Increased Safety & Efficiency from a Dedicated Light Well Intervention Vessel on Deepwater Subsea Wells

A Truly Integrated Service Delivery

09 August 2017
Agenda

Introduction to Light Well Intervention
Pros and Cons + alternative
Latest Generation LWI vessel & equipment

Types of Services run
Additional Future Services
Q&A
RLWI History

1987: BP first RLWI campaign in the North Sea

Mature technology with 28 years of continuous track record

Highly efficient and effective

Deepest RLWI job: 8,200 ft (2,499m) in Gulf of Mexico

More than 1,300 wells intervened on

More than 3,300 runs into the well (just by FMC Technologies and Island Offshore)
Global LWI Market

Source: Quest Offshore; Infield Systems database
Data for global flowing wells @ end 2017

**Gulf of Mexico**
- Existing subsea wells: ~1100
- Number of subsea stacks: 3 + 3 x 3” – TechnipFMC = 1

**Brazil**
- Existing subsea wells: ~1700
- Number of subsea stacks: 0

**North Sea**
- Existing subsea wells: ~2700
- Number of subsea stacks: 6 – TechnipFMC = 3

**West Africa**
- Existing subsea wells: ~1600
- Number of subsea stacks: 0

**Asia Pacific**
- Existing subsea wells: ~950
- Number of subsea stacks: 2
- 2017 FMC = 1

**World total**
- Global Subsea wells: >8000 by YE 2017
- Number of available (large bore) subsea stacks: 11
Key Components for RLWI

**DP2/3 Intervention vessel (+ROVs)**
- 100-150M$, 2 yrs lead time

**Subsea Stack**
- 30-80M$, 1.5-2 yrs lead time

**Mechanical Intervention services**
- Continually developing; ENABLER for the utilization of subsea non-rig based intervention
APAC Integrated, Purpose Built RLWI System
Intervention Options
Conventional Drilling Rig (CAT C)

**Pros**
- Depth only limited to rig capacity
- Full pumping capability
- Can run all interventions (WL, CT, Pipe)
- Can pull/run completions
- Well-known deployment/access technology

**Cons**
- High day-rate and total spread cost
- Needs to be reconfigured for work over
- High mob/demob costs-impact economics for interventions
- Over-kill for e-line interventions
- Not able to drill when using for intervention.
Intervention Options
Riserless Light Well Intervention (CAT A)

Pros

- Light, cost effective, flexible intervention setup
- Mobilize, deploy & move between wells quickly
- 80-90% of intervention requirements on e-line
- Vessel used for additional activities (Stimulation, Installation, P&A etc.), increases economics for intervention
- Depth capability can reach >95% of global wells

Cons

- Limited number of subsea stacks worldwide (11)
- Limited in volume of fluid to inject
- Cannot run CT (today)
- Cannot pull pipe (today)
- Operators not all locally aware of technology and services possibilities
Latest Generation Vessel & Stack now in Australia

- 440 Wells
- 3,350 Wireline Runs
Benefits of Fully Integrated Vessel

- Safer
  - Skidding system avoids lifting
  - Automated deployment avoids manual handling
  - Integrated shutdowns (Bridge/Control cabin/Back deck)
  - Vessel management system based on Well Intervention

- Shorter Mob/Demob

- Faster to respond to well integrity issues

- Higher Operational Efficiency & continued improvements w same crew & procedures
  - Lower total job costs to Operator

- Requires minimal Operator resources to manage

- TechnipFMC committed to expand services into APAC
  - Can provide full service with well services subcontracted
Economies of Scale with multi-capable vessel & equipment

GREENFIELDS

Installation & Commissioning

Inspection, Maintenance & Repair

Hydraulic Intervention

Riserless Well Intervention

BROWNFIELDS

Riser-based Well Intervention

Rigless Plug & Abandonment
Intervention Priority & Capabilities

**Tier 1 – Integrity Restoration**
- Setting Plugs
- XMT change out
- Tubing leak repair (straddle)
- Hydrate & Flowline remediation
- Well Kill etc...

**Capability:**
- Setting Plugs
- XMT change out
- Tubing leak repair (straddle)
- Hydrate & Flowline remediation
- Well Kill etc...

**Tier 2 – Production Restoration & P&A**
- Scale milling, debris/sand cleanout
- Water shut off
- Sliding sleeve, GLV & valve manipulation
- P&A & wellhead recovery
- Etc...

**Capability:**
- Scale milling, debris/sand cleanout
- Water shut off
- Sliding sleeve, GLV & valve manipulation
- P&A & wellhead recovery
- Etc...

**Tier 3 – Production Enhancement**
- Production logging
- Re-perforation
- Acidizing & Scale treatment
- Etc...

**Capability:**
- Production logging
- Re-perforation
- Acidizing & Scale treatment
- Etc...

Increasing Demand as fields age
Typical RLWI Applications

- Zone isolation (plug/straddle)
- Perforating
- Data gathering (PLT)
- Milling and removal of scale
- Well barrier re-establishment prior to rig work over (XT change out)
- Well Clean Up
- Chemical Spotting
- Inspection/repair
- Camera inspection
- Change-out of gas lift valves
- Sleeve operations – DIACS valves
- Caliper logging
- Fishing on e-line
- Temporary P&A operations of subsea wells
P&A Operations

- RLWI Vessels are capable of a variety of P & A related operations which can reduce Rig time.
- Drilling Rigs are currently needed for pulling or milling Casing
- Options available for B & C annular cementing from RLWI vessel
- Wells must be assessed on a case-by-case basis
- Splitting workscope has been best practice by operators in the North Sea and GOM.
Deployment of Additional Services
Open Water Coiled Tubing on Island Performer
Pipe Handling from Island Performer Intervention Vessel
240T tower to run 6 5/8” or 8 5/8” casing riser or Drill pipe
Convertible system from Vessel

Agreed requirements:
- Minimum change to existing equipment
- Maintain safety functions and propose equipment safe to use
- Meet typical RLWI needs – flushing, hydrate prevention, grease injection
- Utilize standard casing joints vs specialty riser joints
- Enable easy integration on vessel
- Water depth capability 150m – 1500m
- CTLF designed for optimal WL/CT operations

Lessons Learnt from pipe handling on other vessels
Pipe Handling from monohull vessel

**Island Frontier**
106m LOA  
Dead weight 4700 Ton  
Deck area 945m²  
Tower 70 T AHC  
Crane 140T AHC  
DP3

**Island Performer**
130m LOA  
Dead weight 7300 Ton  
Deck area 1400m²  
Tower 140T AHC  
Crane 250T AHC  
DP3
The first Step to making a Step-Change

https://www.youtube.com/watch?v=JZFNqOxaJYY
Step 2 Oil & Gas Open Water Coiled Tubing Drilling

https://www.youtube.com/watch?v=nGp7gGGn4n0
Conclusions

RLWI is a mature technology
  • 28 years of field experience
  • > 1,200 wells
  • FMC > 3,300 runs (4 vessels in last 10 years)
  • Industry > 5000 runs & 2,500m maximum water depth

Integrated RLWI Services from dedicated vessel
  • Safer
  • Shorter Mob/Demob + faster response
  • Higher Operational Efficiency
    • Equipment in state of readiness
    • Same crews
    • Lower total job costs to Operator

TechnipFMC is expanding Integrated System to Australia in 2017
  • Flexible with ability to run multiple services

TechnipFMC are developing other unique solutions for cost effective vessel based interventions (P&A, Riser from vessel etc)

In Australia now – 2023 +
QUESTIONS

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