

ABSTRAK

ANALISA PETROFISIKA UNTUK IDENTIFIKASI ZONA PROSPEK HIDROKARBON BERDASARKAN DATA LOG PADA SUMUR FDY-01, FDY-02, DAN FDY-03 DI LAPANGAN Z

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Sumur FDY-01, FDY-02, dan FDY-03 terletak di Lapangan Z, Provinsi Riau, yang termasuk dalam wilayah Cekungan Sumatra Tengah. Formasi produktif utama di lapangan ini adalah Formasi Bekasap yang didominasi oleh batu pasir berbutir sedang hingga kasar, diselingi lapisan lempung dan serpih. Ketiga sumur masih berstatus eksplorasi, sehingga diperlukan penelitian lebih lanjut untuk mengidentifikasi zona prospek hidrokarbon serta mengestimasi cadangan awal minyak dan gas bumi.

Proses analisis petrofisika dalam penelitian ini diawali dengan pengumpulan data *wireline log*, yang kemudian melalui tahapan *log Quality Control* terhadap log mentah GR, DRES, SRES, RHOB, dan NPHI guna memastikan kualitas data. Tahap selanjutnya adalah normalisasi log GR untuk menyamakan skala antar sumur, serta rekonstruksi log sintetik pada RHOB dan NPHI guna mengisi data yang hilang. Proses analisis petrofisika meliputi perhitungan *volume shale* (GR), porositas (SSPW), saturasi air (metode Simandoux), dan permeabilitas (*multiple regression*). Hasil analisis kemudian divalidasi dengan membandingkan *volume shale* (Vcl) terhadap log GRN, porositas dan permeabilitas terhadap data RCAL, serta saturasi air (S_w) terhadap data *test*. Jika hasil validasi menunjukkan kesesuaian, maka dilakukan penentuan nilai *Cut-off* untuk mengidentifikasi zona *sand* dan zona *pay*. Akhirnya, dilakukan estimasi hidrokarbon *in-place*.

Berdasarkan analisa yang telah dilakukan, ditentukan nilai *Cut-off* yaitu V_{shale} (minyak) ≤ 0.32 dan V_{shale} (gas) ≤ 0.30 , porositas (minyak) ≥ 0.11 dan porositas (gas) ≥ 0.09 , saturasi air (minyak) ≤ 0.60 dan saturasi air (gas) ≤ 0.75 , sebagai batas zona produktif. Berdasarkan kriteria tersebut, diperoleh ketebalan net *pay* pada sumur FDY-01 sebesar 14.76 ft, FDY-02 sebesar 16 ft, dan FDY-03 sebesar 16.4 ft. Estimasi hidrokarbon *in-place* menunjukkan bahwa nilai *original oil in place* (OOIP) untuk sumur FDY-01 adalah 0.45 MMSTB, sedangkan nilai *original gas in place* (OGIP) untuk sumur FDY-02 dan FDY-03 masing-masing sebesar 2.32 BSCF dan 2.88 BSCF.

Kata kunci: Analisis Petrofisika, Formasi Bekasap, OGIP, OOIP, *Cut-off*

ABSTRACT

Petrophysical Analysis for Hydrocarbon Prospect Zone Identification Based on Well Log Data from Wells FDY-01, FDY-02, and FDY-03 in Field Z

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Wells FDY-01, FDY-02, and FDY-03 are located in Field Z, Riau Province, within the Central Sumatra Basin. The main productive formation in this field is the Bekasap Formation, which is predominantly composed of medium to coarse-grained sandstones interbedded with clay and shale layers. As all three wells are still in the exploration stage, further analysis is required to identify hydrocarbon prospect zones and estimate the initial oil and gas reserves.

The petrophysical analysis in this study began with the collection of wireline log data, followed by log Quality Control (QC) on raw GR, DRES, SRES, RHOB, and NPHI logs to ensure data integrity. Subsequent steps included gamma ray (GR) normalization to standardize log scales between wells and synthetic log reconstruction for RHOB and NPHI to fill missing data. The petrophysical evaluation involved calculating shale volume (from GR), porosity (using SSPW), water saturation (using the Simandoux method), and permeability (using multiple regression). The results were validated by comparing shale volume (V_{sh}) against the GR Neutron log, porosity and permeability with routine core analysis (RCAL) data, and water saturation (S_w) with test data. If validation results were consistent, Cut-off values were determined to identify sand and pay zones. Finally, hydrocarbon in-place volumes were estimated.

Based on the analysis that has been conducted, the determined Cut-off values are $V_{shale} (oil) \leq 0.32$ and $V_{shale} (gas) \leq 0.30$, porosity (oil) ≥ 0.11 and porosity (gas) ≥ 0.09 , water saturation (oil) ≤ 0.60 and water saturation (gas) ≤ 0.75 , as the boundary of the productive zone. Based on these criteria, the net pay thickness in well FDY-01 is 14.76 ft, FDY-02 is 16 ft, and FDY-03 is 16.4 ft. The in-place hydrocarbon estimation shows that the original oil in place (OOIP) value for well FDY-01 is 0.45 MMSTB, while the original gas in place (OGIP) values for wells FDY-02 and FDY-03 are 2.32 BSCF and 2.88 BSCF, respectively.

Keywords: Petrophysical Analysis, Bekasap Formation, OGIP, OOIP, Cut-off