
N744: Well Engineering: Torque and Drag and Hydraulics

Instructor(s): Robello Samuel

Format and Duration

Classroom - 2 Days

Virtual - 4 Sessions

Summary

This course provides a comprehensive treatment of torque and drag forces, as well as wellbore hydraulics, grounded in theoretical principles and practical applications. Participants will learn the basics of friction factors and how to estimate torque and drag forces, including hookload calculations and tubular buckling concepts for both 2D and 3D scenarios.

It will also focus on drill bit hydraulics, covering drilling mud composition, properties, and functions, along with various rheology models. Participants will be introduced to different hydraulic pump and nozzle optimization methods, each with distinct objective functions.

Additional topics will include hole cleaning, selected empirical correlations and models for deviated wells, with an emphasis on addressing practical drilling problems, as well as understanding surge and swab effects.

Business Impact: This course enhances operational efficiency, improves well design, and reduces drilling costs by equipping engineers with advanced knowledge in torque/drag, hydraulics, and high-angle well operations. It minimizes non-productive time, improves safety, and reduces risks, while optimizing resources and addressing complex drilling challenges. This leads to cost savings, better project outcomes, and a competitive advantage.

Learning Outcomes

Participants will learn to:

1. Provide procedures to enhance practical knowledge related to high-angle wells.
2. Synthesize the concept of the friction factor.
3. Comprehend various models used for calibration in well engineering.
4. Contextualize the application of various downhole tools in drilling operations.
5. Demonstrate the importance of wellbore hydraulics and wellbore pressure engineering in relation to well designs.
6. Develop a broader understanding of the application of principles and methods in well engineering.

Training Method

This is a classroom or virtual classroom course comprising a mixture of lectures, discussions, case studies, and practical exercises.

Who Should Attend

This course is designed for drilling engineers, well operations personnel, rig supervisors, drilling supervisors, and pipe manufacturers who seek to gain a deeper understanding of torque and drag, as well as hydraulics calculations.



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Course Content

1. Introduction
2. Fundamentals
3. Properties and specification of Tubulars
4. Load Capacity of Tubulars
5. Friction Factor
6. Side Force Calculations
7. Torque and Drag Calculations
8. Hookload and Drag chart
9. Limit calculations
10. Broomstick chart
11. Friction Factor Calibration
12. Fluids basics
13. Drilling Hydraulics
 - Mechanical Energy and Pressure Balances
 - Pressure Losses in the circulating system
 - Flow through Jet Bits
 - Rheological Models
 - Laminar Flow and Laminar Flow in Pipes and Annuli
 - Flow through Core Bits
 - Swab and Surge Pressures
 - Hydraulics Optimization
 - ECD During Tripping Operations
 - ECD During Drilling Operations
 - ECD During Well Control Operations
14. Drill Bit Hydraulics
 - Jet Bit Nozzle Size Selection
 - Hydraulics Power Requirement
 - Nozzle Optimization
 - Split Flows
15. Hole Cleaning
 - Factors affecting Hole Cleaning
 - HoleCleaning in deviated holes
 - Empirical correlations for high angle wells