CASE STUDY – 2019USA026

DEEPWATER GOM OPEN HOLE CUT & PULL

94.5 hours saved - 8 extra BHA's avoided - 28,000 tripping feet avoided

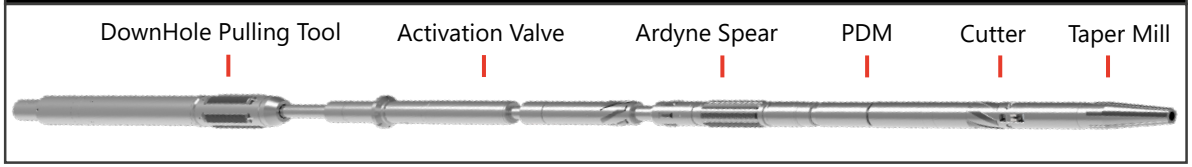
THE CHALLENGE

Following the successful deployment of the TRIDENT® System, which performed two cuts and recovered casing to surface in a single trip, 334' of casing remained in the wellbore blocking access to the open hole. A portion of this casing required recovering in order to complete the slot recovery program.

The conventional approach can typically require multiple trips using a combination of pipe cutting BHA's and Jarring BHA's or alternatively pilot milling, both of which consume significant amounts of rig time.

Operation carried out in 3,798ft water depth from Shell's Ursa Platform in conjunction with Wellbore Fishing & Rental Tools

TITAN® System - Industry's only field proven repeatable on demand hydraulic jack, pull, cut & recover system



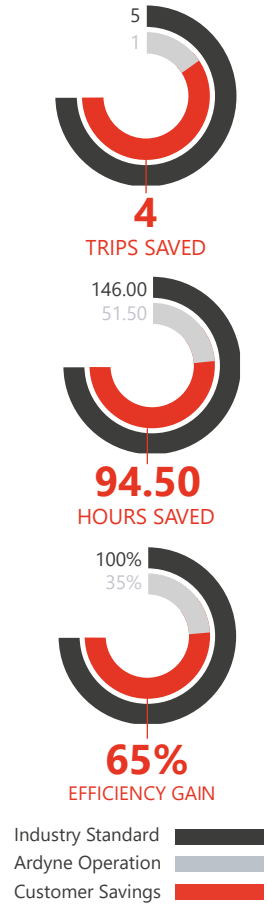
THE SOLUTION

The TITAN system is a multi-functional BHA. Features include downhole casing pull capability combined with casing cutting on the same trip. Positioning the downhole pulling system directly at the fish enables maximum available hydraulic pulling power. The system is able to cut casing into smaller sections, re-engage the power tool, pull free and recover to surface.

***RECOVERING THE UNRECOVERABLE** FOR AN OPEN HOLE SIDETRACK, THE TITAN SYSTEM IS SETTING THE NEW STANDARD FOR CASING RECOVERY IN THE GULF OF MEXICO*

THE RESULT

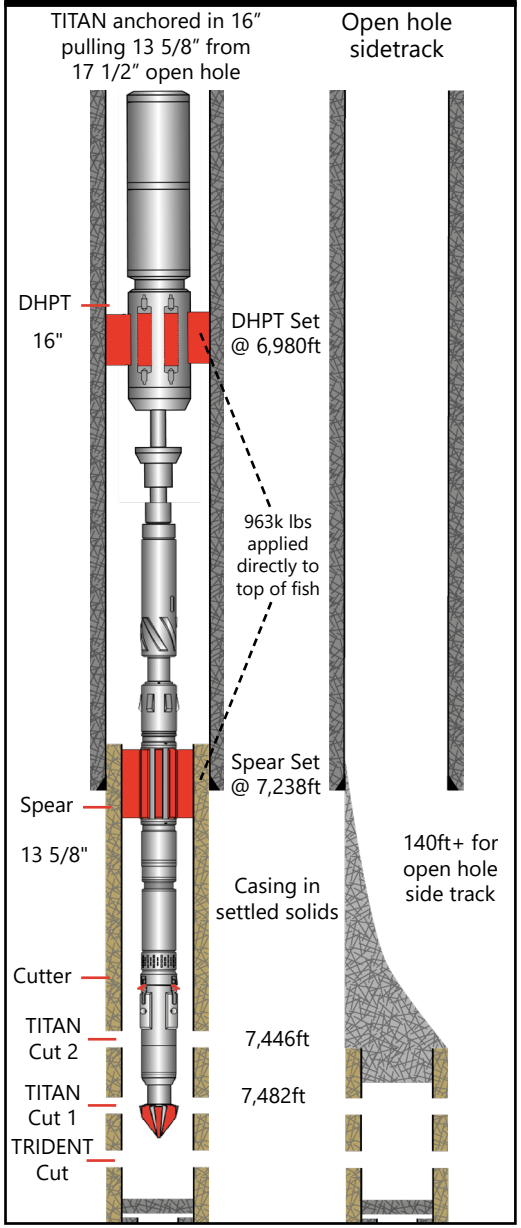
The total rig time saved was 94.5 hours, when benchmarked with prior wells due to the use of the TITAN hydraulic pulling capabilities (1.4M lbs) to remove the requirement for milling. When combined with the prior TRIDENT run, Ardyne saved Shell a total of 152.5 hrs. The subsequent open hole access provided below the 16" casing shoe enabled sidetracking operations to proceed as per plan.



DOWNHOLE ADAPTABILITY IN ONE SOLUTION

Improving safety and reducing costs

TITAN on Ursa



GOM Standard Approach

	Rig Activity	Time
Run 1 34.50	P/U ITCO / jar assembly	3.00
	RIH to 7238ft	9.00
	Attempt to jar casing free	10.50
	POOH	9.00
	Rack-back ITCO / jar BHA	3.00
Run 2 20.00	P/U cutter	1.00
	RIH to 7482ft	9.00
	Cut casing @ 7482ft	1.00
	POOH, rack-back cutter	9.00
Run 3 34.50	P/U ITCO / jar assembly	3.00
	RIH to 7238ft	9.00
	Attempt to jar free	10.50
	POOH	9.00
	Rack-back ITCO / jar BHA	3.00
Run 4 21.00	P/U cutter	1.00
	RIH to 7446ft	9.00
	Cut casing @ 7446ft	1.00
	POOH, rack-back cutter	9.00
	Rack-back Cutter assembly	1.00
Run 5 36.00	P/U ITCO / jar assembly, RIH, jar free, POOH & rack-back	36.00
TOTAL		**146.00**

If unable to pull free on the fifth run, then a **pilot mill** would be required. Previous campaigns targeted **milling @ 36ft/day**, this would require an **additional 138 hours** in order to remove the casing for the open hole side track.

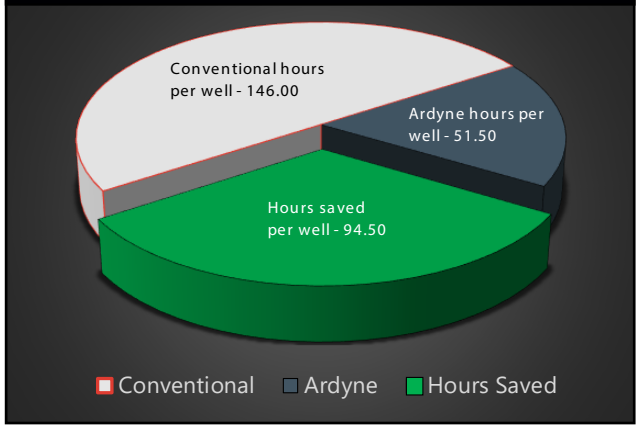
Ardyne Real Time Hours

	Rig Activity	Time
Run 1 50.50	P/U TITAN System	6.00
	RIH TITAN System	9.00
	Engage & pull 7238-7572ft (hold max for 2 hours)	4.00
	Cut 13 5/8 casing @ 7482ft (including tripping)	2.00
	Pull up engage TYPHOON & pull 7238-7482ft	3.00
	Cut 13 5/8 casing @ 7446ft	2.00
	Pull up engage TYPHOON & pull free 13 5/8 7238-7446ft with DHPT	1.50
	POOH at reduced speed - due to formation	17.00
	Lay down TITAN System	7.00
TOTAL		**51.50**

Single Trip Accomplished

- Two cuts made - in the same trip
- Ability to perform additional cuts if necessary
- Ability to jack on demand - beyond rig power
- Open hole sidetrack access delivered in single trip
- 4 trips saved = elimination of red zone activity

TITAN Time Savings



Ardyne Efficiency Gain

- Ability to make **multiple cuts in same trip** - industry unique
- Ability to **jack on demand** when required
- Casing pulled **free with 963,592lbs -** 1.4Mlbs available with TITAN
- **Eliminates** rig system **wear & derrick inspections** by removing jarring from the workflow
- Power controlled through hydraulics instead of tension - **prescriptive power**
- Max overpull applied **directly to stuck casing**
- Immediate indication **casing is free**
- Red Zone reduction - **28,000ft of tripping avoided** - Less BHA handling
- Pre assembled BHA's **minimizes surface make up time**
- **Remove friction & stretch** from drill pipe
- No swarf handling - **18,300lbs of swarf avoided**

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