



Advanced Drilling Engineering Course-5 Days

Objective

This course will address advanced drilling topics which is essential and timely in today's drilling technology climate. These topics were carefully selected to add to the skill set of a novice as well as advanced drilling engineer. The course intends to stress the appreciation of the complexity of the management of the drilling process to better integrate with company strategic goals. Key drilling efficiency improvements areas were presented in a way to emphasis real time drilling problems diagnostics, mitigations, prevention, and problem solving. Issues concerning technical limits, advanced wellbore stability analysis, pore pressure and fracture gradient estimation strategies before and during drilling are highly critical topics for anyone involved in the drilling process. These topics shine throughout the fabric of this highly acclaimed and practical course.

Who should attend?

Anyone who is connected with well construction from the planning phase to post mortem including drillers, engineers, geologists, geophysicists, and environmental engineers.

Course Materials

The course will be delivered using a mixture of power point presentation and heavy class participation (almost 70% hands on practical and discussions)

Instructor:

Dr. Saad Saleh, Drill-Sense International (Vita Attached)

Course Content:

1. **Day 1: Drilling Analysis and Benchmarking**
 - a. Data collection and QC process
 - b. Interactive learning curve analysis
 - c. Expectation and resulting drilling performance
 - d. Best composite time
 - e. AFE statistical approach
 - f. Drilling process management
 - g. Drilling the technical limit
 - h. Real time drilling performance monitoring

2. **Day 2: Advanced Topics in Pore/Fracture Pressure Gradient Estimation**
 - a. Pore pressure generation mechanisms
 - b. Classical pore pressure theories
 - c. Pressure data analysis

- d. Rock physics of pore pressure
 - e. Pore pressure in carbonate
 - f. The Centroid concept
 - g. Seal integrity evaluation
 - h. Real time pore pressure estimation from drilling data
 - i. Classical fracture estimations
 - j. Minimum horizontal stress estimation from frac data
 - k. LOT analysis
 - l. Calibration of fracture gradient model
 - m. Pre drill fracture gradient estimation
 - n. Practicals
- 3. Day 3: Wellbore Stability Analysis**
- a. Introduction to rock mechanics
 - b. Vertical stress
 - c. Maximum and minimum horizontal stresses
 - d. Wellbore stresses
 - e. Rock strength
 - f. Rock failure criteria
 - g. Wellbore stability models (linear elastic)
 - h. Calibration of wellbore stability model
 - i. Shale and drilling fluid interactions
 - j. Caving analysis
 - k. Class problems
- 4. Day 4: Advanced topics in Drilling Fluids Management**
- a. Drilling fluid selection
 - b. Barite sag
 - c. Hydraulic optimization
 - d. Solids control economics
 - e. Rig auditing for solids control efficiency
- 5. Day 5: Advanced topics in Drilling Mechanics and Hole Problems**
- a. Loss of circulation contingency planning
 - b. Selection of loss circulation materials
 - c. Shale problems
 - d. Stuck pipe
 - e. Bit optimization
 - f. Drilling rate optimization
 - g. Mechanical specific energy
 - h. Final Exam



The Instructor: Dr. Saad Saleh



Dr. Saleh holds a Ph.D. and MS degrees in Petroleum Engineering from the Colorado School of Mines. He has over 20 years of professional drilling experience in industry and 6 years in academia. Dr. Saleh is a specialist in real time geopressure, wellbore stability, and drilling analysis. Dr. Saleh is highly experienced in drilling technology frontiers (HPHT deepwater, sub salt drilling to name few) in many parts of the world including Latin America, Gulf Coast, North Sea, Canadian Shelf, and the Far East. Over a decade, Dr. Saleh has been involved in training and mentoring drilling engineers and drilling operation personnel on geopressures prediction, wellbore stability analysis, drilling fluid solids control, and drilling fluids optimization.

Currently, Dr. Saleh is the President of Drill-Sense International, a consulting firm which specializes in advancing real time drilling technologies, training in all aspects of Petroleum Engineering with emphasis on drilling training, as well as providing expert advice to the global drilling industry on drilling diagnostics, optimization, well planning, and real time drilling surveillance. Dr. Saleh is serving as a Global Advisor for Knowledge Systems in Houston as well as other service providers and operators. Dr. Saleh literally wrote the book for drilling best practices in the deepwater Gulf of Mexico subsalt wells, best practices for geopressure predictions in deepwater for many parts of the world including the Gulf of Mexico, Nile Delta, and others. At the present time, Dr. Saleh is heavily involved in

Recently, Dr. Saleh was a Senior Drilling Fluid Specialist with Saudi Aramco (from 2005 to 2007). Dr. Saleh championed the introduction of the Saudi Aramco's Real Time Drilling Operation Center (RTOC), drilling rate optimizations and other strategic projects.

Prior to Aramco, Dr. Saleh was the Principal Geopressure advisor/consultant for Knowledge Systems (6 years from 2000 to 2005) in Houston, Texas. With over 2000 wells analyzed world wide, Dr. Saleh has gained extensive experience in the field of geopressure and wellbore stability analysis which covered Latin America, U.S. Gulf Coast, East Canadian Shelf, North Sea, and the Mediterranean Nile Delta. During his tenure with Knowledge Systems, he has served as the Knowledge Systems' project manager, a wellsite geopressure/wellbore stability Consultant, a Trainer, and a specialist to audit internal drilling work processes with special focus on geopressure and geomechanics aspects.



Prior to joining Knowledge Systems, Dr. Saleh served as Drilling Advisor for PDVSA-Intevep (3.5 years from 1997 to 2000), Assistant Professor at the Colorado School of Mines (4 years from 1994 to 1997) and the University of Alaska (2 years from 1988 to 1990), and a Senior Drilling Engineer for BP Exploration in Alaska (4 years from 1990 to 1994) and Northern Petroleum (2 years from 1977 to 1979).

In his career, Dr. Saleh has worked as a Drilling Engineer, Special Projects Engineer, Project Leader, Assistant Professor, Drilling Technology Advisor and Mentor. Dr. Saleh worked in drilling operations/rig supervision, well planning for deepwater HPHT wells, rig site and real-time advisor for drilling extremely difficult wells (subsalt), well productivity enhancement, and pioneered new technologies in bits for hard drilling, cementing in horizontal and highly deviated wells, drilling vibration minimization, foam diversion, foam application for production systems, and advanced enhanced oil recovery concepts. Dr. Saleh worked as an advisor to the United States Sandia National Laboratory to develop models for buckling of tubular, minimize water hammering effects, casing failure under salt loading, and other drilling problems. In addition, Dr. Saleh served as a Drilling Editor for the SPE Drilling Magazine. Dr. Saleh developed from scratch several state-of-the-art research laboratories for foam, formation damage, flow loop, and gas well testing simulator. Dr. Saleh has written several technical manuals for academic and industry teaching and published over 24 papers in drilling, formation damage, production, and reservoir engineering.