

ADVANCED DIRECTIONAL DRILLING

DRL005

COURSE OVERVIEW

This course builds a firm foundation in the principles and practices of directional drilling, calculations, and planning for directional and horizontal wells. Specific problems associated with directional/horizontal drilling such as torque, drag, hole cleaning, logging and drill string component design are included.

Participants will receive instruction on planning and evaluating horizontal wells based on the objectives of the horizontal well. The basic applications and techniques for multi-lateral wells are covered in the course. Additionally, they will become familiar with the tools and techniques used in directional drilling such as survey instruments, bottomhole assemblies, motors, steerable motors and steerable rotary systems.

Participants will be able to predict wellbore path based on historical data and determine the requirements to hit the target and use COMPOS LANDMARK software.

COURSE OBJECTIVES

Upon successful completion of this course, participant will be able to:

- Make survey calculations
- Interpret TVD, polar and rectangular coordinates and vertical section
- Interpret dogleg severity and the problems associated with dogleg severity
- Plan a two-dimensional directional well
- Plan horizontal wells based on the objectives of the well
- Determine the best multi-lateral completion for an application
- Determine declination and non-magnetic drilling collar selection
- Apply the best survey instrument for the job
- Directionally drill with rotary BHAs, jetting, whipstocks, motor, steerable motors, and rotary steerable systems
- Interpret torque and drag and determine what factors will affect the torque and drag
- Determine cementing requirements for directional wells
- Use COMPOS LANDMARK software

WHO SHOULD ATTEND

Drilling, production and operations engineers, field supervisors, toolpushers, managers and technical support personnel.

COURSE DURATION

5 Working Days

COURSE OUTLINES

Day 1

1. **Pre course evaluation**
2. **Directional Well Profiles**
 - Build and hold design
 - S-Types design
 - J-type Design
 - Exercise
3. **Extended reach wells**
 - Optimized planning (SPE-149099-MS)
 - Well trajectory design
 - BHA and drill string design
 - Torque drag and buckling
 - Hydraulics and hole cleaning
 - ECD management
 - Bit hydraulics
 - Challenges
 - New technology
 - Completion and production optimization
 - Well intervention
 - Exercise
4. **Survey calculations and accuracy**
 - Tangential method
 - Balanced tangential method
 - Average angle method
 - Radius of curvature method
 - Minimum of curvature method
 - Vertical section
 - Survey report
 - Exercise

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Day 2

5. Dogleg severity calculations and problems associated with doglegs

- Meaning of dogleg angle
- Dogleg angle calculations
- Dogleg severity
- Problem associated with dogleg: Fatigue, keyseat, torque and drag
- Exercise

6. Planning directional and horizontal wells

- Planning build and hold
- Planning S-Type
- Planning J type
- Planning horizontal single radius build curve
- Planning horizontal complex build curve
- Planning horizontal ideal build curve
- Design a well using COMPOS LANDMARK software

7. Horizontal drilling methods and applications

- Rotary steerable system
- Power drive or geopilot system
- Tracking the well

8. Logging high angle wells

- Wire line logging operation
- Coiled tubing logging operation
- LWD tools and operation

9. Hole-cleaning

- Factors affecting hole cleaning
- Recommended flow rate and RPM
- Angle between 0 and 10
- Angle between 10 and 30
- Angle between 39 and 60
- Angle above 60

10. Multi-laterals

- Level 1 drilling and completion
- Level 2 drilling and completion

- Level 3 drilling and completion
- Level 4 drilling and completion
- Level 5 drilling and completion
- Level 6 drilling and completion

Day 4

11. Types of survey instruments

- Magnetic survey tools work and application
- Errors and correction for magnetic reading
- Gyro survey tools work and application
- Error and correction for Gyro survey reading
- MDW tools and applications
- Survey report

12. Tools used to deflect a wellbore

- Whipstock
- Jetting
- Rotary BHA
- Rotary BHA with undergauge stabilizers
- Rotary steerable system
- Autotrack technique
- Case study

13. Torque and drag calculations

- Meaning of torque and drag
- Torque and drag principles
- Torque and drag calculations
- Reasons for torque and drag increase
- Torque and drag problems
- Exercises

Day 5

14. Tool face setting

- Ragland diagram
- Ouija board

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- Calculation method
- Graphical method

15. Cementing

- Cement design
- Cement setting techniques
- Cement evaluation
- Exercise

16. Case study

- Case study 1: Extended reach well drilling
- Case study 2: Horizontal well drilling
- Case study 3: Directional well drilling

17. Post course evaluation.

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