Perforating Deployment System Reduces Rig Time
59 runs in 75 days
vs.
10 runs in 24 days
Agenda

- Case Study Introduction
- Perforating Conveyance Methods
- Perforating Deployment System
- Other Wireline Technology Enablers
- Operational Planning
- Job Execution & Results
- Additional Operations and Applications
Case Study Introduction

The Challenge
Which conveyance method would you use to perforate?

- Horizontal well
- > 6000 m deep
- 5 ½” casing
- 350m (1,184 ft) net interval
- 900m (2,952 ft) gross interval
- 3 ½” guns
- Underbalanced
- Offshore platform
- Limited rig height of only ~ 17m (56’)

Coiled Tubing
Tubing Conveyed Perforating
Wireline
Slickline
Perforating Conveyance Methods

- **Slickline**
- **Wireline**
- **Coiled Tubing**
- **Tubing Conveyed**

Relative Cost of Operations vs. System Capability

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Perforating Conveyance Methods

- Standard deployment method allows only 6-meter gun
- Requested 350-meter interval = 59 runs = 75 days

Reduce the # of runs — reduce total time!
Perforating Deployment System

Three Main Components:

Connectors
• Connect gun sections together
• Provide sealed ballistic transfer

Deployment Stack
• Open/close connectors under pressure
• Support and lock disconnected string

Gate valves
• Isolate lubricator from well pressure
Perforating Deployment System

Connectors
- 2 parts
  - Stinger
  - Receiver
- Mechanical and Ballistic link between guns
- Stinger contains the donor transfer
- Receiver contains boosters
- Quick connect system
- 2” – 4.5” hollow gun systems
Perforating Deployment System

Deployment Stack
• Open/close connectors under pressure
• Support and lock disconnected string
• Between the XMAS Tree / Gate Valves
• Hydraulically controlled
• Contains 2 rams
  • No Go Rams
  • Guide Rams
Perforating Deployment System

Gate valves
- Isolate lubricator from well pressure
- Used during rig in / out of guns
- Replaces XMAS Tree
- Minimum of 2 gate valves are used to create 2 barriers
- Pressure below valves, above pressure can be bled to zero
Perforating Deployment System

Perforating Deployment System Reduces Rig Time

- Pressure Test Sub (2nd Gen) 0.87
- 2 ft 7" Pump in Sub 6.38" ID 0.66
- Wireline Quad Ram BOP 1.76
- 0.28 7" Tool trap 6.38" ID 0.85
- 5-1/8" Gate Valve 0.73
- 5-1/8" Coupling Manifold 0.14
- 5-1/8" Gate Valve 0.73
- 4.00" CIRP Deployment Stack 0.87
- 5-1/8" Gate Valve 0.73

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Other Wireline Technology Enablers

Conveyance Systems
- Perforating gun deployment
- Cable Selection

Advanced Modelling
- How many guns?
- What gun type?

Reliable Downhole Hardware
- How do we convey guns to depth?
- How do we release, if required?
Operational Planning

Operation Planning - Reduce the # of runs — reduce total time!

- Polymer-capsulated cables
- Ballistic deployment system

- Tension modelling
- Shock modelling
- Tractor forces

- High-performance wireline tractor
- Reliable release device
- Contingency wireline cable cutters

Combining different technologies enable a proposed gun length of 53 meters / 174 feet
Job Execution and Results

• +100 insertions / retrievals perforating connections over 10 runs
• Tensions kept below pulling capability
• Future deployments may have longer strings based on actual tension modelling
• 19,600 m (64,300 ft) tractored in one well
• 53 meters of perforating guns were deployed in a single run using a ballistic deployment method
Job Execution and Results

- Runs were reduced from 59 to **10 runs**
- Well was brought online **51 days sooner**
- Longest perforating run was **53 meters**
- Rig time savings meant **additional volume add jobs** could be added
In Offshore Canada
• 29 WL jobs completed
• 55 CT jobs completed
• Used for fishing operations on limited rig up height

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QUESTIONS?

THANK YOU