

# MANAGED PRESSURE DRILLING WELL DESIGN AND APPLICATION

## DRL023

### COURSE DESCRIPTION

Drilling wells in complex environments with century-old technology is difficult at best and unsafe at worst. From drilling through narrow pore-pressure/fracture-pressure gradient windows to mitigating kicks and differential sticking, managed pressure drilling (MPD) succeeds when conventional techniques are likely to fail. MPD entails the use of specialized equipment to control Wellbore pressure profiles more precisely than is possible with conventional drilling methods. A major component of MPD systems, rotating control devices (RCDs) create a closed and pressurized system, which gives you ultra-precise control over fluids flowing into and out of the well. MPD systems introduce better monitoring and response capabilities so you can more accurately detect and manage downhole anomalies to prevent the risk of catastrophic well-control incidents.

This course covers Managed Pressure Drilling (MPD) as technology for Dynamic Pressure Drilling (DPD). It will involve numerous examples of the applications of these types of projects drawn from the literature and the Trainer's own experiences. Examples will show the benefits, as well as the pitfalls of using this technology. The course requires an understanding of conventional well design processes and well control principles.

### COURSE GOAL

To enhance the participants' knowledge, skills, and ability necessary to not only enable safer drilling of challenging wells, but also to enable more efficient drilling and necessary to help them successfully navigate tight drilling windows and mitigate drilling hazards to maximize the productivity of your wells.

### COURSE OBJECTIVES

By the end of this course, participant will be able to:

- Determine open hole operating pressure profile limits.
- Use advanced calculation models to develop fluid and hydraulics programs.
- Select best MPD application.
- Specify specialized equipment for the appropriate MPD method.
- Maintain bottom hole pressure (BHP) within close tolerances.
- Overcome pressure transients and problems to safely manage MPD operations.

## WHO SHOULD ATTEND

- Drilling Engineers.
- Well Superintendents.
- Rig Managers.

## COURSE DURATION

5 Working Days

## COURSE OUTLINES

1. Pre-Course Test
2. Geological factors
3. Rock properties
4. Sources of abnormal pressure
5. Sources of subnormal pressure
6. Pressure estimation methods
7. Introduction to Underbalanced Drilling (UBD)
8. Underbalanced Drilling Techniques
  - Air, Gas and Mist Drilling
  - Foam Drilling
  - Aerated Fluid or Gaseated Fluid
9. Borehole Stability
  - Factors Causing Wellbore Instability
  - Predicting Stresses Around Borehole
  - Wellbore Placement
  - Rock Mechanics Issues
10. Equipment Selection
  - Gas Injection Equipment
  - Air compressors
  - Nitrogen Generation System

- Booster Compressors
- Well Control Equipment
- Rotating Diverters
- Snubbing systems
- Separation Equipment
- Horizontal separators
- Vertical Separators
- UBD Choke manifold
- Data acquisition Flares

## **11. Flow Drilling**

## **12. Mudcap Drilling**

- Mud Cap Drilling in Fractured Formations
- Introduction to Mud Cap Drilling
- Mud Cap—Geology and Drilling
- Stabilizing Conditions with Mud Cap Drilling
- Mud Caps versus Gas Assist UBD
- Mud Cap and Hole Cleaning
- Concentric Annuli
- Constant Surface Circulation Approach
- Different Pressure Regimes

## **13. Managed Pressure Drilling (MPD)**

- MPD Overview
  - Concept and Technique Selection
- Basis of Design (Design & Operational Elements)
- Elements of Hydrodynamic Modeling
- Required Surface Equipment
  - Configuration
  - Flow Paths
  - Offshore Floaters
- Surface Monitoring
- MPD Variations
  - Varying Pressure
  - CBHP and Advanced MPD Techniques
  - PCP (Point of Constant Pressure)

- MPD Sample Hydraulic Design
  - Fluid Type Selection
  - Use of Hydraulic Simulator Software
  - Determining Optimum Flow Rates
  - Case History: Several Onshore and Offshore Examples

#### **14. MPD & UBD Selecting an Appropriate Technique**

- Required Data for UBD Candidate Identification
- Poor Candidates for UBD
- Good Candidates for UBD
- Candidate Decision Tree
- Potential Applications and Candidate technique
- Technical Feasibility
- Economic analysis

#### **15. MPD & UBD Well Engineering**

- Wellhead Design
- Casing Design
- Completion Design
- Bit Selection
- Underbalanced Perforating
- Drillstring Design
- Separator Design

#### **16. UB Completion Types**

- General Considerations
- Open Hole
- Various Liners
- Cased Hole

#### **17. Post-Course Test**

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