Baker Hughes

Real-time Slickline benefits in abandonment operations

SPE ICoTA European Well Intervention Conference 16 Nov 2023

Real-time Slickline (RtS) overview

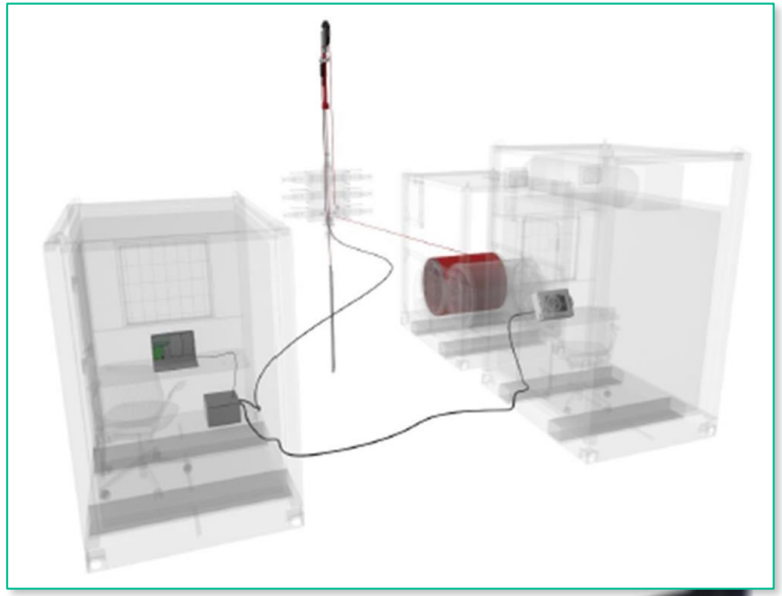
What is Real-time Slickline?

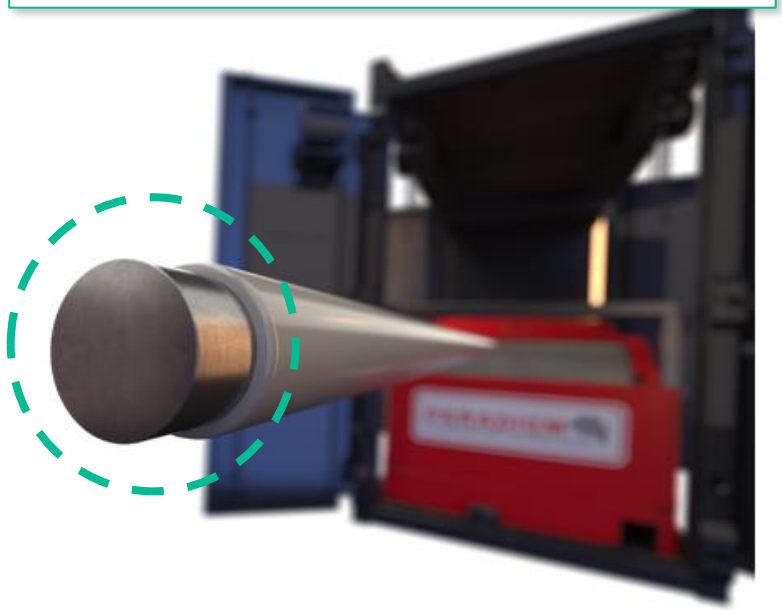
A system allowing manipulation of downhole tools and data collection, as per e-line operations, using a polymer-coated slickline cable

- Data collection (e-line)
- Real-time ballistic services (e-line)
- Electro-mechanical services (e-line / slickline)
- Mechanical services (slickline)

What are the benefits?

- Reduced pre-job planning and preparation time
- Reduced personnel on-board
- Reduced rig-time
- Reduced HSE exposure
- Simplified logistics and fewer lifts
- Reduced cost, risk and carbon footprint



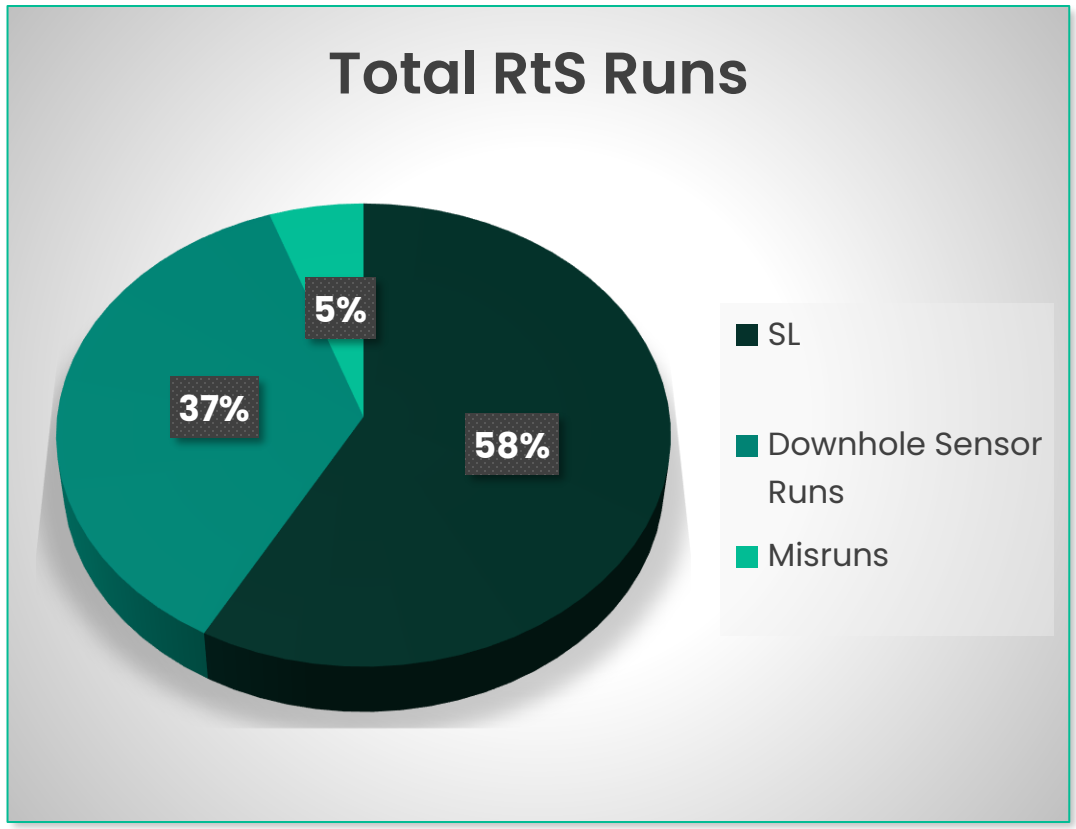


Real-time Slickline applications

- Intelligent drift / correlation
- Real-time pressure / temperature data in all runs
- Production logging
- Tubing / casing evaluation (RBT)
- Perforating / plug / punch / cut
  - Real-time correlation and activation
- 24, 40, & 60 Sondex Multi-finger Callipers
- Real-time correlation and activation of electro-mechanical services
  - Plug / punch / cut
- RSS release device compatible

Operation	E-line 72%	RtS 86%	Slickline 14%
Real-time reservoir evaluation	✓	✓	
Real-time well integrity	✓	✓	
Real-Time production logging	✓	✓	
Real-time depth control	✓	✓	
Mechanical intervention		✓	✓
Data-enabled mechanical ops		✓	
Horizontal conveyance	✓		

Real-time Slickline run record



UK North Sea Record

4 major UKCS operators

15 wells

102 Runs

Total Runs	
RTS Runs	102
Slickline (SL)	65
Downhole Sensor Runs (e-line)	37
Misruns	6

Campaign scope of work

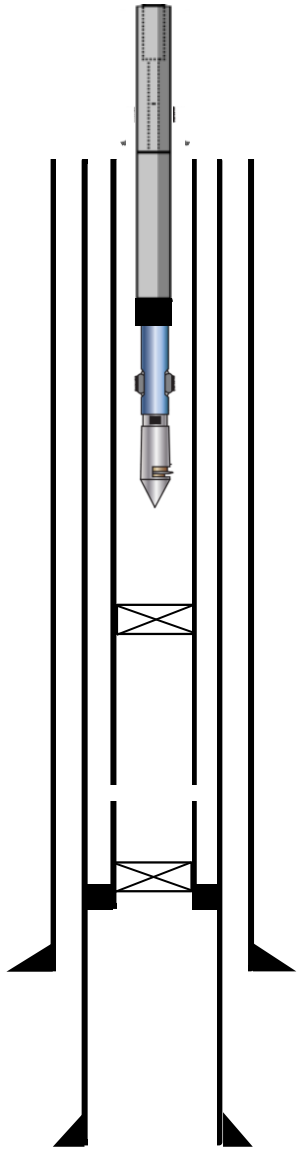
TYPICAL WELL SCOPE

- Drift
- MIT
- Plug
- Cut
- Plug

SOLUTION

All performed on RtS, excluding Cut for this campaign

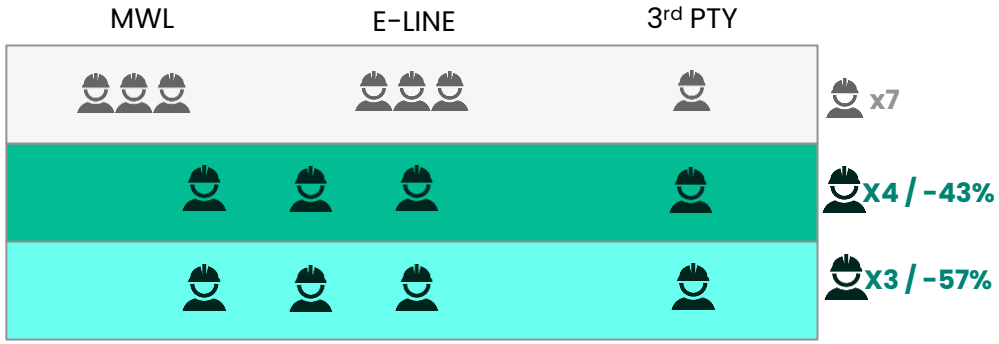
RBT also performed on 1 well
EM Punch performed on 1 well



WELL 'E'

Operation	Conveyance	RtS	Saving
Drift	Slickline	✓	
MIT	E-Line	✓	8hrs
Plug	E-Line	✓	
Cut	E-Line	✓	
Drift	Slickline	✓	8hrs
Set HOS	Slickline	✓	
Plug	E-Line	✓	8hrs
Savings			**16 hrs**

PoB



Real-time Slickline campaign

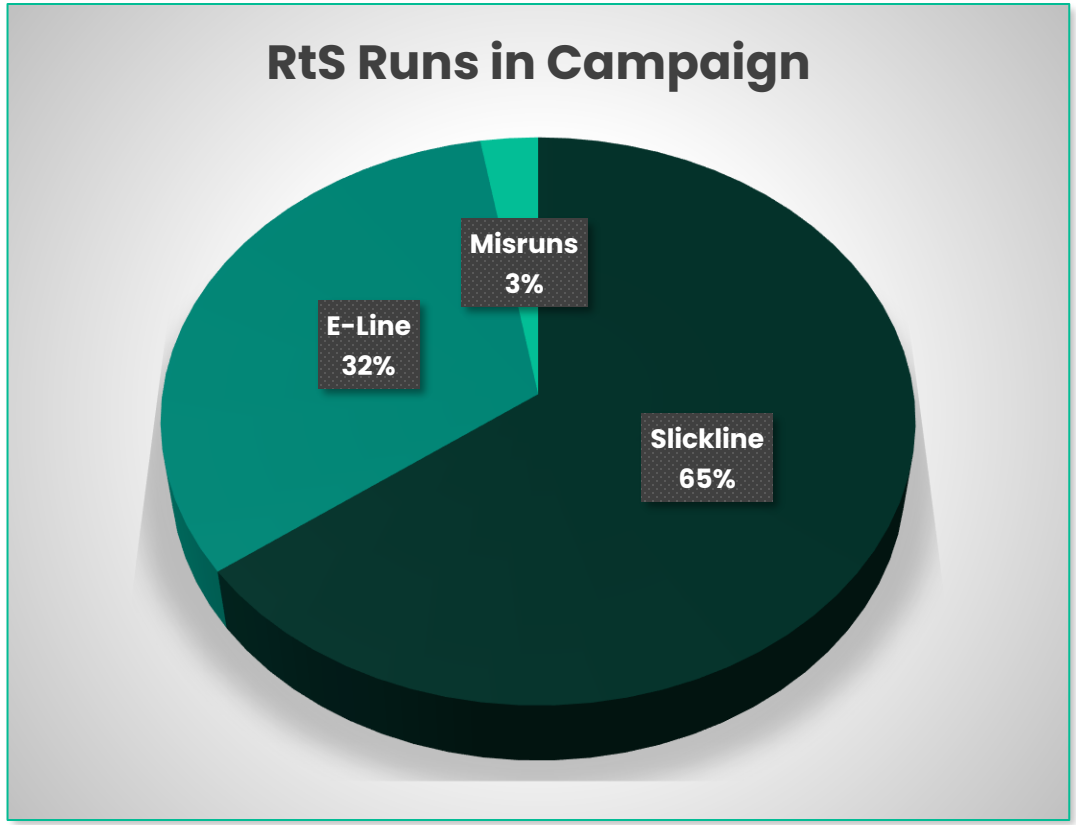
Well A	Well B	Well C	Well D	Well E	Well F	Well G	Well H	Well I
Drift	Drift	Drift	Drift	Drift	Plug	Drift	Drift	Pull
Pull	MIT	MIT	Plug	MIT	RBT	Debris Removal	MIT 40	Drift
MIT 40	Plug	Plug	Drift	Plug		MIT	Plug	MIT
Cut	Cut	MIT	Set HOS	Cut		Plug	Pull	Bailer
Plug	Plug	Punch	Plug	Drift		Cut	Plug	Plug
				Set HOS			Pull	Bailer
				Plug				MIT
								Plug
								MSIL
								Cut
								E-Red

Traditional Drum Change

RtS Campaign Drum Change

New technology RtS Drum Change

Real-time Slickline campaign – Pre-Abandonment Phase



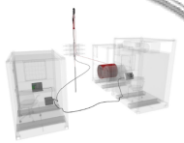
Single deployment Q2 - Q3 2022

Total runs	
Wells	9
RTS Runs	74
Non-RTS Runs	7
Mechanical (traditional slickline)	48
Data collection / activation (traditional e-line)	26
Misruns	2

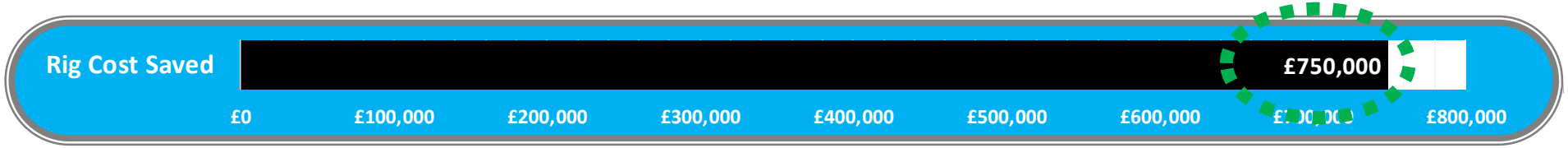
Time saved	
Total drum changes (traditional conveyance)	21
Drum changes required this campaign	6*
Drum changes saved this campaign	15
Operational time saved	5 days
*Drum changes required with new technology	1

Real-time Slickline campaign ABEX benefits

RtS Benefit Value Calculator



Time Saving Per Rig up/Down	4.0-Hrs	Occassions/Well	2	No. of Wells	9	RtS £Δ	5%
Rig Day Rate	£250,000	Hourly Rig Rate	£10,417	Total Hours Saved	72 Hrs	Min Rig$_t$	2-Mins



World record for the longest real-time acquisition of multi finger caliper (MIT40) data on Digital Slickline

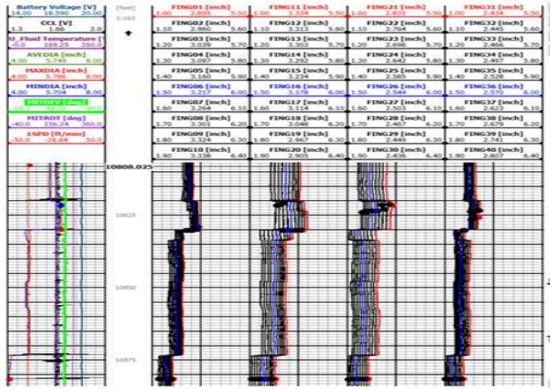
CHALLENGES

- As part of an abandonment campaign, a North Sea operator required logging across multiple wells for both well integrity analysis and suitable joint selection for barrier placement.
- The objective of using Digital Slickline across the campaign was to increase time efficiencies and reduce PoB through Baker Hughes' integrated multi-skilled crews.

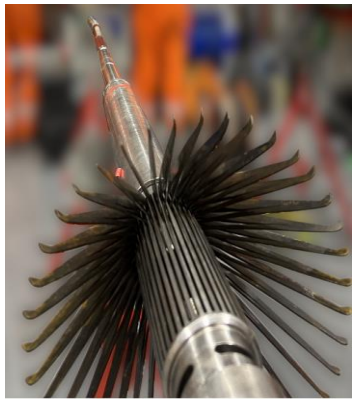
SOLUTION

Real-time Slickline was implemented to meet the operators objective of completing the pre-abandonment phase of 9 wells prior to rig work for further abandonment phases.

Successful collaboration between Baker Hughes and Paradigm to use their Digital Slickline system for the full pre-abandonment phase, including mechanical wireline operations, data logging, including Multi-Finger Caliper (MIT40) logging, and electro-mechanical punch and plug setting.



Real-time MIT 40 data in ParaOffice software



MIT40 Caliper

Task	E-line + Slickline	RtS
Total campaign Drum changes	21	6*
Drum changes saved		15
Savings	120 hrs / 5 days	

*With new technology available on RtS (Cutter and RBT), only 1 drum change to E-Line would have been required in this campaign

RESULTS

On one particular well, a world-record 10,800ft of continuous section was logged using the multi finger caliper with real-time control and data read out. Cumulatively, 19,920ft of MIT40 data was logged during this segment of the campaign.

Further, all further mechanical wireline, electro-mechanical and logging runs were undertaken using the same single unit as part of the operators permanent abandonment strategy, saving rig-time, cost, risk and carbon footprint.

Baker Hughes

Baker Hughes first offshore digital slickline solution in Brazil reduces total job time by 47% in Petrobras P&A operation

CHALLENGES

- Optimize deepwater plug and abandonment (P&A) intervention, including depth correlation, caliper measurements, and pressure/temperature logging
- Reduce operational time and costs, as well as health, safety, and environmental (HSE) risks associated with Wireline P&A operations

SOLUTION

Using a digital slickline solution for the full scope versus a sequential slickline and electric line operation

- Reduction of logistics, footprint and crew requirements

o Executing slickline and electric scope with common equipment and crew

- Single rig-up of common unit and pressure control equipment, with simplified grease-free pressure seal
- Bi-directional telemetry for real-time data comms and in-well toolstring control throughout

RESULTS

- Quality: Real-time QC and data driven decisions across the entire operation
- Efficiency: Operation time savings of 16.9 hours (47%)
- Personnel: crew reduction of 6 persons (43%)
- HSE: Reduced risk and exposure to crew and operations

Brazilian Rig crew, after flawless first digital slickline execution

Digital slickline cabin view

	Electricline + Slickline	DSL
Task	**Time (h)**	**Time (h)**
Rig up SL	6	6
Drift run	8.9	8.9
Rig Down SL	4	
Rig Up Eline	10	
P/T Survey	2.9	
Rig down Eline	4	4
Total time	35.8	18.9
Savings	47%	

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