SHALY SAND - PETROPHYSICS GEP012

COURSE DESCRIPTION

The presence of clay minerals and shale laminations strongly affects the physical properties of the reservoir rock and induce significant effects on the response of most logging tools; these perturbations often result in low resistivity/low contrast pay zones that can be significant hydrocarbon producers but are often overlooked. A properly designed analytical program (cores and logs) for the evaluation of shaly sands can add significant reserves in existing fields and can allow for the rapid identification of potential by-passed pay zones in exploration wells. This course covers the important and nontrivial problem of practical formation evaluation in shaly sand provinces. The course is practical, and participants are given laboratory and field problems to emphasize the instruction.

COURSE GOAL

To enhance the participants' knowledge, skills and abilities necessary to understand shaly sands.

COURSE OBJECTIVES

By the end of this course, participant will be able to:

- Determine the nature, volume and distribution of clay minerals and shales in shaly sands, and their impact on the analyses of cores and logs.
- Integrate petrographic, core and log data to significantly improve reservoir evaluation in shaly sands and other rock types containing significant amounts of microporosity.
- Bring order out of chaos on porosity-permeability cross-plots using rock typing.
- Evaluate effective and total porosity, fluid saturations and producibility of shaly sands using time-tested specific methods.
- Evaluate the strengths and weaknesses of advanced logging tools for characterization of shaly sands.
- Scan a log quickly for possible hydrocarbon pay zones
- Evaluate QA/QC issues
- Apply borehole and environmental corrections
- Evaluate Ra's and determine Ro, Rw, Rxo, Rt, porosities and permeabilities from the logs
- Calculate saturations (Archie or Shaly Sand)
- Evaluate hydrocarbon mobility.

WHO SHOULD ATTEND

This training course was designed for Petrophysicists, geologists, geophysicists, engineers and explorationists involved in all phases of reservoir evaluation in shaly sand provinces.

COURSE DURATION

5 Working Days

COURSE OUTLINES

1. Day One
    - Reservoirs, reservoir analysis, reservoir models
    - Reservoir processes and properties
    - Petrophysics as a key-discipline in integrated reservoir analysis
    - Petrophysical properties of reservoir rocks
    - Reservoir rocks and types
    - Definition and occurrence of shaly sands
    - Definition of a petrophysical model
    - Petrophysical concepts relevant to shaly sands
    - What clays are, how clay is different from shale, and why is clay important?
    - The nature of clay minerals and shale laminations and how they are distributed in shaly sands
    - Clay indicators and the methods for calculating clay volume from the various indicators
2. Day Two
    - The physical characters of different clay minerals
    - Occurrence of clay minerals and shale types in reservoir rocks and relation to depositional environment and digenesis
    - Influence of clay minerals and shale laminations on petrophysical properties
    - Integration of petrographic, core and log data for evaluation of shaly sands
    - Basic rock models in shale sand reservoir
3. Day Three
    - Clay minerals play an important role as masking agent for hydrocarbon occurrence and productivity
    - Review of log interpretation techniques in clean formation
    - Why many popular methods of clay volume analysis often do not provide good results
    - Log analysis – formation evaluation
    - Fundamentals of well logging
    - The borehole and its environment
    - Open hole and cased hole logging
    - Electric and electromagnetic methods

- Acoustic methods
- Nuclear methods

4. Day Four
    - Fundamental problems of formation evaluation Profile description and reservoir detection Reservoir characterisation
    - Basic interpretation methods Vshale, porosity, water saturation
    - How to detect the Permeable zones
    - Porosity tools and their application in shaly sand analysis
    - Calculation of water saturation from resistivity measurements
    - Strengths and limitations of resistivity-based water saturation analysis
    - Models for porosity and saturation determination: Total and Effective Porosity, and Archie, Waxman-Smits, Dual Water and Juhasz saturation methods
    - Capillary pressure, water saturation, fluid contacts
    - Prediction of permeability and producibility from logs in shaly sands: identification of bypassed pay
5. Day Five
    - Advanced interpretation methods
    - Combined determination of porosity and rock composition Cross plot methods
    - Shaly sand interpretation Fractured reservoirs
    - Saturation determination, movable fluids Permeability estimation
    - Thin bed evaluation and anisotropic reservoirs Integrating the information; the reservoir model
    - Use of advanced logs- NMR, BHI, Dipmeter - integration with core data for purposes of evaluation
    - Case Studies for many countries (shaly sand reservoirs) and practical shaly sand interpretation by using Interactive petrophysics (IP)