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Abstract Index

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Application of Cuckoo Search Method in 3D Slope Stability Analysis for Limestone Quarry Mine

Aplikasi Metode* Cuckoo Search *pada Analisis Kestabilan Lereng 3D untuk Tambang Kuari Batu Gamping

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P. 57-65

The Cuckoo Search (CS) is a very fast and efficient global optimization method to locating the slip surface which carried out by iteration. However, the Grid Search (conventional method) method in 3D slope stability analysis takes longer than this method on the computation process. Slope stability analysis was performed using the 3D limit equilibrium method "Bishop" with Cuckoo Search of slip surface by maximizing iteration of the simulation and columns in X or Y. To ensure that the slip surface within the global minimum slip surface, the maximum iteration in CS was also specified from 40 to 1200. Based on maximum columns in X or Y, the safety factor value of the 3D CS results was then compared to the Grid Search results to determine the final 3D safety factor and the estimated volume of potential failure. The final 3D safety factor obtained from the average 3D safety factor (with maximum iteration 400, 800, 1000, and 1200) is about 2,01 with the average estimated volume of slope failure of 190.000 m^3 that located at the north of the pit.

Keywords: open pit mine, limestone, slope stability analysis, 3D-limit equilibrium method, Cuckoo Search

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Delay Effect of Mud Loading to the Open Pit Design in Terms of Meeting 2018 – A Coal Production Target Case Study of Pit XYZ at South Kalimantan

Pengaruh Keterlambatan Pemuatan Lumpur Terhadap Rancangan Penambangan dalam Rangka Memenuhi Target Produksi Batubara 2018 Sebuah Studi Kasus di* Pit XYZ*, Kalimantan Selatan

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Based on the 2018, there a mining plan, two temporary sumps, namely the ABC and BCD sumps. They located in a mining sequence pattern. These sumps required a mud loading process prior to mining the coal below the sequence. The mud loading process is loaded sequentialy. However, the problem occurs when the mud loading process in the ABC sump is delayed, and resulted only 42% of mud production. Such the delay resulted in hindering the mining sequence pattern which forced changes in plans, designs, and decrease of coal production. These condition led to study the cause, impact, and alternative solution of the delay during mud loading process. The method used in this study includes direct observations and data collection of working conditions, equipment capabilities, material properties, and operation timeline. In this study, the statistical analysis is used to determine the cause and effect of delayed mud loading process. A Minex Software is then used to simulate the alternative of redesign the mining sequence pattern. The study found that the delay in mud loading process is due to the external and internal factors, that result in underproduction of coal only 505,833 tons, and delayed of coal production around 64 days. An alternative that can be conducted is to change the direction progress to the area that has low stripping ratio. Factors that can hinder the progress are need to be considered for anticipating the plan distraction at mid-term-plan.

Keywords: delay, mud loading, sequence, coal production

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Subsidence and Heat Propagation Modeling on the Underground Coal Gasification (Case Study at Muara Enim Formation, South Sumatera)

Pemodelan Penurunan Tanah dan Rambatan Panas pada Gasifikasi Batubara Bawah Tanah (Studi Kasus di Formasi Muara Enim, Sumatera Selatan)

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P. 83-98

One of the important issues to study underground coal gasification (UCG) is the prediction of surface subsidence. Several parameters that influence these conditions are the thickness of cap rock, the physical and mechanical characteristics, the structure condition, the minerals composition of the rock, and external conditions. This study had been carried out simulation and modeling to determine the level of surface subsidence risk and the effect of high temperatures due to the activities. The modeling results show that the thickness of the rock above the UCG coal seam greatly affects the surface subsidence. The depth is more than 200 m and found that the SF value is 1.59 which indicates UCG reactor depth of ≥ 200 m is safe from the risk of subsidence. From the characteristic aspect of the cap rock, the claystone types which not contain kaolinite minerals are more prone to collapse than those of contain kaolinite minerals. From this models, the gasifier at 150 m depth was estimated that there will be a decline of -7.23 m, and the minimum subsidence is at 275 m about 0.1 m. The heat

propagation modeling results show that at 50 m the temperature is estimated to be 213- 289°C, but if the thickness of the cap rock is > 200 m depth, the temperature is around 29-28°C.

Keywords: numerical modeling, subsidence, cap rock, kaolinite, non-kaolinite

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Hidayat, Kukuh N.; Wahyudi, Agus and Husaini (R&D Centre for Mineral and Coal Technology)
Making a Synthetic Zeolite from a Residue of Bauxite Washing
Pembuatan Zeolit Sintetik dari Sisa Hasil Pencucian Bauksit
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P. 99-104

A zeolite synthetic of NaA type is generally prepared by mixing the alumina and silicate-containing materials (alkali alumino hydro-silicates). The used raw materials include the amorphous solids such as metakaolin, siliceous earth, coal ash, kimberlite waste, alumina trihydrate [$Al(OH)_3$], bauxite, and aluminum metal. Residue of bauxite washing retains a fine texture and contains significant alumina and silica content, namely 30-36% Al_2O_3 and 10-15% SiO_2. Both components are required for making the zeolite NaA . In this research, the zeolite NaA was made by extracting the alumina from residue of bauxite washing with caustic soda, and followed by reacting it with a water glass after through the flushing and washing process. The composition of zeolite NaA is as follows: 33.87% SiO_2, 27.63% Al_2O_3, 16.31% Na_2O, and 22.18% H_2O with $Na_{96}Al_{96}Si_{96}O_{384}.216H_2O$ or $Na_{12}(AlO_2)_{12}(SiO_2)_{12}.27H_2O$ as its mineral composition.

Keywords: alumina, bauxite, reactive silica, waste washing bauxite, zeolite NaA

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Umar, Datin F.; Suganal; Monika, Ika; Hudaya, Gandhi K. and Diniyati, Dahlia (R&D Centre for Mineral and Coal Technology)
The Influence of Steam Drying Process on Combustion Behavior of Indonesian Low-Rank Coals
Pengaruh Proses Pengeringan Uap Terhadap Sifat Pembakaran Batubara Peringkat Rendah Indonesia
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P. 105-115

Steam drying process of the Low Rank Coals (LRCs) has been conducted to produce coal which is comparable with the High Rank Coal (HRC). Characterization of the raw and dried coals was carried out through proximate, ultimate, calorific value, Fourier Transform Infrared (FTIR) spectroscopy and Thermo Gravimetry-Differential Thermal Analysis (TG-DTA) to study the combustion behavior of the coals. This study used Indonesian low rank coals coming from Tabang (TKK coal) and Samurangau (SP coal), East Kalimantan. The results indicate that the calorific value of the dried coals increases significantly due to the decrease in moisture content of the coal. The FTIR spectrums show that the methylene-ethylene ($R_{CH3/CH2}$) and aromaticity-aliphaticity ratios ($R_{ar/al}$) of the dried coals increased while the ratio of $R_{CO/ar}$ decreased which reflect that the rank of the coals increased equivalent to the high rank coal (bituminous). Meanwhile, the TG-DTA indicates that the ignition temperature (Tig) and combustion rate (Rmax) of the dried coals increased. This analysis expresses that the dried coals produced by steam drying process have better combustion behavior due to the higher calorific value than those of the raw coals.

Keywords: linkage, coefficient, sector, input, output