تزریق غیر امتزاجی بمنظور افزایش برداشت از یکی از مخازن ترکدار ایران: یک مطالعه موردی با نگاه به پارامترهای با عدم قطعیت

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چکیده

مخازن ترکدار متشکل از ماتریس بلوک ها و شبکه شکاف ها ممکن است تحت ترکیبی از مکانیزم‌های تولیدی مانند تخلیه ثقلی و آشام باشند. این مسئله در برخی موارد می تواند باعث بهبود قابل توجه بازیافت نفت گردد. بنابراین بازیافت نهایی نفت در چنین سیستم های پیچیده ای وابسته به مشخصه های مخزن تحت مطالعه می باشد. این در حالی است که پارامترهای مخزنی زیادی با عدم قطعیت وجود دارد که نتایج شبیه سازی را سوال برانگیز می نمایند. در این کار تحقیقاتی ما شبیه ساز تخلخل دو گانه معمول برای بررسی میزان بازیافت نفت از یکی از مخازن ترکدار تحت تخلیه طبیعی با تاکید بر پارامتر های با عدم قطعیت مانند فشار مویینگی شکاف ها، و ارتفاع بلوک ماتریس ها را بکار می گیریم. سپس سناریوی تزریق گاز غیر امتزاجی در بازه زمانی مطالعه مد نظر اجرا می شود. مشاهده می شود که خواص فیزیکی شکاف که اغلب با عدم قطعیت همراه است بطور قابل توجهی بر بازیافت نفت اثر می گذارد. بعلاوه سناریوی تزریق گاز غیر امتزاجی در بازه زمانی مورد مطالعه منجر به افزایش برداشت تا ۵,۲٪ بسته به ارتفاع ماتریس ها گردید. بنابراین بعنوان نتیجه مخازن ترکدار با اندازه بزرگ ارتفاع ماتریس ها می تواند کاندیدای مناسبی برای اجرای پروژه تزریق گاز غیر امتزاجی باشند.

کلمات کلیدی: مخازن ترکدار، فشار مویینگی، آشام مجدد، تزریق گاز

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Compositional Modelling of Gas Injection into Oil Reservoirs

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Abstract

In this paper, a simplified formulation for compositional modeling of gas injection process into oil reservoirs is presented. Compositional models are used when interphase mass transfer depends on phase composition as well as pressure. A procedure for solving compositional model equations is completely described. Peng Robinson Equation of State is used for preparing a compositional thermodynamic program for equilibrium calculation, property estimation and pseudo component determination. The validity of this program was tested against experimental data such as swelling data and saturation pressure. Also the results of this model is compared with GEM software output. It is another purpose of this paper, to prepare an experimental apparatus for displacement of oil by injecting gas in a porous media. In each experiment, oil recoveries as a function of injected pore volume of gas were measured. Application of the developed simulator to simulate the results of oil recovery from slim tube experiments is presented.

Keywords: Model, Compositional Simulator, Equation of State, Slim Tube, Oil Recovery

New Minimum Miscibility Pressure Correlation for Hydrocarbon Miscible Injections

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Abstract

This paper presents a new empirically derived correlation for estimating the minimum miscibility pressure required for multicontact miscible (MCM) displacement of reservoir petroleum by hydrocarbon gas flooding. Only few empirical correlations exist for determining the MMP.These correlations are often used to estimate the MMP without considering the composition of the injected gas. On the other hand these correlations are based on a limited set of experimental data which are not quite applicable. In addition, in such correlations the complex condensing/vaporizing displacement process is not regarded. In this study, however, the derived correlation investigates the influence of the vaporizing/condensing drive mechanism and oil and gas composition on gas miscibility pressure.

By comparing the calculated MMPs from the improved correlation data with currently used correlations and experimentally measured data, it was found that the novel correlation is significantly more accurate than other correlations.

Keywords: Correlation, MMP, Gas Injection, Enhanced Oil Recovery, Gas Composition, Simulation

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Phase Behaviour Study of Flue Gas Injection into an Oil Reservoir

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Abstract

In this work, injection of CO_2 as the main constituent of flue gas into an oil reservoir is studied. The Peng Robinson (PR) equation of states (EOS) was used to investigate phase behavior of flue gas/crude oil system. After tuning the (EOS), effect of impurities on the minimum miscibility pressure (MMP), saturation pressure, and swelling factor of reservoir oil was investigated. Results show that the PREOS can predict the saturation pressure with good accuracy. Also, such components as N_2, CO, and NO increase saturation pressure and reduce oil swelling factor, while the sulfur oxides and NO_2 have a reverse effect. The maximum allowable amount of each component in the injecting flue gas into reservoir is determined.

Keywords: Gas injection, Flue Gas, Equation of States, Swelling Factor, Miscibility

Comparison and Investigation of Recovery Factor From Simulation of Miscible and Immiscible Gas Injection in One of the Fractured Oil Reservoirs in Iran

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Abstract

A large proportion of the world proven oil has been found in reservoirs rocks that are naturally fractured. Understanding of matrix-fractured interactions, display a unique challenge for enhanced oil recovery. The S Reservoir is a dual porosity fractured reservoir having active aquifer. Because of heterogeneous production zones, total oil recovery was only about 8.04 percent by a total production of 240 MMSTB up to 2008. Production optimization and final recovery increment is the main idea of gas injection in this reservoir. According to Eakin et al.'s empirical correlation, minimum miscibility pressure of 4104 pisa is possible. This pressure is below the average reservoir pressure at 2008. In this study, different injection patterns were investigated. The best injection pattern was selected according to the recovery coefficient. Miscible and immiscible injection scenarios at various rates were compared with natural depletion. The results show that miscible gas injection in this reservoir has more recovery coefficient in comparison with other alternatives.

Keywords: Miscible and Immiscible Gas Injection, Simulation, Fractured Reservoir, Recovery Factor

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تاثیر حل شدن گازکربنیک و خروج آسفالتین بر رفتار فازی نفت و میزان بازیافت نفت

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چکیده

تزریق گازکربنیک یکی از رایج ترین روش های ازدیاد برداشت از مخازن نفت می باشد اما همزمان می تواند باعث تغییر خواص سیالات مخزن شود و موجب بروز پاره ای مشکلات مانند خروج آسفالتین از فاز مایع (تعرق) و درنتیجه رسوب آن شود که خود منجر به کاهش تزریق پذیری و توان تولید چاه ها و نیز بسته شدن دهانه چاه و تجهیزات تولید شود.

هدف اصلی این مقاله شبیه سازی PVT نفت و تعرق آسفالتین در یک شبیه ساز ترکیبی و با استفاده از داده های آزمایشگاهی منتشر شده توسط اسریواستاوا (۱۹۹۵) می باشد. فرآیند تزریق و اثر همزمان حل شدن گازکربنیک و تعرق آسفالتین روی میزان بازیافت ، چگالی و گرانروی نفت بررسی شده است.

نتایج نشان می دهند که بیشترین میزان تعرق در نزدیکی فشار وغلظت اشباع سیال و گاز کربنیک اتفاق می افتد. همچنین نشان داده شده است که خروج آسفالتین ازنفت و حل شدن گازکربنیک به صورت موازی باعث افزایش چگالی نفت می شوند این در حالی است که تاثیری مخالف هم روی گرانروی دارند به این معنی که خروج آسفالتین ازنفت باعث افزایش گرانروی و حل شدن گازکربنیک باعث کاهش آن می شود. تعرق آسفالتین می تواند باعث ارتقای کیفیت نفت شود که این مسئله می تواند به نفع ازدیاد برداشت باشد و یا می تواند باعث افزایش نرخ بسته شدن گلوگاه ها در محیط متخلخل شده و به کاهش نفوذپذیری بیانجامد؛ دو پدیده متضاد که برای سیالات و شرایط مختلف می تواند برآیند متفاوتی داشته باشد.

کلمات کلیدی: تزریق امتزاجی CO_2، رسوب آسفالتین

Screening of Iranian Oil Reservoirs for CO_2 Miscible Injection

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Abstract

The use of CO_2 for enhanced oil recovery of the Iranian oil reservoirs offers a unique opportunity to boost incremental oil recovery and reducing emissions of greenhouse gas through geological sequestration.
In this paper, oil fields were screened and ranked for CO_2-EOR suitability using new rapid and parametric method which can be applied to a large number of reservoirs with considering the technical feasibility of the EOR process and utilized essential reservoir properties via a developed program.
By using this methodology, a systematic screening and ranking of all possible Iranian oil reservoirs was carried out. Evaluation and prediction of the efficiency of CO_2 flooding technique were performed for candidate reservoirs by using an analytical method. In addition, a commercial stream-line type model was used to compare the results of this screening which clearly proves the pervious outcomes. Finally, best candidates were chosen by considering suitable distance from CO_2 sources.

Keywords: Reservoir Screening, Technical Ranking, Reservoir Properties, Oil Recovery Prediction, CO_2 Miscible Injection, Analytical Model, Parametric Method, X-Y plot

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Experimental Study of Solvent Injection to Heavy Oil in Homogeneous and Fractured Five-Spot Porous Media Using Glass Micromodel

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Abstract

In this work glass micromodel which is initially saturated with the heavy oil has been used to investigate the effect of fracture geometrical properties as well as different injection scenarios of hydrocarbon solvents such as Hexane, Decane and mixed solvent, in fractured and non-fractured quarter five-spot micromodels. The effect of different parameters such as solvent injection rate, solvent type, pore geometry, fracture orientation, fracture discontinuity, fracture spacing, fracture overlap and number of fracture, on oil recovery factor have been investigated. In addition, different injection schemes, water alternating solvent, co-injection of water and solvent, and solvent-soak were designed and performed on glass micromodels. The results show that when the injection rate increased the oil recovery decreased. While, by increasing the viscosity of solvent the oil recovery factor increased. In addition, fro square pore shape the oil recovery is greater than the case that the pore shape is diamond. The oil recovery factor for the pattern with throat orientation angle of 30 degree is greater than the cases 90 and 45 degrees. The results confirmed that the oil recovery for the fracture orientation angle equal to 45 degree in greater than the fracture which is in direction of flow. Also, it has been observed that the discontinuity and overlap of fractures and increasing of fracture spacing, decreases the oil recovery. While the fractures distribution increases the oil recovery. The results confirmed that the ultimate oil recovery of WAS scheme is higher in comparison with the SWAS, and the efficiency of solvent-soak goes further both.

Keywords: Heavy Oil, Five-Spot Model, Micromodel, Fractured Porous Media, Solvent