



Darya Musharova

Enhanced Oil Recovery

Alkaline-Surfactant-Polymer (ASP) Injection



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Enhanced Oil Recovery Alkaline Surfactant Polymer Asp Injection

Harry L. Chang



Enhanced Oil Recovery Alkaline Surfactant Polymer Asp Injection:

Enhanced Oil Recovery Using the Alkaline-Surfactant-Polymer (ASP) Darya Musharova, 2010 Alkaline Surfactant Polymer ASP process is a tertiary method of oil recovery that has promising results for future development. It has already been implemented in different areas of the United States such as Wyoming, West Texas, also in Canada and China. The success of this process depends on the proper combination of alkali, surfactant, and polymer and their compatibility with a reservoir. Therefore, the main objective of the proposed research is to identify chemical interactions between ASP chemicals and reservoir fluids and rock. I hypothesize that testing different alkalis, polymers, and surfactants will result not only in getting different profiles of rheological properties of ASP system but also analyzing compatibility degrees of chemicals with formation fluids and rock properties such as rock wettability, oil mobility, and sweep efficiency, which will be affected by the designed ASP system. In this paper, the results of chemical interactions between ASP chemicals and reservoir fluids are presented, and the phenomena occurred are described. The experiments conducted are considered to be unique for a selected oil sample with certain values of API gravity, viscosity, and chemical composition. Lab experiments conducted show the effect of polymer, alkali, and surfactant addition to an aqueous solution. Polymers were tested with alkali as a function of shear rate for the purposes of the buildup water viscosity in EOR. Different types of alkali at different concentrations are tested for alkali optimal concentration determination. The effect of adding surfactant at different concentrations has been tested, and acidic number of tested oil sample was identified. Polymers tested with alkali result in non-Newtonian behavior of the testing solution and display a shear thinning beneficial effect for the buildup water viscosity in EOR. The results show that acidic number of crude oil is a critical parameter that affects the optimal concentration for mixing chemicals and interfacial tension profile. The alkali and surfactant added to crude oil result in a significant reduction of interfacial tension and lead to increase of oil mobilization, which is a desired output after ASP injection in EOR process.

Surfactants for Enhanced Oil Recovery Applications Muhammad Sagir, Muhammad Mushtaq, M. Suleman Tahir, Muhammad Bilal Tahir, Abdul Ravoof Shaik, 2020-01-29 This book provides a concise treatise on the use of surfactants in enhanced oil recovery (EOR) including information on key types of surfactants and their respective applications in the wider petroleum industry. The authors discuss carbon dioxide EOR, alkaline surfactant polymer flooding strategies, and the use of surfactants as a means of reducing interfacial tension while also paying special attention to the challenges involved in using surfactants for enhanced oil recovery, such as the difficult issue of surfactant adsorption on reservoir rock. All chapters highlight and are based on the authors' own laboratory scale case studies. Given its content, the book offers a valuable asset for graduate students of petroleum and chemical engineering as well as researchers in the field of chemical enhanced oil recovery. It will also be of interest to professionals involved in enhanced industrial oil recovery.

Alkali-surfactant-polymer (ASP) Flooding - Potential and Simulation for Alaskan North Slope Reservoir Tejas S. Ghorpade, 2014 Enhanced oil recovery (EOR) is essential to recover

bypassed oil and improve recovery factor Alkaline surfactant polymer ASP flooding is a chemical EOR method that can be used to recover heavy oil containing organic acids from sandstone formations It involves injection of alkali to generate in situ surfactants improve sweep efficiency and reduce interfacial tension IFT between displacing and displaced phase and injection of a polymer to improve mobility ratio typically it is followed by extended waterflooding The concentration of alkali surfactant and polymer used in the process depends on oil type salinity of solution pressure temperature of the reservoir and injection water quality This project evaluates the effect of waterflooding on recovery calculates the recovery factor for ASP flooding and optimum concentration of alkali surfactant and polymer for an Alaskan reservoir Also the effects of waterflooding and improvement with ASP flooding are evaluated and compared Studies of these effects on oil recovery were analyzed with a Computer Modeling Group CMG generated model for the Alaskan North Slope ANS reservoir Based on a literature review and screening criteria the Western North Slope WNS 1 reservoir was selected for the ASP process A CMG WinProp simulator was used to create a fluid model and regression was carried out with the help of actual field data The CMG WinProp model was prepared with a 5 spot well injection pattern using the CMG STARS simulator Simulation runs conducted for primary and waterflooding processes showed that the recovery factor increased from 3% due to primary recovery to 45% due to waterflooding at 500 psi drawdown for 60 years with a constant producing gas oil ratio GOR ASP flooding was conducted to increase recovery further and optimum ASP parameters were calculated for maximum recovery Also effect of alkali surfactant and polymer on recovery was observed and compared with ASP flood If proved effective the use of ASP chemicals for ANS reservoirs to increase the recovery factor could replace current miscible gas injection with chemical EOR It will help to develop chemical flooding processes for heavier crude oil produced in harsh environments and create new horizons for chemical industries in Alaska *Chemical Enhanced Oil Recovery (cEOR)* Laura

Romero-Zerón, 2016-10-19 Commercial application of chemical enhanced oil recovery cEOR processes is expected to grow significantly over the next decade Thus Chemical Enhanced Oil Recovery cEOR A Practical Overview offers key knowledge and understanding of cEOR processes using an evidence based approach intended for a broad audience ranging from field operators researchers to reservoir engineers dealing with the development and planning of cEOR field applications This book is structured into three sections the first section surveys overall EOR processes The second section focuses on cEOR processes while the final section describes the electrorheology technology These sections are presented using a practical and realistic approach tailored for readers looking to improve their knowledge and understanding of cEOR processes in a nutshell

Microbial Enhanced Oil Recovery Lalit Pandey, Pankaj Tiwari, 2021-10-21 This book presents the fundamentals of the reservoir and interfacial engineering The book systematically starts with the basics of primary secondary and tertiary enhanced oil recovery and emphasizes on the theory of microbial enhanced oil recovery MEOR and its potential toward recovery of oil in place Different approaches of MEOR such as in situ ex situ and integration of chemical and microbial

enhanced oil recovery EOR are discussed in detail This book highlights the link between the effectiveness of MEOR and the local reservoir conditions crude oil characteristics and indigenous microbial community The latest implementations of MEOR across the globe are highlighted as case studies to outline the potential as well as the scope of MEOR Given the topics covered this book will be useful for professionals and researchers working in the areas of petroleum science and engineering chemical engineering biotechnology bioengineering and other related fields

Fundamentals of Enhanced Oil and Gas Recovery from Conventional and Unconventional Reservoirs Alireza Bahadori, 2018-08-18 Fundamentals of Enhanced Oil and Gas Recovery from Conventional and Unconventional Reservoirs delivers the proper foundation on all types of currently utilized and upcoming enhanced oil recovery including methods used in emerging unconventional reservoirs Going beyond traditional secondary methods this reference includes advanced water based EOR methods which are becoming more popular due to CO₂ injection methods used in EOR and methods specific to target shale oil and gas activity Rounding out with a chapter devoted to optimizing the application and economy of EOR methods the book brings reservoir and petroleum engineers up to speed on the latest studies to apply Enhanced oil recovery continues to grow in technology and with ongoing unconventional reservoir activity underway enhanced oil recovery methods of many kinds will continue to gain in studies and scientific advancements Reservoir engineers currently have multiple outlets to gain knowledge and are in need of one product go to reference Explains enhanced oil recovery methods focusing specifically on those used for unconventional reservoirs Includes real world case studies and examples to further illustrate points Creates a practical and theoretical foundation with multiple contributors from various backgrounds Includes a full range of the latest and future methods for enhanced oil recovery including chemical waterflooding CO₂ injection and thermal

Chemical Nanofluids in Enhanced Oil Recovery Rahul Saha, Pankaj Tiwari, Ramgopal V.S. Uppaluri, 2021-09-14 Sustainable world economy requires a steady supply of crude oil without any production constraints Thus the ever increasing energy demand of the entire world can be mostly met through the enhanced production from crude oil from existing reservoirs With the fact that newer reservoirs with large quantities of crude oil could not be explored at a faster pace it will be inevitable to produce the crude oil from matured reservoirs at an affordable cost Among alternate technologies the chemical enhanced oil recovery EOR technique has promising potential to recover residual oil from matured reservoirs being subjected to primary and secondary water flooding operations Due to pertinent complex phenomena that often have a combinatorial role and influence the implementation of chemical EOR schemes such as alkali surfactant polymer flooding and their combinations necessitates upon a fundamental understanding of the potential mechanisms and their influences upon one another and desired response variables Addressing these issues the book attempts to provide useful screening criteria guidelines and rules of thumb for the identification of process parametric sets including reservoir characteristics and response characteristics such as IFT adsorption etc that favor alternate chemical EOR systems Finally the book highlights the relevance of nanofluid nanoparticle for conventional and

unconventional reservoirs and serves as a needful resource to understand the emerging oil recovery technology Overall the volume will be of greater relevance for practicing engineers and consultants that wish to accelerate on field applications of chemical and nano fluid EOR systems Further to those budding engineers that wish to improvise upon their technical know how the book will serve as a much needed repository *Enhanced Oil Recovery Field Case Studies* Harry L. Chang,2013-04-10 This chapter covers the alkaline surfactant polymer ASP process and field results Background information describing the history of alkaline alkaline surfactant alkaline polymer and ASP flooding processes is given followed by a review of the requirement of high acid content in the crude oil for these processes to be effective Proceedings of the International Field Exploration and Development Conference 2017 Zhan Qu,Jia'en Lin,2018-07-11 This book presents selected papers from the 7th International Field Exploration and Development Conference IFEDC 2017 which focus on upstream technologies used in oil gas development the principles of the process and various design technologies The conference not only provides a platform for exchanging lessons learned but also promotes the development of scientific research in oil gas exploration and production The book will benefit a broad readership including industry experts researchers educators senior engineers and managers *Chemical Methods* Abdolhossein Hemmati-Sarapardeh,Mahin Schaffie,Mohammad Ranjbar,Mingzhe Dong,Zhaomin Li,2021-11-30 *Chemical Methods* a new release in the Enhanced Oil Recovery series helps engineers focus on the latest developments in one fast growing area Different techniques are described in addition to the latest technologies in data mining and hybrid processes Beginning with an introduction to chemical concepts and polymer flooding the book then focuses on more complex content guiding readers into newer topics involving smart water injection and ionic liquids for EOR Supported field case studies illustrate a bridge between research and practical application thus making the book useful for academics and practicing engineers This series delivers a multi volume approach that addresses the latest research on various types of EOR Supported by a full spectrum of contributors this book gives petroleum engineers and researchers the latest developments and field applications to drive innovation for the future of energy Presents the latest research and practical applications specific to chemical enhanced oil recovery methods Helps users understand new research on available technology including chemical flooding specific to unconventional reservoirs and hybrid chemical options Includes additional methods such as data mining applications and economic and environmental considerations **The Journal of Canadian Petroleum Technology** ,2010 **Experimental Studies on Polymer and Alkaline-Surfactant-Polymer Flooding to Improve Heavy Oil Recovery** Razieh Solatpour,2015 *Journal of Nano Research Vol. 26* Andreas Öchsner,Irina V. Belova,Graeme E. Murch,2013-12-06 This periodical edition includes peer reviewed scientific and engineering papers on all aspects of research in the area of nanoscience and nanotechnologies and wide practical application of the achieved results *Kirk-Othmer Encyclopedia of Chemical Technology, Volume 18* Kirk-Othmer,2006-01-30 The fifth edition of the Kirk Othmer Encyclopedia of Chemical Technology

builds upon the solid foundation of the previous editions which have proven to be a mainstay for chemists biochemists and engineers at academic industrial and government institutions since publication of the first edition in 1949 The new edition includes necessary adjustments and modernisation of the content to reflect changes and developments in chemical technology Presenting a wide scope of articles on chemical substances properties manufacturing and uses on industrial processes unit operations in chemical engineering and on fundamentals and scientific subjects related to the field The Encyclopedia describes established technology along with cutting edge topics of interest in the wide field of chemical technology whilst uniquely providing the necessary perspective and insight into pertinent aspects rather than merely presenting information Set began publication in January 2004 Over 1 000 articles More than 600 new or updated articles 27 volumes

Enhanced Oil Recovery Field Case Studies James J. Sheng, 2013-04-10 The fundamentals of individual chemical process alkaline surfactant and polymer and their two component combinations have been discussed in preceding chapters This chapter only briefly discusses the synergy and practical issues in the three component combination Alkaline surfactant polymer process The practical issues discussed are produced emulsion scaling and chromatographic separation Overall performance and amount of chemicals used in field projects are summarized Most of the Chinese field cases were presented in Sheng 2011 In this chapter we only present a few field cases outside China These projects are the Lawrence field in Illinois the Cambridge Minnelusa field the West Kiehl field and Tanner field in Wyoming and Lagomar LVA 6 9 21 area in Venezuela

SPE Advanced Technology Series ,1993 **Hart's E&P.** ,2009-05 *Proceedings of the Annual Convention - Indonesian Petroleum Association* Indonesian Petroleum Association, 2003 **Journal of Petroleum Technology** ,2008 Improved Oil Recovery Chengzhi Yang, 1998

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