Increasing Recovery from Subsea Wells Through Electric Line Riserless Light Well Intervention (RLWI) Methods

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Introduction

• Global decline in production (peak oil)

• Increasing consumption

• Average Global Recovery Factor without Interventions = 22%

=> 78% left in the ground
World Liquids Supply By Type

Millions of Oil - Equivalent Barrels/Day

We are not running out of oil, We are running out of “easy oil”

We have to further explore the need for cost-effective solutions as RLWI in conjunction with robotic tools

Source : Exxonmobil

Norwegian Oil production is increasing again. After being on decline for 13 years!!!!!

Source : Dagens Næringsliv 15.Januar 2014
Subsea wells normally underperform platform wells in recovery between 15-20%

- Riserless Light Well Intervention (RLWI) is one method to close the recovery gap between surface wells and subsea wells

- RLWI operations are now common in shallow water depths up to 1800 ft (600 m)

- Operations have been performed at 3991 ft. (1216m) water depth Should be applicable at 2000m with today’s technology.

- Modelling of Cable Forces as a Decision Support Tool for RLWI operations to fully understand the limitations and to provide operators with a tool to assess if RLWI is possible is available:
  - Simulated behavior
  - Empirical data
  - Environmental data
Food for Thought

Where should we start exploring to find more oil and gas?

**In our existing fields?**

How should we increase recovery from existing wells?

**Use of right equipment for the right job!**
Intervention Strategy

- Do you have one?
- Break/fix or scheduled?
- Consider when and where to intervene
The Subsea Intervention Challenge & Dilemma

Too big and expensive?

Too advanced and expensive?

"... fit for purpose"?
Or Vessel of Opportunity (VooP)
What is RLWI?

PCH – Pressure Control Head
Installation package #3 (w/ wire line tool string)

LS – Lubricator Section
Installation package #2

WCP – Well Control Package
Installation package #1 (w/XT adaptor)

ULP & LUB TUB –
Upper Lubricator Package & Lubricator Tubular

LLP – Lower Lubricator Package

Source: FMC
RLWI – The Cost Effective Wireline Solution

Benefits compared to interventions from a semi submersible rig:

• Reduced operation cost
• Reduced operating time
• Increased Weather Window

Results in:
• Reduced cost per intervention
• Enabling more interventions that otherwise would not have been performed (typical data acquisition)

With next generation RLWI stacks it is possible to do RLWI operations at 2000m water depth.

This mean it’s possible to perform RLWI in more than 89% of the subsea wells with current technology!
Expanding the Work Scope on Electric Line

Shifting subsea wells from heavy solutions to the world of lightweight electric line operations is a revolution of the subsea industry

Electric line services cover 90% of the work scope for RLWI
Electric Line Advantages

- No need for a rig
- Deployed from small vessels
- Most cost-effective solution
- Increased operational efficiency
- Smaller carbon footprint
- Available for Deep Water

RLWI operations with subsea lubricator for wireline work and with expanding Surface Read Out (SRO) capability of collected data will increase recovery

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

RLWI enables the application of Robot Technology in subsea wells at a substantially lower cost compared to conventional rig operations
Case Story - Milling Hydrates

From frozen XMT and SSSV

Achievements:
- RLWI deployment of RCB milling tool submerged in Glycol
- Successfully milled 173ft in 4 runs
- 20 hrs of milling
- Milled past SSSV to allow operator to re-establish SSSV functionality
- Validate milling solution for other hydrate scenarios
Case Story - Milling Ashphaltene

In world record water depth

Achievements:

• First time asphaltene has been milled on e-line
• Achieved in 1216m water depth
• Successful samples recovered for chemical analysis before future interventions
Case Story - Mill and Clean Hard Packed Debris

From Plug to pull and retrieve in single runs

- First run, milling/cleaning tool with brush bit broke through and recovered hard packed debris on top of plug
- Second run, cleaning tool with suction capabilities / flow through GS removed the remaining debris inside the internal fish neck
- In the same run, the plug was pulled using a stroking tool
- 0 hours NPT/100% SQ
- Returned well back on-line ~ 12 months earlier than rig based intervention
- Restored ~ 2,000Sm3/day production
Increased Oil Recovery

- IOR by 1% on Statoil wells = 50 bill USD
- Should be possible to achieve globally!

Source: Statoil
Questions?

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... and thank you for your time