TRANSACTIONS

OF THE

SPWLA

FORTY-FOURTH

ANNUAL LOGGING SYMPOSIUM

Sponsored by

THE SOCIETY OF PROFESSIONAL WELL LOG ANALYSTS, INC.
8866 Gulf Freeway, Suite 320
Houston, Texas 77017

Presented at

MOODY GARDENS HOTEL and
CONVENTION CENTER
GALVESTON, TEXAS
June 22-25, 2003

NOTICE TO EDITORS: Permission is hereby granted to publish elsewhere any of these transactions after June 25, 2003, provided that conspicuous acknowledgement is given to the original presentation of the paper and the authors of the paper have agreed to the republication.

(The statements and opinions expressed in these transactions are those of the authors and should not be construed as an official action or opinion of the Society of Professional Well Log Analysts, Inc.)
TABLE OF CONTENTS

PETROPHYSICAL PROPERTIES I

A The Effect of Scale on the Petrophysical Estimation of Intergranular Permeability; Paul Worthington (Gaffney, Cline & Assocs.)

B Petrophysics-based Flow Unit Determination in the Phosphoria Formation, Little Sand Draw Field, Wyoming; Alper Karadavut (Turkiye Petrolleri A.O.), Neil Hurley (Colorado School of Mines)

C Improved Reservoir Characterization Of Mature Oil Fields Using LWD and Wireline Resistivities and Core Measurements; Graham Davis (BP UK), John Williams (BP Exploration Co. Ltd.), Simon Miller, Geoff Page, Jeremy Lofts (Baker Atlas/INTEQ)

GENERAL FORMATION EVALUATION

D A New Technique Utilizing Near-Wellbore Resistivity Measurements for Imaging Distant Salt Diapirs; Amal Vittachi (BP)

E Dynamic Invasion Profiles and Time-Lapse Electrical Logs; Shanjun Li, Liang Shen (Univ. of Houston)

F Finding Faults with Shear-Wave Anisotropy; T. Klimentos (Schlumberger), A. Farghaly (RWE Dea), M. Qleibo (Schlumberger)

G Clustering Resistivity Ratios for Saturation Evaluation and Improved Permeability and Facies Predictions; Philippe Rabiller (Consultant), Hugues Thevoux-Chabuel (Paradigm)

H Electrofacies and Permeability Modeling in Carbonate Reservoirs using Image Texture Analysis and Clustering Tools; Leonora Knecht (Institut EGID), Benoît Mathis, Jean-Pierre Leduc, Thibault Vandenabeele, Raffaele Di Cuia (TotalFinaElf)

I Wellbore Stability and Rock-Mechanics Study in a Gulf of Suez Well Saves 1 Million USD in Drilling Costs; T. Klimentos (Schlumberger), H. Fahmy, S. Townsend (Gupco)
CASE HISTORIES

J Geosteering using Ultradeep Resistivity on the Grane Field, Norwegian North Sea; Marianne Iversen, Morton Fejerskov, Anna-Lena Skjerdingstad, Andrew Clark (Norsk Hydro asa), Jean Michel Denichou, Luca Ortenzi, Jean Seydoux, Jacques Tabanou (Schlumberger)

K A Case Study Integrating the Physics of Mud-Filtrate Invasion with the Physics of Induction Logging: Assessment of In-situ Hydrocarbon Saturation in the Presence of Deep Invasion and Highly Saline Connate Water; Bovan K. George, Carlos Torres-Verdin, Mojdeh Delshad (The University of Texas at Austin), Richard Sigal, Farid Zouieouche (Anadarko Petroleum Corp.), Barbara Anderson (Schlumberger-Doll Research)

L Western Analysis of Russian Log Data; George Carlstrom, Robert Cluff (The Discovery Group)

M Flow-Unit Modeling using Neural Networks, Logs, and Core in a Vuggy Dolomite Reservoir, Dagger Draw Field, New Mexico; Bob Adibrata (Pertimina), Neil Hurley (Colorado School of Mines)

N Porosity Estimation from Shear Wave Interval Transit Time in the Norphlet Aeolian Jurassic Sandstone of Southern and Offshore Alabama; Russell Spears, Wayne Nicosia (ExxonMobil Production Company)

O Correspondence Analysis for Lithology Identification of Igneous Rocks, Songliao Basin, China; Baozhi Pan, Linfu Xue (Ji Lin Univ.), Haibo Wu (Daqing Institute of Petroleum E&D), Zhoubo Li (Ji Lin Univ.), Guijing Yan (Qingdao Marine Geological Inst.)

NUCLEAR LOGGING

P Improved Formation Evaluation through Image-Derived Density; R. Radtke, R. Adolph, H. Climent, (Schlumberger), L. Ortenzi (Schlumberger Oilfield Services), N. Wijeyesekera (Schlumberger Technical Services)

Q Subsurface Properties Determination from Nuclear Well-Logging Data using Neural Networks; Elsa Aristodemou, Christopher Pain, Cassiano de Oliveira, A. Goddard (Imperial College London), Chris Harris (Shell International E&P)

R An Assessment of Neural Networks Applied to Pulsed Neutron Data for Predicting Open Hole Triple Combo Data; John Quirein, Dingding Chen, Jeff Grable, Jack Wiener, Harry Smith, Jr., Tegwyn Perkins, Jerome Truax (Halliburton Energy Servs.)
PETROPHYSICAL PROPERTIES II

S Dispersed Shale, Shaly-Sand Permeability – A Hydraulic Analog to the Waxman-Smits Equation; Jurgen Schön (Joanneum Research), Dan Georgi (Baker Atlas)

T Conductivity Anisotropy in Shale-Free Sandstone; W. David Kennedy (ExxonMobil Exploration Co.), David Herrick (Baker Atlas)

U A New Capillary Curve Modelling Method for North Sea Chalk and Other Low Permeability Reservoirs; Jørgen Jensenius (Amerada Hess)

V Reservoir Monitoring with the CHFR-Plus in Water Injection Oil Fields, Libya Examples; Mohamed Tchambaz (Schlumberger Oilfield Services)

W Methods of Saturation Modeling using Capillary Pressure Averaging and Pseudos; Nick Wiltgen, Joël Le Calvez, Keith Owen (Schlumberger)

X Petrophysical Properties of the Tensleep Sandstone at Sage Creek Field, Bighorn Basin, Wyoming; Ricky Wibowo (Pertamina), Neil Hurley (Colorado School of Mines)

Y Joint Inversion of Acoustic and Resistivity Data for Carbonate Microstructure Evaluation; M. Markov, A. Mousatov, E. Kazatchenko (Instituto Mexicano del Petróleo)

BOREHOLE IMAGING

Z Real-Time Density and Gamma Ray Images Acquired While Drilling Help to Position Horizontal Wells in a Structurally Complex North Sea Field; R-M Greiss, C. Webb, J. White (Schlumberger), B. McDonald, K. Flanagan, J. Rodriguez, H. Scholey (Kerr-McGee North Sea Ltd.)

AA Advanced Borehole Image Applications in Turbidite Reservoirs Drilled with Oil Based Mud: A Case Study from Deep Offshore Angola; Ilidio Silva, Frederico Domingos, Paulo Marinho, (Sonangol), Robert Laronga, Shahnawaz Khan (Schlumberger)

BB Detailed Reservoir Characterization Utilizing Oil-Based Micro-Resistivity Image Logs; Vince Hilton, Ajay Sapru (Baker Atlas Geoscience), Mitch Pavlovic (Baker Atlas)
CC  Logging-while-Coring – New Technology Advances Scientific Drilling; D. Goldberg, G. Myers (Lamont Doherty Earth Observatory), K. Grigar, T. Pettigrew (Texas A&M Univ.), S. Mrozewski, C. Arceneaux, T. Collins (Schlumberger Drilling & Measurements), Shipboard Scientific Party, ODP Leg 204

WIRELINE FORMATION TESTING

DD  Measuring In-situ Permeability and Well Communication in Angola Offshore by using Formation Tester Tool; Ilidio Silva, Joaquim Fernandes, Frederico Domingues, Paula Marinho (Sonangol), Adil Ceyhan, Don Twaddle, Ahmed Abdelouhab, Juan Angel (Schlumberger)

EE  Precision Pressure Gradient Through Disciplined Pressure Survey; Jaedong Lee, John Michaels, Michael Shammai (Baker Atlas), Wayne Wendt (BP America)

FF  Advances in Downhole Contamination Monitoring and GOR Measurement of Formation Fluid Samples; Chengli Dong, Peter Hegeman (Schlumberger), Hani Elshahawi (Shell), Oliver Mullins, Go Fujisawa, Andrew Kurkjian (Schlumberger)

GG  A New Inversion Technique Determines In-Situ Relative Permeabilities and Capillary Pressure Parameters From Pumpout Wireline Formation Tester Data; Jianghui Wu, Carlos Torres-Verdín, Kamy Sepehrnoori (The Univ. of Texas at Austin) Mark Proett (Halliburton Energy Services), Steve Van Dalen (ChevronTexaco)

HH  Using PV Tests for Bubble Point Pressures and Quality Control; Jaedong Lee, John Michaels, Rocco DiFoggio (Baker Atlas)

ACOUSTIC/BOREHOLE SEISMIC

II  Logging-while-Drilling Shear and Compressional Measurements in Varying Environments; X. Tang, D. Patterson, V. Dubinsky, C.W. Harrison, A. Bolshakov (Baker Hughes)

JJ  Fast and Slow Sonic Velocities Created in Soft Sands: Case Histories in West Africa Wells; Ferdinanda Pampuri (ENI-E&P), Fabio Ogliani (Schlumberger DCS), Adeniji Adebiyi (N.P.D.C.)

KK  Investigation of LWD Quadrupole Shear Measurement in Real Environments; Tsili Wang, Xiaoming Tang (Baker Atlas/INTEQ)
Shear-Wave Anisotropy Applications for Perforation Strategy and Production Optimization in Oil Bearing Porous Sands; T. Klimentos (Schlumberger), M. Emara, T. ElZefzaf, M. Abdelfatah (GPC)

North-Sea Acoustic LWD Field-Test Results Utilizing Integrated System Approach; Trond Gravem, Hans Christian Freitag, Doug Patterson (Baker Hughes INTEQ)

High-Resolution Acoustic and Seismic Investigation of Carbonate Rock Properties; Jorge Parra, Chris Hackert (Southwest Research Institute), Michael Bennett (South Florida Water Management District), Hughbert Collier (Collier Consulting)

Accurate Approximations to qSV and qP Wave Speeds in TIV Media and Stoneley Wave Speed in General Anisotropic Media; Shihong Chi, Xiaoming Tang (The Univ. of Texas at Austin)

**ELECTRICAL/ELECTROMAGNETIC LOGGING**

Sharp Boundary Inversion of Tensor Induction Logging Data; Michael S. Zhdanov, Arvidas Cheryauka, Ertan Peksen (Univ. of Utah)

Field Test Results of an Experimental Fully-Triaxial Induction Tool; Richard Rosthal, Tom Barber, Steve Bonner, Kuo-Chang Chen, Sophia Davydycheva, Gary Hazen, Dean Homan, Charles Kibbe, Gerald Minerbo, Robert Schlein, Laurent Villegas, Hanming Wang, Feng Zhou (Schlumberger)

Resistivity Dispersion – Fact or Fiction?; John Rasmus, Jacques Tabanou, Qiming Li, ChengBing Liu (Schlumberger), Ron Pagan (Shell), Nelson Pacavira (ChevronTexaco), T. Higgins (Consultant)

Joint Inversion of Pressure and Time-Lapse Electromagnetic Logging Measurements; Faruk Alpak (Univ. of Texas at Austin), Tarek Habashy (Schlumberger-Doll Research), Carlos Torres-Verdín (Univ. of Texas at Austin), Elisabeth Dussan V. (Schlumberger-Doll Research)

Fast Inversion of Borehole Array Induction Data using an Inner-Outer Loop Optimization Technique; Guo-zhong Gao, Carlos Torres-Verdín (Univ. of Texas at Austin)

Automated Interpretation for LWD Propagation Resistivity Tools Through Integrated Model Selection; Qiming Li, ChengBing Liu, Carlos Maeso, Peter Wu, Jan Smits, Hendrayadi Prabawa (Schlumberger Oilfield Services), John Bradfield (CNOOC SES)
VV Fast 3D Modeling of Borehole Induction Data in Dipping and Anisotropic Formations using a Novel Approximation Technique; Guo-zhong Gao, Carlos Torres-Verdín (Univ. of Texas at Austin) Sheng Fang (Baker Atlas)

WW Neural Networks for the Modeling of Electrical and Induction Logs; Pedro Anguiano-Rojas, Daniel Dorantes-Huerta (Instituto Mexicano del Petróleo), James H. Spurlin, Antonio Mejia-Olvera (Consultants)

XX Stabilizing the Shallow (10 inch) Resolution Matched Curve of the High-Definition Induction Log and Evaluating Quality Control for Array Induction Logs; Zhiqiang Zhou, Ingo M. Geldmacher, Bill H. Corley (Baker Hughes)

YY Feasibility of Azimuthal Electrical Sondes for the Study of Anisotropy in Fractured Formations; A. Mousatov, E. Pervago, E. Kazatchenko (Instituto Mexicano del Petróleo)

NUCLEAR MAGNETIC RESONANCE LOGGING I

ZZ MR Explorer Log Acquisition Methods: Petrophysical-Objective-Oriented Approaches; Songhua Chen, David Beard, Michael Gillen, Sheng Fang, Gigi Zhang (Baker Atlas)

AAA Field Test of a New Nuclear Magnetic Resonance Tool; R. Khamatdinov, E. Mityushin, V. Murtsovkin (NPF “Karotazhi”), D. Tiller (Computalog Research), J. Jonkers (Computalog Wireline Services)

BBB Design and Implementation of a New Magnetic Resonance Tool for the While Drilling Environment; Ralf Heidler, Chris Morriss, Robert Hoshun (Schlumberger Oilfield Services)

CCC A Novel Approach to Real Time Detection of Facies Changes in Horizontal Carbonate Wells using LWD NMR; D. Rose (Schlumberger), P. Hansen, A. Damgaard, M. Raven (Maersk Oil Qatar),

NUCLEAR MAGNETIC RESONANCE LOGGING II

DDD NMR Petrophysical Predictions on Cores; Steve Lonnes, Angel Guzman-Garcia, Robert Holland (ExxonMobil Upstream Research Co.)

EEE T1 MAS 2D NMR Technique Provides Valuable Information on Produced Oil; Boqin Sun, Keh-Jim Dunn, Jose Lopes, Simon Stonard (Chevron Petroleum Technology Co.)
FFF A New Method for Separating Lithologies and Estimating Thickness-Weighted Permeability using NMR Logs; Ben Lowden (Energy Scitech)

GGG NMR Inversion Methods for Fluid Typing; Boqin Sun, Keh-Jim Dunn (ChevronTexaco Expl. & Prod. Technology Co.)

HHH NMR Applications in Petroleum Related Rock-Mechanics: Sand Control, Hydraulic Fracturing, Wellbore Stability; T. Klimentos (Schlumberger)

III NMR Application in Reservoirs with Complex Lithology: a Case Study; Iskender Djafarov, Sergi Khafizov (Tyumen Oil Co.), Pavel Syngaevsky (Sperry-Sun)