

RINGKASAN

SKENARIO PENGEMBANGAN LAPANGAN “KAFA” DENGAN METODE *CYCLIC WATERFLOODING* MENGUNAKAN SIMULATOR TNAVIGATOR

Oleh
Khalifatur Aflah R
NIM: 113200028
(Program Studi Sarjana Teknik Perminyakan)

Lapangan "KAFA" telah berproduksi sejak Oktober 1997 dengan OOIP sebesar 1011,34 MMSTB. Lapangan ini memiliki 37 sumur terdiri atas 25 sumur produksi aktif, 7 sumur produksi *shut-in*, dan 5 sumur injeksi. Lapangan ini masih terdapat cadangan minyak yang dapat diproduksi. Data menunjukkan bahwa Per Agustus 2023, kumulatif produksi minyak Lapangan "KAFA" sebesar 412,24 MMSTB atau *recovery factor* di angka 40,76%, dan *watercut* sebesar 94,48%. Untuk itu, diperlukan solusi untuk memaksimalkan *recovery minyak* dan menahan produksi *watercut*. Lapangan ini bertipe *stratified sandstone* dengan permeabilitas yang heterogen, sehingga dipilih metode injeksi *cyclic*, karena sangat efisien memanfaatkan *cross flow* permeabilitas tinggi dan rendah untuk produksi minyak.

Studi pengembangan Lapangan "KAFA" dimulai dengan menganalisa kandidat sumur *convert to injection* (CTI) berdasarkan *oil cumulative* yang rendah, *watercut* yang tinggi, serta melalui analisa peta *oil per unit area* dan *oil saturation* yang kemudian dikonversi menjadi sumur injeksi pada skenario CTI. Tahap berikutnya adalah menyusun *workflow* dari *assisted history matching* (AHM) yang kemudian digunakan dalam optimasi laju injeksi untuk skenario *conventional waterflooding*. Jika telah didapat laju injeksi terbaik, maka dilakukan optimasi periode *cyclic* untuk skenario *cyclic waterflooding* guna mendapatkan *recovery factor* terbesar.

Berdasarkan hasil dari ketiga skenario yang disimulasikan pada Lapangan "KAFA" didapatkan skenario dengan *recovery factor* terbesar yaitu CWF-13 atau skenario *cyclic waterflooding* dengan memanfaatkan sumur *convert to injection* yaitu D-5H, E-5H, D-3H, dan B-6H dengan menerapkan laju injeksi di angka 20749,13 stb/day, dan periode *cyclic* sebesar 120 On dan 30 Off. Pengembangan ini dilakukan selama 17 tahun hingga 2040, dengan menghasilkan kumulatif minyak sebesar 452,914 MMSTB, *recovery factor* (RF) sebesar 44,783%, *watercut* 97,429%, serta peningkatan RF sebesar 1,533% dibandingkan dengan *Basecase*.

Kata kunci: *Cyclic Waterflooding, Assisted History Matching, Recovery Factor*

ABSTRACT

“KAFA” FIELD DEVELOPMENT SCENARIO WITH CYCLIC WATERFLOODING METHOD USING TNAVIGATOR SIMULATION

By
Khalifatur Aflah R
NIM: 113200028
(Petroleum Engineering Undergraduate Program)

The "KAFA" field has been producing since October 1997, with OOIP of 1011.34 MMSTB. The field comprises of 37 wells, including 25 active production wells, 7 shut-in production wells, and 5 injection wells. Potential reserves remain in the field presenting further development prospects. As of August 2023, the field's cumulative oil production is 412.24 MMSTB, with a recovery factor of 40.76% and a watercut of 94.48%. This field is stratified sandstone reservoir with high heterogeneous permeability. Thus, cyclic injection method was chosen as its capability to enhance oil recovery and manage watercut by utilizes cross-flow between high permeability zone and low permeability zones to produce oil.

The study began with data preparation, which included creating a reservoir model, gathering reservoir characteristics, and collecting oil field production data. The reservoir model for the "KAFA" field had passed history matching. After completing data preparation, simulations were done with the first scenario to determine Convert to Injection (CTI) well candidates which is production wells to be converted into injection wells. The next step is building a workflow for assisted history matching (AHM), used to optimize the injection rate for the conventional waterflooding scenario. Once the optimal injection rate was determined, then optimization of cyclic period was performed for the cyclic waterflooding scenario.

Based on the results from the three simulated scenarios for the "KAFA" field, the scenario with the best oil recovery was Scenario WF-13 or cyclic waterflooding which involved convert to injection wells of D-5H, E-5H, D-3H, and B-6H into injector well, applying an injection rate of 20479.13 STB/day, and a cyclic period of 120 days On and 30 days Off. This development is conducted over 17 years from August 2023 to 2040, with produced oil cumulative of 452.914 MMSTB, a recovery factor (RF) of 44.783%, a water cut of 97.429%, and incremental RF of 1.533% compared to the Basecase.

Keywords: Cyclic Waterflooding, Assisted History Matching, Recovery Factor