Drilling Hydraulics

Duration
Five (5) days

Objectives
This course is designed to provide the participants with an advanced knowledge needed to design and analyze drilling hydraulics. The participants will learn hydrostatics of single and multiphase systems; fundamentals of drilling fluid rheology; calculating frictional pressure losses in the circulating system; optimizing bit hydraulics; evaluating hole cleaning performance; and predicting swab/surge pressure changes. The theory given in the class will also be complemented with practical examples and case histories.

Content
• Hydrostatics of Drilling Fluids: Hydrostatic pressure of incompressible, compressible and complex fluid columns; Buoyancy.

• Drilling Fluid Rheology: Fundamentals of fluid flow; Newtonian and non-Newtonian fluids; Rheological models; Time-dependent (thixotrophy) behavior; Viscoelasticity; Determination of rheological parameters.

• Hydraulics Models: Prediction of flow regimes; Friction pressure correlations of drilling fluids through pipes and concentric/eccentric annuli; Equivalent circulating density; Hole erosion; Effects of drillpipe rotation on annular performance.

• Bit Hydraulics: Evaluation of jet velocity, bit pressure loss, hydraulic horsepower, specific horsepower and impact force; Bottom-hole cleaning; Cross-flow; Floundering; Drilling specific energy.

• Hole Cleaning: Vertical, extended reach and horizontal wells; Cuttings transport mechanisms; Carrying capacity index; Transport ratio; In-situ cuttings concentration; Barite sag; Hole cleaning sweeps.

• Swab/Surge Pressures: Practical calculation methods for closed pipe, fully open pipe and pipe with bit; Swab-surge with and without circulation. Controlling parameters; Determining the safe trip velocities; Dynamic swab-surge model.

• Hydraulics Optimization: Principle of hydraulic optimization; Maximizing bit hydraulic horsepower, impact force and jet velocity; Hydraulic program design - Bit nozzle selection.

Prerequisites
Basic knowledge of drilling and drilling fluids and fluid mechanics.

Audience
Wellsite supervisors, drilling engineers and drilling superintendents.