CONCEPT

# Drill String Design and BHA Engineering: Torque and Drag, Buckling and Hydraulics

12 – 16 April 2027
London - Central London four-star



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**Ref:** 650_18395 **Date:** 12 – 16 April 2027 **Location:** London - Central London four-star **Fees:** 23000 SAR

## Introduction:

Drill string design choices made before spud decide whether tubulars part under tensile load, twist off at a tool joint, lock up in a lateral or leave a cuttings bed on the low side of an inclined wellbore. This Core Concept course takes specialists through steel grades and inspection classes, tensile, torsional and collapse margins, stabiliser layouts, neutral point and buckling, fatigue, friction factor calibration, nozzle and annular flow and vibration control. Participants build a Drill String and BHA Load, Friction and Flow Workbook for a sample inclined wellbore.

## Course Objectives:

- Select tubular grades, inspection classes, tool joints and transition components for each interval
- Size a rotary column for tension, torsion and collapse with stated safety factors and a margin of overpull
- Configure packed, pendulum and steerable bottom assemblies and keep the neutral point inside the collars or heavyweight joints
- Calibrate friction models against field hook load and surface torque readings and predict buckling and lockup
- Set nozzle, flow rate and rotary speed parameters that balance jet energy and cuttings transport in inclined and extended reach intervals
- Diagnose stick-slip, whirl and fatigue failures and specify mitigation for the next run

## Target Audience:

- Specialists who specify tubular columns and stabiliser layouts in wellbore programmes
- Rig-based supervisors who verify makeup, weights and operating parameters on tour
- Modelling specialists who run friction, buckling and flow simulations for inclined and extended reach wellbores
- Tubular inspection staff who manage steel classification and connection care
- Service company staff who configure motor, rotary steerable and measurement-while-drilling assemblies

## Course Outline:

### Day 1: Column Anatomy, Steel Grades and Threaded Connections

- Column Sections: Bottom Assembly, Transition Heavyweight Joints and Tube Body
- Steel Grades, Specified Minimum Yield Strength and Wall Thickness Tables
- Remaining Body Wall Inspection Classes: Premium, Class 2 and Scrap Colour Banding
- Tool Joint Box and Pin Geometry, Rotary Shoulder Threads and Makeup Torque
- Bending Strength Ratio and Stiffness Transition Between Collars and Heavyweight Joints

### Day 2: Load Margins and Stabiliser Layouts

- Tensile Sizing with Buoyancy Factor, Safety Factor and Margin of Overpull
- Torsional Capacity of Tube Body and Tool Joint Under Combined Tension
- Collapse Check for Partially Evacuated Columns and Formation Test Conditions
- Packed, Pendulum and Fulcrum Assemblies: Stabiliser Spacing and Side Force
- Steerable Motor and Rotary Steerable Layouts with Sensor and Jar Placement

### Day 3: Neutral Point, Friction Modelling and Nozzle Energy

- Neutral Point Location and Available Axial Load in Inclined Wellbores
- Soft-String Friction Calculation for Tripping, Sliding and Rotating Modes
- Friction Factor Back-Calculation from Pick-Up, Slack-Off and Off-Bottom Torque Readings
- Nozzle Total Flow Area, Hydraulic Horsepower per Square Inch and Jet Impact Force
- Standpipe Pressure Budget, Pump Liner Limits and Flow Rate Selection

### Day 4: Buckling, Fatigue, Torsional and Lateral Vibration and Cuttings Transport

- Sinusoidal and Helical Buckling Thresholds and Lockup Prediction in Laterals
- Cumulative Fatigue Damage from Rotation Through Doglegs and Connection Stress Relief Grooves
- Twist-Off and Washout Investigation with Fracture Surface Evidence
- Stick-Slip, Whirl and Axial Bounce: Surface Signatures and Parameter Mitigation
- Cuttings Transport at High Inclination: Low-Side Beds, Rotation Speed and Sweep Pills

### Day 5: Workbook Build: Load, Friction and Flow Checks for a Sample Inclined Wellbore

- Sample Wellbore Data Review: Survey Profile, Shoe Depths and Formation Hazards
- Column and Assembly Selection Sheet with Tension, Torsion and Overpull Margins
- Friction Model Run with Calibrated Factors and Buckling Screen
- Flow and Cuttings Transport Check Against Pump and Pressure Limits
- Workbook Presentation and Peer Technical Challenge

## Skills You Will Gain:

- Tubular Grade Selection
- Margin of Overpull Calculation
- Stabiliser Tendency Analysis
- Neutral Point Placement
- Friction Factor Calibration
- Buckling Lockup Prediction
- Nozzle Energy Optimisation
- Downhole Vibration Diagnosis

## Why Attend This Course:

- Return with a Drill String and BHA Load, Friction and Flow Workbook built on a sample inclined wellbore
- Question contractor column and assembly proposals with your own load and margin calculations
- Recognise the surface signs of buckling, vibration and cuttings build-up before they become downhole failures
- Compare tubular practice and failure lessons with peers from operators, contractors and service companies

## Conclusion:

A rotary column fails where its weakest component, connection or operating limit was never checked against the loads it will meet. The course moves from steel grades, inspection classes and threaded connections through tensile, torsional and collapse margins, stabiliser layouts and neutral point, to friction calibration, nozzle energy, buckling, fatigue, vibration and cuttings transport. The final day applies these methods to a sample inclined wellbore and produces a Drill String and BHA Load, Friction and Flow Workbook ready for technical review.