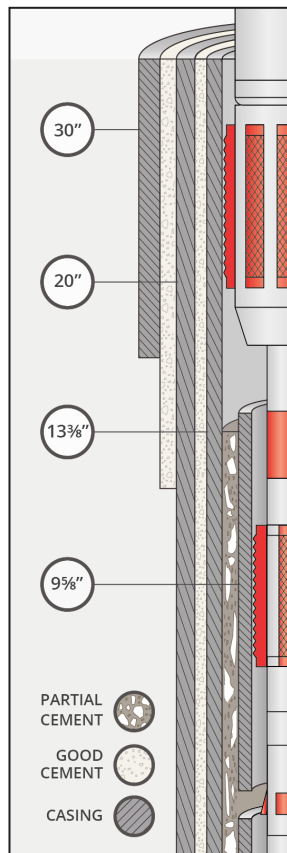


CEMENTED CASING RECOVERY

A Proven Alternative to Casing Milling



TITAN® SYSTEM

The TITAN System unifies casing cutting and recovery with a downhole hydraulic power tool, in a single trip operation.

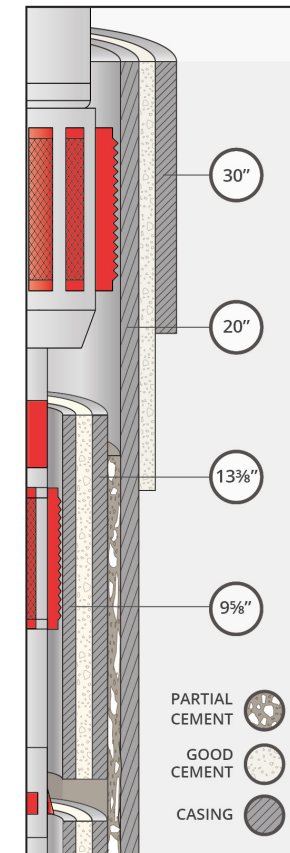
The downhole adaptability of the TITAN System ensures and maximises the recoverable casing by utilizing the pulling capacity of the hydraulic power tool with added repeatable casing cutting capability in a single trip.

THE APPLICATIONS

WELL STAGE	DRIVER	SURFACE UNIT	REQUIREMENT	TITAN SOLUTION	VALUE
Workover	Well integrity	Rig or Rigless	Sustained annulus casing pressure issues	Restore well / casing integrity by recovering leaking casing / external patch & re-cement	No milling / swarf
Brown Field	Re-entry / Workover	Rig	Slot Recovery Sidetrack Barrier placement (depth)	Open Hole Sidetrack - potential hole size enabler by pulling casing below the shoe	Rock to Rock Barrier No BOP Cleaning
P&A	Permanent barrier plug installation	Rig or Rigless	Casing removal for barrier placements (depth)	Recovering casing in settled annular solids	No logging

SINGLE STRING RECOVERY

DUAL STRING RECOVERY



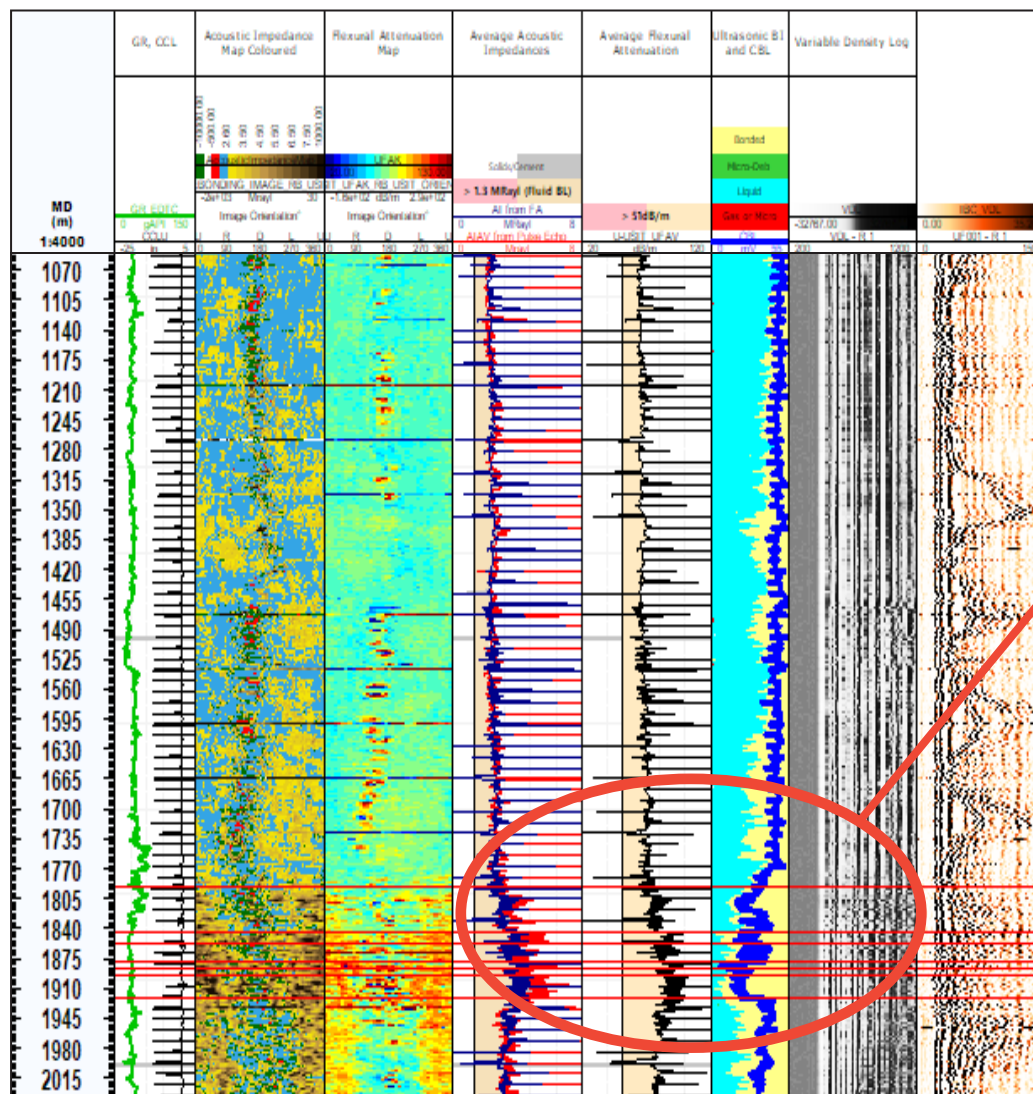
TITAN System	DownHole Power Tool	ALO-Valve	TYPHOON® Spear	Mud Motor	Casing Cutter	Taper Mill
RUNS	750+	200+	170+	Industry Standard	Industry Standard	Industry Standard

CASE HISTORY OVERVIEW

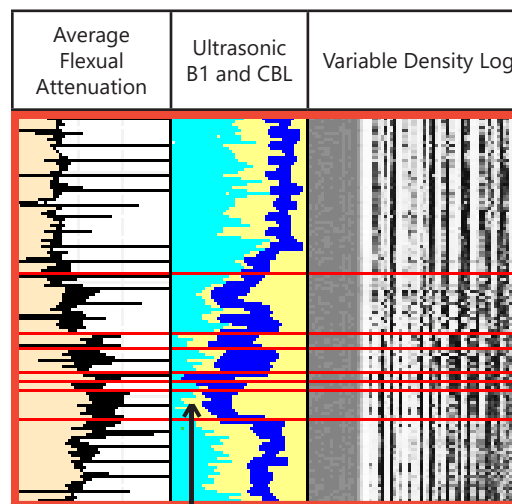
When can you pull cemented casing?



Well Log

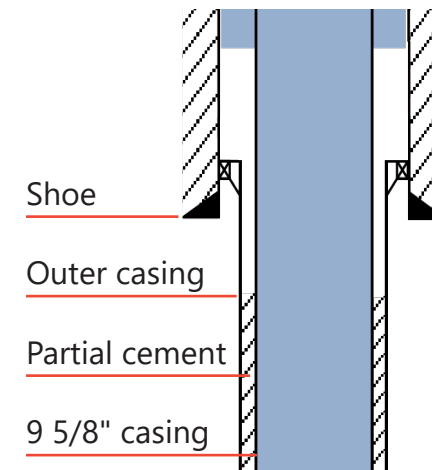


Area of Interest



Log showing partial cement bond

Well Profile



Ardyne Performance

CASING SIZE	9 5/8"
NUMBER OF CUTS	3
NUMBER OF RUNS	3
NUMBER OF JACKS	12
LENGTH RECOVERED (ft)	1772

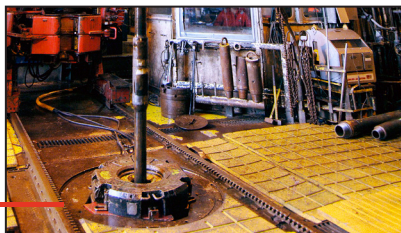
TECHNICAL EXAMPLE

Single String (9 5/8")



TITAN Anchored in Rigfloor.

This approach could also be used in a Rigless Intervention Scenario



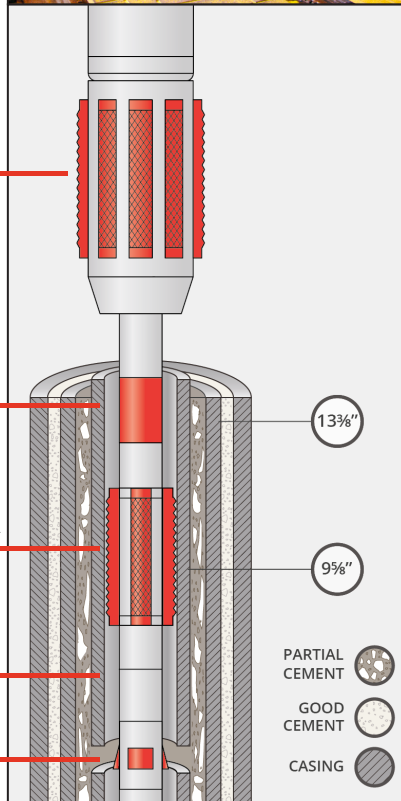
DHPT

ALO VALVE

TYPHOON SPEAR

MUD MOTOR

CASING CUTTER



Pulling 9 5/8" casing with TITAN anchored at rig floor

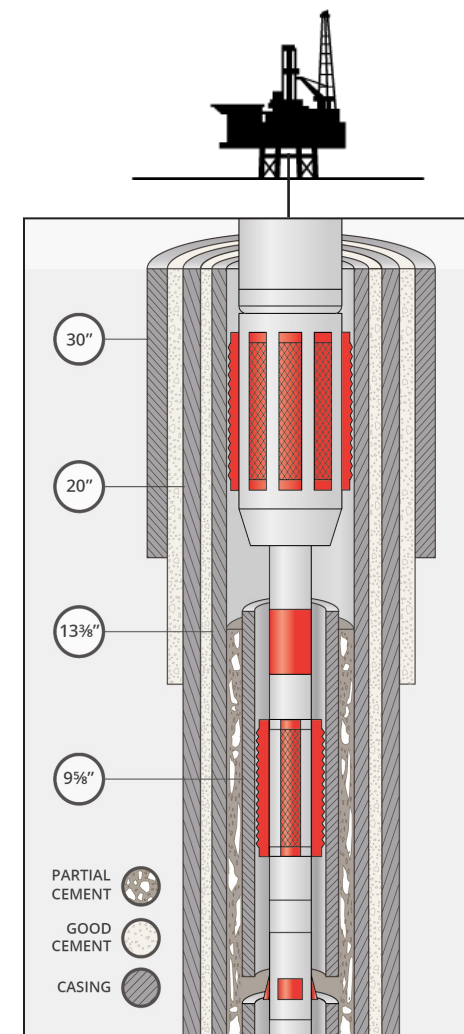
- After the data interpretation of the cement bond log, a decision is made on where the cut will be performed to enable casing recovery. Cuts are normally positioned above a coupling. This helps to avoid the need for rigging up casing tongs to break out individual pieces of casing.
- To enable the client to achieve this, the unconventional method of anchoring our TITAN System at the rig floor was proposed. This application could also be tailored to rigless interventions.
- This step allows the client to remove a single section of casing or multiple sections.

Pulling 9 5/8" casing with TITAN anchored in 13 3/8" casing string

- This configuration shows the TITAN System being anchored in the 13 3/8" casing.
- From this position, the ALO Valve is closed by pulling into tension and the string is pressured up. This energises a series of internal pistons in the Power Tool, which cause it to stroke closed.
- With the Power Tool stroke, the 9 5/8" casing, which is gripped internally by the spear, is then pulled into tension, stripping it out of the cement which is holding it in place.

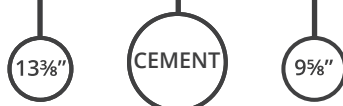
CASING SIZE	9 5/8"	13 3/8"
TOTAL LENGTH PULLED (ft)	2004	3645*
JOBS COMPLETED	3	8

*Also applicable for recovering 13 3/8" casing from inside 20" casing



TECHNICAL EXAMPLE

Dual String (9 5/8" X 13 3/8")



Pulling 9 5/8" x 13 3/8" casing with TITAN anchored at rig floor

- A series of dual cuts at different depths above the couplings is performed through the 9 5/8" and 13 3/8" casing, using a conventional casing cutter.

- As per the previous functionality of the TITAN BHA, a tensile force was exerted upon the 'Sandwich' casing joint now free from below, pulling it into tension, allowing the cement holding the 13 3/8" casing in place to yield and remove the 'Sandwich' from the 20" casing.

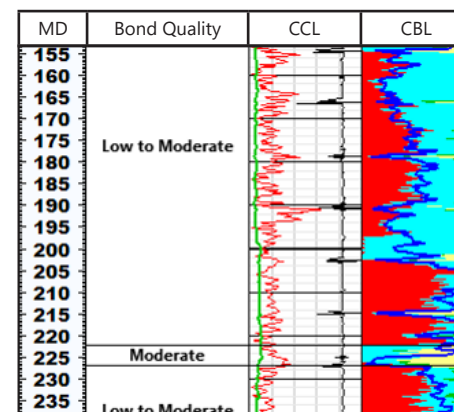
- The 'Sandwich' joint is then pulled to surface and immediately laid out. Where the operational steps can be repeated to allow other remedial steps to be undertaken.

Pulling 9 5/8" x 13 3/8" 'Sandwich' joint with TITAN anchored in 20" casing string

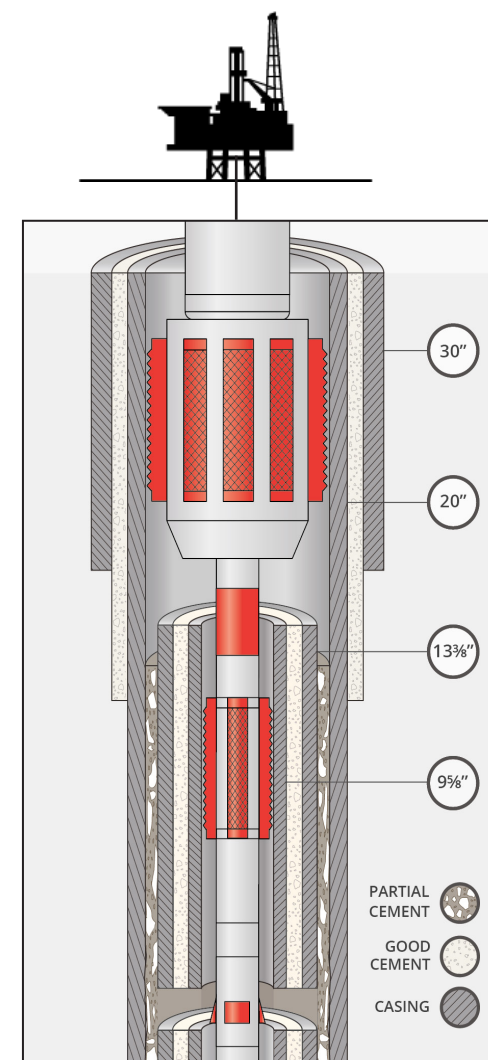
- Access to the 20" casing is required to allow it to be used as the anchoring point for the retrieval of the 'Sandwich' casing Joint.

- After performing a dual casing cut, if the Cement bond between the 9 5/8" and 13 3/8" has a good degree of integrity, the recovery of the 'Sandwich' Casing Joint in one run could be achieved.

- With pulling the 'Sandwich' joint the need to bore and pin the section of casing before it is laid out is removed.



CBL showing 'Sandwich' joint cement coverage



CASING SIZE	TOTAL LENGTH PULLED (ft)	JOBS COMPLETED
9 5/8" X 13 3/8"	2310	4