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IN-SITU COMBUSTION HANDBOOK – PRINCIPLES AND PRACTICES

Final Report
November 1998

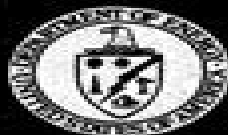
By
Partha S. Sarathi

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In Situ Combustion Handbook

Johannes Fink



In Situ Combustion Handbook:

In-situ Combustion Handbook Partha S. Sarathi, BDM Petroleum Technologies, United States. Department of Energy, 1999 **In-Situ Combustion Handbook -- Principles and Practices**, 1999 Thermal Methods Abdolhossein Hemmati-Sarapardeh, Alireza Alamatsaz, Mingzhe Dong, Zhaomin Li, 2023-04-18 Thermal Methods Volume Two the latest release in the Enhanced Oil Recovery series helps engineers focus on the latest developments in this fast growing area In the book different techniques are described in addition to the latest technologies in data mining and hybrid processes Supported field case studies are included to illustrate a bridge between research and practical applications making it useful for both academics and practicing engineers Structured to start with thermal concepts and steam flooding the book's editors then advance to more complex content guiding engineers into areas such as hybrid thermal methods and edgier technologies that bridge solar and nuclear energy Supported by a full spectrum of contributors this book gives petroleum engineers and researchers the latest research developments and field applications to drive innovation for the future of energy Presents the latest understanding surrounding the updated research and practical applications specific to thermal enhanced oil recovery methods Provides an analysis of editors research on available technology including hybrid thermal solvent processes and dual pipe configurations Teaches about additional methods such as data mining applications and economic and environmental considerations **List of NPTO Publications** United States. National Petroleum Technology Office, 2001

Proceedings of the International Field Exploration and Development Conference 2019 Jia'en Lin, 2020-07-11 This book gathers selected papers from the 8th International Field Exploration and Development Conference IFEDC 2019 and addresses a broad range of topics including Low Permeability Reservoir Unconventional Tight Shale Oil Reservoir Unconventional Heavy Oil and Coal Bed Gas Digital and Intelligent Oilfield Reservoir Dynamic Analysis Oil and Gas Reservoir Surveillance and Management Oil and Gas Reservoir Evaluation and Modeling Drilling and Production Operation Enhancement of Recovery Oil and Gas Reservoir Exploration The conference not only provided a platform to exchange experiences but also promoted the advancement of scientific research in oil gas exploration and production The book is chiefly intended for industry experts professors researchers senior engineers and enterprise managers Enhanced Oil Recovery Ajay Mandal, Keka Ojha, 2023-11-29 Oil recovery efficiency can be increased by applying the enhanced oil recovery EOR processes which are based on the improvement of mobility ratio reduction of interfacial tension between oil and water wettability alteration reduction of oil viscosity formation of oil banks and so forth This book describes the different EOR methods and their mechanisms which are traditionally used after conventional primary and secondary processes The present scenario of different EOR processes at both the field application stage and research stage is also covered Further it discusses some of the recent advances in EOR processes such as low salinity water flooding the application of nanotechnology in EOR microbial EOR carbonated water injection etc Features Comprehensive coverage of all enhanced oil recovery EOR methods

Discussion of reservoir rock and fluid characteristics Illustration of steps in design and field implementation as well as the screening criteria for process selection Coverage of novel topics of nanotechnology in EOR and hybrid EOR method and low salinity waterfloods Emphasis on recent technologies feasibility and implementation of hybrid technologies This book is aimed at graduate students professionals researchers chemists and personnel involved in petroleum engineering chemical engineering surfactant manufacturing polymer manufacturing oil gas service companies and carbon capture and utilization

Enhanced Oil Recovery Field Case Studies James J. Sheng, 2013-04-10 Enhanced Oil Recovery Field Case Studies bridges the gap between theory and practice in a range of real world EOR settings Areas covered include steam and polymer flooding use of foam in situ combustion microorganisms smart water based EOR in carbonates and sandstones and many more Oil industry professionals know that the key to a successful enhanced oil recovery project lies in anticipating the differences between plans and the realities found in the field This book aids that effort providing valuable case studies from more than 250 EOR pilot and field applications in a variety of oil fields The case studies cover practical problems underlying theoretical and modeling methods operational parameters solutions and sensitivity studies and performance optimization strategies benefitting academicians and oil company practitioners alike Strikes an ideal balance between theory and practice Focuses on practical problems underlying theoretical and modeling methods and operational parameters Designed for technical professionals covering the fundamental as well as the advanced aspects of EOR Subsurface Upgrading of Heavy Crude Oils and Bitumen Cesar Ovalles, 2019-07-24 Heavy crude oils and bitumen represent more than 50% of all hydrocarbons available on the planet These feedstocks have a low amount of distillable material and high level of contaminants that make their production transportation and refining difficult and costly by conventional technologies Subsurface Upgrading of Heavy Crude Oils and Bitumen is of interest to the petroleum industry mainly because of the advantages compared to aboveground counterparts The author presents an in depth account and a critical review of the progress of industry and academia in underground or In Situ upgrading of heavy extra heavy oils and bitumen as reported in the patent and open literature This work is aimed to be a standalone monograph so three chapters are dedicated to the composition of petroleum and fundamentals of crude oil production and refining Key Features Offers a multidisciplinary scope that will appeal to chemists geologists biologists chemical engineers and petroleum engineers Presents the advantages and disadvantages of the technologies considered Discusses economic and environmental considerations for all the routes evaluated and offers perspectives from experts in the field working with highlighted technologies **Fundamentals of Enhanced Oil Recovery Methods for Unconventional Oil Reservoirs** Dheiaa Alfarge, Mingzhen Wei, Baojun Bai, 2020-09-09 Fundamentals of Enhanced Oil Recovery Methods for Unconventional Oil Reservoirs Volume 67 provides important guidance on which EOR methods work in shale and tight oil reservoirs This book helps readers learn the main fluid and rock properties of shale and tight reservoirs which are the main target for EOR techniques and understand the physical

and chemical mechanisms for the injected EOR fluids to enhance oil recovery in shale and tight oil reservoirs The book explains the effects of complex hydraulic fractures and natural fractures on the performance of each EOR technique The book describes the parameters affecting obtained oil recovery by injecting different EOR methods in both the microscopic and macroscopic levels of ULR This book also provides proxy models to associate the functionality of the improved oil recovery by injecting different EOR methods with different operating parameters rock and fluid properties The book provides professionals working in the petroleum industry the know how to conduct a successful project for different EOR methods in shale plays while it also helps academics and students in understanding the basics and principles that make the performance of EOR methods so different in conventional reservoirs and unconventional formations Provides a general workflow for how to conduct a successful project for different EOR methods in these shale plays Provides general guidelines for how to select the best EOR method according to the reservoir characteristics and wells stimulation criteria Explains the basics and principles that make the performance of EOR methods so different in conventional reservoirs versus unconventional formations

Application of thermal methods to enhanced oil recovery: Numerical and experimental investigations Taofik Nassan, 2024-12-05 Reservoir simulation is a powerful tool to model fluid flow within oil and gas reservoirs and predict their behaviour This dissertation is devoted primarily to model some thermal enhanced oil recovery TEOR methods Two software were used for this purpose and namely Comsol Multiphysics and CMG Computer Modelling Group The dissertation can be classified into three parts and all of them are standalone that discuss different topics within TEOR The work starts with reviewing enhanced oil recovery EOR methods with concentration on thermal methods TEOR for heavy oil and bitumen Basics of mathematical modelling of single two phase and three phase flow in porous media that is the base of all commercial and scientific reservoir simulation software are reviewed Formulations of the set of representative PDEs are reviewed and other formulations are suggested and applied directly in subsequent sections in Comsol Multiphysics Part 1 The application of finite element method FEM in reservoir simulation has been discussed and evaluated using Comsol Multiphysics package which is based on Galerkin approach In the demonstrated problems the mathematical model is solved using mathematics module in Comsol Multiphysics Energy equation in 1D Buckley Leverett benchmark two phase flow model on inverted 5 spot scheme in 3D and SAGD process PDE model are all solved and discussed FEM using Comsol Multiphysics looks promising at moderate mobility ratios Part 2 A comparison of water flooding with steam injection in heavy oil reservoirs as secondary stage is demonstrated and discussed The whole modelling was achieved by CMG STARS A comparison of five different scenarios is shown SPE4 comparative project data were used for this purpose The results showed that steam can achieve more recovery in a short period of time with an ultimate recovery factor higher than cold recovery followed by steam flooding process Part 3 A series of flooding and in situ combustion experimental work that has been achieved in Kazan Federal University in cooperation with Institute of Drilling Engineering and Fluid Mining IBF is elaborated briefly and discussed Four

experiments with different core samples consolidated and unconsolidated were run between 05 2020 and 05 2021 The samples were taken from a Russian extra heavy oilfield with initial viscosity around 600 000 cP The results were evaluated and a numerical model was built using CMG STARS The numerical results were correlating the experimental results Relative permeability data were history matched for flooding processes and this data was used for in situ combustion model Modelling of the reactions in in situ combustion was a challenge to match the experimental results The final results showed that steam injection was not the best recovery method for this oilfield and in situ combustion was the best available technique with the highest recovery factor **Official Gazette of the United States Patent Office** United States. Patent Office,1960

Petroleum Engineer's Guide to Oil Field Chemicals and Fluids Johannes Fink,2015-08-31 The oil and gas engineer on the job requires knowing all the available oil field chemicals and fluid applications that are applicable to the operation Updated with the newest technology and available products *Petroleum Engineer s Guide to Oil Field Chemicals and Fluids* Second Edition delivers all the necessary lists of chemicals by use their basic components benefits and environmental implications In order to maintain reservoir protection and peak well production performance operators demand to know all the options that are available Instead of searching through various sources *Petroleum Engineer s Guide to Oil Field Chemicals and Fluids* Second Edition presents a one stop non commercialized approach by organizing the products by function matching the chemical to the process for practical problem solving and extending the coverage with additional resources and supportive materials Covering the full spectrum including fluid loss additives drilling muds cement additives and oil spill treating agents this must have reference answers to every oil and gas operation with more options for lower costs safer use and enhanced production Effectively locate and utilize the right chemical application specific to your oil and gas operation with author s systematic approach by use Gain coverage on all oil field chemicals and fluids needed throughout the entire oil and gas life cycle including drilling production and cementing Understand environmental factors and risks for oil field chemicals along with pluses and minuses of each application to make the best and safest choice for your operation *Working Guide to Reservoir Engineering* William Lyons,2009-09-16 *Working Guide to Reservoir Engineering* provides an introduction to the fundamental concepts of reservoir engineering The book begins by discussing basic concepts such as types of reservoir fluids the properties of fluid containing rocks and the properties of rocks containing multiple fluids It then describes formation evaluation methods including coring and core analysis drill stem tests logging and initial estimation of reserves The book explains the enhanced oil recovery process which includes methods such as chemical flooding gas injection thermal recovery technical screening and laboratory design for enhanced recovery Also included is a discussion of fluid movement in waterflooded reservoirs Predict local variations within the reservoir Explain past reservoir performance Predict future reservoir performance of field Analyze economic optimization of each property Formulate a plan for the development of the field throughout its life Convert data from one discipline to another Extrapolate data from a few discrete points to the entire

reservoir **Enhanced Oil Recovery** Association de recherche sur les techniques d'exploitation du pétrole,1982 **A Guide to Federal Terms and Acronyms** Don Philpott,2017-12-20 Navigating government documents is a task that requires considerable knowledge of specialized terms and acronyms This required knowledge nearly amounts to knowing a completely different language To those who are not fluent the task can be overwhelming as federal departments fill their documents with acronyms abbreviations and terms that mean little or nothing to the outsider Would you be able to make sense of a document that described how the COTR reports to the CO regarding compliance with FAR GPRA SARA and FASA This is a common procedure in government contracting Would you have any clue what was being referred to if you came across MIL STD 129P It is the new standard for Military Shipping Label Requirements The sheer number of such terms makes mastering them nearly impossible But now these terms and their definitions are within reach This new edition of A Guide to Federal Terms and Acronyms presents a glossary of key definitions used by the federal government It is updated to include new acronyms and terminology from various federal government departments It covers the most common terms acronyms and abbreviations used by each major agency presenting definitions and explanations in a user friendly and accessible way This is an essential tool for anyone who works with federal government information Environmental Compliance Guide ,1981

Petroleum Decoded: A Comprehensive Guide to the Exploration, Extraction, and Recovery of Crude Oil and Natural Gas Pasquale De Marco,2025-04-20 Prepare to embark on an unparalleled journey into the enthralling world of petroleum This comprehensive guide unlocks the secrets of crude oil and natural gas revealing the intricate processes that bring these precious resources to the surface From the depths of geological formations to the complexities of extraction and production this book provides an in depth exploration of the petroleum industry Discover the fascinating origins and formation of petroleum delve into the latest exploration techniques and witness the engineering marvels of drilling and well completion Unravel the intricacies of production methods transportation networks and refining processes Understand the environmental considerations and sustainable practices that shape the industry s future Explore the economic and political dimensions of petroleum gaining insights into global markets geopolitical influences and government regulations Meet the dedicated professionals behind petroleum geologists engineers drilling crews and refining specialists Their expertise and innovation have transformed the industry meeting the world s growing energy demands This book culminates in a thought provoking examination of the future of petroleum As the world transitions towards renewable energy discover the role petroleum will play in a carbon constrained world Explore the ongoing technological advancements and innovations that will shape the industry in the years to come Whether you re a student seeking a comprehensive overview a professional seeking to expand your knowledge or an enthusiast eager to delve into the complexities of petroleum this book is your indispensable guide Immerse yourself in the captivating world of petroleum and gain an unparalleled understanding of this vital resource that powers our modern civilization If you like this book write a review on google books Heavy Oil Recovery and

Upgrading James G. Speight, 2019-02-28 Heavy Oil Recovery and Upgrading covers properties factors methods and all current and upcoming processes giving engineers new and experienced the full spectrum of recovery choices including SAGD horizontal well technology and hybrid approaches Moving on to the upgrading and refining of the product the book also includes information on in situ upgrading refining options and hydrogen production Rounding out with environmental effects management methods on refinery waste and the possible future configurations within the refinery this book provides engineers with a single source to make decisions and manage the full range of challenges Presents the properties mechanisms screening criteria and field applications for heavy oil enhanced recovery projects Includes current upgrading options and future methods for refining heavy oil development Fills in the gaps between literature and practical application for everyday industry reference

Energy Research Abstracts, 1987

Efficient Simulation of Thermal Enhanced Oil Recovery Processes Zhouyuan Zhu, 2011 Simulating thermal processes is usually computationally expensive because of the complexity of the problem and strong nonlinearities encountered In this work we explore novel and efficient simulation techniques to solve thermal enhanced oil recovery problems We focus on two major topics the extension of streamline simulation for thermal enhanced oil recovery and the efficient simulation of chemical reaction kinetics as applied to the in situ combustion process For thermal streamline simulation we first study the extension to hot water flood processes in which we have temperature induced viscosity changes and thermal volume changes We first compute the pressure field on an Eulerian grid We then solve for the advective parts of the mass balance and energy equations along the individual streamlines accounting for the compressibility effects At the end of each global time step we account for the nonadvective terms on the Eulerian grid along with gravity using operator splitting We test our streamline simulator and compare the results with a commercial thermal simulator Sensitivity studies for compressibility gravity and thermal conduction effects are presented We further extended our thermal streamline simulation to steam flooding Steam flooding exhibits large volume changes and compressibility associated with the phase behavior of steam strong gravity segregation and override and highly coupled energy and mass transport To overcome these challenges we implement a novel pressure update along the streamlines a Glowinski scheme operator splitting and a preliminary streamline finite volume hybrid approach We tested our streamline simulator on a series of test cases We compared our thermal streamline results with those computed by a commercial thermal simulator for both accuracy and efficiency For the cases investigated we are able to retain solution accuracy while reducing computational cost and gaining connectivity information from the streamlines These aspects are useful for reservoir engineering purposes In traditional thermal reactive reservoir simulation mass and energy balance equations are solved numerically on discretized reservoir grid blocks The reaction terms are calculated through Arrhenius kinetics using cell averaged properties such as averaged temperature and reactant concentrations For the in situ combustion process the chemical reaction front is physically very narrow typically a few inches thick To capture accurately this front

centimeter sized grids are required that are orders of magnitude smaller than the affordable grid block sizes for full field reservoir models To solve this grid size effect problem we propose a new method based on a non Arrhenius reaction upscaling approach We do not resolve the combustion front on the grid but instead use a subgrid scale model that captures the overall effects of the combustion reactions on flow and transport i e the amount of heat released the amount of oil burned and the reaction products generated The subgrid scale model is calibrated using fine scale highly accurate numerical simulation and laboratory experiments This approach significantly improves the computational speed of in situ combustion simulation as compared to traditional methods We propose the detailed procedures to implement this methodology in a field scale simulator Test cases illustrate the solution consistency when scaling up the grid sizes in multidimensional heterogeneous problems The methodology is also applicable to other subsurface reactive flow modeling problems with fast chemical reactions and sharp fronts Displacement front stability is a major concern in the design of all the enhanced oil recovery processes Historically premature combustion front break through has been an issue for field operations of in situ combustion In this work we perform detailed analysis based on both analytical methods and numerical simulation We identify the different flow regimes and several driving fronts in a typical 1D ISC process For the ISC process in a conventional mobile heavy oil reservoir we identify the most critical front as the front of steam plateau driving the cold oil bank We discuss the five main contributors for this front stability instability viscous force condensation heat conduction coke plugging and gravity Detailed numerical tests are performed to test and rank the relative importance of all these different effects

The Top Books of the Year In Situ Combustion Handbook The year 2023 has witnessed a remarkable surge in literary brilliance, with numerous captivating novels captivating the hearts of readers worldwide. Lets delve into the realm of top-selling books, exploring the captivating narratives that have enthralled audiences this year. The Must-Read : Colleen Hoover's "It Ends with Us" This heartfelt tale of love, loss, and resilience has captivated readers with its raw and emotional exploration of domestic abuse. Hoover skillfully weaves a story of hope and healing, reminding us that even in the darkest of times, the human spirit can triumph. In Situ Combustion Handbook : Taylor Jenkins Reids "The Seven Husbands of Evelyn Hugo" This intriguing historical fiction novel unravels the life of Evelyn Hugo, a Hollywood icon who defies expectations and societal norms to pursue her dreams. Reids absorbing storytelling and compelling characters transport readers to a bygone era, immersing them in a world of glamour, ambition, and self-discovery. Discover the Magic : Delia Owens "Where the Crawdads Sing" This mesmerizing coming-of-age story follows Kya Clark, a young woman who grows up alone in the marshes of North Carolina. Owens spins a tale of resilience, survival, and the transformative power of nature, entrancing readers with its evocative prose and mesmerizing setting. These bestselling novels represent just a fraction of the literary treasures that have emerged in 2023. Whether you seek tales of romance, adventure, or personal growth, the world of literature offers an abundance of captivating stories waiting to be discovered. The novel begins with Richard Papen, a bright but troubled young man, arriving at Hampden College. Richard is immediately drawn to the group of students who call themselves the Classics Club. The club is led by Henry Winter, a brilliant and charismatic young man. Henry is obsessed with Greek mythology and philosophy, and he quickly draws Richard into his world. The other members of the Classics Club are equally as fascinating. Bunny Corcoran is a wealthy and spoiled young man who is always looking for a good time. Charles Tavis is a quiet and reserved young man who is deeply in love with Henry. Camilla Macaulay is a beautiful and intelligent young woman who is drawn to the power and danger of the Classics Club. The students are all deeply in love with Morrow, and they are willing to do anything to please him. Morrow is a complex and mysterious figure, and he seems to be manipulating the students for his own purposes. As the students become more involved with Morrow, they begin to commit increasingly dangerous acts. The Secret History is a exceptional and gripping novel that will keep you speculating until the very end. The novel is a warning tale about the dangers of obsession and the power of evil.

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