Riser-less Coil Tubing intervention and PP&A of Subsea-Completed wells

PTIL’s ‘’Intervensjonsdagen 2023”

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Agenda

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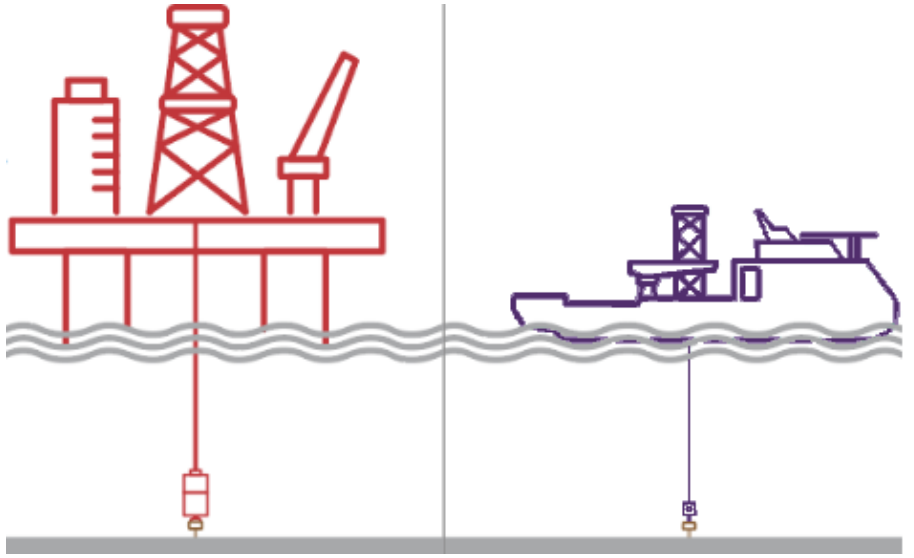
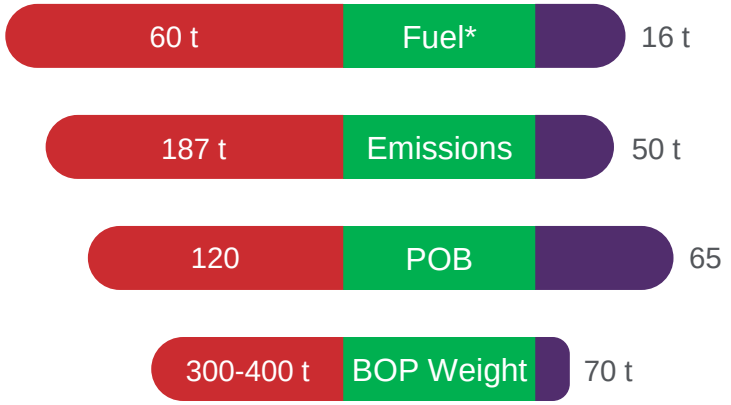
Background

Why Riserless?





*Fuel consumption per day on DP

- Simpler Setup and Operations
- Reduced POB and Personnel Exposure
- Reduced Environmental Impact
- Reduction in Wellhead Stresses and Fatigue
- RLCT and Additional Tooling Expands the RLWI Offering

$$$$ REDUCED COST

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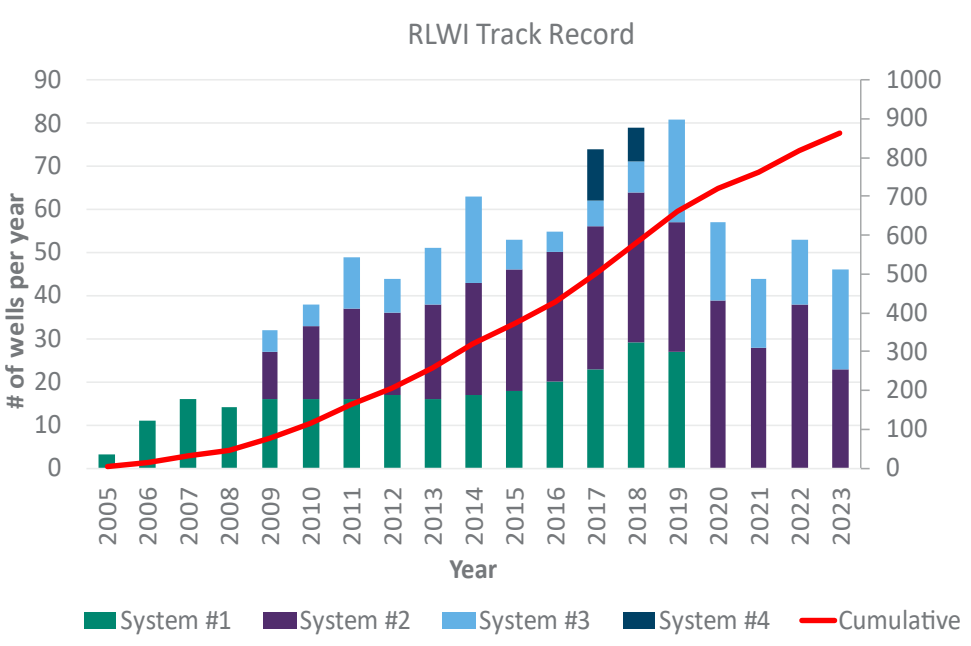
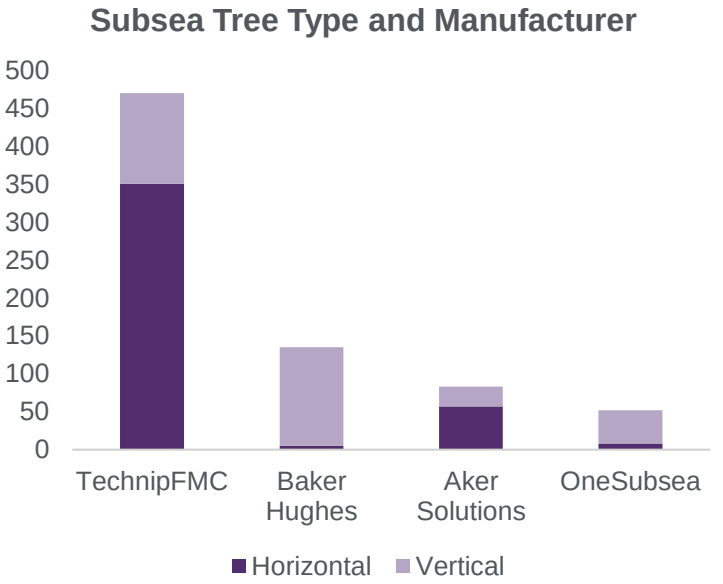
Global RLWI Track Record

Highlights





Takeaways

RLWI Track Record of >863 wells, >5,500 runs in hole

Over 508 wells (59%) were Horizontal Trees with crown plugs

Average days per well has decreased by 59% in the past 12 years

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West Africa RLWI Track Record

Country: Nigeria
Operator: Erin Energy
Date: May 2016
Scope: Lock open SCSSV
Result:
- 1 well, 9 days, 8 runs
- Well back in production
- 99.6% uptime, 0% WOW

Country: Equatorial Guinea
Operator: ExxonMobil
Date: February 2019
Scope: GLV changeout, SCSSV repair, scale removal
Result:
- 9 wells, 74 days, 110 runs
- 780m of scale cleaned
- 24 GLV changeout, 1 SCSSV repaired
- 96% uptime, 0% WOW

Country: Angola
Operator: ENI
Date: January 2021
Scope: Acid Stimulation
Result:
- 2 wells, 11 days
- Dual-vessel operation with Stimulation vessel
- 93.1% uptime, 0% WOW

Country: Angola
Operator: ENI
Date: January 2022
Scope: Acid Stimulation + Water Shut-off
Result:
- 2 wells, 22 days
- Dual-vessel operation with Stimulation vessel
- 84% uptime, 0% WOW

Country: Angola
Operator: Total Energies
Date: January 2023
Scope: Acid Stimulation + Water Shut-off
Result:
- 3 wells, 27 days
- Dual-vessel operation with Stimulation vessel
- 99.3% uptime, 0% WOW

- 5 Campaigns, 5 Successes
- Already planning for 6th Campaign

Riserless Advantages in Deep Water

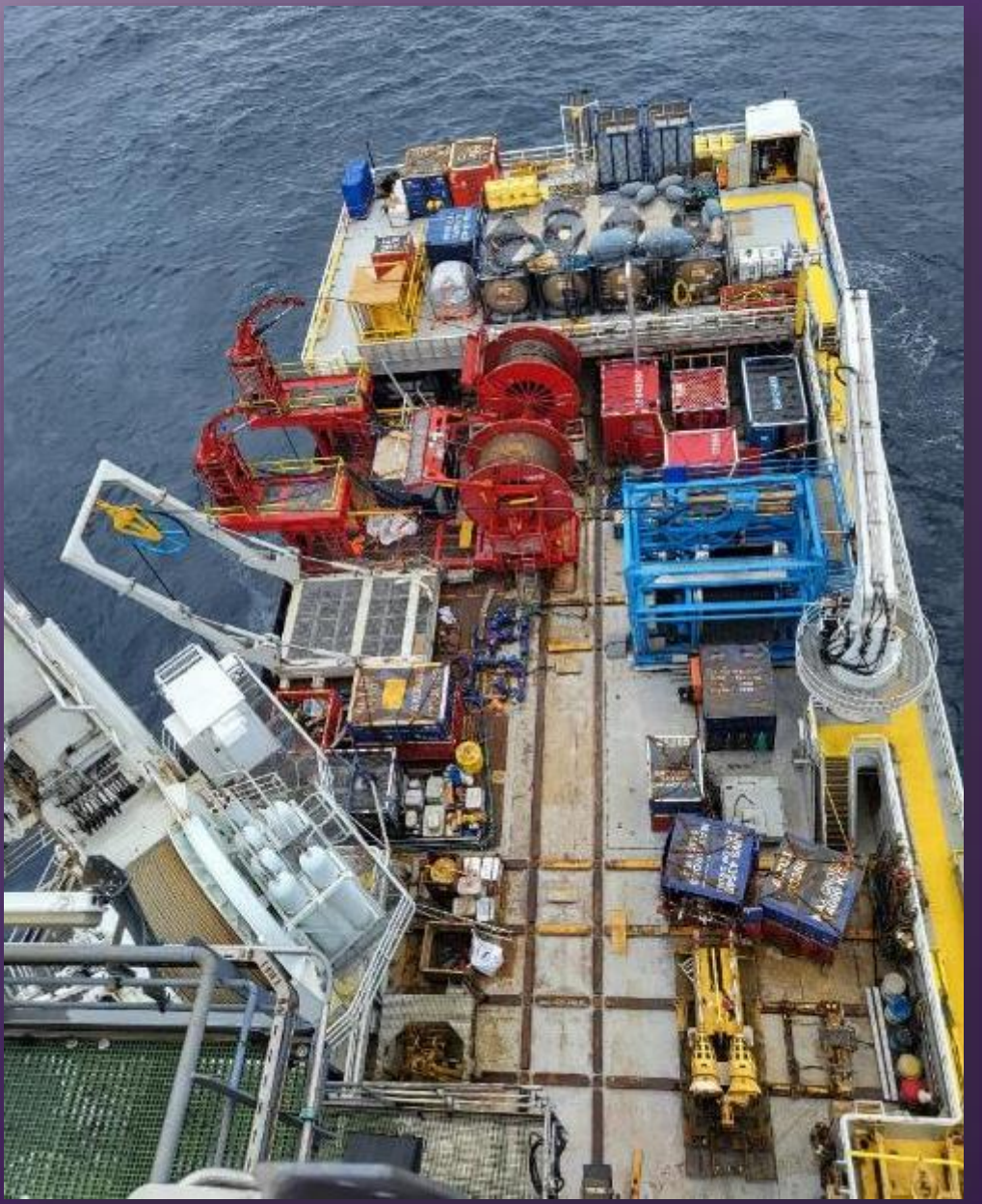
Country: Angola

Date: December 2022 / January 2023

Scope:
- 1 well, water shut-off, **1,900 m water depth,** Aker Solutions VXT
- 2 wells, acid stimulation with stimulation vessel, Aker Solutions VXT and TechnipFMC HXT

Challenges:
- Integrated / permanent vessel set-up requiring modifications
  - Control Umbilical's
  - Compensation on Subsea Well Control Equipment
  - Downline limitations
  - Short Mobilization Window coming off jobs in Norway and Sail to Angola
  - Limitations on tower capacity (winch water depth)
- Perform Deepwater SIT
- Multiple XT interfaces
- Short window to execute work and be back in Norway

Success was defined by executing with the same operational efficiencies that are performed day in and day out in the North Sea while upgrading the RLWI unit and performing work in Ultra-deep-water



Riserless Advantages in Deep Water

Result:

- Mobilized from Norway
- Upgraded subsea stack for deep-water operations
- Executed SIT on transit down to Angola
- No waiting on weather
- No interim port calls
- Adaptor changed offshore
- Minimal NPT
- Established a new benchmark of efficiency in ultra-deep water

Activity	Duration [days]	Scope of Work	Water Depth	Pumping Rate	Volume Pumped
In-Country Mob+De-Mob	7.2				
Transit to/from field	1.6				
Well #1	7.6	Water Shut Off	1,900 m		
Well #2	5.6	Acid Stimulation	1,700 m	5-6 bpm	2,629 bbl
Well #3	4.9	Acid Stimulation	1,000 m	5-6 bpm	1,492 bbl
Total In-Country time	26.9				

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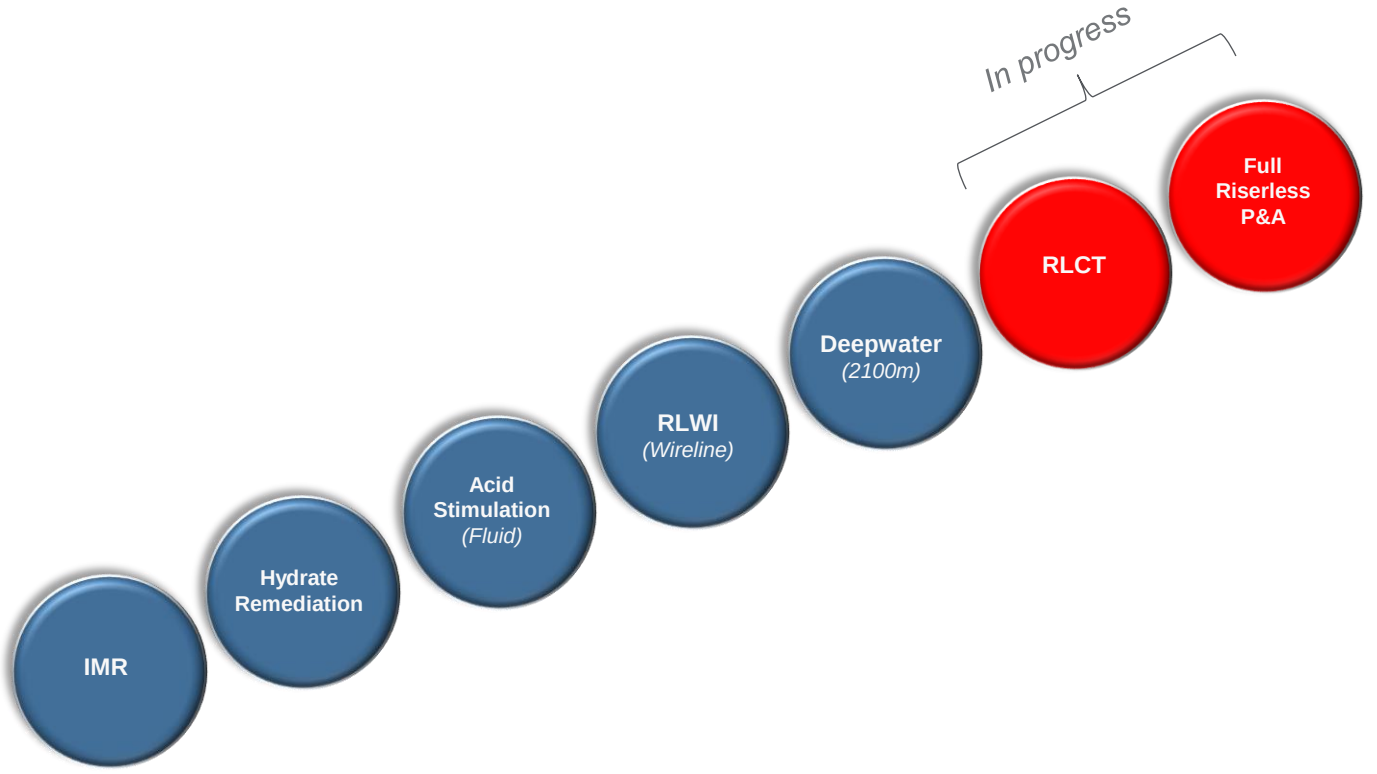
RLWI Assets & Roadmap

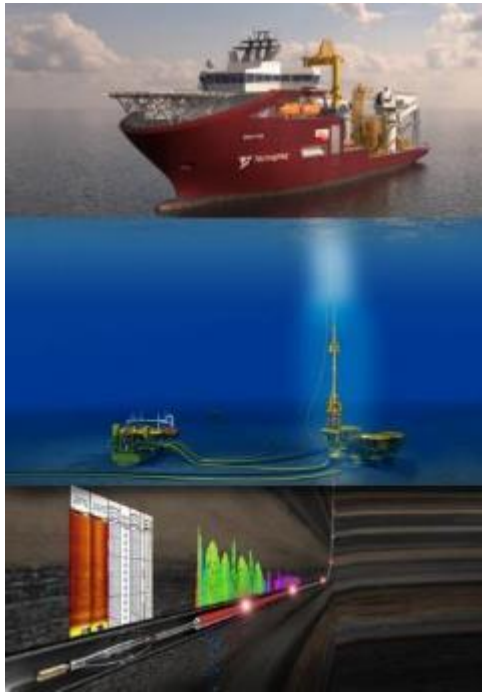
Vision: From Rig to Vessel

Current Toolbox → Toolbox Expansion →

Hydraulic Intervention	Wireline	Pump Cement	Spot Acid / Cement	Sand Cleanout	Pull Tubing/ Casing	Well Testing	Drilling

Riser-less Capabilities





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Current Fleet & Assets

Island Wellserver

2009

2nd Generation RLWI-stack,
[500m water-depth]
North Sea, Equinor

Island Constructor

2009 - 2023

2nd Generation RLWI-stack,
[2,100m water-depth]
North Sea, West Africa

2024

New/upgraded RLWI-stack,
[2,500m water-depth]
North Sea, West Africa

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New RLWI-stack on Island Constructor

New stack:

- **More maintenance friendly, increases efficiency**
- **Less HP-piping and electrical wiring, less parts**
- **More module-based, reduces repair-time**
- **XT-controller placed higher up on the stack, more ROV-friendly**
- **2500 meter water-depth capacity**
- **Previous stack will be recertified, and entire stack can be changed out in a couple of days, instead of 5 – 7 weeks at quay-side to recertify**

Alltogether a more robust and efficient RLWI/RLCT-operation

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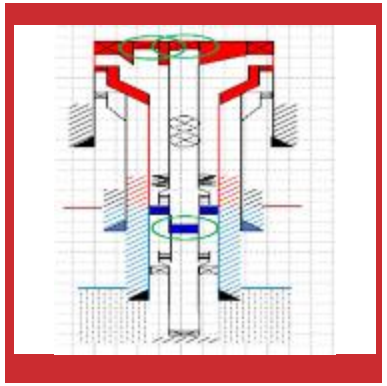
PP&A Development Roadmap



2005
RLWI

- 18 year track record
- 863+ wells
- 5500+ runs in hole

2011
Pre-P&A

- 120+ wells
- Bullhead well
- Punch/cut tubing above production packer
- Set suspension plugs
- Set annulus plug if needed
- Retrieve VXT

2020
P&A
Incl. Cementing

- Patented subsea injection spool enables cement injection below WCP
- Reservoir cementing
- Through tubing cementing

2021
PP&A Incl.
Tubing Retrieval

- Installed primary and secondary cement barrier plugs
- Unlock and retrieve subsea tubing hanger
- Retrieval of tubing in open water

2023
P&A
Gravity-Fed RLCT

- Subsea CT stripper
- Riserless gravity-fed coiled tubing capabilities
- Joint Industry Project (JIP)
- Waiting on 1st well

2024
P&A
Full RLCT

- Riserless coiled tubing with subsea injector now available
- Operator support and participation needed

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Riser-Less Coiled Tubing (RLCT)

Why Riser-Less Coil Tubing?

Riser-Less Coiled Tubing (RLCT) closes the biggest technology gap for doing all rig-less, and without the need for a riser. The RLCT development use existing technology, built & modified to suit a subsea application, customized to our RLWI stack.

The Solution is already here ...

with un-matched capabilities and efficiency

FEATURES	WIRELINE	COILED TUBING
Production Logging	✓	✓
Replacement of Hardware, Shifting Sleeves	✓	✓
Plug & Perforation	✓	✓
Temporary P&A	✓	✓
Circulation	✗	✓
Sand/ Scale Removal	✗	✓
Spotting Fluids/Cement	✗	✓
Lower Abandonment	✓	✓
Full Permanent P&A	✗	✓

RLCT Case Studies

E39 Rogfast Drilling and Coring (2014)

Water Depth: up to 300 m.

Total Drilled Length: 537 m. (150 m. cores) in 3 wells

CT size: 2 7/8”

Number of CT runs: 52

Bit size/type: 5 7/8” rock bit

BHA size: 4 ¾”

Duration: 4 weeks

Subsea Injector: yes

Well Control Equipment: no

Publications: SPE-179086

Butch Pilot Hole Drilling, Centrica (2015)

Water Depth: 65 m.

Pilot Hole Depth: 351 m.

CT size: 2 7/8”

Number of CT runs: 2

Bit size/type: 5 7/8’’ tri-cone rock-bit

BHA size: 4 ¾’’

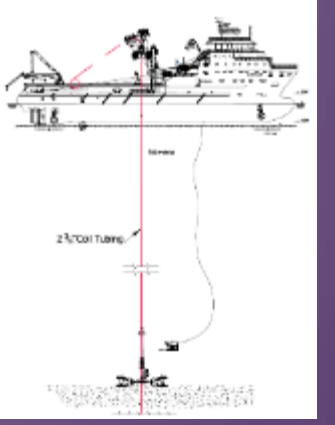
Duration: 4.25 days on location

Subsea Injector: yes

Well Control Equipment: no

Logging-tools: GR, resistivity, pressure, direction, sonic

Abandoned pilot-hole with cement.



Seabed Coring Campaign, NPD (2020)

Water Depth: 2,780 - 3,085 m.

Drilled Length: confidential

CT size: 2 3/8”

Number of CT runs: 14

Bit size/type: 6-1/2" × 3-¼“ coring bit

BHA size: 4 ¾”

Duration: 26 days on location

Subsea Injector: no

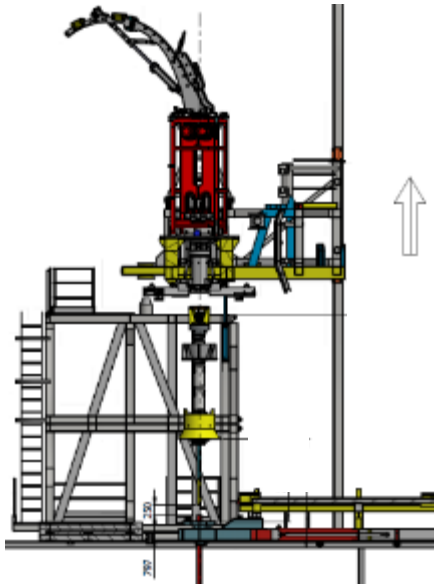
Well Control Equipment: no

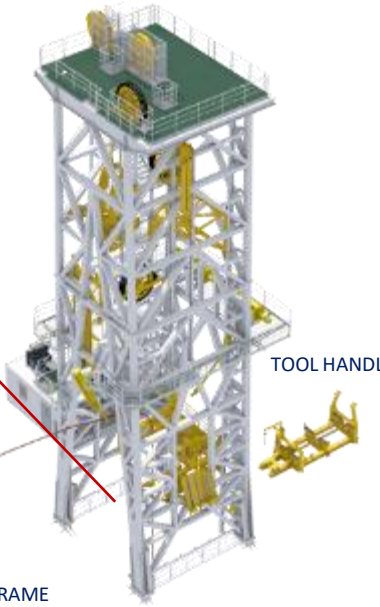
Publications: SPE-205828

System overview

Phase 1
Gravity-Fed

Phase 2
Subsea Injector





TOOL HANDLING SKID

PARKING FRAME

FILTRATION UNIT

CT POWER PACK

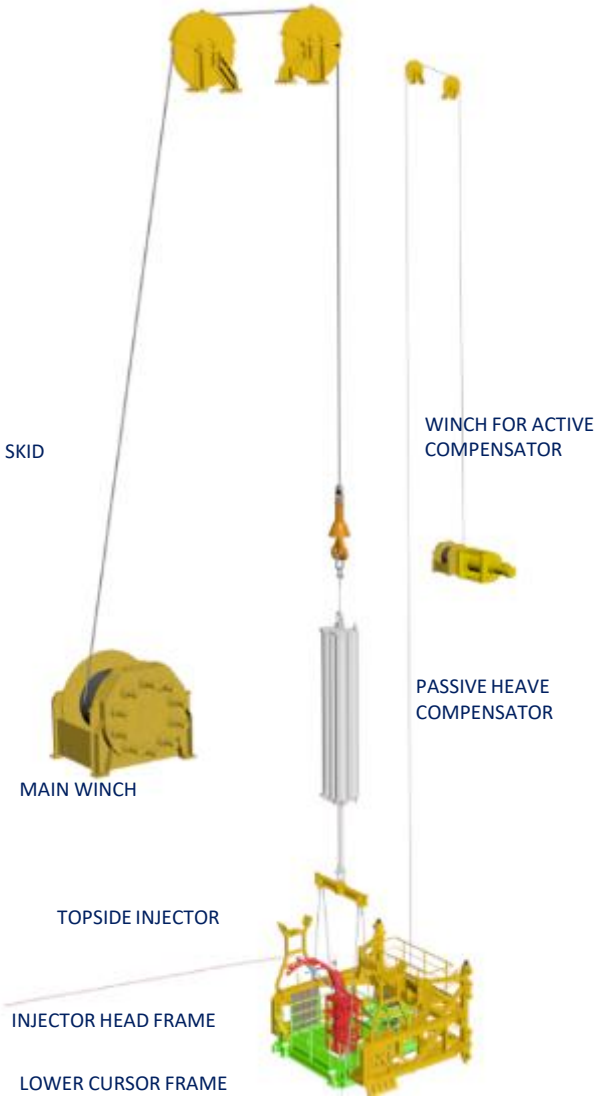
SMART TANK UNIT

CT CONTROL CABIN

CT REEL

FLUID TANKS

DEBRIS TANK



WINCH FOR ACTIVE COMPENSATOR

PASSIVE HEAVE COMPENSATOR

MAIN WINCH

TOPSIDE INJECTOR

INJECTOR HEAD FRAME

LOWER CURSOR FRAME

SUBSEA STRIPPER

LUBRICATOR SECTION AS FOR WIRELINE

LOWER LUBRICATION PACKAGE

WELL CONTROL PACKAGE

SUBSEA INJECTOR

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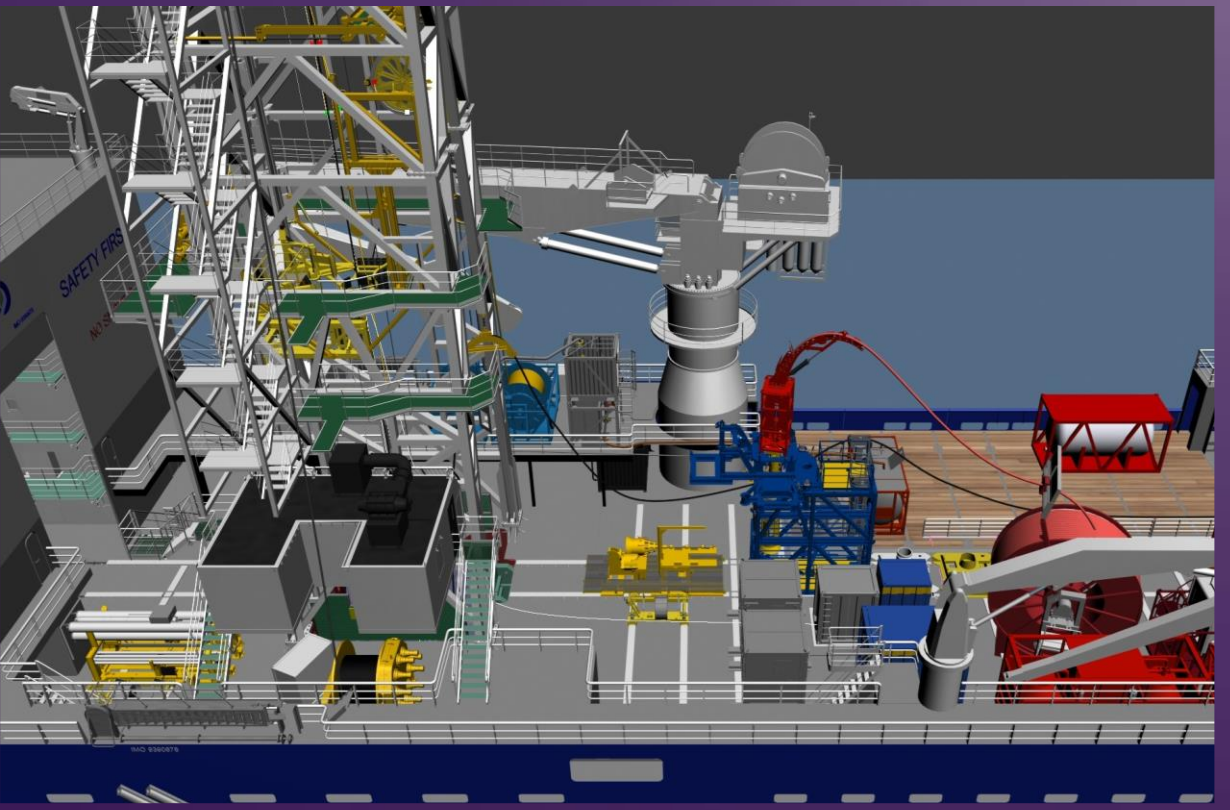
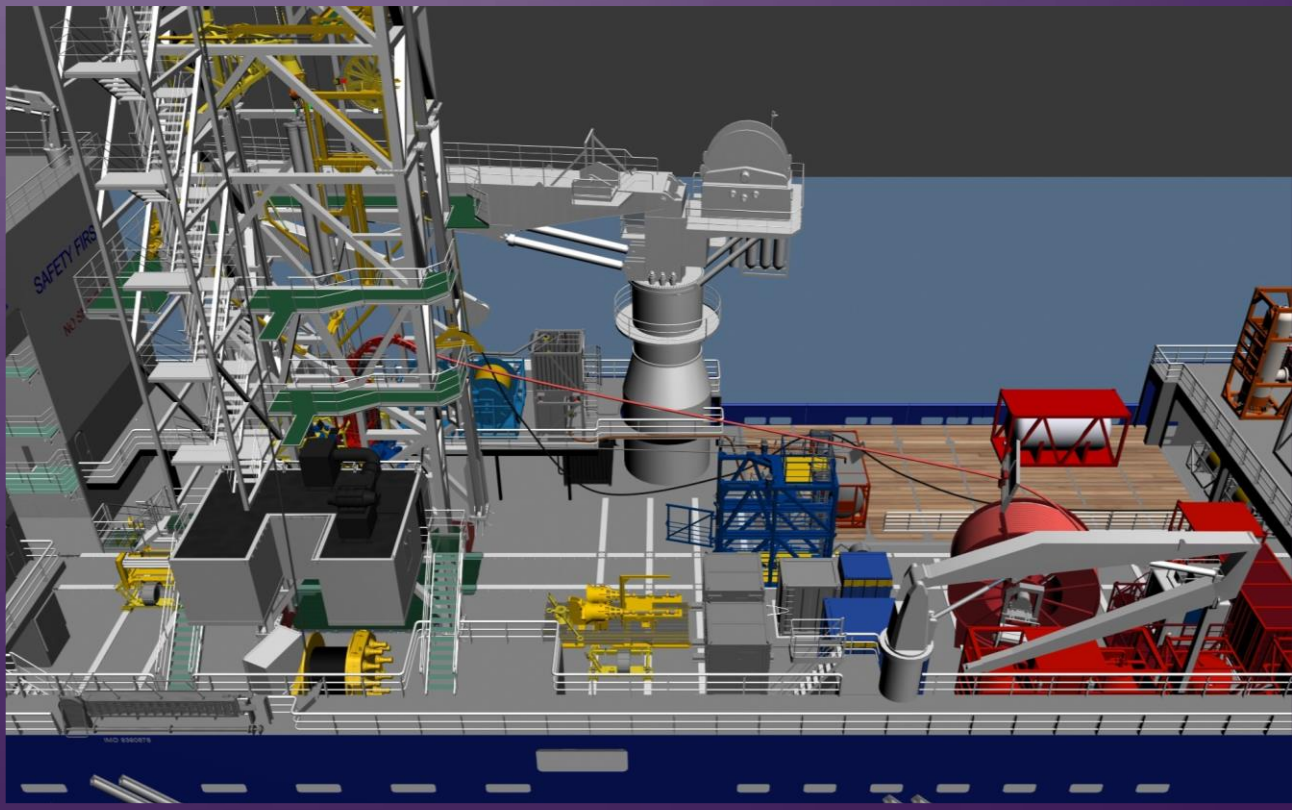
And an efficient change of mode … the riserless combination

WL Mode ⇄ CT Mode





The next generation Intervention Vessel is the combination of RLWI and RLCT permanently set-up onboard, with additional plug & play capabilities for an integrated service delivery model, applicable to light & heavy well intervention including hydrocarbon return system + permanent plug and abandonment capacities

Summary

- **Riser-less Coiled Tubing will be a game changer within well intervention service.**
  - An enabler for full permanent P&A from a vessel
- **We will have Riser-less Coil Tubing services established as a standard offering.**
  - Expect similar evolution of downhole tools for CT as for the wireline industry
- **Will increase utilization of the intervention business and drive efficiency and lower the overall cost.**
  - All-year utilization is key to deliver a cost optimum service
- **What are we waiting for?**
  - Well candidates to field prove Riser-less Coiled Tubing

Thank you!

Riserless Light Well Intervention

Leading the way into the future of
Subsea Well Intervention and
Plug & Abandonement