ABSTRACT

CHARACTERIZATION OF COAL QUALITY AFFECTED BY FAULT STRUCTURES USING THE WELL LOGGING METHOD IN THE BATU TEGAK SEJAJAR FIELD PT BUDI GEMA GEMPITA

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The Batu Tegak Sejajar site in Muara Lawai Village, Merapi Timur District, Lahat Regency, South Sumatra Province, is part of the Muara Enim Formation within the South Sumatra Basin. It features complex geological conditions, including coal seam dips ranging from 69.87° to 82° and fault structures suspected of influencing coal distribution and quality. This study aims to identify lithological characteristics, model coal seam distribution, characterize fault structures, and analyze their impact on coal quality. The data utilized include well logs (Gamma Ray [GR], Long Spacing Density [LSD], and High Resolution Density [HRD]) from 21 wells, actual coal seam data from 22 wells, and coal quality data from 16 wells. Processing was conducted using Minescape software to generate lithological profiles, 3D drill hole models, structural contour maps, and actual coal seam maps, alongside ordinary kriging interpolation for parameters such as Ash Content (AC), Fixed Carbon (FC), Total Moisture (TM), Total Sulfur (TS), Volatile Matter (VM), and calorific value (CV). All parameters were integrated into a coal quality ranking map. The study identified nine coal seams—S6A1, S6A2, S6AU, S6AL, S6BU, S6BL, S6CU, S6CL, and S7D—as well as a seam splitting phenomenon in Seam S6A. The coal exhibits average values of 3.88 cps for Gamma Ray, 1.80 g/cc for density, 0.043 for IGR, and 0.014 for Vshale, indicating relatively clean coal. A normal fault structure trending Southeast–Northwest was identified with a throw of approximately 14 m. Regression analysis reveals that Fixed Carbon has the strongest positive correlation with calorific value ($R^2 = 0.6452$), whereas Total Moisture shows a moderately strong negative correlation ($R^2 = 0.5821$). Rank integration yielded a quality index of 2.333–2.986, with the highest-quality zones concentrated away from fault structures. These results indicate that fault structures influence coal quality distribution, whereas the characteristics of the Muara Enim Formation and the degree of coalification remain the primary controls on coal quality.

Keywords: Coal, Coal Quality, Multi-stacking, Linear Regression, Fault Structure, Well Logging

ABSTRAK

KARAKTERISASI KUALITAS BATUBARA TERHADAP PENGARUH STRUKTUR PATAHAN BERDASARKAN METODE *WELL LOGGING* PADA LAPANGAN BATU TEGAK SEJAJAR PT BUDI GEMA GEMPITA

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Lapangan Batu Tegak Sejajar di Desa Muara Lawai, Kecamatan Merapi Timur, Kabupaten Lahat, Provinsi Sumatera Selatan merupakan bagian dari Formasi Muara Enim, Cekungan Sumatera Selatan, yang memiliki kondisi geologi kompleks dengan kemiringan lapisan batubara 69,87°–82° serta keberadaan struktur patahan yang diduga memengaruhi persebaran dan kualitas batubara. Penelitian ini bertujuan mengidentifikasi karakteristik litologi, memodelkan persebaran lapisan batubara, mengkarakterisasi struktur patahan, serta menganalisis pengaruhnya terhadap kualitas batubara. Data yang digunakan meliputi *well logging* dari 21 sumur berupa Gamma Ray (GR), *Long Spacing Density* (LSD), dan *High Resolution Density* (HRD), *coal actual* dari 22 sumur, serta data kualitas batubara dari 16 sumur. Pengolahan dilakukan menggunakan *Minescape* melalui pembuatan profil litologi, model 3D *drill hole*, peta kontur struktur, peta *coal actual*, serta interpolasi *ordinary kriging* pada parameter *Ash Content* (AC), *Fixed Carbon* (FC), *Total Moisture* (TM), *Total Sulfur (*TS), *Volatile Matter* (VM), dan *calorific value* (CV). Seluruh parameter diintegrasikan dalam peta ranking kualitas batubara. Hasil penelitian mengidentifikasi sembilan seam batubara, yaitu S6A1, S6A2, S6AU, S6AL, S6BU, S6BL, S6CU, S6CL, dan S7D, serta fenomena splitting pada Seam S6A. Batubara memiliki nilai rata-rata Gamma Ray 3,88 cps, densitas 1,80 gr/cc, IGR 0,043, dan Vshale 0,014 yang menunjukkan batubara relatif bersih. Struktur patahan normal berarah Tenggara–Barat Laut memiliki throw sekitar 14 m. Analisis regresi menunjukkan Fixed Carbon memiliki hubungan positif terkuat terhadap calorific value (R^2 = 0,6452), sedangkan Total Moisture memiliki hubungan negatif yang cukup kuat (R^2 = 0,5821). Integrasi ranking menghasilkan indeks kualitas 2,333–2,986 dengan zona kualitas terbaik terkonsentrasi menjauhi struktur patahan. Hasil ini menunjukkan bahwa struktur patahan memengaruhi distribusi kualitas batubara, sedangkan karakteristik Formasi Muara Enim dan tingkat coalification tetap menjadi pengendali utama kualitas batubara.

Kata kunci: Batubara, Kualitas Batubara, Multi Stacking, Regresi Linear, Struktur Patahan, *Well Logging*.