

INTISARI

Formasi Cibulakan Atas merupakan salah satu reservoir dengan potensi *low resistivity* di Lapangan GAIA, Cekungan Jawa Barat Utara. Berdasarkan data DST (*Drill Stem Test*), terdapat interval yang terbukti produktif dengan nilai resistivitas rendah ($0,85\text{--}5\ \Omega\text{m}$), sehingga menjadi tantangan dalam evaluasi petrofisika karena metode konvensional seperti Archie cenderung menghasilkan estimasi saturasi air yang tidak akurat. Penelitian ini bertujuan untuk menentukan interval dan faktor penyebab *low resistivity reservoir*, menentukan metode saturasi air yang paling sesuai dengan kondisi aktual formasi, serta menentukan zona prospek hidrokarbon pada Sumur ARES, BOREAS, CLIO, DORIS, EROS, dan FATES.

Data penelitian berupa *wireline log*, *mud log*, laporan sumur, data batuan inti, dan data uji sumur. Penyebab dominan *low resistivity* adalah salinitas air formasi yang tinggi (30.300 ppm), yang menekan nilai resistivitas batuan secara menyeluruh. Kondisi ini diperkuat oleh kehadiran mineral lempung ilit dan kaolinit bertipe distribusi *dispersed* dengan nilai CEC tinggi. Mineral lempung tersebut mengikat *clay-bound water* dalam jumlah signifikan sehingga meningkatkan konduktivitas formasi secara independen. Volume serpih dihitung menggunakan metode Stieber, porositas menggunakan kombinasi log densitas-neutron (Bateman-Konen), serta saturasi air dievaluasi secara komparatif menggunakan metode Archie, Simandoux, Waxman-Smits, Juhasz, dan Dual Water.

Hasil penelitian menunjukkan metode Waxman-Smits memberikan estimasi saturasi air yang paling representatif, divalidasi oleh tiga zona DST produktif. Zona prospek hidrokarbon ditentukan berdasarkan nilai *cut-off* $V_{sh} \leq 0,44$, $PHIE \geq 0,13$, dan $Sw \leq 0,75$, dengan total *net pay* 303 ft yang tersebar pada 33 zona LRR di enam sumur.

Kata kunci: *low resistivity reservoir*, petrofisika, saturasi air, Waxman-Smits, Formasi Cibulakan Atas

ABSTRACT

The Upper Cibulakan Formation is one of the reservoirs with low resistivity potential in the GAIA Field, Northwest Java Basin. Based on Drill Stem Test (DST) data, several intervals have been proven productive despite exhibiting low resistivity values ($0.85\text{--}5\ \Omega m$), posing a challenge in petrophysical evaluation as conventional methods such as Archie tend to produce inaccurate water saturation estimates. This study aims to determine the intervals and causative factors of low resistivity reservoir, identify the most appropriate water saturation method representing actual formation conditions, and delineate hydrocarbon prospect zones in Wells ARES, BOREAS, CLIO, DORIS, EROS, and FATES.

Research data consist of wireline logs, mud logs, well reports, core data, and well test data. The dominant cause of low resistivity is high formation water salinity (30,300 ppm), which suppresses formation resistivity throughout the field. This is further compounded by the presence of illite and kaolinite clay minerals with dispersed distribution and high CEC values. These clay minerals bind significant amounts of clay-bound water, thereby independently increasing formation conductivity. Shale volume was calculated using the Stieber method, porosity using the density-neutron combination (Bateman-Konen), and water saturation was evaluated comparatively using the Archie, Simandoux, Waxman-Smits, Juhasz, and Dual Water methods.

The results show that the Waxman-Smits method provides the most representative water saturation estimation, validated against three productive DST zones. Hydrocarbon prospect zones were determined based on cut-off values of $V_{sh} \leq 0.44$, $PHIE \geq 0.13$, and $S_w \leq 0.75$, yielding a total net pay of 303 ft distributed across 33 LRR zones in six wells.

Keywords: low resistivity reservoir, petrophysics, water saturation, Waxman-Smits, Upper Cibulakan Formation