Drilling Bits & Hydraulics Technology

Course general description:

Comprehensive training in drilling bits selection, optimization, and hydraulics calculations for optimal drilling performance and efficiency in oil and gas wells. It is a skill module addresses roller cone and cutter bit design features and their associated hydraulics programs at an awareness competency level.

Audience:

This course is designed for:

1. Drilling engineers
2. Well planners
3. Bit optimization specialists
4. Field supervisors
5. Technical support staff.

Course objectives:

By end of the course participants will:

1. Master bit selection and applications
2. Understand hydraulics principles
3. Learn optimization techniques
4. Develop troubleshooting skills
5. Apply performance analysis methods.

Course duration:

5 days

Course location:

Dubai

Course contents:

Day 1: Introduction to Drilling Bits and Pretest

- Pretest: Conduct a preliminary assessment to gauge participants' baseline knowledge of drilling bits and hydraulics.
- Overview of Bit Types: Introduce the two main categories of drilling bits—fixed cutter bits (e.g., PDC) and roller cone bits (e.g., tricone bits).
- Bit Applications: Discuss the specific applications of each bit type in different formations (soft, medium, hard, and abrasive).
- Historical Evolution: Provide a brief history of drilling bit technology and its impact on drilling efficiency.

Day 2: PDC Bit Technology and IADC Classification

- PDC Bit Design: Explore the cutting structures, materials, and geometries of PDC (Polycrystalline Diamond Compact) bits.
- Nozzle Configurations: Explain the role of nozzle placement and sizing in bit performance and cuttings removal.
- IADC Classification System: Teach participants how to interpret the IADC (International Association of Drilling Contractors) code for bit classification.
- Dull Grading and Wear Mechanisms: Analyze common wear patterns (e.g., broken cutters, erosion) and their implications on bit performance.

Day 3: Bit Selection and Operating Parameters

- Formation Evaluation: Discuss how formation characteristics (e.g., hardness, abrasiveness) influence bit selection.
- Economic Considerations: Introduce cost-based criteria for bit selection, including cost per foot and overall drilling efficiency.
- Optimizing Weight on Bit (WOB) and RPM: Explain the relationship between WOB, RPM, and rate of penetration (ROP).
- Performance Analysis: Teach participants how to calculate cost per foot and evaluate bit performance using real-world data.

Day 4: Hydraulics Fundamentals and Bit Hydraulics

- Hydraulics Basics: Cover the fundamentals of fluid flow regimes (laminar, turbulent, and transitional) and pressure loss calculations.
- Nozzle Sizing and Hydraulic Horsepower: Explain how to optimize nozzle size and hydraulic horsepower for efficient cuttings removal.
- ECD Management: Discuss the importance of Equivalent Circulating Density (ECD) in maintaining wellbore stability.
- Hole Cleaning Techniques: Explore strategies for optimizing hole cleaning and minimizing drilling issues like stuck pipe.

Day 5: Case Studies, Performance Evaluation, and Final Assessment

- Case Study Analysis: Review real-world case studies to demonstrate the application of bit selection, hydraulics, and optimization techniques.
- Performance Evaluation: Conduct a hands-on session to evaluate bit performance and hydraulics efficiency using provided data sets.
- Final Assessment: Administer a comprehensive test to assess participants' understanding of the course material.
- Q&A and Feedback: Allow participants to ask questions, share insights, and provide feedback on the course.

Methodology:

- 50% lectures & concepts
- 10% Videos
- 15% Case studies
- 15% Exercises
- 10% Discussions

Course code: (TDRL003)