Deepwater AX-S™
Subsea Well Wireline Intervention

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Agenda

- Setting the Scene
- Dry Tree Intervention
- Subsea Intervention Opportunity
- AX-S™ Overview
- Testing
- Challenges
- Risk Mitigation
- Schedule
- Summary
- Next Steps
Expro’s Vision and Mission

The Expro mission is **Well Flow Management.**

We provide products and services that:

- Measure
- Control, and
- Improve
- Process

flow from high-value oil and gas wells.

The Expro vision is to be **brand leader in Well Flow Management by 2010**
Dry Tree (Wireline) Intervention

Every Dry Tree has an Intervention performed every ~ 1.2 Years!

Stuffing Box
• Dynamic Seal around wire
• Leak path

BOP
• Break every tool change out

Xmas Tree
Well interventions mean:

- Higher Production = more cash-flow
- Higher Ultimate Recovery = more asset value
“Rigless subsea intervention is coming”

Rob Perry BP Houston April 2008
Value of Subsea Intervention

Integrity related
- Repair and inspection of wells, including trees and completions

Surveillance
- Collection of data to help understand current and future well performance

Production enhancing
- Changing the well performance by shutting off water or gas, increasing the hydrocarbon flow by re-perforating or improving lift performance
Intervention Options

TODAY

• Rig – workover riser
  ▪ High operating cost
  ▪ Limited availability

• Wireline – wire to surface with subsea lubricator
  ▪ Special purpose vessel
  ▪ Limited to shallow water & low currents

• Intelligent / Smart Wells – remote operated completion valves
  ▪ High CAPEX
  ▪ Flow Control Only

FUTURE OPTIONS

• Subsea Coiled Tubing spool
  ▪ Technology challenge

• Subsea wireline winch.....
AX-S™ overview

• 3000m / 10,000 ft water depth capability
• 10,000 psi rated system
• Work on all tree types
• 8 tool change out at depth
• 7-3/8” bore
AX-S™ tower on Subsea Well

- Control / Power Umbilical
- Winch Package
- Tool Storage Package
- Well Control Package
- Subsea Tree
Well Control Package

- Dual barrier
- Fast action
- Standard interfaces

- ROV contingency
- Hydraulic plug pulling / setting
Well Control Package – Manufacture
Tool Storage Package

- Subsea Warehouse - stores wireline tools and tree plugs
- Fast tool change
- Pressure retaining housing
Tool Connection

Wet Tool Connect System

- Electrical and overpull test
- Locking collet
- Tool ID
Wireline Winch Package

Winch within pressure housing

- No seal (stuffing box) around cable
- No wireline cable in water
- No hydrocarbon leak potential
- No seawater in well (hydrates)
- Tractor storage
- Auto spooling
- ROV backup
Wireline Winch Package – Manufacture

IT’S BIG!
Controls – Qualification / ESS Testing – Vibration Testing
Deployment - Active Heave Compensation

Challenges / Innovation

• Fibre Rope Winch
• 3-Stage Deployment - 85 tonne max load
• Fibre Rope Active-Heave Compensation
• “Crawford Winch”
Deployment - On-Deck Handling

Moonpool Deployment
• Safety – No Free-Swinging Loads
Deployment and Operations

SAFE
Motivation for using Fibre rope

Advantages:

• Winch working load limited to module weight
• Less power consumption
• Reduced system weight
• Smaller vessels
• No torque in lifting line
• Rope inspectable and repairable
Integration Tests – Prototype Integration

• Aberdeen
• Sep - Dec 2007
• Complete Stack Up Tests
  ▪ Vertical
  ▪ 5 degrees Angle
Deepwater Challenges

Today

337m
With Guidelines

Tool change outs

Challenges for 3000m

No Guidelines and Subsea currents
Technical Risk Mitigation

- DNV Technology Qualification Process
- People
  - Internal – First Class Team
  - External – Best in Class
- Prototype Testing
  - As early as possible
  - Exceed service conditions
- JIP / Customer Engagement
Schedule

- **Phase 1, Feasibility**: Completed 2004
- **Phase 2, Engineering**: Mid 2005 - 2008
  - Design and test key components
  - Complete manufacturing file
- **Phase 3, System Testing**: 2007-2010
  - System Integration Tests
  - Offshore Field test
- **1st commercial jobs**: 2010
AX-S™ Benefits

Rapid diagnosis & cure
• Rapid mobilisation

Restore cash-flow
• Fix simple mechanical well problems

Cheaper
• 1/3 cost of using a rig
• Less time - faster operations:
  ▪ Riserless
  ▪ ROV installed (no guidelines)
  ▪ Automated tool changes
  ▪ No system pressure test required when tools changed

Deeper
• No wire in ocean currents

Safer
• Dual barrier
• No grease injection to sea
• Vessel is not over the well
Management Challenges

• Interfaces
• Complexity
• Information Overload
• Stakeholders’ Expectations

Resolved through:

• People
• Communication
Deepwater AX-S™
Summary

• Subsea Intervention is Essential
• AX-S™ solution

• Technology
• Teamwork
• Communication
• People
Next Steps

Future challenges
• Well-Specific Interface Engineering
• Manage the Rush to be 2nd Team
• Knowledge
• Offshore / Operational Experience / Learning
• Can we deliver?

YES WE CAN!!!