Riserless Drilling - Applications of an Innovative Drilling Method and Tools

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OVERVIEW

I. Riserless / Dual Gradient Methods

II. EdR MPD Method

III. Primary Enablers

IV. Conclusions
Dual Gradient Deepwater Drilling

- Pressure (psi)
- TVD (ft)
- Water Depth
- Mudline
- Mud Weight Equivalent
- Pore Pressure
- Fracture Gradient
- 8.6 ppg Density Equivalent
- 16 ppg Mud
Risers
Maurer – Glass Bead Lin
Texaco - DeepVision

Shell - SSPS System
Casing String Targets Using EdR-MPD

- 30" Csg (700 ft)
- 20" Csg (2,000 ft)
- 16" Csg (6,000 ft)
- 13-3/8" Csg (12,000 ft)
- 9-5/8" Csg (20,000 ft)
- 7" Csg (22,000 ft)

EdR-MPD
E-Ductor Return Managed Pressure Drilling System

Pump & Dump Modified EdR or Other Method
Primary Enablers

- Active Control Station
- Eductor Return Line
- In-line Multi-Phase Pump
- Subsea Rotating Control Device
Managed Pressure Drilling technique precisely controls the annular fluid pressure profile within a wellbore.
Rotating Control Device
Deployment Units
flowlines

Return Line Technology
Choke Manifold

A set of high-pressure valves and associated piping that usually includes at least two chokes, arranged such that one choke may be isolated and taken out of service for repair and refurbishment while well flow is directed through the other one. Also allows the driller to apply a pressure drop as well as grants the ability to divert gas and fluids returned while drilling.
Process Control Principles

Shewhart Control Charts for variables.
NORMAL DISTRIBUTION DETERMINED

ADJUSTMENTS MADE

POINT OUTSIDE CONTROL LIMITS

PROBABILITY OF A POINT OUTSIDE

CONCLUDE PROCESS HAS SHIFTED AND UNSTABLE

Reference pool

m+3s
m+2s
m+1s
m
m-1s
m-2s
m-3s

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Active Control Process

1. Identify Defined Processes
2. Identify Measurable Attributes of Process
3. Characterize Natural Variation of Attributes
4. Track Variation
5. Feedback Controller
6. Feedforward Model
7. Process
8. Manipulated Variable
9. Measured Disturbances
10. Unmeasured Disturbances
11. Controlled Variable

Is Process Controlled?

- Yes
  - Identify Assignable Cause
- No
  - Remove Assignable Cause
Key Advantages of EdR MPD

Cost Savings

- Mitigates **Capital Costs** of Riser Pipe.
- Eliminates **Riser Tensioning** & Maintenance.
- Reduced **Installation Time**.
- Less **Mud Volumes** to Fill Riser.
- Lower **Inspection & Handling** Costs.
- Selection of Lower Cost Drilling **Vessels**.
- Less **Handling** = Enhanced Safety Benefits.
Key Advantages of EdR MPD

E-Duct Return Line Advantages:

- Mitigates Riser **Fatigue** and Joint **Leaks**.
- Enables **Reverse Circulation**.
- Increases **Riser Angle** Limits.
- Minimizes **VIV** Issues.
- Greater Degree of Vessel **Drifting**.
- Quicker Emergency **Break-Away**.
- Potential Elimination of “**Pump and Dump**”. 
Key Advantages of EdR MPD

Managed Pressure Drilling Allows:

• Drilling with **Annular Control** at all Times.
• Fewer **Casing Strings**.
• Improved **Kick Tolerance**.
• Reduced Risk of **Lost Returns**.
Conclusions

- **STEP CHANGES**
  are needed in deepwater drilling systems, particularly as we continue to explore in greater water depths.

- **EVOLUTION**
  There are various competing step change technologies regarding riserless drilling. These various programs continue to evolve as the enabling tools and new technologies come in to play.
Conclusions

• **EXISTING TECHNOLOGY**
  Tremendous cost savings when drilling in deepwater can be achieved using existing technologies.

• **COMBING**
  existing technology and tools that are cost effective and provide a safe means of deepwater drilling will be the essential key to enabling large step changes.
Conclusions

• CHAMPIONS

Step changes occur slowly in our industry when no empowered champions take the lead.

Challenges to current drilling techniques in deepwater must be made or the high associated costs will continue to be a barrier to future deepwater exploration.
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THANK YOU