INTISARI

Reservoir *basal sand* pada Anggota Zelda, Formasi Talang Akar di Lapangan Galaksi, Cekungan Asri merupakan interval produktif yang menghasilkan 467 BOPD minyak tanpa air, meskipun menunjukkan resistivitas rendah (<5 Ωm) berdasarkan data *Drill Stem Test* (DST) pada laporan internal Maxus Southeast Sumatra, Inc. (1990). Kondisi resistivitas rendah ini menjadi tantangan dalam evaluasi petrofisika karena metode konvensional seperti Archie dan Indonesia cenderung memberikan estimasi saturasi air (Sw) yang terlalu tinggi (pesimistis). Penelitian ini bertujuan menghitung Sw secara lebih representatif dengan mempertimbangkan karakter litologi dan penyebab resistivitas rendah. Data yang digunakan meliputi *wireline* log (GR, resistivitas, densitas, neutron), mud log, laporan sumur, data core, dan data test. Litofasies diidentifikasi dari deskripsi batuan inti dan integrasi dengan analisis klaster log GR, RHOB, dan NPHI yang menunjukkan bahwa *basal sand* tersusun atas batupasir sedang–kasar, batupasir halus, dan batupasir lempungan. Resistivitas rendah diinterpretasikan disebabkan oleh kandungan mineral lempung yang tinggi, yaitu kaolinit, illit, klorit, dan illit-smektit berdasarkan hasil analisis *X-Ray Diffraction* (XRD). Mineral-mineral ini memiliki nilai *Cation Exchange Capacity* (CEC) yang tinggi, sehingga meningkatkan konduktivitas formasi. Volume *shale* dihitung menggunakan metode linear gamma ray, porositas total (PHIT) dan porositas efektif (PHIE) dengan log densitas–neutron. Sw dihitung menggunakan pendekatan berbasis CEC (Waxman–Smits dan Juhasz), kemudian dibandingkan dengan metode *shaly sand* (Indonesia). Nilai resistivitas air formasi (Rw) ditentukan dari plot salinitas dan diperoleh sebesar 0.16 Ωm. Hasil penelitian ini menunjukkan bahwa metode Waxman–Smits memberikan estimasi Sw yang lebih optimis (28,85–87,30%) dibandingkan Archie (67,58–90,90%). Zona prospek hidrokarbon diidentifikasi pada empat sumur berdasarkan cut-off Vsh ≤36%, PHIE ≥12%, dan Sw ≤73%, dengan interval *net pay* yang ditentukan berdasarkan nilai Sw paling optimis dari metode Waxman–Smits. Zona tersebut terdapat pada Sumur Altair (4030–4052 ft MD), Bellatrix (4766.5–4770.5 ft MD dan 4770.5–4780 ft MD), Deneb (4251–4266 ft MD dan 4268–4278 ft MD), dan Enif (5790–5865 ft MD). Tidak ditemukan zona prospek hidrokarbon pada Sumur Canopus dan Vega.

Kata kunci: *basal sand*, reservoir resistivitas rendah, petrofisika

ABSTRACT

The basal sand reservoir within the lower Zelda Member of the Talang Akar Formation in the Galaksi Field, Asri Basin, is a productive interval that has yielded 467 BOPD of oil without water, despite exhibiting low resistivity values (<5 Ωm), based on Drill Stem Test (DST) data in the internal report of Maxus Southeast Sumatra, Inc. (1990). This low-resistivity condition poses a challenge in petrophysical evaluation, as conventional methods such as Archie and the Indonesia equation tend to produce overestimated water saturation (Sw) values. This study aims to calculate Sw more representatively by considering lithological characteristics and the causes of low resistivity. The integrated dataset includes wireline logs (GR, resistivity, density, neutron), mud logs, well reports, core descriptions, and test data. Lithofacies were identified from core descriptions and integration with clustering analysis of GR, RHOB, and NPHI logs, indicating that the basal sand consists of medium–coarse sandstone, fine sandstone, and shaly sandstone. Low resistivity is interpreted to be primarily caused by a high content of clay minerals—kaolinite, illite, chlorite, and illite-smectite— based on from X-Ray Diffraction (XRD) analysis. These minerals exhibit high Cation Exchange Capacity (CEC), which increases the formation's conductivity. Shale volume (Vsh) was estimated using the linear gamma ray method, while total and effective porosity (PHIT and PHIE) were derived from density–neutron log crossplots. Sw was calculated using CEC-based models (Waxman–Smits and Juhasz) and compared to shaly sand method (Indonesia). Formation water resistivity (Rw) was determined from a salinity plot, yielding a value of 0.16 Ωm. The results show that the Waxman–Smits method provides more realistic Sw estimates values for this low-resistivity reservoir (28.85–87.30%) compared to Archie (67.58–90.90%). Hydrocarbon prospective zones were identified in four wells based on the applied cut-off values of Vsh ≤36%, PHIE ≥12%, and Sw ≤73%, with net pay intervals determined using the most optimistic Sw estimates derived from the Waxman–Smits method. These prospective zones are found in Altair (4030–4052 ft MD), Bellatrix (4766.5–4770.5 ft MD and 4770.5–4780 ft MD), Deneb (4251–4266 ft MD and 4268–4278 ft MD), and Enif (5790–5865 ft MD). No hydrocarbon prospective zones were identified in Wells Canopus and Vega.

Keywords: *basal sand, low resistivity reservoir, petrophysics*