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**Dynamic Reservoir
Simulation of the Alwyn
Field using ECLIPSE™**

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Dynamic Reservoir Simulation Of The Alwyn Field Using Eclipse

K. Aziz, Antonín Settari



Dynamic Reservoir Simulation Of The Alwyn Field Using Eclipse:

Reservoir Simulation Study of an Oil Field Ahmed Elshabani,2015 Applied Reservoir Simulation of Farnsworth Field, Texas Kewei Chen,2013 **Reservoir Simulation Study for the South Slattery Field** Linna Wang,2007 A detailed understanding of the reservoir in the successful operation of mature oil fields is so essential that can be used to determine the optimum recovery method However reservoir management and characterization has seldom been carried out by small and medium operators due to lack of reservoir data and technical personnel Babadagli 2005 There are thousands of oil and gas fields in mature basins that haven t had the benefit of more detailed study In this study ECLIPSE is used to simulate the South Slattery Field validated by the history match on primary production Our goal is to build a general reservoir simulation model for the South Slattery Field which can be applied for the further recovery process This study will assist in making decisions on the further recovery scheme and operations Based on a satisfactory history match result it is concluded that the primary drive mechanism is water influx which accounts for 95% and other mechanisms including rock compaction and oil expansion have a 5% contribution Since there is very little gas dissolved in the reservoir fluid the gas drive mechanism can be ignored After more than 40 years production the field oil recovery has reached 30% which implies the reservoir still has plenty of remaining oil in place 10 71MMSTB that would be suitable for some other form of enhanced oil recovery It has been determined that the infill drilling strategy is an effective method that could be taken to enhance oil recovery The field oil recovery could be enhanced from 34% to almost 40% in the next 10 years The preliminary result of the polymer flood for the South Slattery Field also draws a promising conclusion the field oil recovery can be enhanced from 34% to 37% in the next 10 years and the water cut can be greatly reduced within the first several years It is recommended that additional reservoir parameters be collected and a more detailed study be implemented because of the large potential for additional oil recovery indicated by this reservoir study **Reservoir Simulation** Calvin C. Mattax,Robert L. Dalton,1990 Reservoir Simulation written by experienced simulation users was designed to help demystify the what s and whys of designing editing and analyzing reservoir simulations *Petroleum Reservoir Simulation* ,1986 Integrated Reservoir Asset Management John Fanchi,2010-07-19 All too often senior reservoir managers have found that their junior staff lack an adequate understanding of reservoir management techniques and best practices needed to optimize the development of oil and gas fields Written by an expert professional educator Integrated Reservoir Asset Management introduces the reader to the processes and modeling paradigms needed to develop the skills to increase reservoir output and profitability and decrease guesswork One of the only references to recognize the technical diversity of modern reservoir management teams Fanchi seamlessly brings together concepts and terminology creating an interdisciplinary approach for solving everyday problems The book starts with an overview of reservoir management fluids geological principles used to characterization and two key reservoir parameters porosity and permeability This is followed by an uncomplicated review of multi phase fluid flow equations an overview of the

reservoir flow modeling process and fluid displacement concepts All exercises and case studies are based on the authors 30 years of experience and appear at the conclusion of each chapter with hints in addition of full solutions In addition the book will be accompanied by a website featuring supplementary case studies and modeling exercises which is supported by an author generated computer program Straightforward methods for characterizing subsurface environments Effortlessly gain and understanding of rock fluid interaction relationships An uncomplicated overview of both engineering and scientific processes Exercises at the end of each chapter to demonstrate correct application Modeling tools and additional exercise are included on a companion website Advances in Reservoir Simulation Haifeng Zhao, Yang Xia, 2025-05-07 This synthesis highlights innovations addressing reservoir heterogeneity and fracture dynamics through integrated numerical modeling data assimilation and multi physics coupling Ensemble based algorithms e.g. ES-MDA enhance history matching by assimilating 4D seismic and production data reducing uncertainties by 15-20% Hydro-mechanical models optimized with true triaxial experiments guide Discrete Fracture Network (DFN) driven hydraulic fracturing boosting shale gas productivity by 40% Proxy models like INSIM-FT and Physics Informed Neural Networks (PINNs) enable rapid simulation cutting computational time from weeks to hours while maintaining 85% accuracy Machine learning XGBoost achieves 92% permeability prediction in carbonates while dynamic heterogeneity analysis reveals fracture induced permeability contrasts exceeding 103 Geomechanical frameworks quantify risks in salt cavern storage 0-12% annual creep strain and fractured reservoirs extending operational lifespans by 20% Field applications demonstrate 8% recovery gains in carbonate fields via 4D seismic integration and 60% leakage risk reduction through multi physics cement design Emerging trends fuse data physics models 30-50% efficiency gains and cross scale simulations while challenges persist in proppant transport modeling and sparse 4D data Future directions prioritize quantum computing for fracture networks IoT enabled digital twins and adapting reservoir engineering to carbon sequestration positioning the field as pivotal for sustainable energy transition

Reservoir Engineering Sylvester Okotie, Bibobra Ikporo, 2018-12-03 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 Reservoir Simulation Modeling of a Natural Gas Field for Reservoir Evaluation Sedef Yılmaz, Orta Doğu Teknik Üniversitesi (Ankara, Turkey). Department of

Petroleum and Natural Gas Engineering,2002 *ECLIPSE Blackoil Reservoir Simulation* ,2010 **Petroleum Reservoir Simulation** K. Aziz, Antonín Settari,1979 The book contains a relatively complete treatment of finite difference models of black oil type reservoirs **Integrated Reservoir Studies** Luca Cosentino,2001 Annotation The goal of this book is to highlight the difference between an integrated reservoir study and a traditional one The benefits of integrated studies are outlined and consider its implications for everyday working conditions Technical and professional challenges are discussed and necessary changes are detailed with emphasis on the role of the project leader Chapters consider elements like the integrated database the integrated geological model rock properties hydrocarbon in place determination reservoir engineering numerical reservoir simulation and planning for a study Cosentino is a reservoir engineer and project manager for a private firm c Book News Inc **Use of Streamline Simulation in Large Scale Reservoir-geomechanical Modeling of Reservoirs** Behrooz Koochmarch Hosseini,2015 The increasing demand for hydrocarbons and decreasing reserves have created the necessity to produce oil and gas more efficiently and economically Increasingly oil and gas companies are focusing on unconventional hydrocarbons oil sands shales and CBM For this class of reservoir materials the geomechanical response of the reservoir can play an important role in the recovery process For naturally fractured stress sensitive reservoirs or thermal recovery processes geomechanical processes play an even greater role in efficient economic recovery For simulations of these processes most research efforts have been focused on reservoir geomechanical simulations using conventional reservoir simulators coupled to geomechanical codes While coupled reservoir geomechanics modeling has been recently widely studied in the literature there is no applicable methodology implemented or proposed to mitigate the challenging computational cost involved with the inclusion of geomechanics in large multimillion cell reservoirs Past studies so far have focused on different coupling schemes but not on the efficient and robust simulation workflows This research was conducted with the aim of development and application of various different strategies to include geomechanics into reservoir simulation workflows in large scale reservoirs and in a timely fashion process The research was performed to allow the future simulators to perform high resolution reservoir geomechanical simulations in a large scale near field and far field with long simulation time windows and lowest computational cost Initially analytical proxies were developed and recommending for implementation in lieu of complex reservoir simulations The analytical model was for prediction of heavy oil geomechanical responses everywhere in the reservoir The model adopted the use of the mathematical domain decomposition technique and a novel temperature front tracking developed in the very early stage of the research As opposed to classical analytical models the proxy predicted reservoir flow and mechanical behavior on a synthetic case geometry with real hydraulic data everywhere in the reservoir and in dynamic and transient flow regimes Subsequent research was aimed at reservoir geomechanics coupled model order reduction by use of a numerical proxy The proxy took advantage of streamline linear space behavior and power in decomposition of the reservoir domain into sub systems delineation drainage areas The

combination of localization and linearization allowed predicting both mechanical and fluid flow responses of the reservoir with only solving the pressure equation in Cartesian underlying 3D grids and the solution of saturation transport equation along only one streamline Following this a streamline based reservoir geomechanics coupling was proposed and was implemented within a Fortran C based platform The new developed technique was compared in terms of computational cost and results accuracy with the conventional hydromechanical coupling strategy that was developed on a C based platform by use of collocated FV FEM discretization scheme One of the final stages of the research explored different streamline based reservoir geomechanics coupling strategies for full field reservoir simulations Various coupling strategies including sequential coupling schemes and a semi fully coupling scheme to embed geomechanics into streamline simulation workflow was developed and performed Numerical software with advanced GUI was coded on QT programming language C based developed to couple mechanical simulator to streamline simulation engine While streamline simulations were the center of the research the last stage of research was conducted on numerical and physical stability convergence and material balance errors of SL based reservoir geomechanics class of couplings The results provided a solid foundation for proper selection of time steps in SL based coupling to ensure a numerically stable and physically robust hydromechanical simulation As a result we showed that use of streamline simulation in both proxy forms and simulator forms have significant added value in full field reservoir geomechanics simulations

Reservoir Simulation - Problems and Solutions Turgay Ertekin, Qian Sun, Jian Zhang, 2020-09-14 Reservoir simulation has been in practice for more than 50 years but it has recently gained significant momentum because of its wider application to the increasingly complex reservoir systems of today Reservoir Simulation Problems and Solutions provides petroleum engineers with extensive practice in the art of problem solving strengthening their critical thinking solution strategies and preparing them for the unique problems they will encounter in this dynamic field Built on the fundamental concepts and solutions of the original exercises found in Basic Applied Reservoir Simulation Turgay Ertekin Jamal H Abou Kassem and Gregory R King this new book provides an additional 180 exercises and solutions that fully illustrate the intricacies of reservoir simulation methodology Turgay Ertekin is Professor Emeritus of Petroleum and Natural Gas Engineering at the Pennsylvania State University where he has been a member of the faculty for more than 40 years Qian Sun is a research engineer at New Mexico Institute of Mining and Technology His research focuses mainly on numerical reservoir simulation and artificial intelligence applications in reservoir Engineering Jian Zhang is a PhD graduate at Penn State His research focuses on rate and pressure transient analysis numerical reservoir simulation artificial neural networks and neuro simulation

Subsurface Flow Management and Real-time Production Optimization Using Model Predictive Control Thomas Jai Lopez, 2012 One of the key challenges in the Oil and 2 efficient utilization of the deluge of data streams Recently history matching and optimization were brought together in the oil industry into an integrated and more structured approach called optimal closed loop reservoir management Closed loop control algorithms

have already been applied extensively in other engineering fields including aerospace mechanical electrical and chemical engineering However their applications to porous media flow such as in the current practices and improvements in oil and gas recovery in aquifer management in bio landfill optimization and in CO₂ sequestration have been minimal due to the large scale nature of existing problems that generate complex models for controller design and real time implementation Their applicability to a realistic field is also an open topic because of the large scale nature of existing problems that generate complex models for controller design and real time implementation hindering its applicability Basically three sources of high dimensionality can be identified from the underlying reservoir models size of parameter space size of state space and the number of scenarios or realizations necessary to account for uncertainty In this paper we will address type problem of high dimensionality by focusing on the mitigation of the size of the state space models by means of model order reduction techniques in a systems framework We will show how one can obtain accurate reduced order models which are amenable to fast implementations in the closed loop framework The research will focus on System Identification System ID Jansen 2009 and Model Predictive Control MPC Gildin 2008 to serve this purpose A mathematical treatment of System ID and MPC as applied to reservoir simulation will be presented Linear MPC would be studied on two specific reservoir models after generating low order reservoir models using System ID methods All the comparisons are provided from a set of realistic simulations using the commercial reservoir simulator called Eclipse With the improvements in oil recovery and reductions in water production effectively for both the cases that were considered we could reinforce our stance in proposing the implementation of MPC and System ID towards the ultimate goal of real time production optimization

A Dynamic Programming Model for Reservoir Simulation Richard Michael Males, 1964 *Integration of Dynamic Data Into Reservoir Description Using Streamline Approaches* Zhong He, 2003

Integration of dynamic data is critical for reliable reservoir description and has been an outstanding challenge for the petroleum industry This work develops practical dynamic data integration techniques using streamline approaches to condition static geological models to various kinds of dynamic data including two phase production history interference pressure observations and primary production data The proposed techniques are computationally efficient and robust and thus well suited for large scale field applications We can account for realistic field conditions such as gravity and changing field conditions arising from infill drilling pattern conversion and recompletion etc during the integration of two phase production data Our approach is fast and exhibits rapid convergence even when the initial model is far from the solution The power and practical applicability of the proposed techniques are demonstrated with a variety of field examples To integrate two phase production data a travel time inversion analogous to seismic inversion is adopted We extend the method via a generalized travel time inversion to ensure matching of the entire production response rather than just a single time point while retaining most of the quasi linear property of travel time inversion To integrate the interference pressure data we propose an alternating procedure of travel time inversion and peak

amplitude inversion or pressure inversion to improve the overall matching of the pressure response A key component of the proposed techniques is the efficient computation of the sensitivities of dynamic responses with respect to reservoir parameters These sensitivities are calculated analytically using a single forward simulation Thus our methods can be orders of magnitude faster than finite difference based numerical approaches that require multiple forward simulations Streamline approach has also been extended to identify reservoir compartmentalization and flow barriers using primary production data in conjunction with decline type curve analysis The streamline diffusive time of flight provides an effective way to calculate the drainage volume in 3D heterogeneous reservoirs The flow barriers and reservoir compartmentalization are inferred based on the matching of drainage volumes from streamline based calculation and decline type curve analysis The proposed approach is well suited for application in the early stages of field development with limited well data and has been illustrated using a field example from the Gulf of Mexico

Reservoir Simulation and Evaluation of the Azal Field in Yemen

Sammy Sallam,1996 *Optimal Reservoir Management and Well Placement Under Geologic Uncertainty* Satyajit Vijay Taware,2012 Reservoir management sometimes referred to as asset management in the context of petroleum reservoirs has become recognized as an important facet of petroleum reservoir development and production operations In the first stage of planning field development the simulation model is calibrated to dynamic data history matching One of the aims of the research is to extend the streamline based generalized travel time inversion method for full field models with multimillion cells through the use of grid coarsening This makes the streamline based inversion suitable for high resolution simulation models with decades long production history and numerous wells by significantly reducing the computational effort In addition a novel workflow is proposed to integrate well bottom hole pressure data during model calibration and the approach is illustrated via application to the CO₂ sequestration In the second stage field development strategies are optimized The strategies are primarily focused on rate optimization followed by infill well drilling A method is proposed to modify the streamline based rate optimization approach which previously focused on maximizing sweep efficiency by equalizing arrival time of the waterfront to producers to account for accelerated production for improving the net present value NPV Optimum compromise between maximizing sweep efficiency and maximizing NPV can be selected based on a trade off curve The proposed method is demonstrated on field scale application considering geological uncertainty Finally a novel method for well placement optimization is proposed that relies on streamlines and time of flight to first locate the potential regions of poorly swept and drained oil Specifically the proposed approach utilizes a dynamic measure based on the total streamline time of flight combined with static and dynamic parameters to identify Sweet Spots for infill drilling The Sweet Spots can be either used directly as potential well placement locations or as starting points during application of a formal optimization technique The main advantage of the proposed method is its computational efficiency in calculating dynamic measure map The complete workflow was also demonstrated on a multimillion cell reservoir model of a mature carbonate field with notable

success The infill locations based on dynamic measure map have been verified by subsequent drilling *The Practice of Reservoir Engineering* L.P. Dake,1994-10-25 The 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 The book is a simple statement of how to do the job and is particularly suitable for reservoir production engineers and is illustrated with 27 examples and exercises based mainly on actual field developments It will also be useful for those associated with the subject of hydrocarbon recovery Geoscientists petrophysicists and those involved in the management of oil and gas fields will also find it particularly relevant The new <http://www.elsevier.nl/locate/ISBN0444506705> Practice of Reservoir Engineering Revised Edition will be available soon

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