

INTISARI

Pendesakan surfaktan merupakan teknik *enhanced oil recovery* (EOR) secara kimia yang bertujuan untuk mengambil sisa minyak yang terperangkap dengan menurunkan tegangan antarmuka minyak dan air. Tingkat keberhasilan dari pendesakan surfaktan sangat dipengaruhi oleh hilangnya surfaktan melalui proses adsorpsi pada batuan mineral di reservoir dan penurunan nilai IFT (*Interfacial Tension*). Tujuan penelitian ini untuk mengetahui *recovery factor* pada pengujian *coreflooding* dengan menggunakan surfaktan SLS yang di produksi dari isolasi lignin limbah tandan kosong kelapa sawit (TKKS) dan penambahan silika nano partikel (SNP).

Formulasi mixed-surfaktan yang digunakan 70% surfaktan SLS, 22% PFAD dan 8% 1-oktanol. Variasi mixed-surfaktan yang digunakan 0,25; 0,5; 0,75; 1; dan 1,25% (w/v). Berdasarkan hasil pengujian IFT menunjukan bahwa nilai IFT terkecil pada konsentrasi 1% sebesar $3,62 \times 10^{-4}$ mN/M. Penambahan silika nano pertikel (SNP) pada larutan mixed-surfaktan yang diharapkan dapat menurunkan nilai interfacial tension (IFT), mereduksi jumlah surfaktan yang terjerap dalam batuan reservoir dan meningkatkan nilai *recovery factor*. Variasi konsentrasi SNP yang digunakan 0,05; 0,09; 0,15; dan 0,3% (w/v). Hasil pengujian IFT dengan penambahan konsentrasi SNP 0,05% diperoleh nilai IFT terendah yaitu $1,71 \times 10^{-4}$ mN/m.

Proses pengujian adsorpsi mixed-surfaktan 1% dan penambahan konsentrasi SNP 0,09% (v/v) dengan waktu adsorpsi 24 jam diperoleh jumlah surfaktan yang terjerap paling sedikit sebesar 0,6432 mg/g. Pada pengujian *coreflooding*, diatur sesuai dengan kondisi reservoir dengan temperatur 60°C, *confining pressure* sebesar 40 psi, dan *injection rate* 0,3 cc/min. Pada konsentrasi mixed-surfaktan 1% tanpa penambahan SNP diperoleh total nilai *recovery factor* (*surfactant flood* dan *flushwater*) sebesar 25,1569% dan total *recovery* minyak sebesar 78,8830% OOIP. Sedangkan dengan adanya penambahan konsentrasi SNP 0.05% diperoleh total nilai *recovery factor* dari (*surfactant flooding* dan *flushwater*) sebesar 35,7113% dan total *recovery* minyak sebesar 87,3242% OOIP. Hal ini menunjukkan bahwa dengan adanya penambahan SNP dapat meningkatkan produktivitas minyak di *reservoir*.

Kata kunci : Surfaktan SLS; Silica Nanoparticles (SNP); Coreflooding; Enhanced Oil Recovery (EOR)

ABSTRACT

Surfactant flooding is a chemical enhanced oil recovery (EOR) technique that aims to remove trapped oil residue by lowering the interfacial tension between oil and water. The success of surfactant flooding is strongly affected by surfactant loss through its adsorption process on reservoir mineral rocks and decrease IFT (Interfacial Tension) value. The purpose of this study was to determine the recovery factor in coreflooding test using surfactant SLS is produced from lignin isolation from empty bunch waste oil palm and the addition of silica nanoparticles (SNPs).

The mixed-surfactant formulation used was 70% surfactant SLS, 22% PFAD and 8% 1-octanol. The concentration of mixed-surfactant variations used are 0.25, 0.5, 0.75, 1, and 1.25% (w/v). Based on the results of the IFT test, it shows that the smallest IFT value at concentration mixed-surfactant of 1% is 3.62×10^{-4} mN/M. The addition of silica nanoparticles (SNPs) to the mixed-surfactant solution is expected to reduce the interfacial tension value (IFT), reduce the amount of surfactant adsorbed on reservoir rocks and increase the recovery factor. Variations of SNPs concentration used are 0.05, 0.09, 0.15, and 0.3% (w/v). The lowest IFT test result by adding concentration SNPs of 0.05% is 1.71×10^{-4} mN/m.

The adsorption test result showed that by adding SNPs with concentration 0.09% with an adsorption time of 24h can reduce the amount of surfactant adsorbed is 0.6432 mg/g. In the coreflooding test, it was adjusted according to reservoir conditions with a temperature of 60°C, a confining pressure of 40 psi and injection rate of 0.3 cc/min. At a 1% mixed-surfactant concentration without the addition of SNP, a total recovery factor (surfactant flooding and flush water) is 25.1569% and a recovery oil total is 78.8830% of OOIP. Meanwhile, with the additional concentration SNPs of 0.05% a total recovery factor (surfactant flooding and flushwater) is 35.7113% and a recovery oil total is 87.3242% of OOIP. It shows that the addition of SNP can increase the productivity of oil produced in reservoir.

Keywords: Surfactant SLS; Silica Nanoparticles (SNP); Coreflooding; Enhanced Oil Recovery (EOR)