

## INTISARI

Gas alam menjadi salah satu sumber energi yang penting dan kebutuhannya terus meningkat. *Coal Bed Methane* (CBM) dapat menjadi alternatif pemenuhan kebutuhan gas alam. Permeabilitas menjadi faktor penting keberhasilan eksploitasi CBM yang ditentukan oleh *cleat system*. Penelitian ini dilakukan di Bowen Basin, Queensland, Australia pada Formasi German Creek, dan Rangal Coal Measure dengan fokus penelitian pada *cleat system*, faktor pembentukannya, dan pengaruhnya terhadap permeabilitas. Data yang diperoleh berupa pengukuran *cleat* oleh Pattinson *et al.*, 1996 dan data primer berupa log FMI yang diperoleh dari laporan pemboran dalam website GSQ Open Data Portal (laman: <https://geoscience.data.qld.gov.au>). Dilakukan tabulasi data pengukuran arah *strike cleat system* oleh Pattinson *et al.*, 1996. Log FMI diinterpretasi untuk menentukan arah *maximum horizontal stress* ( $S_{Hmax}$ ), struktur geologi bawah permukaan, dan *cleat* batubara. Hasil interpretasi log FMI ini ditabulasi dan digunakan untuk menganalisis proses pembentukan *cleat* secara semi kualitatif. Hasil perhitungan permeabilitas dianalisis dengan atribut – atribut *cleat* menggunakan metode regresi korelasi non-linear. *Trend* arah *face cleat* dan *butt cleat* adalah sebagai berikut: di Area German – Oaky Creek arah *strike face cleat* dominan barat laut – tenggara dan *butt cleat* timur laut – barat daya; arah *strike face cleat* yang dominan di Area Tambang Blackwater dan Moura adalah timur laut – barat daya dengan *butt cleat* barat laut – tenggara. Rata – rata panjang *cleat* adalah 0,52 – 60 cm. Rata – rata apertur *cleat* adalah 0,0017 – 0,005 cm. Intensitas *cleat* bervariasi dari 4 – 18 *cleat*/0,15 m<sup>2</sup>. Densitas *cleat* berkisar antara 0,001 – 0,280 cm/cm<sup>2</sup>. Rata – rata *spacing face cleat* adalah 5 – 50 mm dan *butt cleat* 13,333 – 50 mm. *Cleat system* di daerah penelitian terbentuk saat pembentukan batubara yang dibuktikan dengan *trend cleat* yang tegak lurus terhadap perlapisan batuan. Hasil perhitungan permeabilitas *cleat* batubara menggunakan rumus Robertson dan Christiansen (2006) berkisar antara 7,12 – 324,75 mD. Atribut *cleat* yang berpengaruh signifikan terhadap permeabilitas adalah apertur; apertur yang besar meningkatkan nilai permeabilitas.

Kata kunci: batubara, *cleat*, permeabilitas

### **ABSTRACT**

*Natural gas is one of the most important sources of energy and its demand continues to increase. Coal Bed Methane (CBM) can be an alternative to meet the needs of natural gas. Permeability is an important factor in the succession of CBM exploitation which is determined by the cleat system. This research was conducted in Bowen Basin, Queensland, Australia in the German Creek Formation, and Rangal Coal Measure with a focus on researching the cleat system, cleat formation factors, and their effect on permeability. The data was obtained in from cleat measurements by Pattinson et al., 1996 and FMI logs as primary data obtained from drilling reports in the GSQ Open Data Portal website (page: <https://geoscience.data.qld.gov.au>). The data tabulation for the orientation of the cleat system direction was conducted by Pattinson et al., 1996. FMI logs are interpreted to determine the direction of maximum horizontal stress ( $S_{Hmax}$ ), subsurface geological structure, and coal cleats. The results of the interpretation of the FMI logs were tabulated and used to analyze the cleat formation process semi-qualitatively. The results of the permeability calculation were analyzed with cleat attributes using a non-linear correlation regression method. The trend direction of the face cleats and butt cleats are as follows: in the German–Oak Creek Area The strike direction of the face cleats is predominantly northwest-southeast and the butt cleats are northeast-southwest; The dominant strike face cleat direction in the Blackwater and Moura Mine Areas is northeast-southwest with the butt cleat northwest-southeast. Average cleat length is 0,52 – 60 cm. The average cleat aperture is 0,0017 – 0,005 cm. Cleat intensity varies from 4 – 18 cleat/0,15 m<sup>2</sup>. The cleat density ranges from 0.001 – 0.280 cm/cm<sup>2</sup>. The average face cleat spacing is 5 – 50 mm and the butt cleat is 13,333 – 50 mm. The cleat system in the study area is formed by the loading process during coal formation as evidenced by the trend of the cleats perpendicular to the rock layer. The calculation result of the permeability of coal cleats using the Robertson and Christiansen formula (2006) ranged from 7,12 – 324,75 mD. The cleat attribute that has a significant effect on permeability was the aperture; a large aperture increases the value of permeability.*

*Keywords: coal, cleat, permeability*