Real-time Slickline for abandonment operations

Case Studies

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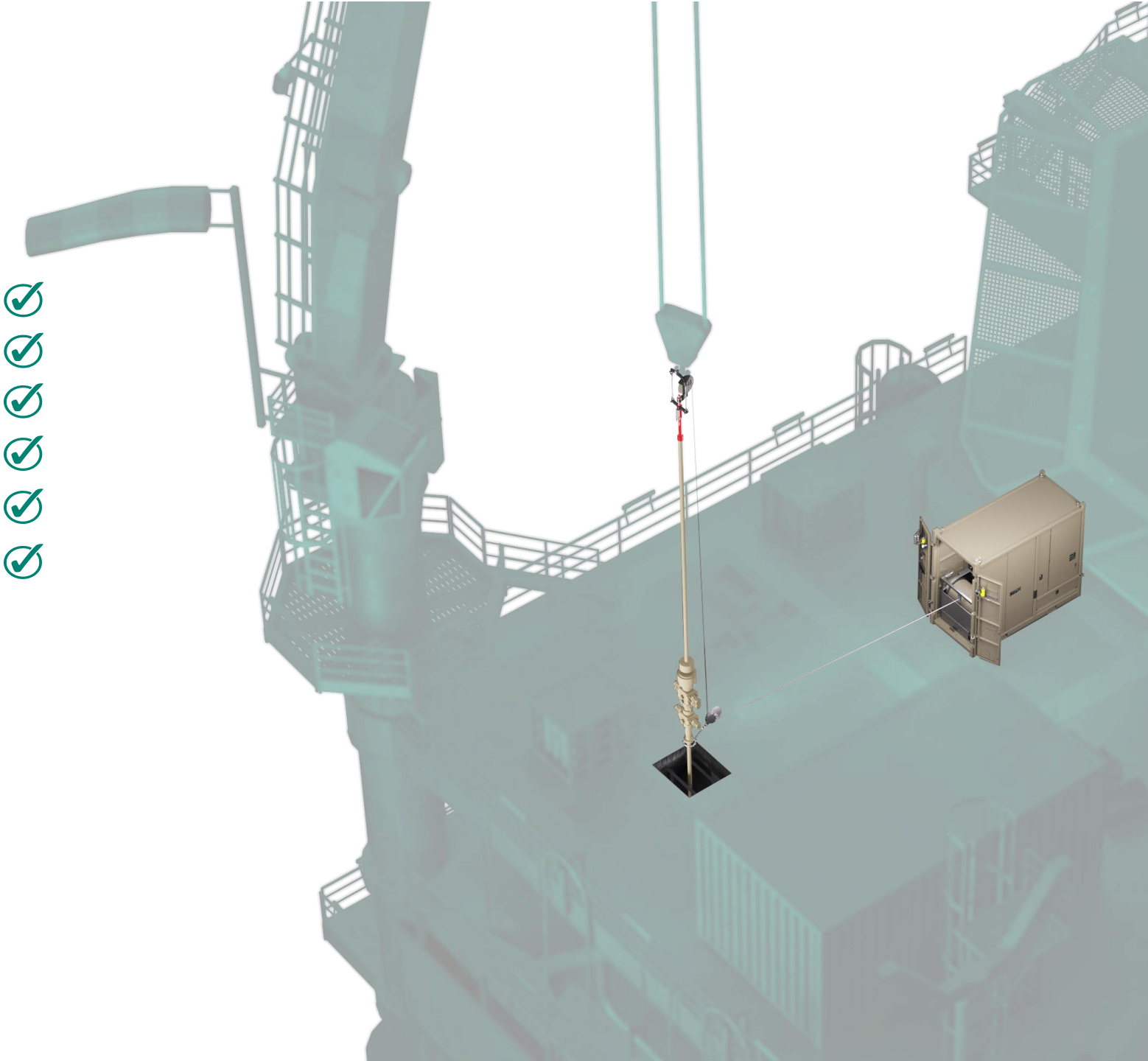
Real-time Slickline

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

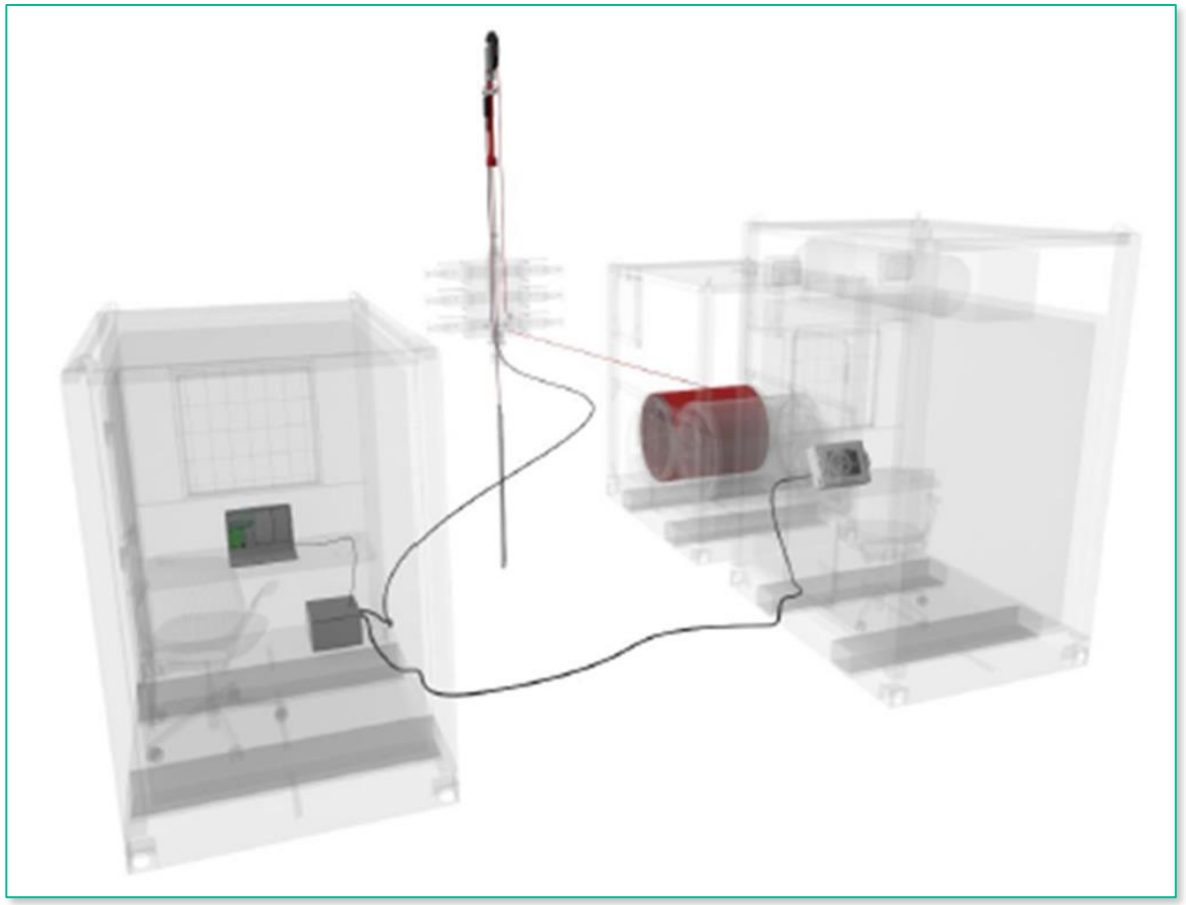


Real-time Slickline (RtS) overview

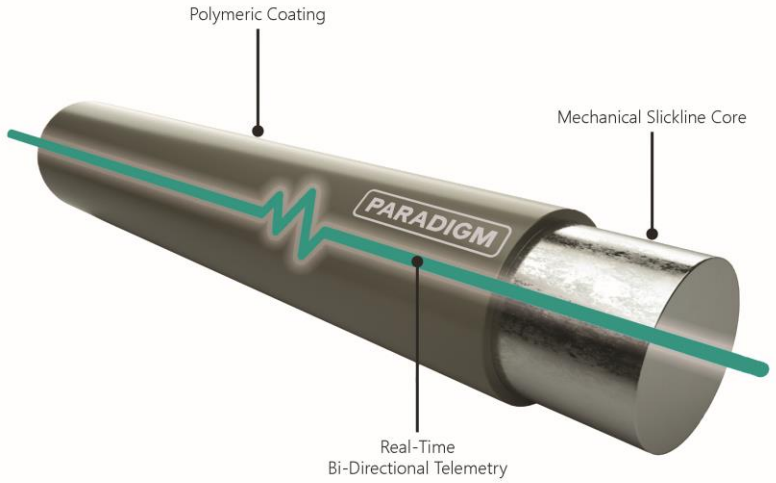
What is Real-time Slickline?

Real-time Slickline is a system allowing manipulation of downhole tools and data collection, as per E-Line operations, using a polymer-coated Slickine cable

- Data collection (E-Line)
- Real-time ballistic services (E-Line)
- Electro-mechanical services (E-Line / Slickline)
- Mechanical services (Slickline)



Real-time Slickline



Wire Specifications

	Imperial	Metric
Max wire lengths	34,500 ft.	10.500 m
Core diameter	0.125"	3.20 mm
Coating thickness	0.0175"	0.4445 mm
Outer diameter	0.160"	4.06 mm
Diameter tolerance	0.002"	0.051 mm
Breaking load - Slick-E-Line®	3,204 lbs.	1,453 kg
Weight	47.36 lbs. / kft	70.33 kg / km
Temperature Constant	-40° F up to 302° F	-40° C up to 150° C
Temperature with time limit	-40° F up to 350° F	-40° C up to 177° C
Pressure	up to 15,000 psi	up to 103 MPa
Crude oil swelling	< 1%	
Chemical resistance	CH4, H2S, CO2, methanol (H2S 3psi partial pressure)	
Shock rated	Jarring and Ballistics	

Real-time Slickline

INTEGRATED OPTIONS

WELL INTEGRITY

3rd Party Tool Adaptors:
- Multifinger Caliper Tools
- Radial Bond Tools
- Noise Tools

PRODUCTION LOGGING

3rd Party Tool Adaptors:
- **GE Sondex** (Production Logging Tools)
- **Probe / HD** (Probe & Hunter Production Logging Tools)
- **Spartek** (Production Logging Tools)
- **GoWell** (Production Logging Tools)

NON-EXPLOSIVE INITIATION

PPU to Go-A:
- **Multipurpose power delivery** (Cement Bailing, Solenoid functioning)
- **Kasum K-Set** (non-explosive plug setting and punching.
- **Electromechanical setting tool control**

EXPLOSIVE INITIATION

Probe EFH Trigger Interface:
- Perforating
- Pipe recovery
- Explosive set plugs

Compatible Detonators / Ignitors
- EBW
- Red/Green
- Dyna

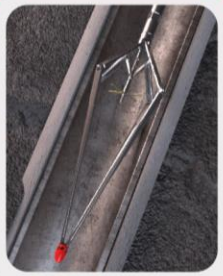
Propriatary Firing System

CONVENTIONAL SLICKLINE

Mechanical Crossover:
PPU to 15/16 Sucker Rod
- Full standard Slickline mechanical deployment
- Full use of PPU realtime data (vibration, pressure, temperature, accelleration, CCL)

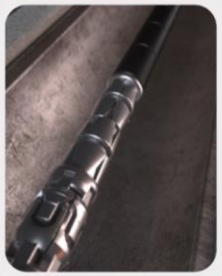
WELL INTEGRITY

PRODUCTION LOGGING

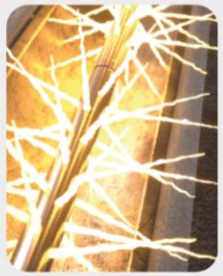


BAILING

PLUG SETTING

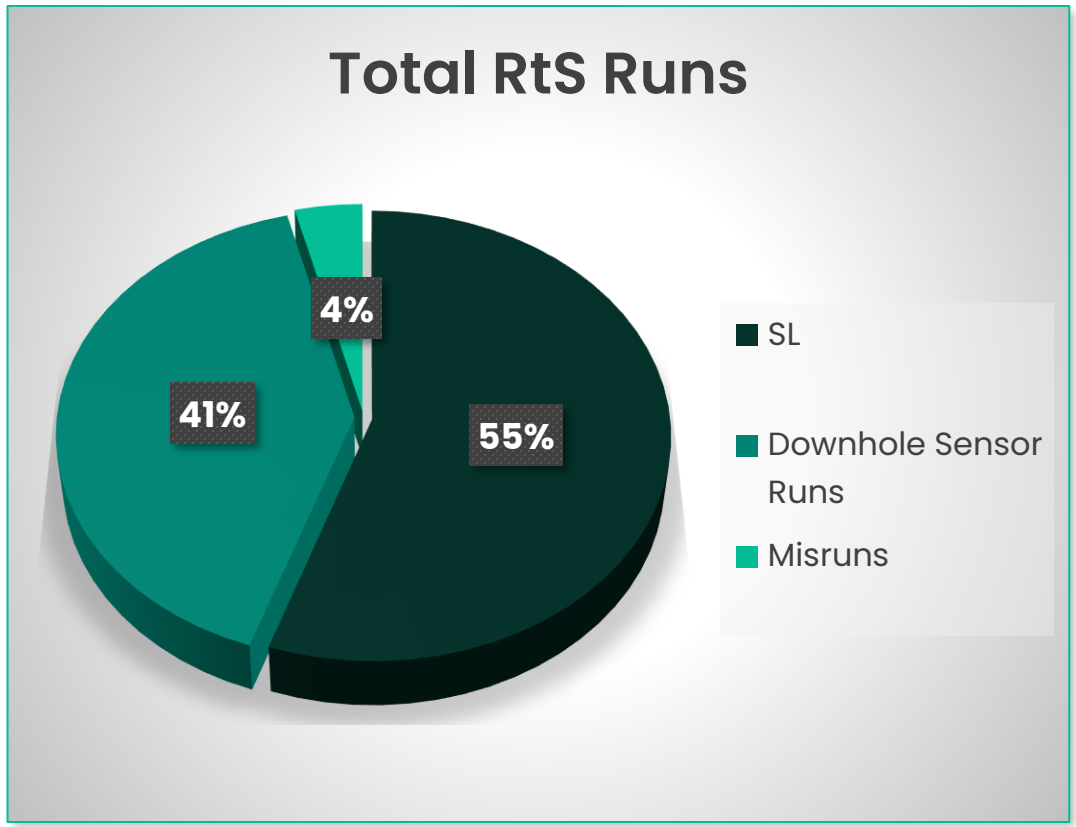


PERFORATING & PIPE RECOVERY



MECHANICAL SLICKLINE

Real-time Slickline run record



Global Run Record

5 major operators

25 wells

146 Runs

	No. of Runs
Total RtS	146
Mechanical Slickline (SL)	84
Downhole Sensor (E-Line)	62
Misruns	6

Real-time Slickline run record

UK North Sea Record

4 major UKCS operators

15 wells

123 Runs

	No. of Runs
Total RtS	123
Mechanical Slickline (SL)	73
Downhole Sensor (E-Line)	50
Misruns	6

Types of Mechanical Operations

	No. of Runs
Drift	29
LIB	11
Bailer	9
Magnet	4
Plug	4
Pulling Tool	4
HOS	3
E-Red	2

Real-time Slickline run record

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123 Runs

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Types of E-Line Operations

	No. of Runs
PT Log	18
EM Plug Setting	15
MIT 40	11
EM Punch	2
EM Cut	2
Explosive Punch	1

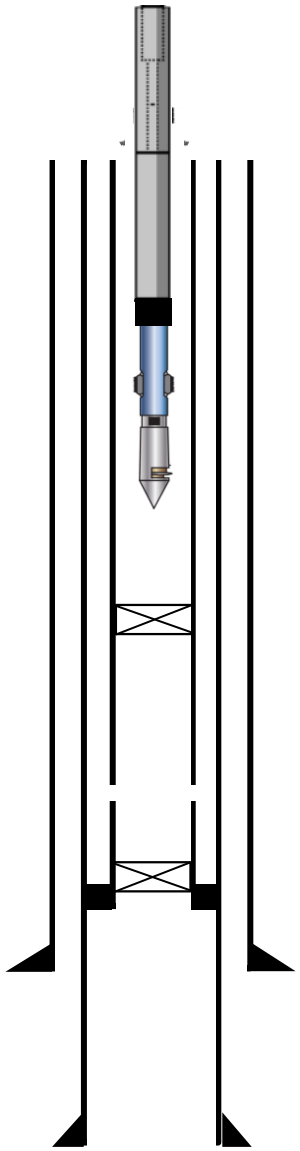
UKCS 9-well campaign

Typical Well Scope

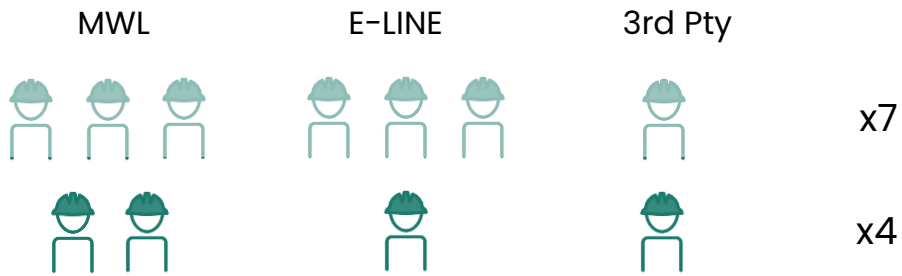
Drift MIT Plug Cut Plug

'Campaign Well 'E'

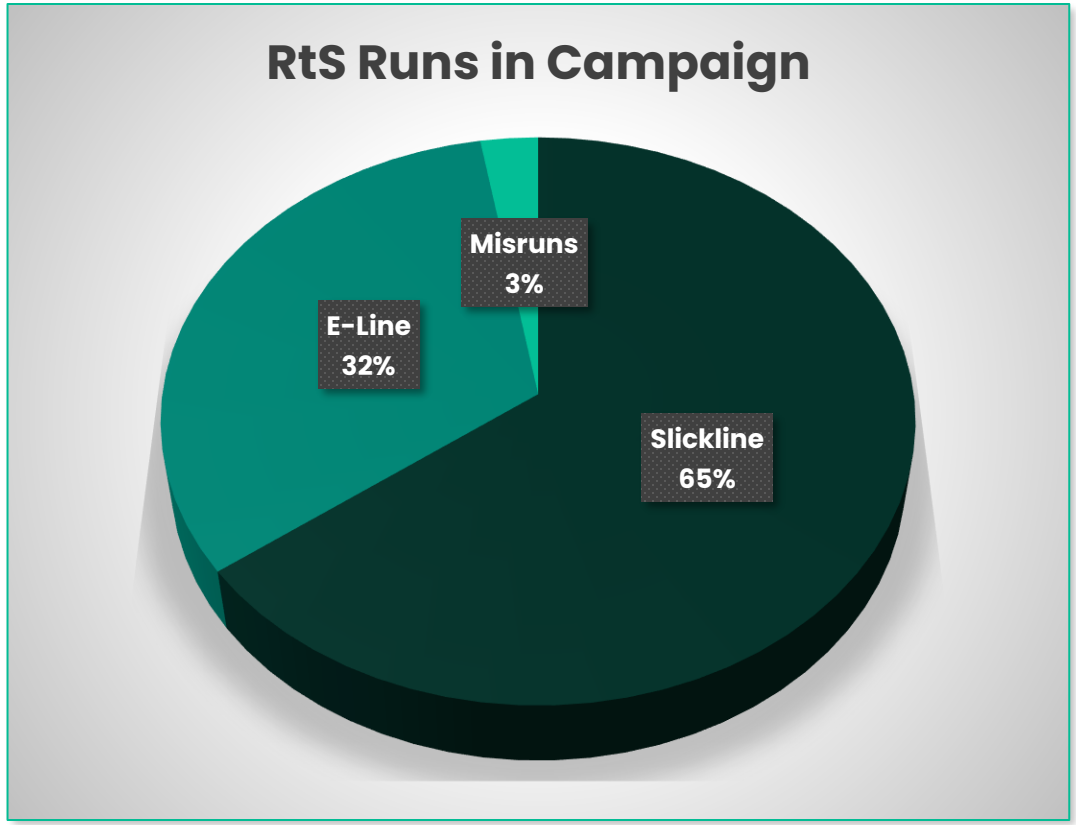
Operation	Traditional Conveyance	RtS	Savings
Drift	Slickline	✓	
MIT	E-Line	✓	8 hrs
Plug	E-Line	✓	
Cut	E-Line	✓	8 hrs
Drift	Slickline	✓	
Set HOS	Slickline	✓	
Plug	E-Line	✓	8hrs
Time Saved			16hrs



PoB



Real-time Slickline campaign – Pre-Abandonment Phase



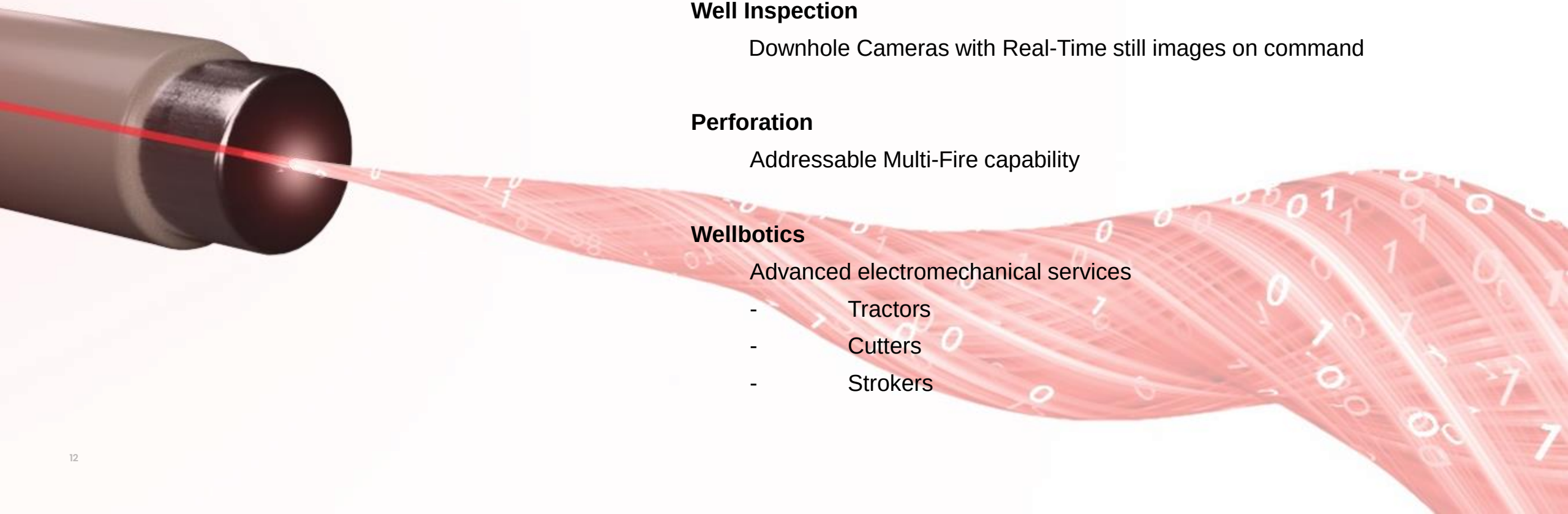
	Runs
Wells	9
RtS Total	74
Non-RtS	7
Mechanical (Slickline)	48
Data collection / activation (E-Line)	26
Misruns	2

	Savings
Total Conveyance changes required (traditional conveyance methods)	21
Actual conveyance changes required on campaign	6
Total conveyance changes saved	15
Operational time saved	120hrs / 5 days

Real-time Slickline: Latest developments

- Downhole tool control
- Surface control over real-time sample rates
- Configurable usage of bandwidth
- Advanced system monitoring

Real-time Slickline: The Future



Telemetry 2.0

Enhanced bandwidth capability

Increased robustness

Well Inspection

Downhole Cameras with Real-Time still images on command

Perforation

Addressable Multi-Fire capability

Wellbotics

Advanced electromechanical services

- Tractors
- Cutters
- Strokers

Operator Savings

"...over 70% of industry emissions come from burning gas or diesel for fuel..."

"...Retrofitting platforms with more energy efficient equipment..." [1]

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[1] OGA (NSTA) *Emissions monitoring report* (2021)

Operator Savings

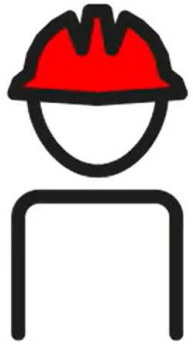
"...over 70% of industry emissions come from burning gas or diesel for fuel..."

"...Retrofitting platforms with more energy efficient equipment..." [1]

	Savings
Total Conveyance changes required (traditional conveyance methods)	21
Possible conveyance changes required on campaign	1
Total conveyance changes saved	20
Operational time saved	160hrs / 6.7 days

[1] OGA (NSTA) *Emissions monitoring report* (2021)

Value to industry



LESS **EQUIPMENT** | LESS **CREW** | LESS **DOWNTIME** | LESS **EXPOSURE** | LESS **COST**

Baker Hughes

PARADIGM