

ABSTRAK

PENENTUAN *REMAINING RESERVE* MENGGUNAKAN METODE *MATERIAL BALANCE* UNTUK VALIDASI *INPLACE VOLUMETRIC* SERTA PENDEKATAN *DECLINE CURVE ANALYSIS*

Oleh
Natha Nael Arsila Vero Antono
NIM: 113220067
(Program Studi Sarjana Teknik Perminyakan)

Penelitian ini dilatarbelakangi oleh sejarah produksi Lapangan N di Lapisan TAF-C yang panjang (1951–2004) dengan total produksi minyak sebesar 992,67 MSTB, namun hanya mencapai *recovery factor* (RF) sebesar 21,69%. Terdapat selisih signifikan dibandingkan potensi RF maksimum sebesar 75,8% berdasarkan perhitungan *special core analysis*, sehingga menunjukkan adanya sisa cadangan hidrokarbon yang besar. Tujuan utama penelitian ini adalah menentukan cadangan minyak sisa (*remaining reserve*) dan memvalidasi *inplace volumetric* menggunakan metode *material balance* sebagai dasar pengembangan lapangan.

Metodologi yang digunakan meliputi analisis *reservoir* dengan metode *material balance* (Havlena-Odeh) dan *decline curve analysis* (DCA), penentuan mekanisme pendorong (*drive mechanism*), serta pemodelan *water influx* menggunakan pendekatan *Schilthuis* untuk aliran *steady state* dan *Van Everdingen-Hurst* untuk aliran *unsteady state*. Kemudian dilakukan perhitungan *remaining reserve* dan validasi *inplace*.

Hasil perhitungan model *water influx* terbaik pada kondisi *finite aquifer* dengan $rD = 10$ dan $A = 90 \text{ hari}^{-1}$. Nilai OOIP yang divalidasi melalui metode *material balance* adalah sebesar 4580,84 MSTB, dengan persentase perbedaan sebesar 1,11% dari hasil perhitungan volumetrik. Sebagai kesimpulan, cadangan minyak sisa (*remaining reserve*) Lapangan N terhitung sebesar 554,336 MSTB berdasarkan *material balance* dan 409,97 MSTB berdasarkan *decline curve analysis*. Berdasarkan hasil perhitungan tersebut menegaskan bahwa Lapangan N masih memiliki potensi sisa cadangan yang signifikan untuk dikembangkan lebih lanjut guna mengoptimalkan perolehan minyak.

Kata kunci: Cadangan Minyak Mula-Mula, Cadangan Minyak Sisa, Keseimbangan Material, Mekanisme Pendorong, Perembesan Air

ABSTRACT

DETERMINATION OF REMAINING RESERVES USING THE MATERIAL BALANCE METHOD FOR IN-PLACE VOLUMETRIC VALIDATION AND DECLINE CURVE ANALYSIS APPROACH

By

Natha Nael Arsila Vero Antono

NIM: 113220067

(Petroleum Engineering Undergraduated Program)

This study was motivated by the long production history of Field N in the TAF-C Layer (1951–2004) with a total oil production of 992,67 MSTB, but only achieving a recovery factor (RF) of 21,69%. There is a significant difference compared to the maximum potential RF of 75,8% depends on special core analysis calculation, indicating that there are large remaining hydrocarbon reserves. The main objective of this study is to determine the remaining oil reserves and validate the in-place volumetric using the material balance method as the basis for field development.

The methodology used includes reservoir analysis using the material balance method (Havlena-Odeh) and decline curve analysis (DCA), determination of the drive mechanism, and water influx modelling using the Schilthuis approach for steady state flow and Van Everdingen-Hurst for unsteady state flow. This is followed by calculation of remaining reserves and in-place validation.

The best water influx model calculation results were obtained under finite aquifer conditions with $rD = 10$ and $A = 90 \text{ days}^{-1}$. The OOIP value validated through the material balance method is 4580,84 MSTB, with a difference percentage of 1,11% from the volumetric calculation results. In conclusion, the remaining oil reserves of Field N are calculated to be 554,336 MSTB based on material balance and 409,97 MSTB based on decline curve analysis. These calculations confirm that Field N still has significant remaining reserves that can be further developed to optimise oil production.

Keywords: *Drive Mechanism, Material Balance, Original Oil In Place, Remaining Reserve, Water Influx*