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Experimental Design in Petroleum Reservoir Studies - Mohammad Jamshidnezhad 2015-04-16
One of the main duties for reservoir engineers is reservoir study, which starts when a reservoir is explored and it continues until the reservoir abandonment. Reservoir study is a continual process and due to various reasons such as complexity at the surface and limited data, there are many uncertainties in reservoir modelling and characterization causing difficulties in reasonable history-matching and prediction phases of study. Experimental Design in Petroleum Reservoir Studies concentrates on experimental design, a trusted method in reservoir management, to analyze and take the guesswork out of the uncertainties surrounding the underdeveloped reservoir. Case studies from the Barnett shale and fractured reservoirs in the Middle East are just some of the practical examples included. Other relevant discussions on uncertainty in PVT, field performance data, and relevant outcomes of experimental design all help you gain insight into how better data can improve measurement tools, your model, and your reservoir assets. Apply the practical knowledge and know-how now with real-world case studies included Gain confidence in deviating uncertain parameters surrounding the underdeveloped reservoir with a focus on application of experimental design Alleviate some of the guesswork in history-matching and prediction phrases with explanations on uncertainty analysis
Reservoir Characterization, Modeling and Quantitative Interpretation - V.P. Dimri 2023-09-01
Reservoir Characterization, Modeling and Quantitative Interpretation: Recent Workflows to Emerging Technologies offers a wide spectrum of reservoir characterization techniques and technologies, focusing on the latest breakthroughs and most efficient methodologies in hydrocarbon exploration and development. Topics covered include 4D seismic technologies, AVAz inversion, fracture characterization, multiscale imaging technologies, static and dynamic reservoir characterization, among others. The content is delivered through an inductive approach, which will help readers gain comprehensive insight on advanced practices and be able to relate them to other subareas of reservoir characterization including CO2 storage and data-driven modeling. The chapters also include cases studies and real-world, expert guidance on how the new principles described can be implemented in practical scenarios. This will be especially useful for field scientists in collecting and analyzing field data, prospect evaluation, developing reservoir models, and adopting new technologies to mitigate exploration risk. They will be able to solve the practical and challenging problems faced in the field of reservoir characterization, as it will offer systematic industrial workflows covering every aspect of this branch of Earth Science, including subsurface geoscientific perspectives of carbon geosequestration. Reservoir Characterization, Modeling and Quantitative Interpretation is a 21st Century guide for exploration geologists, geoscience students at postgraduate level and above, and petrophysicists working in the oil and gas industry who need the latest techniques in reservoir characterization.
Reservoir Development - M. Rafiqul Islam 2021-12-04
Sustainable Oil and Gas Development Series: Reservoir Development delivers research materials and emerging technologies that conform sustainability in today’s reservoirs. Starting with a status of technologies available, the reference describes sustainability as it applies to fracturing fluids, particularly within unconventional reservoirs. Basement reservoirs are discussed along with non-energy applications of fluids. Sustainability considerations for reserve predication are covered followed by risk analysis and scaling guidelines for further field development. Rounding out with conclusions and remaining challenges, Sustainable Oil and Gas Development Series: Reservoir Development gives today and future petroleum engineers a focused and balanced path to strengthen sustainability practices. Gain insight to more environmentally-friendly protocols for both unconventional and basement reservoirs, including non-energy applications of reservoir fluids Determine more accurate reserves and keep budgets in line while focusing on emission reduction Learn from a well-known author with extensive experience in both academia and industry
Handbook of Borehole Acoustics and Rock Physics for Reservoir Characterization - Vimal Saxena 2018-04-28
The Handbook of Borehole Acoustics and Rock Physics for Reservoir Characterization combines in a single useful handbook the multidisciplinary domains of the petroleum industry, including the fundamental concepts of rock physics, acoustic logging, waveform processing, and geophysical application modeling through graphical examples derived from field data. It includes results from core studies, together with graphics that validate and support the modeling process, and explores all possible facets of acoustic applications in reservoir evaluation for hydrocarbon exploration, development, and drilling support. The Handbook of Borehole Acoustics and Rock Physics for Reservoir Characterization serves as a technical guide and research reference for oil and gas professionals, scientists, and students in the multidisciplinary field of reservoir characterization through the use of petrosonics. It overviews the fundamentals of borehole acoustics and rock physics, with a focus on reservoir evaluation applications, explores current advancements through updated research, and identifies areas of future growth. Presents theory, application, and limitations of borehole acoustics and rock physics through field examples and case studies Features "Petrosonic Workflows" for various acoustic applications and evaluations, which can be easily adapted for practical reservoir modeling and interpretation Covers the potential advantages of

acoustic-based techniques and summarizes key results for easy geophysical application

DEVELOPMENT OF RESERVOIR CHARACTERIZATION TECHNIQUES AND PRODUCTION MODELS FOR EXPLOITING NATURALLY FRACTURED RESERVOIRS. - 2002

For many years, geoscientists and engineers have undertaken research to characterize naturally fractured reservoirs. Geoscientists have focused on understanding the process of fracturing and the subsequent measurement and description of fracture characteristics. Engineers have concentrated on the fluid flow behavior in the fracture-porous media system and the development of models to predict the hydrocarbon production from these complex systems. This research attempts to integrate these two complementary views to develop a quantitative reservoir characterization methodology and flow performance model for naturally fractured reservoirs. The research has focused on estimating naturally fractured reservoir properties from seismic data, predicting fracture characteristics from well logs, and developing a naturally fractured reservoir simulator. It is important to develop techniques that can be applied to estimate the important parameters in predicting the performance of naturally fractured reservoirs. This project proposes a method to relate seismic properties to the elastic compliance and permeability of the reservoir based upon a sugar cube model. In addition, methods are presented to use conventional well logs to estimate localized fracture information for reservoir characterization purposes. The ability to estimate fracture information from conventional well logs is very important in older wells where data are often limited. Finally, a desktop naturally fractured reservoir simulator has been developed for the purpose of predicting the performance of these complex reservoirs. The simulator incorporates vertical and horizontal wellbore models, methods to handle matrix to fracture fluid transfer, and fracture permeability tensors. This research project has developed methods to characterize and study the performance of naturally fractured reservoirs that integrate geoscience and engineering data. This is an important step in developing exploitation strategies for optimizing the recovery from naturally fractured reservoir systems. The next logical extension of this work is to apply the proposed methods to an actual field case study to provide information for verification and modification of the techniques and simulator. This report provides the details of the proposed techniques and summarizes the activities undertaken during the course of this project. Technology transfer activities were highlighted by a two-day technical conference held in Oklahoma City in June 2002. This conference attracted over 90 participants and included the presentation of seventeen technical papers from researchers throughout the United States.

Applied Techniques to Integrated Oil and Gas Reservoir Characterization - Enwenode Onajite 2021-04-09

Over the past several years, there has been a growing integration of data – geophysical, geological, petrophysical, engineering-related, and production-related – in predicting and determining reservoir properties. As such, geoscientists now must learn the technology, processes, and challenges involved within their specific functions in order to optimize planning for oil field development. Applied Techniques to Integrated Oil and Gas Reservoir Characterization presents challenging questions encountered by geoscientists in their day-to-day work in the exploration and development of oil and gas fields and provides potential solutions from experts. From basin analysis of conventional and unconventional reservoirs, to seismic attributes analysis, NMR for reservoir characterization, amplitude versus offset (AVO), well-to-seismic tie, seismic inversion studies, rock physics, pore pressure prediction, and 4D for reservoir monitoring, the text examines challenges in the industry as well as the techniques used to overcome those challenges. This book includes valuable contributions from global industry experts: Brian Schulte (Schiefer Reservoir Consulting), Dr. Neil W. Craigie (Saudi Aramco), Matthijs van der Molen (Shell International E&P), Dr. Fred W. Schroeder (ExxonMobil, retired), Dr. Tharwat Hassane (Schlumberger & BP, retired), and others. Presents a thorough understanding of the requirements of various disciplines in characterizing a wide spectrum of reservoirs Includes real-life problems and challenging questions encountered by geoscientists in their day-to-day work, along with answers from experts working in the field Provides an integrated approach among different disciplines (geology, geophysics, petrophysics, and petroleum engineering) Offers advice from industry experts to geoscience students, including career guides and interview tips

Reservoir Characterization II - Lake 2012-12-02

Reservoir Characterization II contains the proceedings of the Second International Reservoir Characterization Conference held in Dallas, Texas in June 1989. Contributors focus on the characterization of reservoir processes and cover topics ranging from surface roughness in porous media and reservoir characterization at the mesoscopic scale to shale clast heterogeneities and their effect on fluid flow, permeability patterns in fluvial sandstones, and reservoir management using 3-D seismic data. This book is organized into six sections encompassing 43 chapters. The first 20 chapters deal with reservoir characterization at the microscopic, mesoscopic, and macroscopic scales. Topics include low-contrast resistivity sandstone formations; the use of centrifuge and computer tomography to quantify saturation distribution and capillary pressures; and cross-well seismology as a tool for reservoir geophysics. The chapters that follow deal with reservoir characterization at the megascopic scale; fractal heterogeneity of clastic reservoirs; heterogeneity and effective permeability of porous rocks; and drilling fluid design based on reservoir characterization. A chapter that outlines a procedure for estimating permeability anisotropy with a minipermeameter concludes the book. This book is a valuable resource for students and practitioners of petroleum engineering, geology and geological engineering, petroleum exploration, and geophysics.

Developing and Managing a Comprehensive Reservoir Analysis Model - Richard J. Hayes 1988

The Corps' Hydrologic Engineering Center (HEC) has developed a generalized simulation model capable of analyzing complex river-reservoir systems. The development of the model, 'HEC-5, Simulation of Flood Control and Conservation Systems' (Eichert, 1974, 1975) has been paced by the changing mission of the Corps as well as the evolution of computer systems. HEC-5 development and management, including code development, testing, documentation, training and field application experience, is discussed. (fr).

Seismic Reservoir Modeling - Dario Grana 2021-04-19

Seismic reservoir characterization aims to build 3-dimensional models of rock and fluid properties, including elastic and petrophysical variables, to describe and monitor the state of the subsurface for hydrocarbon exploration and production and for CO_2 sequestration. Rock physics modeling and seismic wave propagation theory provide a set of physical equations to predict the seismic response of subsurface rocks based on their elastic and petrophysical properties. However, the rock and fluid properties are generally unknown and surface geophysical measurements are often the only available data to constrain reservoir models far away from well

control. Therefore, reservoir properties are generally estimated from geophysical data as a solution of an inverse problem, by combining rock physics and seismic models with inverse theory and geostatistical methods, in the context of the geological modeling of the subsurface. A probabilistic approach to the inverse problem provides the probability distribution of rock and fluid properties given the measured geophysical data and allows quantifying the uncertainty of the predicted results. The reservoir characterization problem includes both discrete properties, such as facies or rock types, and continuous properties, such as porosity, mineral volumes, fluid saturations, seismic velocities and density. Seismic Reservoir Modeling: Theory, Examples and Algorithms presents the main concepts and methods of seismic reservoir characterization. The book presents an overview of rock physics models that link the petrophysical properties to the elastic properties in porous rocks and a review of the most common geostatistical methods to interpolate and simulate multiple realizations of subsurface properties conditioned on a limited number of direct and indirect measurements based on spatial correlation models. The core of the book focuses on Bayesian inverse methods for the prediction of elastic petrophysical properties from seismic data using analytical and numerical statistical methods. The authors present basic and advanced methodologies of the current state of the art in seismic reservoir characterization and illustrate them through expository examples as well as real data applications to hydrocarbon reservoirs and CO_2 sequestration studies.

Petroleum Reservoir Engineering Practice - Nnaemeka Ezekwe 2010-09-09

The Complete, Up-to-Date, Practical Guide to Modern Petroleum Reservoir Engineering This is a complete, up-to-date guide to the practice of petroleum reservoir engineering, written by one of the world’s most experienced professionals. Dr. Nnaemeka Ezekwe covers topics ranging from basic to advanced, focuses on currently acceptable practices and modern techniques, and illuminates key concepts with realistic case histories drawn from decades of working on petroleum reservoirs worldwide. Dr. Ezekwe begins by discussing the sources and applications of basic rock and fluid properties data. Next, he shows how to predict PVT properties of reservoir fluids from correlations and equations of state, and presents core concepts and techniques of reservoir engineering. Using case histories, he illustrates practical diagnostic analysis of reservoir performance, covers essentials of transient well test analysis, and presents leading secondary and enhanced oil recovery methods. Readers will find practical coverage of experience-based procedures for geologic modeling, reservoir characterization, and reservoir simulation. Dr. Ezekwe concludes by presenting a set of simple, practical principles for more effective management of petroleum reservoirs. With Petroleum Reservoir Engineering Practice readers will learn to • Use the general material balance equation for basic reservoir analysis • Perform volumetric and graphical calculations of gas or oil reserves • Analyze pressure transients tests of normal wells, hydraulically fractured wells, and naturally fractured reservoirs • Apply waterflooding, gasflooding, and other secondary recovery methods • Screen reservoirs for EOR processes, and implement pilot and field-wide EOR projects. • Use practical procedures to build and characterize geologic models, and conduct reservoir simulation • Develop reservoir management strategies based on practical principles Throughout, Dr. Ezekwe combines thorough coverage of analytical calculations and reservoir modeling as powerful tools that can be applied together on most reservoir analyses. Each topic is presented concisely and is supported with copious examples and references. The result is an ideal handbook for practicing engineers, scientists, and managers—and a complete textbook for petroleum engineering students.

Reservoir Engineering - Abdus Satter 2015-09-22

Reservoir Engineering focuses on the fundamental concepts related to the development of conventional and unconventional reservoirs and how these concepts are applied in the oil and gas industry to meet both economic and technical challenges. Written in easy to understand language, the book provides valuable information regarding present-day tools, techniques, and technologies and explains best practices on reservoir management and recovery approaches. Various reservoir workflow diagrams presented in the book provide a clear direction to meet the challenges of the profession. As most reservoir engineering decisions are based on reservoir simulation, a chapter is devoted to introduce the topic in lucid fashion. The addition of practical field case studies make Reservoir Engineering a valuable resource for reservoir engineers and other professionals in helping them implement a comprehensive plan to produce oil and gas based on reservoir modeling and economic analysis, execute a development plan, conduct reservoir surveillance on a continuous basis, evaluate reservoir performance, and apply corrective actions as necessary. Connects key reservoir fundamentals to modern engineering applications Bridges the conventional methods to the unconventional, showing the differences between the two processes Offers field case studies and workflow diagrams to help the reservoir professional and student develop and sharpen management skills for both conventional and unconventional reservoirs

Seismic Stratigraphy, Basin Analysis and Reservoir Characterisation - Paul C. H. Veeken 2007

They are the basis for understanding the regional basin framework and the stratigraphic subdivision. Seismic stratigraphy combines two very different scales of observation: the seismic and well-control. The systematic approach applied in seismic stratigraphy explains why many workers are using the principles to evaluate their seismic observations. The here presented modern geophysical techniques allow more accurate prediction of the changes in subsurface geology. Dynamics of sedimentary environments are discussed with its relation to global controling factors and a link is made to high-resolution sequence stratigraphy. Seismic Stratigraphy Basin Analysis and Reservoir Characterisation summarizes basic seismic interpretation techniques and demonstrates the benefits of integrated reservoir studies for hydrocarbon exploration. Topics are presented from a practical point of view and are supported by well-illustrated case histories.-

Carbonate Reservoir Heterogeneity - Vahid Tavakoli 2019-11-11

This book provides a comprehensive overview of the parameters and factors that cause heterogeneity in carbonate reservoirs, and examines how they interact with one another. It explores the various scales of heterogeneity, how they are caused, and how they can be minimized, as well as how the scales affect each other, providing practical examples in each chapter. The book concludes by discussing the effect of heterogeneity on petrophysical evaluations. As reducing heterogeneity is the only way to obtain accurate carbonate reservoir characteristics at the regional scale, the book offers an important reference guide for all geologists, engineers, and modelers working with subsurface data.

Giant Hydrocarbon Reservoirs of The World - Paul Mitchell Harris 2006

Reservoirs described in this volume are located in the Middle East, Asia, West Africa, North and South America. The authors explore historical and alternative approaches to reservoir description, characterization, and management, as well as examining appropriate levels and timing of data gathering, technology

applications, evaluation techniques, and management practices in various stages in the life of individual development projects. The giant fields discussed address issues important to reservoir description, characterization, and management from both geologic & engineering perspectives.

Anisotropic Seismic Characterization of the Eagle Ford Shale - Qi Ren 2016

Quantitative reservoir characterization using integrated seismic data and well log data is important in sweet spot identification, well planning, and reservoir development. The process includes building up the relations between rock properties and elastic properties through rock physics modeling, inverting for elastic properties from seismic data, and inverting for rock properties from both seismic data and rock physics models. Many quantitative reservoir characterization techniques have been developed for conventional reservoirs. However, challenges remain when extending these methods to unconventional reservoirs because of their complexity, such as anisotropy, micro-scale fabric, and thin beds issues. This dissertation focuses on developing anisotropic rock physics modeling method and seismic inversion method that are appliable for unconventional reservoir characterization. The micro-scale fabric, including the complex composition, shape and alignment of clay minerals, pore space, and kerogen, significantly influences the anisotropic elastic properties. I developed a comprehensive three-step rock-physics approach to model the anisotropic elastic properties, accounting for the micro-scale fabric. In addition, my method accounts for the different pressure-dependent behaviors of P-waves and S-waves. The modeling provides anisotropic stiffnesses and pseudo logs of anisotropy parameters. The application of this method on the Upper Eagle Ford Shale shows that the clay content kerogen content and porosity decrease the rock stiffness. The anisotropy increases with kerogen content, but the influence of clay content is more complex. Comparing the anisotropy parameter pseudo logs with clay content shows that clay content increases the anisotropy at small concentrations; however, the anisotropy stays constant, or even slightly decreases, as clay content continues to increase. Thin beds and anisotropy are two important limitation of the application of seismic characterization on unconventional reservoirs. I introduced the geostatistics into stochastic seismic inversion. The geostatistical models, based on well log data, simulate small-scale vertical variations that are beyond seismic resolution. This additional information compensates the seismic data for its band-limited nature. I applied this method on the Eagle Ford Shale, using greedy annealing importance sampling as inversion algorithm. The thin Lower Eagle Ford Formation, which cannot be resolved by conventional inversion method, is clearly resolved in the inverted impedance volume using my method. In addition, because anisotropy is accounted for in the forward modeling, the accuracy of inverted S-impedance is significantly improved.

Department of Energy's Fossil Energy Research and Development, and Clean Coal Technology Programs - United States. Congress. Senate. Committee on Energy and Natural Resources. Subcommittee on Energy Research and Development 1989

Stratigraphic reservoir characterization for petroleum geologists, geophysicists, and engineers - Roger M. Slatt 2006-11-03

Reservoir characterization as a discipline grew out of the recognition that more oil and gas could be extracted from reservoirs if the geology of the reservoir was understood. Prior to that awakening, reservoir development and production were the realm of the petroleum engineer. In fact, geologists of that time would have felt slighted if asked by corporate management to move from an exciting exploration assignment to a more mundane assignment working with an engineer to improve a reservoir's performance. Slowly, reservoir characterization came into its own as a quantitative, multidisciplinary endeavor requiring a vast array of skills and knowledge sets. Perhaps the biggest attractor to becoming a reservoir geologist was the advent of fast computing, followed by visualization programs and theaters, all of which allow young geoscientists to practice their computing skills in a highly technical work environment. Also, the discipline grew in parallel with the evolution of data integration and the advent of asset teams in the petroleum industry. Finally, reservoir characterization flourished with the quantum improvements that have occurred in geophysical acquisition and processing techniques and that allow geophysicists to image internal reservoir complexities.

Unconventional Oil and Gas Resources Handbook - Y Zee Ma 2015-10-06

Unconventional Oil and Gas Resources Handbook: Evaluation and Development is a must-have, helpful handbook that brings a wealth of information to engineers and geoscientists. Bridging between subsurface and production, the handbook provides engineers and geoscientists with effective methodology to better define resources and reservoirs. Better reservoir knowledge and innovative technologies are making unconventional resources economically possible, and multidisciplinary approaches in evaluating these resources are critical to successful development. Unconventional Oil and Gas Resources Handbook takes this approach, covering a wide range of topics for developing these resources including exploration, evaluation, drilling, completion, and production. Topics include theory, methodology, and case histories and will help to improve the understanding,integrated evaluation, and effective development of unconventional resources. Presents methods for a full development cycle of unconventional resources, from exploration through production Explores multidisciplinary integrations for evaluation and development of unconventional resources and covers a broad range of reservoir characterization methods and development scenarios Delivers balanced information with multiple contributors from both academia and industry Provides case histories involving geological analysis, geomechanical analysis, reservoir modeling, hydraulic fracturing treatment, microseismic monitoring, well performance and refracturing for development of unconventional reservoirs

Seismic Attributes for Prospect Identification and Reservoir Characterization - Satinder Chopra 2007

Seismic attributes play a key role in exploration and exploitation of hydrocarbons. In Seismic Attributes for Prospect Identification and Reservoir Characterization (SEG Geophysical Developments No. 11), Satinder Chopra and Kurt J. Marfurt introduce the physical basis, mathematical implementation, and geologic expression of modern volumetric attributes including coherence, dip/azimuth, curvature, amplitude gradients, seismic textures, and spectral decomposition. The authors demonstrate the importance of effective color display and sensitivity to seismic acquisition and processing. Examples from different basins illustrate the attribute expression of tectonic deformation, clastic depositional systems, carbonate depositional systems and diagenesis, drilling hazards, and reservoir characterization. The book is illustrated generously with color figures throughout. "Seismic Attributes" will appeal to seismic interpreters who want to extract more information from data; seismic processors and imagers who want to learn how their efforts impact subtle stratigraphic and fracture plays; sedimentologists, stratigraphers, and structural geologists who use large 3D seismic volumes to interpret their plays within a regional, basinwide context; and reservoir engineers whose work is based on detailed 3D reservoir models.

Copublished with EAGE.

Strategies for Reservoir Characterization and Identification of Incremental Recovery Opportunities in Mature Reservoirs in Frio Fluvial-Deltaic Sandstones, South Texas - 1995

Fluvial-deltaic sandstone reservoirs in the United States are being abandoned at high rates, yet they still contain more than 34 billion barrels of unrecovered oil. The mature Oligocene-age fluvial-deltaic reservoirs of the Frio Formation along the Vicksburg Fault Zone in South Texas are typical of this class in that, after more than three decades of production, they still contain 61 percent of the original mobile oil in place, or 1.6 billion barrels. This resource represents a tremendous target for advanced reservoir characterization studies that integrate geological and engineering analysis to locate untapped and incompletely drained reservoir compartments isolated by stratigraphic heterogeneities. The D and E reservoir intervals of Rincon field, Starr County, South Texas, were selected for detailed study to demonstrate the ability of advanced characterization techniques to identify reservoir compartmentalization and locate specific infield reserve-growth opportunities. Reservoir architecture, determined through high-frequency genetic stratigraphy and facies analysis, was integrated with production history and facies-based petrophysical analysis of individual flow units to identify recompletion and geologically targeted infill drilling opportunities. Estimates of original oil in place versus cumulative production in D and E reservoirs suggest that potential reserve growth exceeds 4.5 million barrels. Comparison of reservoir architecture and the distribution of completions in each flow unit indicates a large number of reserve-growth opportunities. Potential reserves can be assigned to each opportunity by constructing an Sooh map of remaining mobile oil, which is the difference between original oil in place and the volumes drained by past completions.

Tight Oil Reservoirs - Hadi Belhaj 2023-02-01

Tight Oil Reservoirs: Characterization, Modeling, and Field Development, the latest release in the Unconventional Reservoir Engineering Series, delivers a full spectrum of reservoir engineering guidelines so that the engineer can focus on every stage of development specific to tight oil. Covering characterization, micro- and nano-scale modeling, drilling horizontally, completing hydraulic fracturing, and field development, each section includes case studies, practice exercises, and future references for even deeper understanding. Rounding out with coverage on field economics and remaining challenges, this book puts control in the engineer’s hands. In this ongoing series, each release will discuss the latest resources, explain their importance in the market, show the benefits of the resource through the latest research, provide details and protocols on how to evaluate and develop the resource, and give case studies and practice questions to gain practicality. Supports the petroleum engineer with a structured table of contents focused on one unconventional resource, making research and solutions easier to find Covers the full spectrum of reservoir engineering, including modern research, development and field development Applies practicality with case studies, exercises and references included in every chapter

Stratigraphic Reservoir Characterization for Petroleum Geologists, Geophysicists, and Engineers - Roger M. Slatt 2013-11-21

Reservoir quality controls the storage, distribution, and flow of fluids within a reservoir. Porosity and permeability are key parameters that are readily measured on rock samples and from well logs; with calibration, porosity can be mapped from 3D seismic surveys. If core material is obtained from a well and porosity and permeability measurements are made on the core, the values can be compared with porosity logs and a permeability log can be developed. Although “flow units” can be determined using a suite of geologic and petrophysical parameters, method uses only the three easily obtained wellbore parameters of porosity, permeability, and thickness to calculate flow units in terms of their capacity to store and transmit fluids within the reservoir. Three-dimensional flow-unit models of a reservoir can be used for reservoir fluid-flow and performance simulation. Flow units can be upscaled, as needed, to meet the requirements of computing time and capability. Capillary properties of a rock also affect the storage and flow of fluids through the rock. Capillary properties are routinely measured and used to determine fluid saturations, height of the oil column above the free water level, and maximum height of the column that can be retained by a reservoir topseal. These are very important parameters for characterizing a reservoir for development and management purposes. Values of porosity, permeability, and capillarity will vary not only according to the nature of rocks comprising a reservoir but also according to the way in which the values were obtained. Caution is the key to interpreting laboratory-derived data, and it is worth knowing just how and where on a rock sample the measurements were made prior to using them for reservoir characterization. Also, upscaling or averaging values such as Sw can provide misleading results, particularly in thin-bedded stratigraphic intervals. The greater the amount of upscaling, the less realistic the reservoir geologic model becomes!

Practical Solutions to Integrated Oil and Gas Reservoir Analysis - Enwenode Onajite 2017-05-19

Practical Solutions to Integrated Oil and Gas Reservoir Analysis: Geophysical and Geological Perspectives is a well-timed source of information addressing the growing integration of geophysical, geological, reservoir engineering, production, and petrophysical data in predicting and determining reservoir properties. These include reservoir extent and sand development away from the well bore, characterizations of undrilled prospects, and optimization planning for field development. As such, geoscientists must now learn the technology, processes, and challenges involved within their specific functions in order to complete day-to-day activities. A broad collection of real-life problems and challenging questions encountered by geoscientists in the exploration and development of oil and gas fields, the book treats subjects ranging from Basin Analysis, to identifying and mapping structures, stratigraphy, the distribution of fracture, and the identification of pore fluids. Looking at the well-to-seismic tie, time-to-depth conversion, AVO analysis, seismic inversion, rock physics, and pore pressure analysis/prediction, the text examines challenges encountered in these technical areas, and also includes solutions and techniques used to overcome those challenges. Presents a thorough understanding of the contributions and issues faced by the various disciplines that contribute towards characterizing a wide spectrum of reservoirs (Conventional, Shale Oil and Gas, as well as Carbonate reservoirs) Provides a much needed and integrated approach amongst disciplines including geology, geophysics, petrophysics, reservoir and drilling engineering Includes case studies on different reservoir settings from around the world including Western Canadian Sedimentary Basin, Gulf of Guinea, Gulf of Mexico, Milne point field in Alaska, North-Sea, San Jorge Basin, and Bossier and Haynesville Shales, and others to help illustrate key points

Heavy Oils - Satinder Chopra 2010

Reservoir characterization requires integration of engineering, geology, and

geophysics, with rock physics supplying a key link. In this volume, geophysical methods, especially time-lapse 3D seismic, are emphasized, and a range of enhanced oil-recovery methods (EOR) are discussed, showing the need to accurately describe a reservoir before and after production.

Energy and Water Development Appropriations for 2013: Dept. of Energy FY 2013 justifications - United States. Congress. House. Committee on Appropriations. Subcommittee on Energy and Water Development 2012

Advanced Oil Recovery Technologies for Improved Recovery from Slope Basin Clastic Reservoirs, Nash Draw Brushy Canyon Pool, Eddy County, NM. - Mark B. Murphy 2005
The Nash Draw Brushy Canyon Pool in Eddy County New Mexico was a cost-shared field demonstration project in the U.S. Department of Energy Class III Program. A major goal of the Class III Program was to stimulate the use of advanced technologies to increase ultimate recovery from slope-basin clastic reservoirs. Advanced characterization techniques were used at the Nash Draw Pool (NDP) project to develop reservoir management strategies for optimizing oil recovery from this Delaware reservoir. The objective of the project was to demonstrate that a development program, which was based on advanced reservoir management methods, could significantly improve oil recovery at the NDP. Initial goals were (1) to demonstrate that an advanced development drilling and pressure maintenance program can significantly improve oil recovery compared to existing technology applications and (2) to transfer these advanced methodologies to other oil and gas producers. Analysis, interpretation, and integration of recently acquired geological, geophysical, and engineering data revealed that the initial reservoir characterization was too simplistic to capture the critical features of this complex formation. Contrary to the initial characterization, a new reservoir description evolved that provided sufficient detail regarding the complexity of the Brushy Canyon interval at Nash Draw. This new reservoir description was used as a risk reduction tool to identify 'sweet spots' for a development drilling program as well as to evaluate pressure maintenance strategies. The reservoir characterization, geological modeling, 3-D seismic interpretation, and simulation studies have provided a detailed model of the Brushy Canyon zones. This model was used to predict the success of different reservoir management scenarios and to aid in determining the most favorable combination of targeted drilling, pressure maintenance, well stimulation, and well spacing to improve recovery from this reservoir. An Advanced Log Analysis technique developed from the NDP project has proven useful in defining additional productive zones and refining completion techniques. This program proved to be especially helpful in locating and evaluating potential recompletion intervals, which has resulted in low development costs with only small incremental increases in lifting costs. To develop additional reserves at lower costs, zones behind pipe in existing wells were evaluated using techniques developed for the Brushy Canyon interval. These techniques were used to complete uphole zones in thirteen of the NDP wells. A total of 14 recompletions were done: four during 1999, four during 2000, two during 2001, and four during 2002-2003. These workovers added reserves of 332,304 barrels of oil (BO) and 640,363 MCFG (thousand cubic feet of gas) at an overall weighted average development cost of $1.87 per BOE (barrel of oil equivalent). A pressure maintenance pilot project in a developed area of the field was not conducted because the pilot area was pressure depleted, and the reservoir in that area was found to be compartmentalized and discontinuous. Economic analyses and simulation studies indicated that immiscible injection of lean hydrocarbon gas for pressure maintenance was not warranted at the NDP and would need to be considered for implementation in similar fields very soon after production has started. Simulation studies suggested that the injection of miscible carbon dioxide (CO{sub 2}) could recover significant quantities of oil at the NDP, but a source of low-cost CO{sub 2} was not available in the area. Results from the project indicated that further development will be under playa lakes and potash areas that were beyond the regions covered by well control and are not accessible with vertical wells. These areas, covered by 3-D seismic surveys that were obtained as part of the project, were accessed with combinations of deviated/horizontal wells. Three directional/horizontal wells have been drilled and completed to develop reserves under surface-restricted areas and potash mines. The third well has not been on production long enough for an accurate assessment but initial results from it are encouraging. Cumulative production from the first two wells through August 31, 2005 was 235,039 BO, 816,592 MCFG and 310,333 barrels of water (BW). Total estimated reserves from all three of the horizontal wells are 878,135 BO and 3.87 BCFG. The ratio of net revenue to cost for the first two wells is approximately 2.9 to 1 for an oil price of $30 per barrel that existed when the wells were drilled. Based on recent pricing trends, a detailed reserve study for the project was performed that assumed an oil price of $40 per barrel and a gas price of $7 per MCFG. These results show that this project has acceptable economics and similar projects can be economically developed as long as oil and gas prices remain over $30 per BOE.

Unconventional Reservoir Rate-Transient Analysis - Clarkson C.R. 2021-06-15
Unconventional Reservoir Rate-Transient Analysis provides petroleum engineers and geoscientists with the first comprehensive review of rate-transient analysis (RTA) methods as applied to unconventional reservoirs. Volume One—Fundamentals, Analysis Methods, and Workflow is comprised of five chapters which address key concepts and analysis methods used in RTA. This volume overviews the fundamentals of RTA, as applied to low-permeability oil and gas reservoirs exhibiting simple reservoir and fluid characteristics. Volume Two—Application to Complex Reservoirs, Exploration and Development is comprised of four chapters that demonstrate how RTA can be applied to coalbed methane reservoirs, shale gas reservoirs, and low-permeability/shale reservoirs exhibiting complex behavior such as multiphase flow. Use of RTA to assist exploration and development programs in unconventional reservoirs is also demonstrated. This book will serve as a critical guide for students, academics, and industry professionals interested in applying RTA methods to unconventional reservoirs. Gain a comprehensive review of key concepts and analysis methods used in modern rate-transient analysis (RTA) as applied to low-permeability ("tight") oil and gas reservoirs Improve your RTA methods by providing reservoir/hydraulic fracture properties and hydrocarbon-in-place estimates for unconventional gas and light oil reservoirs exhibiting complex reservoir behaviors Understand the provision of a workflow for confident application of RTA to unconventional reservoirs

Reservoir Characterization of Tight Gas Sandstones - Ali Kadkhodaie 2022-08-22
Reservoir Characterization of Tight Gas Sandstones: Exploration and Development is essential reading for those working in oil and gas exploration (both in industry and academia) as it contains chapters that help them further understand all aspects of tight gas reservoirs. In this book, experts in industry and academia update readers on new methods of tight gas reservoir modeling and evaluation. As there are very limited published books in the field of tight sandstones, this book will benefit readers by making them familiar with state-of-art methods of tight

gas sandstones characterization and evaluation. Features case studies from countries with considerable tight gas sandstones such as the United States, China, Canada and Australia Includes recent developments in sedimentological, petrophysical, reservoir modeling and fracking technologies of tight gas sandstone reservoirs Covers applications for the characterization and evaluation of tight sandstones for the methodologies presented

Introduction to Geological Uncertainty Management in Reservoir Characterization and Optimization - Reza Yousefzadeh 2023-04-08

This book explores methods for managing uncertainty in reservoir characterization and optimization. It covers the fundamentals, challenges, and solutions to tackle the challenges made by geological uncertainty. The first chapter discusses types and sources of uncertainty and the challenges in different phases of reservoir management, along with general methods to manage it. The second chapter focuses on geological uncertainty, explaining its impact on field development and methods to handle it using prior information, seismic and petrophysical data, and geological parametrization. The third chapter deals with reducing geological uncertainty through history matching and the various methods used, including closed-loop management, ensemble assimilation, and stochastic optimization. The fourth chapter presents dimensionality reduction methods to tackle high-dimensional geological realizations. The fifth chapter covers field development optimization using robust optimization, including solutions for its challenges such as high computational cost and risk attitudes. The final chapter introduces different types of proxy models in history matching and robust optimization, discussing their pros and cons, and applications. The book will be of interest to researchers and professors, geologists and professionals in oil and gas production and exploration.

Development of Volcanic Gas Reservoirs - Qiquan Ran 2018-09-29

Development of Volcanic Gas Reservoirs: The Theory, Key Technologies and Practice of Hydrocarbon Development introduces the geological and dynamic characteristics of development in volcanic gas reservoirs, using examples drawn from the practical experience in China of honing volcanic gas reservoir development. The book gives guidance on how to effectively develop volcanic gas reservoirs and similar complex types of gas reservoir. It introduces basic theories, key technologies and uses practical examples. It is the first book to systematically cover the theories and key technologies of volcanic gas reservoir development. As volcanic gas reservoirs constitute a new research area, the distribution and rules for development still being studied. Difficulties in well deployment and supportive development technology engender further challenges to development. However, in the past decade, research and development in the Songliao and Junggar Basins has led to marked achievements in volcanic gas reservoir development. Introduces the theory, key technologies and practice of volcanic gas reservoir development Provides links between theory and practice, highlighting key technologies for targeted development Offers guidance on complex issues in volcanic gas reservoir development Presents practical evidence from effective development and exploitation of gas reservoirs

Dynamic Description Technology of Fractured Vuggy Carbonate Gas Reservoirs - Hedong Sun 2019-04-15

Thanks to technology, fractured carbonate gas reservoirs are becoming more discoverable, but because these assets are more complex and diverse, there is a high level of difficulty in understanding how to plan design and performance analysis. Dynamic Description Technology of Fractured Vuggy Gas Reservoirs delivers a critical reference to reservoir and production engineers on all the basic characteristics of fractured vuggy gas reservoirs and combines both static and dynamic data to improve the reservoir characterization accuracy and development. Based on the full life cycle of well testing and advanced production decline analysis, this reference also details how to apply reservoir dynamic evaluation, reserve estimation, and performance forecasting. Offering one collective location for the latest research on fractured gas reservoirs, the reference also covers: Physical models, analysis examples, and processes 3D numerical well test analysis technology Deconvolution technology of production decline analysis Packed with many calculation examples and more than 100 case studies, Dynamic Description Technology of Fractured Vuggy Gas Reservoirs gives engineers a strong tool to further exploit these complex assets. Gain advanced knowledge in well test and production decline analysis as well as performance forecasting specific to fractured vuggy carbonate gas reservoirs Understand the characteristics, advantages, disadvantages, and current limitations in technology of fractured vuggy carbonate gas reservoirs Bridge from theory to practice by combining static and dynamic data to form more accurate real-world analysis and modelling

Demonstration of High-resolution Inverse VSP for Reservoir Characterization Applications - Jorge O. Parra 1992

Reservoir Formation Damage - Faruk Civan 2011-08-30

Reservoir Formation Damage, Second edition is a comprehensive treatise of the theory and modeling of common formation damage problems and is an important guide for research and development, laboratory testing for diagnosis and effective treatment, and tailor-fit- design of optimal strategies for mitigation of reservoir formation damage. The new edition includes field case histories and simulated scenarios demonstrating the consequences of formation damage in petroleum reservoirs Faruk Civan, Ph.D., is an Alumni Chair Professor in the Mewbourne School of Petroleum and Geological Engineering at the University of Oklahoma in Norman. Dr. Civan has received numerous honors and awards, including five distinguished lectureship awards and the 2003 SPE Distinguished Achievement Award for Petroleum Engineering Faculty. Petroleum engineers and managers get critical material on evaluation, prevention, and remediation of formation damage which can save or cost millions in profits from a mechanistic point of view State-of-the-Art knowledge and valuable insights into the nature of processes and operational practices causing formation damage Provides new strategies designed to minimize the impact of and avoid formation damage in petroleum reservoirs with the newest drilling, monitoring, and detection techniques

Advanced Petroleum Reservoir Simulation - M. R. Islam 2010-04-19

Reservoir Characterization - Larry Lake 2012-12-02

Reservoir Characterization is a collection of papers presented at the Reservoir Characterization Technical Conference, held at the Westin Hotel-Galleria in Dallas on April 29-May 1, 1985. Conference held April 29-May 1, 1985, at the Westin Hotel—Galleria in Dallas. The conference was sponsored by the National Institute for Petroleum and Energy Research, Bartlesville, Oklahoma. Reservoir characterization is a process for quantitatively assigning reservoir properties, recognizing geologic information and uncertainties in spatial variability. This book contains 19 chapters, and begins with the geological characterization of sandstone reservoir, followed by the geological prediction of shale distribution

within the Prudhoe Bay field. The subsequent chapters are devoted to determination of reservoir properties, such as porosity, mineral occurrence, and permeability variation estimation. The discussion then shifts to the utility of a Bayesian-type formalism to delineate qualitative ""soft"" information and expert interpretation of reservoir description data. This topic is followed by papers concerning reservoir simulation, parameter assignment, and method of calculation of wetting phase relative permeability. This text also deals with the role of discontinuous vertical flow barriers in reservoir engineering. The last chapters focus on the effect of reservoir heterogeneity on oil reservoir. Petroleum engineers, scientists, and researchers will find this book of great value.

Ultradeep Carbonate Gas Reservoirs - Lu Wang 2023-01-30

This book provides a systematical investigation on the reservoir characteristics and percolation mechanism of ultradeep carbonate gas reservoirs, including reservoir characteristics and classification, gas storage and percolation capacities, gas-phase and gas-water two-phase percolation mechanism, microscale complex gas-water relationship, reservoir sensitivity characteristics, and gas production characteristics of heterogeneous carbonate reservoirs. Some advanced and improved experimental techniques and analytical methods are introduced and applied, including comprehensive evaluation technique of storage and percolation capacities, ultra-high temperature and pressure physical simulation experiment technique, microscopic visualization technique based on CT scanning and microelectronics lithography, and physical simulation technique for heterogeneous reservoir development. In addition, it summarizes strategies for the efficient development of ultradeep carbonate gas reservoirs based on these theoretical research results. The key techniques and methods introduced in this monograph satisfy the need for efficient development of ultradeep carbonate gas reservoirs and provide theoretical basis and methodological value for investigations on similar gas reservoirs. This book serves as a reference for engineering technical professionals, researchers, and graduate students who are engaged in the exploration and development of carbonate gas reservoirs.

Fine Reservoir Description - Huanqing Chen 2022-07-20

Fine Reservoir Description: Techniques, Current Status, Challenges and Solutions presents studies on fine oil and gas reservoirs, covering aspects of current status and progress, content and methods/techniques, as well as challenges and solutions through literature review and case studies of reservoirs, including volcanic rocks in the Songliao Basin, glutenite at the northwestern margin of the Junggar Basin, and sandstone in the Liaohe Basin, China. This book contains a large amount of data and illustrations. Provides a comprehensive overview of the latest advances in refined reservoir characterization for three types of reservoirs: high water cut, low permeability, and complex lithology Includes methods and techniques of fine reservoir description that are elaborated from nine aspects, such as fine stratigraphic division and correlation, fracture characterization and fine characterization of sand body Presents eight easy to use measures that are proposed to solve the problems of fine reservoir description

Volcanic Gas Reservoir Characterization - Qiquan Ran 2014-03-27

Volcanic gas reservoirs are the new natural gas frontier. Once thought too complex, too harsh on the drilling bit, and too difficult to characterize, reservoir engineers and petroleum geologists alike now manage more advanced seismic and logging tools, making these "impossible" field developments possible. Bridging meaningful information about these complicated provinces and linking various unconventional methods and techniques, Volcanic Gas Reservoir Characterization: Describes a set of leading-edge integrated volcanic gas reservoir characterization techniques, helping to ensure the effective development of the field Reveals the grade and relationship of volcanic stratigraphic sequence Presents field identification and prediction methods, and interpretation technology of reservoir parameters, relating these to similar complex fields such as shale These innovative approaches and creative methods have been successfully applied to actual development of volcanic gas reservoirs. By sharing the methods and techniques used in this region with reservoir engineers and petroleum geologists all over the world, those with better understanding of these unconventional basins will begin to consider volcanic rock like any other reservoir. Summarizes the research and explains detailed case studies of volcanic gas reservoir developments, showing the latest achievements and lessons learned Supplies knowledge on volcanic gas reservoir basins to provide meaningful insight into similar complex reservoirs such as shale, coal bed methane, and heavy oil basins Contains extensive methodology, strong practicality and high innovation, making this an ideal book for both the practicing and seasoned reservoir engineer and petroleum geologists working with complex reservoirs

Practical Reservoir Engineering and Characterization - Richard O. Baker 2015-04-30

Practical Reservoir Characterization expertly explains key technologies, concepts, methods, and terminology in a way that allows readers in varying roles to appreciate the resulting interpretations and contribute to building reservoir characterization models that improve resource definition and recovery even in the most complex depositional environments. It is the perfect reference for senior reservoir engineers who want to increase their awareness of the latest in best practices, but is also ideal for team members who need to better understand their role in the characterization process. The text focuses on only the most critical areas, including modeling the reservoir unit, predicting well behavior, understanding past reservoir performance, and forecasting future reservoir performance. The text begins with an overview of the methods required for analyzing, characterizing, and developing real reservoirs, then explains the different methodologies and the types and sources of data required to characterize, forecast, and simulate a reservoir. Thoroughly explains the data gathering methods required to characterize, forecast, and simulate a reservoir Provides the fundamental background required to analyze, characterize, and develop real reservoirs in the most complex depositional environments Presents a step-by-step approach for building a one, two, or three-dimensional representation of all reservoir types

Advanced Petroleum Reservoir Simulation - M. R. Islam 2010-10-26

Advanced Petroleum Reservoir Simulation Add precision and ease to the process of reservoir simulation. Until simulation software and other methods of reservoir characterization were developed, engineers had to drill numerous wells to find the best way to extract crude oil and natural gas. Today, even with highly sophisticated reservoir simulations software available, reservoir simulation still involves a great deal of guesswork. Advanced Petroleum Reservoir Simulation provides an advanced approach to petroleum reservoir simulation, taking the guesswork out of the process and relying more thoroughly on science and what is known about the individual reservoir. This state of the art publication in petroleum simulation: Describes solution techniques that allow multiple solutions to the complete equations, without linearization. Solves the most difficult reservoir engineering problems such as viscous fingering. Highlights the importance of non-linear solvers on decision tree with scientific argument.

Discusses solution schemes in relation to other disciplines and revolutionizes risk analysis and decision making. Includes companion software with 3-D, 3-phase multipurpose simulator code available for download from www.scrivenerpublishing.com. By providing a valuable tool to support reservoir simulation predictions with real science, this book is an essential reference for engineers, scientists and geologists.