

UNIVERSITI TEKNOLOGI MARA

**SURFACTANT POLYMER FLOODING
ENHANCED OIL RECOVERY : SLUG
SCHEME AFFECTED OIL RECOVERY**

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ABSTRACT

Surfactant Polymer (SP) flooding is a chemical Enhanced Oil Recovery (EOR) method involves the injection of surfactants and polymer into the reservoir to increase oil recovery. However, problem such as performance aggregation, adsorption and dissemination in porous media can be arised depending on the chemical involved. The effectiveness of industrial water treatment surfactant is studied as potential materials for EOR process alongside the conventional polymer while identifying the effect of different injection scheme of surfactant and polymer on oil recovery. Three different scheme implementing surfactant polymer flooding has been carried out. From BK80-XG formulation screening result, 0.3% of Sulfocat BK80 concentration and 400 ppm Xanthan Gum concentration is appear to be the optimum parameter for sandpack flooding experiment. The result of sandpack flooding shows that Sulfocat BK80 is a good potential material to be use in chemical EOR method as it increase the performance of oil recovery. From three different scheme implemented during surfactant polymer flooding, Scheme C in which the sandpack has been soaked with BK80 for 24 hours and then being flooded with Xanthan Gum flooding is found to give the highest incremental of oil recovery which is 4.88% compared to other schemes.

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CHAPTER ONE

INTRODUCTION

1.1 Background of Study

In oil and gas industry, oil production can be classified into three phases which are primary, secondary and tertiary (Enhanced Oil Recovery). Technically, the complexity of each stage is increasing than previous stage thus more expensive (Abramova & Abramov, 2014). Primary oil recovery refers to the process of producing oil from an oil reservoir using only the natural energy of reservoir or with the assists of artificial lift devices. The potential of oil production is very limited up to only 20% of oil recovery in major cases (Zitha *et al.*, 2008). Secondary oil recovery refers to the gas or water injection into the reservoir to increase the energy of the natural system and helps displace the oil and forcing it to move towards the surface. This method is successful in increasing the additional oil and typically up to 30% OOIP after primary recovery for mature waterflooding projects (Zitha *et al.*, 2008).

Enhanced Oil Recovery (EOR) is the third and final options implemented after primary and secondary recovery to produce the total possible oil from an oil reservoir. The process basically involves one fluid is displaced by the other fluid in a heterogeneous reservoir (Gharbi *et al.*, 2012). EOR process can be categorized into thermal method, gas injection method and chemical methods. Thermal method is adding a sufficient heat to reservoir in order to reduce the viscosity of oil for production. Gas injection method involves the injection of solvent such as carbon dioxide, light hydrocarbons and nitrogen in the reservoir. The solvents can either miscible or immiscible with oil in the reservoir for easy mobilization (Gharbi *et al.*, 2012). Chemical flooding methods involves the injection of chemicals to injected water. For example surfactant is injected in order to reduce the interfacial tensions while polymer injection will create a favorable mobility ratio for sweep efficiency improvement thus improves mobility control (Gharbi *et al.*, 2012).

Chemical flooding method is classified into a special group of EOR processes. Generally it helps to produce residual oil that traps in the reservoir thus increase oil recovery after injection of water flooding. Surfactant-polymer (SP) flooding is one of chemical EOR process. It involves the injection of surfactants and polymer into the