settled Barite Using THOR® System

Challenge

The Equinor Gullfaks asset are doing extensive slot recovery operations and continuously struggle to pull 9 5/8" casing out of 13 3/8" with settled barite in the annulus. On Gullfaks 34/10-B22 it was expected from the CBL logs and calculations that the bottom 249m (1355-1106mMD) of the 9 5/8" tie-back was expected to have settled barite. The length of pipe recovered on each run vary greatly but the pieces can even be less than 10m. The use of a hydraulic jacking system is costly and time consuming.

Solution

The **Samurai®** Multi-function Cutter was prepared to dress cement, tag and cut the 9 5/8" tie-back casing below Whipstock kick-off point at 1355m and just above the free point at 1106m in one run. TCP for the **THOR®** System was prepared to perforate 240m with automatic gun release and the **Spearhead®** placed above the **Barricade®** tool to engage in top of casing and pull the piece free.

Result

Washing of the perforated area was done with decreasing SPP on each pass and large amounts of barite coming over the shakers. The upper part of the tie-back casing which was indicated to be free pipe was pulled free with 60ton overpull while the bottom 250m of perforated and washed casing was pulled free with only 8ton overpull. The 13 3/8" casing was subsequently logged and found to be free from damage.

250m of casing in settled barite

Casing pulled free with 8ton

Large amounts of barite coming over the shakers



“The THOR® system is recommended for cleaning the back side of casing to remove solids and improve pulling efficiencies ”



CASE STUDY 2:

CCR - pulled up to 400m of casing from settled barite in one trip

Challenge

The Vigdis is a field in the Tampen area in the northern part of the North Sea, between the Snorre, Statfjord and Gullfaks fields, with a water depth of 280 metres.

Simulations during the planning of the P&A work for Vigdis E-4 well showed that up to 400 meters of 9 5/8" casing with settled barite have to be retrieved, above the deepest planned cut

Solution

Multiple C&P and/ or jacking 400 meter casing in settled barite is very time consuming, and to reduce the rig time for pulling casing the Archer THOR® System was utilized to efficiently retrieve the 400 meter casing.

The THOR® Casing Cleaning and Recovery System enables the operator to perforate, clean and recover the casing all in a single trip using TCP to avoid damage to the outer casing. Delivering a step change in performance pulling longest casing strings from settled barite.

Result

The 9 5/8" casing was first cut at 1313 mMD to 1708 mMD by using the THOR® System to dress, tag cement and cut the casing. The 400 meter casing was successfully perforated, washed and pulled free with 45 ton overpull without any NPT.

The operation was delivered efficiently and proves that the THOR® System is the solution for retrieving casing stuck in settled barite when performing sidetracks or C&P operations.

400m of casing in settled barite

Casing pulled free with 45ton



“The THOR® system is recommended for cleaning the back side of casing to remove solids and improve pulling efficiencies ”

Summary

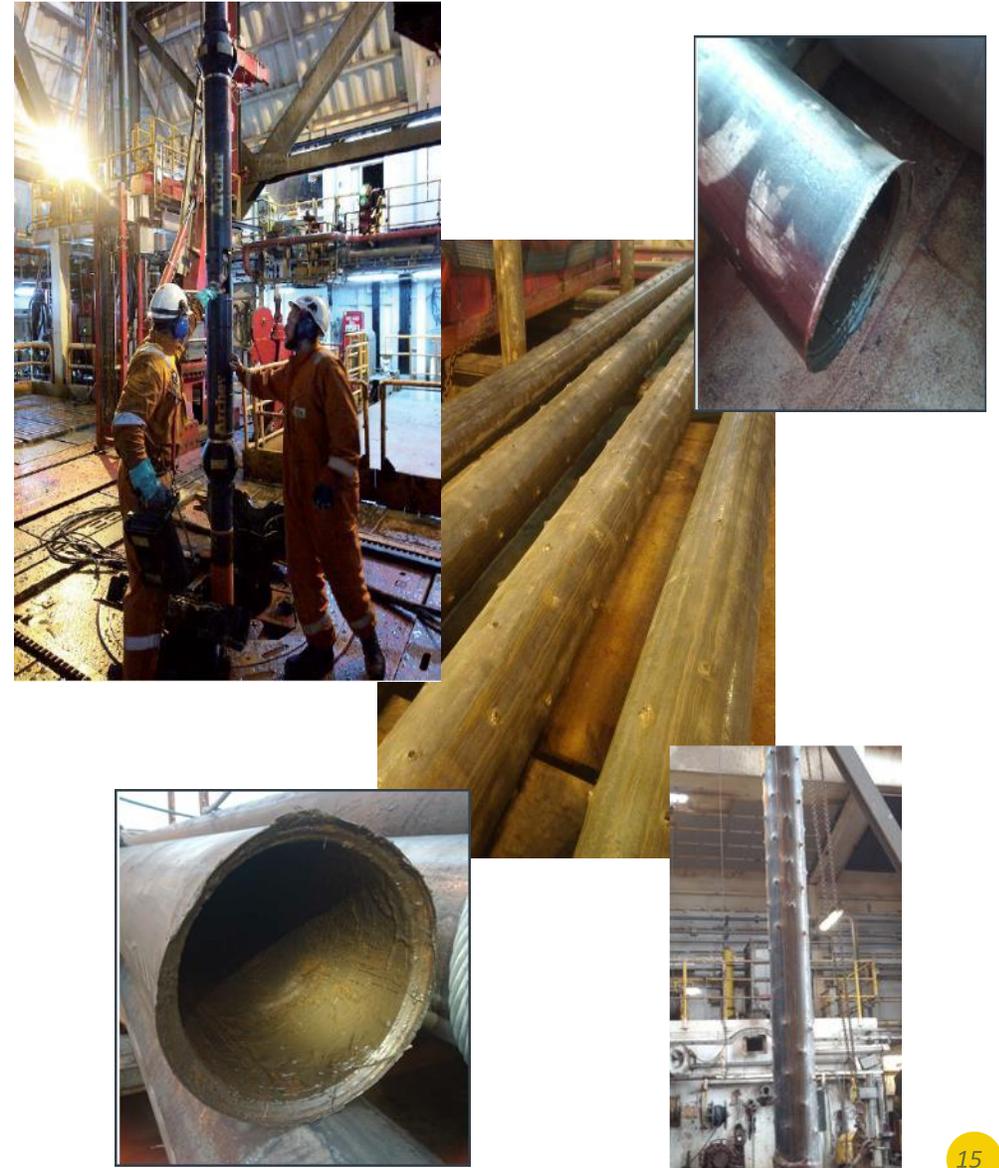
THOR® Casing Cleaning & Recovery (CCR)

Benefits

- Efficient one-trip system with TCP perforation guns
- Washing out barite to reduce resistance between casings
- Large section of casing at deck at minimum time
- No need for Cutting, Pulling & Jacking small sections of Csg
- Improve operational efficiency
- Can use plug pulling system or dedicated spears
- Can be run with mechanical punching
- Sizes (casing) 7", 9 5/8", 10 3/4", 13 3/8"
- Reliable & Cost efficient

Success Factors

- It is a major benefit to log the casing to select the right interval and to assess the annular conditions.
- Perform strategic cuts with the Samurai Multi-cutter across the intervals where there is Low, moderate and high bond quality. To setup up the THOR® System for several options.





THANK YOU

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Technical Business Development - Archer