

Petroleum Reservoir Engineering

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

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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 Formulas and Calculations for Petroleum Engineering unlocks the capability for any petroleum engineering individual, experienced or not, to solve problems and locate quick answers, eliminating non-productive time spent searching for that right calculation. Enhanced with lab data experiments, practice examples, and a complimentary online software toolbox, the book presents the most convenient and practical reference for all oil and gas phases of a given project. Covering the full spectrum, this reference gives single-point reference to all critical modules, including drilling, production, reservoir engineering, well testing, well logging, enhanced oil recovery, well completion, fracturing, fluid flow, and even petroleum economics. Presents single-point access to all petroleum engineering equations, including calculation of modules covering drilling, completion and fracturing Helps readers understand petroleum economics by including formulas on depreciation rate, cashflow analysis, and the optimum number of development wells The job of any reservoir engineer is to maximize production from a field to obtain the best economic return. To do this, the engineer must study the behavior and characteristics of a petroleum reservoir

to determine the course of future development and production that will maximize the profit. Fluid flow, rock properties, water and gas coning, and relative permeability are only a few of the concepts that a reservoir engineer must understand to do the job right, and some of the tools of the trade are water influx calculations, lab tests of reservoir fluids, and oil and gas performance calculations. Two new chapters have been added to the first edition to make this book a complete resource for students and professionals in the petroleum industry: Principles of Waterflooding, Vapor-Liquid Phase Equilibria.

The Definitive Guide to Petroleum Reservoir Engineering-Now Fully Updated to Reflect New Technologies and Easier Calculation Methods Craft and Hawkins' classic introduction to petroleum reservoir engineering is now fully updated for new technologies and methods, preparing students and practitioners to succeed in the modern industry. In Applied Petroleum Reservoir Engineering, Third Edition, renowned expert Ronald E. Terry and project engineer J. Brandon Rogers review the history of reservoir engineering, define key terms, carefully introduce the material balance approach, and show how to apply it with many types of reservoirs. Next, they introduce key principles of fluid flow, water influx, and advanced recovery (including hydrofracturing). Throughout, they present field

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examples demonstrating the use of material balance and history matching to predict reservoir performance. For the first time, this edition relies on Microsoft Excel with VBA to make calculations easier and more intuitive. This edition features Extensive updates to reflect modern practices and technologies, including gas condensate reservoirs, water flooding, and enhanced oil recovery Clearer, more complete introductions to vocabulary and concepts- including a more extensive glossary Several complete application examples, including single-phase gas, gas-condensate, undersaturated oil, and saturated oil reservoirs Calculation examples using Microsoft Excel with VBA throughout Many new example and practice problems using actual well data A revamped history-matching case study project that integrates key topics and asks readers to predict future well production

A strong foundation in reservoir rock and fluid properties is the backbone of almost all the activities in the petroleum industry. *Petroleum Reservoir Rock and Fluid Properties* offers a reliable representation of fundamental concepts and practical aspects that encompass this vast subject area. The book provides up-to-date coverage of vari

Petroleum engineering now has its own true classic handbook that reflects the profession's status as a mature major engineering discipline. Formerly titled the *Practical Petroleum Engineer's Handbook*, by

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Joseph Zaba and W.T. Doherty (editors), this new, completely updated two-volume set is expanded and revised to give petroleum engineers a comprehensive source of industry standards and engineering practices. It is packed with the key, practical information and data that petroleum engineers rely upon daily. The result of a fifteen-year effort, this handbook covers the gamut of oil and gas engineering topics to provide a reliable source of engineering and reference information for analyzing and solving problems. It also reflects the growing role of natural gas in industrial development by integrating natural gas topics throughout both volumes. More than a dozen leading industry experts-academia and industry-contributed to this two-volume set to provide the best , most comprehensive source of petroleum engineering information available.

Reservoir Engineering of Conventional and Unconventional Petroleum Resources is a practical guide and handbook for engineers and geoscientists. It is also a complete textbook for teaching of reservoir engineering courses with exercises in each chapter. The sources and applications of basic rock properties are presented. Prediction of PVT properties from correlations and equations of state, and laboratory measurements of same properties from fluid samples are discussed. These basic data are applied in material balance analyses, volumetric calculation of hydrocarbons-in-place and reserves, and analyses of reservoir performance using case histories. Production forecasts for conventional and unconventional reservoirs using Arps' decline equations in

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decline curve analyses (DCA) are presented. The applications of modified Arps' decline equations coupled with transient flow models in rate transient analyses (RTA) are illustrated. Dr. Ezekwe presents fundamental equations and methods for pressure transient analysis (PTA) for fractured and unfractured wells in conventional reservoirs. This is accompanied with well test analyses in unconventional reservoirs using diagnostic fracture injection tests (DFIT). Secondary recovery methods focused on waterflooding, gasflooding, and low salinity waterflooding are demonstrated. Enhanced oil recovery methods are discussed. Dr. Ezekwe recommends experience-based practical procedures for geologic modeling, reservoir characterization, reservoir simulation, and reservoir management. Fundamental economic decision criteria including profitability index, net present value, rate of return are demonstrated with examples. Reservoir Engineering of Conventional and Unconventional Petroleum Resources equips engineers with knowledge and skills on how to:

- Acquire basic rock and fluid properties
- Predict PVT properties for oil and gas reservoirs from correlations and equations of state
- Perform reserves evaluations for conventional & unconventional reservoirs using DCA methods
- Perform PTA and DFIT analyses for wells in conventional and unconventional reservoirs
- Conduct rate transient analyses (RTA) for unconventional reservoirs
- Implement waterflooding, gasflooding, and low salinity waterflooding projects
- Screen reservoirs for EOR processes and install field-wide EOR projects
- Build geologic models, reservoir models, and conduct reservoir simulation
- Develop and implement reservoir management strategies
- Perform economic evaluation of petroleum projects and resources.
- Build economic models of projects, fields, and resources

Practical Reservoir Characterization expertly explains key technologies, concepts, methods, and terminology in a way

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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 Reservoir Engineering offers the practicing engineer and engineering student a full description, with worked examples, of all of the kinds of reservoir engineering topics that the engineer will use in day-to-day activities. In an industry where there is often a lack of information, this timely volume gives a comprehensive account of the physics of reservoir engineering, a thorough knowledge of which is essential in the petroleum industry for the efficient recovery of hydrocarbons. Chapter one deals exclusively with the theory and practice of transient flow analysis and offers a brief but thorough hands-on guide to gas and oil well testing. Chapter

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two documents water influx models and their practical applications in conducting comprehensive field studies, widely used throughout the industry. Later chapters include unconventional gas reservoirs and the classical adaptations of the material balance equation. * An essential tool for the petroleum and reservoir engineer, offering information not available anywhere else * Introduces the reader to cutting-edge new developments in Type-Curve Analysis, unconventional gas reservoirs, and gas hydrates * Written by two of the industry's best-known and respected reservoir engineers

Petroleum Reservoir Simulation, Second Edition, introduces this novel engineering approach for petroleum reservoir modeling and operations simulations. Updated with new exercises, a new glossary and a new chapter on how to create the data to run a simulation, this comprehensive reference presents step-by-step numerical procedures in an easy to understand format. Packed with practical examples and guidelines, this updated edition continues to deliver an essential tool for all petroleum and reservoir engineers.

Includes new exercises, a glossary and references Bridges research and practice with guidelines on introducing basic reservoir simulation parameters, such as history matching and decision tree content Helps readers apply knowledge with assistance on how to prepare data files to run a reservoir simulator

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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

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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.

Chapter 1. Fundamentals of Well Testing -- Chapter 2. Decline and Type-Curves Analysis -- Chapter 3. Water Influx -- Chapter 4. Unconventional Gas Reservoirs -- Chapter 5. Performance of Oil Reservoirs -- Chapter 6. Predicting Oil Reservoir Performance -- Chapter 7. Fundamentals of Enhanced Oil Recovery -- Chapter 8. Economic Analysis --

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Chapter 9. Analysis of Fixed Capital Investments -- Chapter 10. Advanced Evaluation Approaches -- Chapter 11.

Professionalism and Ethics.

This book on PVT and Phase Behaviour Of Petroleum Reservoir Fluids is volume 47 in the Developments in Petroleum Science series. The chapters in the book are: Phase Behaviour Fundamentals, PVT Tests and Correlations, Phase Equilibria, Equations of State, Phase Behaviour Calculations, Fluid Characterisation, Gas Injection, Interfacial Tension, and Application in Reservoir Simulation.

"This book is fast becoming the standard text in its field", wrote a reviewer in the Journal of Canadian Petroleum Technology soon after the first appearance of Dake's book. This prediction quickly came true: it has become the standard text and has been reprinted many times. The author's aim - to provide students and teachers with a coherent account of the basic physics of reservoir engineering - has been most successfully achieved. No prior knowledge of reservoir engineering is necessary. The material is dealt with in a concise, unified and applied manner, and only the simplest and most straightforward mathematical techniques are used. This low-priced paperback edition will continue to be an invaluable teaching aid for years to come.

Quantitative Methods in Reservoir Engineering, Second Edition, brings together the critical aspects of the industry to create more accurate models and better financial forecasts for oil and gas assets. Updated to cover more practical applications related to intelligent infill drilling, optimized well pattern arrangement, water flooding with modern wells, and multiphase flow, this new edition helps reservoir engineers better lay the mathematical foundations for analytical or semi-analytical methods in today's more difficult reservoir engineering applications. Authored by a worldwide expert on computational flow modeling, this reference integrates current

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mathematical methods to aid in understanding more complex well systems and ultimately guides the engineer to choose the most profitable well path. The book delivers a valuable tool that will keep reservoir engineers up-to-speed in this fast-paced sector of the oil and gas market. Stay competitive with new content on unconventional reservoir simulation Get updated with new material on formation testing and flow simulation for complex well systems and paths Apply methods derived from real-world case studies and calculation examples

Many natural objects have been found to be fractal and fractal mathematics has been used to generate many beautiful ?nature? scenes. Fractal mathematics is used in image compression and for movies and is now becoming an engineering tool as well. This book describes the application of fractal mathematics to one engineering specialty ? reservoir engineering. This is the process of engineering the production of oil and gas. The reservoir engineer's job is to design and predict production from underground oil and gas reservoirs. The successful application of fractal mathematics to this engineering discipline should be of interest, not only to reservoir engineers, but to other engineers with their own potential applications as well. Geologists will find surprisingly good numerical descriptions of subsurface rock distributions. Physicists will be interested in the application of renormalization and percolation theory described in the book. Geophysicists will find the description of fluid flow scaling problems faced by the reservoir engineer similar to their problems of scaling the transport of acoustic signals. This text is written to include reservoirs that produce under steady-state conditions at much higher rates. You can be better prepared to solve reservoir engineering problems, in the U.S. and around the world. Problems are presented throughout the book to give you hands-on experience with

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various field calculations.

This book introduces in detail the physical and chemical phenomena and processes during petroleum production. It covers the properties of reservoir rocks and fluids, the related methods of determining these properties, the phase behavior of hydrocarbon mixtures, the microscopic mechanism of fluids flowing through reservoir rocks, and the primary theories and methods of enhancing oil recovery. It also involves the up-to-date progress in these areas. It can be used as a reference by researchers and engineers in petroleum engineering and a textbook for students majoring in the area related with petroleum exploitation.

Fundamentals of Applied Reservoir Engineering introduces early career reservoir engineers and those in other oil and gas disciplines to the fundamentals of reservoir engineering. Given that modern reservoir engineering is largely centered on numerical computer simulation and that reservoir engineers in the industry will likely spend much of their professional career building and running such simulators, the book aims to encourage the use of simulated models in an appropriate way and exercising good engineering judgment to start the process for any field by using all available methods, both modern simulators and simple numerical models, to gain an understanding of the basic 'dynamics' of the reservoir –namely what are the major factors that will determine its performance. With the valuable addition of questions and exercises, including online spreadsheets to utilize day-to-day application and bring together the basics of reservoir engineering, coupled with petroleum

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economics and appraisal and development optimization, Fundamentals of Applied Reservoir Engineering will be an invaluable reference to the industry professional who wishes to understand how reservoirs fundamentally work and to how a reservoir engineer starts the performance process. Covers reservoir appraisal, economics, development planning, and optimization to assist reservoir engineers in their decision-making. Provides appendices on enhanced oil recovery, gas well testing, basic fluid thermodynamics, and mathematical operators to enhance comprehension of the book's main topics. Offers online spreadsheets covering well test analysis, material balance, field aggregation and economic indicators to help today's engineer apply reservoir concepts to practical field data applications. Includes coverage on unconventional resources and heavy oil making it relevant for today's worldwide reservoir activity.

Real-world reservoirs are layered, heterogeneous and anisotropic, exposed to water and gas drives, faults, barriers and fractures. They are produced by systems of vertical, deviated, horizontal and multilateral wells whose locations, sizes, shapes and topologies are dictated "on the fly, at random" by petroleum engineers and drillers at well sites. Wells may be pressure or rate-constrained, with these roles re-assigned during simulation with older laterals shut-in, newer wells drilled and brought on stream, and so on. And all are subject to steady and transient production, each satisfying different physical and mathematical laws, making reservoir simulation an art difficult to master and introducing numerous barriers

to entry. All of these important processes can now be simulated in any order using rapid, stable and accurate computational models developed over two decades. And what if it were further possible to sketch complicated geologies and lithologies, plus equally complex systems of general wells, layer-by-layer using Windows Notepad? And with no prior reservoir simulation experience and only passing exposure to reservoir engineering principles? Have the user press "Simulate," and literally, within minutes, produce complicated field-wide results, production forecasts, and detailed three-dimensional color pressure plots from integrated graphics algorithms? Developed over years of research, this possibility has become reality. The author, an M.I.T. trained scientist who has authored fifteen original research books, over a hundred papers and forty patents, winner of a prestigious British Petroleum Chairman's Innovation Award in reservoir engineering and a record five awards from the United States Department of Energy, has delivered just such a product, making real-time planning at the well-site simple and practical. Workflows developed from experience as a practicing reservoir engineer are incorporated into "intelligent menus" that make in-depth understanding of simulation principles and readings of user manuals unnecessary. This volume describes new technology for down-to-earth problems using numerous examples performed with our state-of-the-art simulator, one that is available separately at affordable cost and requiring only simple Intel Core i5 computers without specialized graphics boards. The new methods are rigorous, validated and well-documented and are now

available for broad petroleum industry application. 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 *Geothermal Reservoir Engineering* offers a comprehensive account of geothermal reservoir engineering and a guide to the state-of-the-art technology, with emphasis on practicality. Topics

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covered include well completion and warm-up, flow testing, and field monitoring and management. A case study of a geothermal well in New Zealand is also presented. Comprised of 10 chapters, this book opens with an overview of geothermal reservoirs and the development of geothermal reservoir engineering as a discipline. The following chapters focus on conceptual models of geothermal fields; simple models that illustrate some of the processes taking place in geothermal reservoirs under exploitation; measurements in a well from spudding-in up to first discharge; and flow measurement. The next chapter provides a case history of one well in the Broadlands Geothermal Field in New Zealand, with particular reference to its drilling, measurement, discharge, and data analysis/interpretation. The changes that have occurred in exploited geothermal fields are also reviewed. The final chapter considers three major problems of geothermal reservoir engineering: rapid entry of external cooler water, or return of reinjected water, in fractured reservoirs; the effects of exploitation on natural discharges; and subsidence. This monograph serves as both a text for students and a manual for working professionals in the field of geothermal reservoir engineering. It will also be of interest to engineers and scientists of other disciplines.

This revised edition of the bestselling *Practice of Reservoir Engineering* has been written for those in the oil industry requiring a working knowledge of how the complex subject of hydrocarbon reservoir engineering can be applied in the field in a practical manner.

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Containing additions and corrections to the first edition, the book is a simple statement of how to do the job and is particularly suitable for reservoir/production engineers as well as those associated with hydrocarbon recovery. This practical book approaches the basic limitations of reservoir engineering with the basic tenet of science: Occam's Razor, which applies to reservoir engineering to a greater extent than for most physical sciences - if there are two ways to account for a physical phenomenon, it is the simpler that is the more useful. Therefore, simplicity is the theme of this volume. Reservoir and production engineers, geoscientists, petrophysicists, and those involved in the management of oil and gas fields will want this edition.

Petroleum reservoir management considerations and practices are deeply rooted in the optimization of development objectives, requisite investments, operational costs, and philosophy in addition to the dynamics of timely decision-making. *Petroleum Reservoir Management: Considerations and Practices* highlights the key reservoir management topics and issues that engage the attention of exploration and production companies over the life cycle of an oilfield. This is the only book to exclusively address petroleum reservoir management based on actual field development experience. It emphasizes the role of good project management, the value of a quantitative assessment of reservoir health, the importance of using good practices, and the need for true collaboration among various team players to maximize the benefits. The book expands the scope of reservoir management from field operations to boardroom discussions about capital financing to product pricing criteria, mechanisms, and strategies. **FEATURES**

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Reviews subsurface and surface management issues
Discusses project and price management factors critical to the oil industry
Describes macromanagement issues covering the reservoir life cycle from production to pricing
Includes the role and significance of teamwork, open communication, and synergy in reservoir management
This book is aimed at professionals and graduate students in petroleum and reservoir engineering, oil and gas companies, and environmental engineering.

Volume 1 of this book dealt with the techniques behind the acquisition, processing and interpretation of basic reservoir data. This second volume is devoted to the study, verification and prediction of reservoir behaviour, and methods of increasing productivity and oil recovery. I should like to bring a few points to the reader's attention. Firstly, the treatment of immiscible displacement by the method of characteristics. The advantage of this approach is that it brings into evidence the various physical aspects of the process, especially its dependence on the properties of the fluids concerned, and on the velocity of displacement. It was not until after the publication of the first, Italian, edition of this book (February 1990) that I discovered a similar treatment in the book *Enhanced Oil Recovery*, by Larry W. Lake, published in 1989. Another topic that I should like to bring to the reader's attention is the forecasting of reservoir behaviour by the method of identified models. This original contribution to reservoir engineering is based on systems theory - a science which should, in my opinion, find far wider application, in view of the "black box" nature of reservoirs and their responses to production processes.

A strong foundation in reservoir rock and fluid properties is the backbone of almost all the activities in the petroleum industry. Suitable for undergraduate students in petroleum engineering, *Petroleum Reservoir Rock and Fluid Properties*,

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Second Edition offers a well-balanced, in-depth treatment of the fundamental concepts and practical aspects that encompass this vast discipline. New to the Second Edition Introductions to Stone II three-phase relative permeability model and unconventional oil and gas resources Discussions on low salinity water injection, saturated reservoirs and production trends of five reservoir fluids, impact of mud filtrate invasion and heavy organics on samples, and flow assurance problems due to solid components of petroleum Better plots for determining oil and water Corey exponents from relative permeability data Inclusion of Rachford-Rice flash function, Plateau equation, and skin effect Improved introduction to reservoir rock and fluid properties Practice problems covering porosity, combined matrix-channel and matrix-fracture permeability, radial flow equations, drilling muds on fluid saturation, wettability concepts, three-phase oil relative permeability, petroleum reservoir fluids, various phase behavior concepts, phase behavior of five reservoir fluids, and recombined fluid composition Detailed solved examples on absolute permeability, live reservoir fluid composition, true boiling point extended plus fractions properties, viscosity based on compositional data, and gas-liquid surface tension Accessible to anyone with an engineering background, the text reveals the importance of understanding rock and fluid properties in petroleum engineering. Key literature references, mathematical expressions, and laboratory measurement techniques illustrate the correlations and influence between the various properties. Explaining how to acquire accurate and reliable data, the author describes coring and fluid sampling methods, issues related to handling samples for core analyses, and PVT studies. He also highlights core and phase behavior analysis using laboratory tests and calculations to elucidate a wide range of properties. Petroleum engineering is a field of engineering that is

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concerned with the production of crude oil or natural gas. The areas of formation evaluation, reservoir simulation, reservoir engineering, drilling, etc. are crucial to petroleum engineering. Reservoir engineering is a branch of petroleum engineering. It strives to solve the drainage problems that arise during the production of oil and gas reservoirs in order to achieve a high economic recovery. Numerical reservoir modeling, well testing, drilling, PVT analysis of fluids, etc. are central to reservoir engineering. The specializations in reservoir engineering are surveillance engineering and simulation modeling. This book presents the complex subject of petroleum reservoir engineering in the most comprehensible and easy to understand language. It is a valuable compilation of topics, ranging from the basic to the most complex theories and principles in this field. It is a complete source of knowledge on the present status of this important field.

Six years ago, at the end of my professional career in the oil industry, I left my management position within Agip S.p.A., a major multinational oil company whose headquarters are in Italy, to take up the chair in reservoir engineering at the University of Bologna, Italy. There, I decided to prepare what was initially intended to be a set of lecture notes for the students attending the course. However, while preparing these notes, I became so absorbed in the subject matter that I soon found myself creating a substantial volume of text which could not only serve as a university course material, but also as a reference for wider professional applications. Thanks to the interest shown by the then president of Agip, Ing. Giuseppe Muscarella, this did indeed culminate in the publication of the first Italian edition of this book in 1989. The translation into English and publication of these volumes owes much to the encouragement of the current president of Agip, Ing. Guglielmo Moscato. My grateful thanks are due to both gentlemen. And now - the English version, translated

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from the second Italian edition, and containing a number of revisions and much additional material. As well as providing a solid theoretical basis for the various topics, this work draws extensively on my 36 years of worldwide experience in the development and exploitation of oil and gas fields.

This book provides a clear and basic understanding of the concept of reservoir engineering to professionals and students in the oil and gas industry. The content contains detailed explanations of key theoretic and mathematical concepts and provides readers with the logical ability to approach the various challenges encountered in daily reservoir/field operations for effective reservoir management. Chapters are fully illustrated and contain numerous calculations involving the estimation of hydrocarbon volume in-place, current and abandonment reserves, aquifer models and properties for a particular reservoir/field, the type of energy in the system and evaluation of the strength of the aquifer if present. The book is written in oil field units with detailed solved examples and exercises to enhance practical application. It is useful as a professional reference and for students who are taking applied and advanced reservoir engineering courses in reservoir simulation, enhanced oil recovery and well test analysis.

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