

INTISARI

Analisis kestabilan lereng dilakukan pada area tambang terbuka batubara PT Kaltim Prima Coal, Kecamatan Sangatta, Kabupaten Kutai Timur, Provinsi Kalimantan Timur. Tujuan penelitian untuk mengetahui kondisi geologi pada daerah penelitian, analisis kestabilan lereng dengan menentukan nilai faktor keamanan (FK) dan probabilitas kelongsoran (PK), dan memberikan rekomendasi desain lereng yang belum memenuhi kriteria keamanan KEPMEN ESDM RI No. 1827 K/30/MEM/2018. Pengumpulan data dilakukan melalui pengamatan lapangan serta uji laboratorium untuk mengetahui kondisi geologi dan parameter sifat fisik dan mekanik material. Geomorfologi daerah penelitian berupa satuan perbukitan bergelombang kuat dan satuan perbukitan bergelombang lemah dengan litologi penyusun berupa batupasir sisipan batulempung dan batubara dan satuan batulempung sisipan batupasir dan batubara dengan arah perlapisan barat daya-timur laut. Struktur geologi berupa kekar memiliki orientasi arah barat laut-tenggara. Metode yang digunakan dalam penelitian yaitu metode kesetimbangan batas dan metode probabilitas dengan bantuan perangkat lunak SLIDE2. Parameter masukan analisis probabilitas berupa nilai UCS dan berat isi dilakukan uji statistik untuk penentuan jenis fungsi distribusi dan uji baik suai menggunakan Metode Anderson Darling sedangkan nilai GSI, m_i , dan D tidak dilakukan uji statistik. Metode kesetimbangan batas menggunakan Morgenstern-Price dengan nilai UCS dan berat isi hasil pendekatan *weighted average* berdasarkan ketebalan litologi. Hasil analisis pada delapan sayatan yaitu SP1_HW, SP2_HW, SP1_LW, dan SP3_LW memenuhi kriteria keamanan sedangkan SP3_HW, SP4_HW, SP2_LW, dan SP4_LW menunjukkan kondisi tidak stabil dengan FK dinamis $\leq 1,0$ dan PK mencapai 33,5% hingga 99,98%. Redesain geometri dilakukan pada lereng tidak stabil dengan memperlebar *bench highwall* menjadi 12 meter pada SP3_HW dan SP4_HW serta menambah jumlah *bench lowwall* pada SP2_LW dan SP4_LW meningkatkan nilai FK $\geq 1,107$ dan menurunkan PK $< 10\%$ sehingga seluruh sayatan desain memenuhi standar KEPMEN ESDM RI No. 1827 K/30/MEM/2018.

Kata kunci: Faktor keamanan, kestabilan lereng, metode probabilitas, metode kesetimbangan batas, probabilitas kelongsoran

ABSTRACT

Slope stability analysis was conducted at PT Kaltim Prima Coal open-pit coal mining area in Sangatta, East Kutai, East Kalimantan. The study aimed to determine geological conditions, evaluate slope stability through the factor of safety (FoS) and probability of failure (PoF), and provide design recommendations for slopes that do not meet the safety criteria set by KEPMEN ESDM RI No. 1827 K/30/MEM/2018. Data collection was carried out through field observations and laboratory testing to obtain geological conditions and the physical-mechanical properties of materials. The geomorphology of the research area consists of strongly and weakly undulating hill units, composed of sandstone interbedded with claystone and coal, and claystone interbedded with sandstone and coal, with bedding oriented southwest–northeast. The geological structures include joints with a northwest–southeast orientation. The methods used in this research are the Limit Equilibrium Method (LEM) and probabilistic analysis using SLIDE2 software. Input parameters for the probabilistic analysis, such as UCS and unit weight, were subjected to statistical analysis to determine their probability distribution and goodness-of-fit using the Anderson-Darling test, while GSI, m_i , and D values were not statistically tested. The LEM analysis employed the Morgenstern-Price method, with UCS and unit weight estimated using a weighted average based on lithological thickness. The analysis results for eight sections indicated that SP1_HW, SP2_HW, SP1_LW, and SP3_LW met the safety criteria, while SP3_HW, SP4_HW, SP2_LW, and SP4_LW were categorized as unstable, with dynamic FoS ≤ 1.0 and PoF ranging from 33.5% to 99.98%. Redesign was applied to unstable slopes by widening the highwall bench to 12 meters in SP3_HW and SP4_HW, and increasing the number of lowwall benches in SP2_LW and SP4_LW. These adjustments increased FoS to ≥ 1.107 and reduced PoF to $< 10\%$, ensuring that all slope designs complied with KEPMEN ESDM No. 1827 K/30/MEM/2018 standards.

Keywords: *Factor of safety, limit equilibrium method, probability method, probability of failure, slope stability,*