

CRITICAL REVIEW ON THE USE OF NATURAL SURFACTANTS
IN ENHANCED OIL RECOVERY

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CRITICAL REVIEW ON THE USE OF NATURAL SURFACTANTS IN ENHANCED
OIL RECOVERY

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ABSTRACT

The enormous energy demand, wide requirement for progressively crude oil production and the low-productivity of the regular strategies are the reasons of expanding interests to Enhanced Oil Recovery (EOR) techniques for recuperating more oil from the current reservoirs. Elective energy sources have not yet introduced reasonable to satisfy the energy need of the world; in this way crude oil will play a basic job in the energy utilization later on. Considering the way that the effectively recoverable oil is running out and much oil stays in the reservoir after conventional strategies have been depleted, the execution of Enhanced Oil Recovery has gotten essential to ensure a continuing crude oil supply. EOR is a challenging field for several petroleum engineers. One of the most widely recognized strategies for enhanced oil recovery is the use of various sorts of surfactants (manufactured or natural) so as to diminish the oil-water interfacial tension. Be that as it may, the surfactants being utilized today are normally synthetic chemicals and polymers, which are costly, connected to fossil fuels, and unfavorable to the environment. In this review common surfactants are examined. Surfactants were removed from the leaves of the tended to plants and the impact of these surfactants on the interfacial tension between water or brackish water and oil is researched. Using these surfactants reduced the interfacial tension between oil and water and that explained in the discussion by different authors using different natural surfactants from different plants over different years of investigation and reviewing. Provided comparisons of interfacial tension versus different surfactants concentrations. Results of these examinations could help analysts in the future to learn about application of natural surfactants in the Enhanced Oil Recovery focuses in petroleum reservoirs. Plant surfactant flooding is suitable choice for EOR owing to significant reduction in interfacial tension and the amount of residual oil in reservoir.

ABSTRAK

Permintaan tenaga yang sangat besar, keperluan yang luas untuk pengeluaran minyak mentah secara progresif dan produktiviti rendah dari strategi biasa adalah alasan untuk memperluas minat kepada teknik Enhanced Oil Recovery (EOR) untuk memulihkan lebih banyak minyak dari takungan semasa. Sumber tenaga elektif belum diperkenalkan yang munasabah untuk memenuhi keperluan tenaga dunia; dengan cara ini minyak mentah akan memainkan peranan asas dalam penggunaan tenaga di kemudian hari. Mengingat cara yang minyak yang dapat dipulihkan berkesan habis dan banyak minyak yang tinggal di takungan setelah strategi konvensional habis, pelaksanaan Enhanced Oil Recovery menjadi penting untuk memastikan bekalan minyak mentah yang berterusan. EOR adalah bidang yang mencabar bagi beberapa jurutera petroleum. Salah satu strategi yang paling terkenal untuk pemulihan minyak yang lebih baik adalah penggunaan pelbagai jenis surfaktan (yang dihasilkan atau semula jadi) untuk mengurangkan ketegangan antara muka minyak-air. Walau bagaimanapun, surfaktan yang digunakan hari ini biasanya bahan kimia sintetik dan polimer, yang mahal, dihubungkan dengan bahan bakar fosil, dan tidak menguntungkan alam sekitar. Dalam tinjauan ini surfaktan biasa diperiksa. Surfaktan dikeluarkan dari daun yang cenderung ke tanaman dan kesan surfaktan ini pada ketegangan antara air atau air payau dan minyak diteliti. Menggunakan surfaktan ini mengurangkan ketegangan antara minyak dan air dan yang dijelaskan dalam perbincangan oleh pengarang yang berbeza menggunakan surfaktan semula jadi yang berbeza dari tumbuhan yang berbeza selama bertahun-tahun penyiasatan dan kajian semula. Memberi perbandingan ketegangan antara muka dan kepekatan surfaktan yang berbeza. Hasil pemeriksaan ini dapat membantu para penganalisis di masa depan untuk belajar tentang penggunaan surfaktan semula jadi dalam Enhanced Oil Recovery yang berfokus pada takungan petroleum. Banjir surfaktan tanaman adalah pilihan yang sesuai untuk EOR kerana pengurangan ketegangan antara muka dan jumlah sisa minyak di takungan.

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CHAPTER 1

INTRODUCTION

1.1. BACKGROUND OF STUDY

Worldwide energy demand is estimated to increase by 30% in 2040 compared to 2010 (Karatayev et al., 2019). It is also estimated that by 2040, oil consumption will reach 111.1 million barrels per day (Zhang et al., 2020). With depleting oil reserves and growing energy demand, due to population growth and rapid industrial development, it has become more important to improve oil recovery from the declining oil reservoirs (Joshi et al., 2015). The process of oil recovery is divided into three main phases including primary, secondary and tertiary phases. In the petroleum industry, the primary and secondary phases are referred to as the conventional methods of oil extraction. On the other hand, the tertiary phase is referred to as enhanced oil recovery (EOR) (Pogaku et al., 2018).

EOR is a challenging field for several scientific disciplines. The number of patents highlights the importance of this area. In fact only 5-30% of original oil-in-place (OOIP) is available to be produced with initial pressure energy stored in the reservoir. This part of oil production called primary production period. For saving pressure of oil in reservoir usually inject water or special gas in it .This method will usually increase oil production to a total recovery of 40-60% of reservoir oil and maintain reservoir pressure during production. This stage of oil production called secondary production period. Then EOR processes are following the period of secondary recovery processes, they are sometimes called tertiary oil recovery methods. The purpose of these methods is to extend the lifetime of reservoir by support of water flooding or other conventional methods, to be reasonable beyond economical limits.

In fact the main aim of the complete cycle of a development plan is to maximize the asset value. Enhanced oil recovery refers to process of producing oil methods different from conventional form of reservoir recovery like gas and water flooding in them.

Surfactant flooding is an Enhanced Oil Recovery (EOR) technique which its objective is to decrease oil trapping by reducing the interfacial tension of water and oil system and so can improve the water flooding sweep efficiency. Surfactant flooding can be affected by different parameters such as surfactant cost, interfacial tension reduction, oil recovery and etc (Spildo et al. 2012). Nowadays because of environmental fates, natural-based surfactants can be used instead of industrial surfactants and many researchers have studied on these kinds of surfactants in recent years.

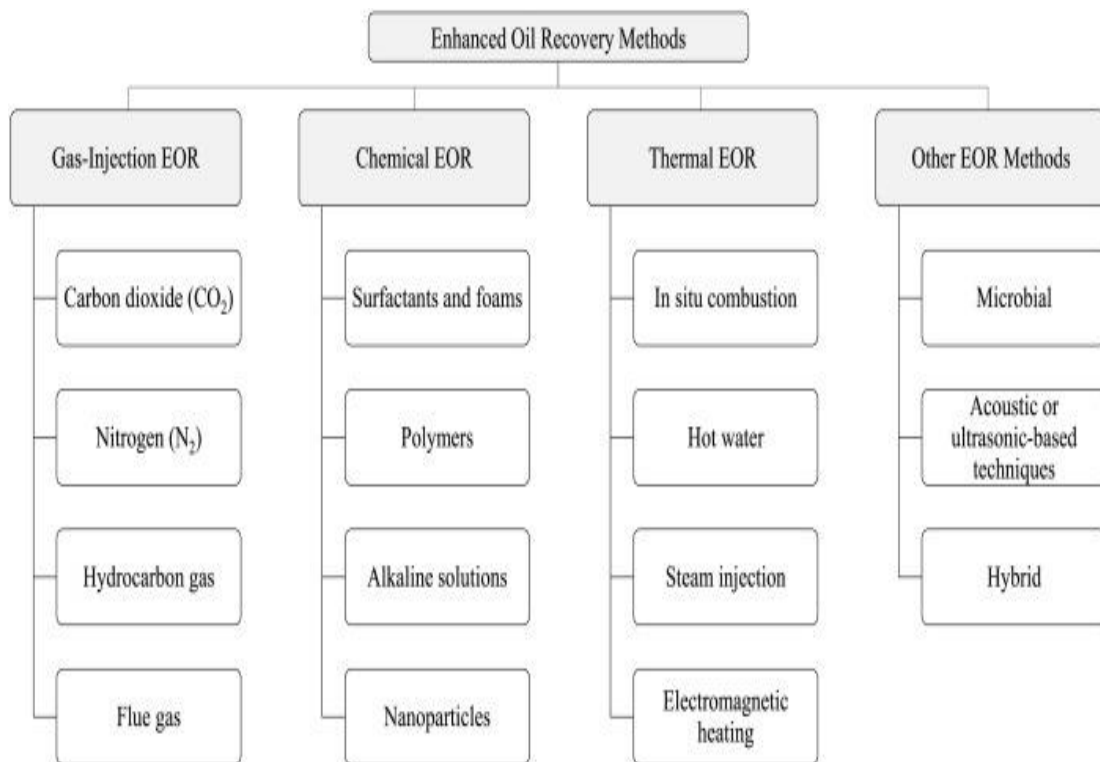


Figure 1 : Main methods of EOR

1.2. PROBLEM STATEMENT

The utilization of different types of surfactants (synthetic or natural) in order to decrease the oil-water interfacial tension is a common method in EOR. But the surfactants which are mostly being used such as synthetic chemicals and polymers are expensive, depending on fossil fuels and harmful for the environment.

1.3. OBJECTIVES OF RESEARCH

Goals of this project were:

- a) To investigate specific natural surfactants which produced from addressed plants.
- b) To study the effect of these surfactants on the interfacial tension between water and oil by current methods.
- c) To suggest a future plan of using the natural surfactants in Chemical EOR.

1.4. SCOPE OF RESEARCH

In this work three parts will be studied.

1- Collection of data from different past investigations in the form of graphs and tables and comparisons between them.

2- Discussion on the different types of the natural surfactants used and their effectiveness.

3- Creation of review on current methods to determine the affect on the water-oil interfacial tension.

1.5. RELEVANCY AND FEASIBILITY

In hope of a successful findings and analysis of the objectives, this research project will give some benefits to the industry. This project is feasible to be carried out by considering the capability of final year student and time constraint with the assistance of supervisor. May this project becomes successful and can be completed within the timeframe.

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