ABSTRAK

ANALISIS KESTABILAN LERENG *HIGHWALL* AKTUAL DENGAN METODE LIMIT EQUILIBRIUM METHOD (LEM) PADA PIT "MHU COAL" PT. ANTAREJA MAHADA MAKMUR, KALIMANTAN TIMUR

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Daerah penelitian berada pada area tambang terbuka PT Antareja Mahada Makmur, Site “MHU Coal”, yang secara geologi termasuk ke dalam Formasi Pulau Balang dan didominasi oleh litologi batupasir, batulempung, batulanau, serta batubara. Penelitian ini bertujuan untuk mengevaluasi kestabilan lereng *highwall*, mengidentifikasi parameter yang paling berpengaruh terhadap nilai faktor keamanan, mengoptimalkan geometri lereng, serta menentukan batas aman kH pada area penelitian. Analisis dilakukan menggunakan LEM dengan pendekatan probabilistik Monte-Carlo, sedangkan pembebanan dinamis dimodelkan menggunakan analisis pseudostatik berdasarkan nilai PGA dengan kH sebesar 0,027 g. Hasil analisis menunjukkan bahwa lereng aktual memiliki nilai faktor keamanan statis sebesar 1,327-1,843, faktor keamanan dinamis sebesar 1,267-1,760, serta PoF sebesar 0-4,4%, sehingga memenuhi kriteria Kepmen ESDM No. 1827/K/30/MEM/2018. Analisis sensitivitas menunjukkan bahwa sudut geser dalam batulempung merupakan parameter yang paling berpengaruh terhadap perubahan nilai faktor keamanan. Hasil optimalisasi menghasilkan geometri lereng dengan tinggi *bench* 10 m, sudut *single slope* 60°, lebar *bench* 5-10 m, lebar *ramp* 10-30 m, dan sudut *overall slope* 30-40°. Geometri tersebut menghasilkan nilai faktor keamanan statis sebesar 1,307-1,846, faktor keamanan dinamis sebesar 1,246-1,767, serta PoF sebesar 0-3,7%. Berdasarkan analisis pembebanan dinamis, diperoleh rekomendasi nilai batas aman kH sebesar 0,06 direkomendasikan sebagai batas aman pembebanan dinamis dalam perencanaan aktivitas peledakan.

Kata kunci: Faktor Keamanan, kH, kestabilan lereng, *Limit Equilibrium Method* (LEM), optimalisasi geometri.

ABSTRACT

SLOPE STABILITY ANALYSIS OF ACTUAL HIGHWALL SLOPES USING THE LIMIT EQUILIBRIUM METHOD (LEM) AT THE "MHU Coal" PIT, PT ANTAREJA MAHADA MAKMUR, EAST KALIMANTAN

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The study area is located at the open-pit mine of PT Antareja Mahada Makmur, "MHU Coal" Site, which is geologically part of the Pulau Balang Formation and is dominated by sandstone, claystone, siltstone, and coal. This study aims to evaluate the stability of the highwall slope, identify the most influential parameter affecting the factor of safety, optimize the slope geometry, and determine the safe limit of the kH within the study area. Slope stability analysis was conducted using the LEM with a probabilistic Monte-Carlo approach, while dynamic loading was simulated using a pseudostatic analysis based on a PGA corresponding to a kH of 0.027 g. The results indicate that the existing slopes have static factors of safety ranging from 1.327 to 1.843, dynamic factors of safety ranging from 1.267 to 1.760, and PoF ranging from 0 to 4.4%, thereby satisfying the stability criteria specified in the Decree of the Minister of Energy and Mineral Resources No. 1827/K/30/MEM/2018. Sensitivity analysis revealed that the internal friction angle of claystone is the most influential parameter affecting the factor of safety. The optimized slope geometry consists of a 10 m bench height, a 60° single slope angle, bench widths of 5-10 m, ramp widths of 10-30 m, and overall slope angles of 30-40°. The optimized design produced static factors of safety ranging from 1.307 to 1.846, dynamic factors of safety ranging from 1.246 to 1.767, and probabilities of failure ranging from 0 to 3.7%. Based on the dynamic loading analysis, a kH of 0.06 is recommended as the safe limit for dynamic loading in blasting operations.

***Keywords**: factor of safety, kH, Limit Equilibrium Method (LEM), Monte-Carlo, slope geometry optimization, slope stability.*