CONCEPT

Managed Pressure Drilling (MPD): Constant Bottom-Hole Pressure, Equipment and Operations



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Introduction:

Managed pressure drilling MPD lets a rig drill through margins where a static mud column alone would either lose returns or take a kick, yet many MPD jobs still suffer from unclear choke set points, untested connection schedules and confusion over who shuts in the well. This Core Concept course trains drilling engineers, rig supervisors and wellsite staff to select an MPD variant, size the surface equipment, model back-pressure and ECD, read the operations matrix and run connections and trips under applied surface pressure. Participants produce an MPD Job Plan with Operations Matrix and Pressure Schedules.

Course Objectives:

- Justify an MPD variant for a well by comparing constant bottom-hole pressure, pressurised mud-cap, dual gradient and returns flow control against the expected drilling hazards
- Specify a rotating control device, MPD choke manifold, Coriolis flow meter and drill string non-return valves and verify their pressure ratings against the job envelope
- Calculate annular friction, required surface back-pressure and ECD for drilling, static and connection states with a hydraulics model
- Detect and classify an influx from Coriolis flow-in/flow-out deltas and apply the MPD operations matrix to decide whether to control, escalate or shut in
- Write connection, tripping and pump ramp schedules that hold bottom-hole pressure within the planned margin
- Lead an MPD HAZID and assemble a job plan with roles, procedures and hand-over criteria to the rig well control system

Target Audience:

- Drilling engineering functions that design wells where the mud-weight window is too narrow for conventional practice
- Rig supervision functions that approve MPD procedures and hold authority for well shut-in
- MPD service functions that operate choke control systems, flow meters and rotating control devices
- Wellsite monitoring functions that watch flow, pit volumes and pressure trends during drilling and tripping
- Well operations planning functions that run hazard reviews and prepare job-specific procedures

Course Outline:

Day 1: Why MPD: Drilling Hazards, Definitions and Variant Selection

- Narrow Drilling Margins, Lost Returns, Ballooning and Kick-Loss Cycles as MPD Drivers
- IADC Definition of MPD and Its System Categories
- Constant Bottom-Hole Pressure and Returns Flow Control Principles
- Pressurised Mud-Cap Drilling with Light Annular Mud and Sacrificial Fluid
- Dual Gradient Drilling and the Contrast with Underbalanced Operations

Day 2: MPD Surface Equipment and Closed-Loop Architecture

- Rotating Control Device Types, Sealing Elements and Pressure Rating Checks
- MPD Choke Manifold Layout, Automated Choke Control and Redundancy
- Coriolis Flow Meter Principle, Mass Flow Accuracy and Placement
- Drill String Non-Return Valves, Back-Pressure Pumps and Trip Tank Integration
- Rig-Up Configuration, Pressure Testing and API Recommended Practice at Overview

Day 3: Back-Pressure Hydraulics, ECD Management and Influx Detection

- Real-Time Hydraulics Model Inputs: Rheology, Temperature and Cuttings Load
- Surface Back-Pressure Set Point Calculation for Drilling, Static and Pump-Off States
- Dynamic Formation Integrity and Pore Pressure Tests Using the MPD System
- Early Kick and Loss Detection from Flow-In, Flow-Out and Standpipe Deltas
- MPD Operations Matrix: Influx Size, Surface Pressure Limits and Response Zones

Day 4: Connections, Tripping and the Well Control Interface

- Pump Ramp-Down and Ramp-Up Schedules to Hold Bottom-Hole Pressure at Connections
- Tripping with Applied Surface Pressure and Kill-Weight Displacement Decisions
- Influx Circulation Through the MPD Choke Versus Rig BOP Shut-In Criteria
- Roles and Authority of Driller, MPD Operator and Rig Supervisor During Events
- Equipment Failure Scenarios: RCD Seal Leak, Choke Plugging and Flow Meter Loss

Day 5: MPD Job Planning Simulation and Job Plan Build

- MPD HAZID Workshop with Bow-Tie Barriers for a High-Pressure Carbonate Section
- Simulation: Connection and Influx Response on an Offshore Narrow-Window Well
- Simulation: Mud-Cap Switch-Over After Total Losses in a Fractured Reservoir
- Job Procedure Drafting: Commissioning, Drilling, Connections and Contingencies
- MPD Job Plan with Operations Matrix and Pressure Schedules Peer Review

Skills You Will Gain:

- MPD Variant Screening
- Rotating Control Device Selection
- Back-Pressure Set Point Calculation
- Coriolis Flow Interpretation
- Operations Matrix Decision-Making
- Connection Pressure Scheduling
- MPD HAZID Facilitation
- Well Control Interface Design

Why Attend This Course:

- Return with an MPD Job Plan with Operations Matrix and Pressure Schedules built for a narrow-margin section
- Rehearse influx, loss and equipment failure responses in simulated rig scenarios before facing them on a live well
- Clarify the hand-over point between the MPD system and the rig BOP so crews know who acts and when
- Compare MPD practice across land, shelf and deepwater operations with peers from operators, drilling contractors and service companies

Conclusion:

MPD succeeds when the choke, the flow meter, the hydraulics model and the people reading them follow one agreed plan. The one week move from the hazards that call for MPD and the variants that answer them, through surface equipment and closed-loop architecture, to back-pressure hydraulics, influx detection, connections, tripping and the well control interface. The final day runs simulated events and a hazard review and produces an MPD Job Plan with Operations Matrix and Pressure Schedules ready for rig approval.