

## SARI

### Aplikasi Log Geofisika Dalam Estimasi Kandungan Gas Reservoir Gas Metana Batubara Di Daerah Muara Enim Sumatera Selatan

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Cekungan Sumatra Selatan memiliki cadangan batubara sebesar 18.8 milyar ton, termasuk didalamnya batubara Formasi Muara Enim yang dipercaya memiliki prospektif tinggi dalam produksi gas metana batubara (Pujobroto, 1997; Sosrowidjojo dan Saghafi, 2009). Estimasi kandungan gas metana batubara (GMB) dengan log geofisika berbeda pada setiap lapangan, karena perbedaan parameter penilaian yang digunakan (Fu, *et al.*, 2009; Deng, *et al.*, 2013; Mavor, *et al.*, 1990).

Penelitian ini dilakukan pada lapisan batubara Mangus-A1 dan Mangus-A2 (M2), lapisan batubara Burung (M3) dan lapisan batubara Kebon (M4) Formasi Muara Enim pada Blok Muara Enim-1, Blok Muara Enim-2 dan Blok Muara Enim-3 di daerah Muara Enim. Data penelitian berasal dari lima sumur pengeboran, terdiri dari data *core*, data kandungan gas, data log geofisika, data geokimia dari analisis proksimat. Analisis yang dilakukan adalah korelasi geokimia dan kandungan gas, korelasi geokimia dan nilai Petrofisika dari log geofisika, korelasi nilai Petrofisika dan kandungan gas batubara, serta analisis regresi linier.

Batubara berperingkat lignit- sub-bituminous ( $R_o$  0,31 – 0,4%) di daerah penelitian, memiliki ketebalan 2,35 – 12,86 m dengan kandungan gas batubara 1,87 - 4,0 m<sup>3</sup>/t. Nilai Petrofisika dari log gamma ray 24,67 - 97,5 API dan 1 – 9 CPS, log densitas 1,1 - 1,6 gr/cm<sup>3</sup> dan 266,7 – 886,7 CPS, log neutron 20,40 - 114,67%, log resistivitas 1,2 - 10  $\Omega$ m, dan log sonik 484 - 568,87  $\mu$ s/m. Hasil analisis geokimia batubaranya mengandung kadar lengas 10 - 15,66%, kadar abu 1,3 - 14,3%, zat terbang 29,1 - 45,19%, dan karbon tertambat 24,4 - 45,57%.

Berdasarkan hasil analisis korelasi geokimia terhadap kandungan gas, korelasi yang signifikan adalah korelasi negatif kadar lengas ( $R = -0,591$ ), kadar abu ( $R = -0,523$ ) dan korelasi positif zat terbang ( $R = 0,652$ ). Berdasarkan hasil korelasi geokimia terhadap nilai petrofisika, korelasi yang signifikan adalah korelasi negatif zat terbang ( $R = -0,547$ ) dan korelasi positif kadar abu ( $R = 0,546$ ) terhadap log densitas dan korelasi negatif kadar lengas ( $R = -0,394$ ) terhadap log neutron. Berdasarkan hasil analisis korelasi, log geofisika dengan korelasi yang signifikan terhadap kandungan gas adalah korelasi negatif log densitas ( $-0,881$ ) dan korelasi positif neutron ( $0,359$ ).

Hasil analisis regresi linier, diperoleh formula estimasi gas berupa formula lokal (Blok GMB) dan formula umum untuk daerah Muara Enim yaitu:

$$Q_p = 7,600 - 4,053 \rho \text{ (Formula Blok Muara Enim-1: } R = 0,726)$$

$$Q_p = 8,869 - 4,257 \rho \text{ (Formula Blok Muara Enim-2: } R = 0,881)$$

$$Q_p = 7.133 - 3.918 \rho + 0.014 \phi \text{ (Formula umum Muara Enim: } R = 0,80)$$

**Kata Kunci:** Formasi Muara Enim, Log geofisika, Regresi linier, Estimasi GMB.

## ABSTRACT

### *Application of Geophysical Logs in Estimating Gas Content of Coalbed Methane Reservoirs in Muara Enim Area South Sumatra*

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*South Sumatra Basin have 18.8 billion tons coal resources, include Muara Enim Formation that having high prospect production of coalbed methane (Pujobroto, 1997; Sosrowidjojo dan Saghafti, 2009). Due to different assessment parameters used, estimating coal gas content with geophysic logs are different in each area.*

*This study was conducted on Mangus-A1, Mangus-A2 (M2), Burung (M3) and Kebon (M4) seam coals of Muara Enim Formation in Muara Enim-1 Block, Muara Enim-2 Block and Muara Enim-3 Block, in Muara Enim area. The data used were obtained from five drilling wells, consisting of coring data, gas content data, geochemical data from proximate analysis and geophysical logs data. The analysis in study consisted of correlation analysis between geochemical and gas content, geochemical and petrophysics from geophysical logs, correlation between petrophysics and coal gas content, and linear regression analysis.*

*Lignit - sub-bituminus (Ro 0.31 – 0.4%) coals in research area has thickness between 2.35 – 12.80 m with gas content 1.93 - 4.00 m<sup>3</sup>/t. Geophysical logs data of coals has 24.67 – 97.5 API and 1 – 9 CPS of gamma ray logs, 1.1 – 1.6 gr/cm<sup>3</sup> and 266.7 – 886.7 CPS of density logs, 20.40 – 114.67% of neutron logs, 1.2 - 10 Ωm of resistivity logs, 484 – 568.8 μs/m of sonic logs. Geochemical composition of coals based on proximate analysis has 10 - 15.66% of moisture, 1.3 – 14.3 % of ash yield, 29.1 - 45.19% of volatile matter, and 24.4 - 45.57% of fixed carbon.*

*Based on correlation analysis of geochemical and gas content, significant correlations were negative correlation of moisture content (R = - 0.591), ash content (R = - 0.523), and positive correlation of volatile matter (R = 0.652). Based on correlation analysis of geochemical and geophysical logs, significant correlations were negative correlation of volatile matter (R = - 0.547), positive correlation of ash yield (R = 0.546) to density log and negative correlation of moisture (R = - 0.394) to neutron log. Based on correlation analysis results, geophysical logs with highest significant correlation to gas content were negative correlation of density log (- 0.881) and positive correlation of neutron log (R = 0.359).*

*Result of linear regression analysis obtained formula to estimate gas content in local area (Blok CBM) and general formula for Muara Enim area are:*

*$Q_p = 7.600 - 4.054 \rho$  (Formula of Muara Enim-1 Block: R = 0,726)*

*$Q_p = 8.869 - 4.257 \rho$  (Formula of Muara Enim-2 Block: R = 0,881)*

*$Q_p = 7.133 - 3.918 \rho + 0.014 \phi$  (General formula of Muara Enim Area: R = 0,80)*

**Keywords:** *Muara Enim Formation, Geophysical Logs, Linier Regression, CBM Estimation.*