Life of Field Vessel & Riserless Well Intervention Services

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Rev 02
Agenda

• Concept of Life of Field Vessel
  - Value Proposition
  - How it Compares

• Overview of Riserless Services from Vessel
  - Hydraulic Intervention
  - Hydrate Remediation
  - Mechanical Intervention

• Case Study; Life of Field Vessel Service to West Africa Region in 2018
  - Varied scopes/campaigns
  - Service Flexibility

• Conclusion
• Questions
Life of Field

A vessel capable of offering clients maximum flexibility of service.

Ability to offer an Integrated, single sourced offering to the client.
  • Greater risk sharing with Contractor.

Existing contracts form the basis for responsive solutions.

Efficiencies through common service elements.
  • Modular Asset Solutions.
  • Solutions utilize common elements of vessel spread.
LoF vs Traditional

**PROs**
- Reduced effective spread rate.
- Flexible vessel configuration for client utilization.
- Full suite of subsea & intervention related services: Pumping, Hydrate remediation, Intervention, Construction, IWOCS, Flotel.
- E-line offering covers significant portion of today's intervention scopes.
- Proven equipment capability to 100% global well depths.
- Vessel uptake / induction times reduced.
- Frees up rig to focus on drilling.

**CONs**
- Technology awareness of services regionally.
- Reduced pumping capacity.
- Slightly longer initial mobilization/demobilization that dedicated vessel, significantly shorter than rig.
- Cannot provide Coiled Tubing intervention (presently).
Life of Field Vessel in Action

- Flexible vessel configuration for client utilization. 1900m² main deck. Underdeck garage & storage.
- 60% of all back deck equipment is utilized for all services.
- Modular topside equipment spread and sea fastening arrangement
- 400 & 100T AHC Cranes
- 8m x 8m Moonpool.
- Fluid Handling tanks & Pumping.
- 500m² deck space for subsea construction activities.
Overview: Riserless Services from LoF Vessel
Hydraulic Intervention

Single vessel solution, or in combination with stim boat, with LoF vessel acting as conduit to well.
- 4 x 120m³ Mud/Brine Tanks.
- 2 x 120m³ Special Products Tanks.

>35 campaigns globally (300m – 2,100m)

Rates to 15bpm.

Proprietary Fatigue monitoring technology for Low and High Cycle (vessel motion feedback).

Subsea Barrier Package suitable for VXT & HXT access.
Flowline Hydrate Remediation

Removes blockages (e.g. hydrates, asphalts, wax) to quickly and safely restore production in deep water flowlines. Allows the operator to restore production by depressurizing the pipeline blockage which allows the area to be treated.

Spread consists of:
- Subsea separator
- Subsea HPU (hydraulic power unit / pump)
- 2 coiled tubing downlines
- EQD System (Emergency Quick Disconnect)
- Topside fluid & gas handling equipment

>30 campaigns globally since 2012.
Flowline Hydrate Remediation (Subsea)

Subsea tie in to flowline

Through FRS barrier package

Draw down of flow line via SHPU to disassociate blockage

Returns to subsea separator

Fluid and Gas dedicated downlines

Fluid and Gas handling at Surface
ROV Intervention & Hydrate Remediation Skid

For small volumes & flow.

Used to supplement LWI Operations - Hydrate removal below XT Cap and barrier verification.

Servicing Plugged umbilical line, control lines, rigid or flexible jumpers.

Repairing leaking control lines via Seal-Tite injection.

Commissioning Leak testing, valve testing, formation isolation valve operations

Logging capability: Pressure & Flow, volume totalizer for precise fluid amounts
Mechanical Intervention (LWI)

7 1/16” ID, 10ksi WP
World Record depth @ 2560m/8200’ – GoM
Up to 22m/72’ tool strings
Enables:
• Slickline & Digital Slickline services
• E-line & Tractor services
Supports in-well needs thru life cycle
• XT install, recovery & replacement
• Well mechanical Integrity & repair
• Well reservoir monitoring & optimisation
• Well flow assurance
• Well lower kill & suspension during P&A
Case Study; LoF West Africa 2018/19
LoF Case Study – West Africa 2018/19

Walvis Bay, Namibia.
• Shipyard scope.
• Deck Handling equipment installation.
• Hydrate remediation equipment mobilized.

Equatorial Guinea
• Hydrate remediation of 2x flowlines
• Reduced LoF equipment specialist crew.

Angola
• 9 well LWI campaign.
• Same CT, topsides fluid handling kit.
• LWI equipment mobilized with TRT & campaign equipment.
LoF Case Study – West Africa 2018/19

Angola
- Called off to emergency IRM scope – EFL change out
- Resumed LWI scope
- Completed scope & demobed LWI spread and personnel.

Ghana
Flotel project in Ghana - on-going
- 800m2 free deck needed
- CT circulating lines etc on-board for
- Future 1x well Scale Squeeze
- Future 1x well Acid Stimulation

7 Months; 6 Jobs, 5 Services, 4 Countries, 4 Clients off the Single Vessel
LoF Case Study – Mechanical Intervention

First riserless wireline operations in-country; 1,250m and 2,060m water depths.
All production enhancement.
All well objectives, field production increases, and fiscals met.

Vessel Quayside only for;

- Initial mobilization for TRT, 3rd party tooling & chemicals.
- Interim mobilization for TRT change-out.

Regional support base provided for;

- Vessel & Equipment Importation
- Crewing
- Mobilisation Logistics
- Explosives License
LoF Case Study – Mechanical Intervention

In-hole Scopes;
- Debris Removal (to access plug)
- Isolations & De isolation (Plug & Straddle)
- Tubing Punch (Ex)
- Caliper logging
- Sleeve shifting (selective via stroker)
- Milling (partially open 25Cr FIV ball valve & recovery of coupon)
- Production Logging (c/w Tractor)
- Sampling (4d seismic validation)
LoF Case Study – Service Flexibility

All services & more from a single mob
- Mechanical & hydraulic intervention
- Flowline hydrate remediation
- Pumping & Stimulation
- XT install / Subsea Construction

OR

Increased Flexibility Enabled
- Mob mechanical intervention kit only
  - Leaves up to 500m² deck space
  - Free issue kit for various other modes of operation

Reduced rates to suit modes
Reduced port calls & hence reduced costs
1. Extensive track record
   1. All four services delivering enhanced production
2. Hydraulic Intervention
   1. >30 campaigns globally
3. Hydrate Remediation
   1. HRS around XT >30 campaigns globally
   2. FRS flowlines >20 campaigns globally
4. Mechanical Intervention
   1. Water depth records achieved
      1. World records
         1. 2010 – 915m/3000’ – GoM
         2. 2012 - 1280m/4200’ – GoM
         3. 2014 – 2040m/6700’ – GoM
         4. 2014 – 2560m/8200’ – GoM
      2. Client world record
         1. 2018 – 2030m/6660’ – Angola
3. West African regional record
   1. 2018 – 2030m/6660’ – Angola

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**Riserless Hydraulic Well Intervention**

- 2009 – Shell Menasa A-5
- 2010 – Shell Europa A1
- 2011 – Shell Deimos
- 2011 – Shell Europa EA1 & EA6
- 2012 – Shell Deimos DM1 & Europa A2
- 2013 – BP Nakika Seal-Tite Injection
- 2013 – Tullow Oil Ghana 5
- 2013 – Shell Crosby A-7
- 2015 – Chevron Tahiti 5

**Riserless Flowline Hydrate Remediation**

- 2012 – Newfield GoM
- 2012 – Newfield GoM
- 2012 – Marubeni GoM
- 2014 – BP GoM
- 2014 – ENI GoM
- 2014 – ENI GoM
- 2015 – Bennu GoM
- 2015 – ENI GoM
- 2015 – Murphy GoM
- 2015 – LLOG GoM
- 2015 – Murphy GoM
- 2015 – Marubeni GoM
- 2016 – Bennu GoM
- 2017 – 4x jobs GoM LLOG, Murphy, Exxon & Apache
- 2018 – 3x jobs GoM LLOG & Exxon
- 2018 – 2x jobs West Africa Exxon

**Riserless Mechanical Well Intervention (Light – Wireline)**

- 2009 – SILS Shell Troika
- 2010 – SILS Mariner Bass Lite
- 2011 – IRIS ATP tubing cleanout & sleeve intervention
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- 2012 – IRIS Anadarko asphaltene cleanout
- 2013 – IRIS Apache P&A
- 2013 – IRIS W&T through tubing plugback
- 2013 – IRIS ENI sleeve shift verification
- 2014 – IRIS Apache bypass smart valves
- 2014 – IRIS Anadarko mechanical diagnostics & sleeve intervention
- 2014 – IRIS Anadarko sleeve intervention
- 2014 – IRIS Anadarko lease renewal
- 2015-16 – WWC Marubeni 9 Wells P&A
- 2017 – IRIS Hess well diagnostics
- 2018 – IRIS BP Angola 9 wells enhance production
Life of Field;  
A vessel capable of offering clients maximum flexibility of service

Integrated, single sourced solutions for;
- Hydraulic Intervention (Stimulation).
- Flowline Hydrate Remediation.
- Hydrate remediation via ROV.
- Mechanical Light Well Intervention.
- Subsea Construction.
- Field Response.

Operationally;
All technologies are Mature, and have been operational for 10+ years.

Riserless Mechanical intervention can tackle 80+% of today's well intervention scopes.
Questions
CONNECTING WHAT’S NEEDED WITH WHAT’S NEXT™