

Aplikasi Metode Inversi Seismik Model-Based dan Dekomposisi Spektral RGB Blending untuk Identifikasi dan Analisis Fasies pada Lapangan "X", Cekungan Banggai, Sulawesi Tengah = Application of Model-Based Seismic Inversion Method and Spectral Decomposition RGB Blending for Facies Identification and Analysis in the "X" Field, Banggai Basin, Central Sulawesi

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Abstrak

Formasi Minahaki dan Mantawa di Cekungan Banggai merupakan reservoir karbonat potensial yang telah menghasilkan hidrokarbon sejak awal 2000-an. Analisis fasies berperan penting dalam memahami persebaran dan kualitas reservoir. Penelitian ini bertujuan untuk menganalisis persebaran lateral fasies karbonat dan zona reservoir di Lapangan "X" menggunakan metode inversi seismik model-based, dekomposisi spektral Continuous Wavelet Transform (CWT), dan RGB blending. Inversi seismik digunakan untuk memetakan litologi karbonat berdasarkan nilai impedansi akustik (AI), dekomposisi spektral memperjelas batas fasies melalui respons frekuensi, sedangkan RGB blending menampilkan anomali spektral yang berkaitan dengan keberadaan hidrokarbon (Direct Hydrocarbon Indicator). Nilai AI berkisar antara 22.000–25.000 (ft/s) × (g/cc) pada Formasi Minahaki dan 24.000–26.000 (ft/s) × (g/cc) pada Formasi Mantawa, yang menunjukkan nilai litologi batuan karbonat. Dekomposisi spektral berhasil menegaskan batas fasies dan mengidentifikasi keberadaan fasies carbonate ramp dan reef, sementara RGB blending menunjukkan anomali putih dan biru muda sebagai DHI. Integrasi ketiga metode tersebut berhasil mendelineasi dua fasies utama dan empat zona reservoir, dengan estimasi luas total sekitar 8.39 km². Dengan demikian, pendekatan ini terbukti efektif dalam identifikasi fasies karbonat dan zona reservoir di Lapangan "X".

.....The Minahaki and Mantawa formations in the Banggai Basin are potential carbonate reservoirs that have produced hydrocarbons since the early 2000s. Facies analysis plays a critical role in understanding the distribution and quality of the reservoir. This study aims to analyze the lateral distribution of carbonate facies and reservoir zones in Field "X" using model-based seismic inversion, spectral decomposition with Continuous Wavelet Transform (CWT), and RGB blending methods. Seismic inversion is used to map carbonate lithology based on acoustic impedance (AI) values, spectral decomposition clarifies facies boundaries through frequency responses, while RGB blending displays spectral anomalies related to the presence of hydrocarbons (Direct Hydrocarbon Indicator). AI values range from 22,000–25,000 (ft/s) × (g/cc) in the Minahaki Formation and 24,000–26,000 (ft/s) × (g/cc) in the Mantawa Formation, indicating carbonate lithology values. Spectral decomposition successfully delineated facies boundaries and identified the presence of carbonate ramp and reef facies, while RGB blending showed white and light blue anomalies as DHI. The integration of these three methods successfully delineated two main facies and four reservoir zones, with a total estimated area of approximately 8.39 km². Thus, this approach has proven effective in identifying carbonate facies and reservoir zones in Field "X".