

RINGKASAN

PT Freeport Indonesia (PTFI) merupakan perusahaan pemegang izin usaha pertambangan khusus (IUPK) operasi produksi bijih tembaga dengan sistem penambangan tambang bawah tanah. Salah satu tambang bawah tanah yang beroperasi di PT Freeport Indonesia yaitu *Big Gossan*. Tambang bawah tanah *Big Gossan* menggunakan metode penambangan *open stope* dengan *paste backfill*. Pada tahun 2023, sasaran produksi bijih tembaga di *Big Gossan* sebesar 7.500 ton/hari berasal dari penambangan dan kegiatan *development*. Produksi bijih tembaga dari kegiatan *development* meliputi area *footwall drift*, sisi selatan dari *footwall drift*, *access crosscut*, serta *production crosscut* dengan kadar rata-rata 1,4% EqCu. Kadar rata-rata tersebut masih dibawah nilai *cut off grade* yang ditetapkan perusahaan yaitu sebesar 1,77% EqCu. Hasil produksi kegiatan *development* dibawah nilai *cut off grade* disebabkan karena masih tercampurnya antara *ore* dan *waste* serta belum adanya komposisi *blending* yang optimal untuk mendapatkan kadar hasil produksi diatas nilai *cut off grade*. Untuk meningkatkan kadar terhadap pencampuran hasil produksi tersebut, perlu dilakukan optimalisasi perencanaan pemisahan *ore* dan *waste* pada kegiatan *development*.

Tujuan penelitian ini adalah menentukan komposisi *blending* yang optimal dengan kadar diatas *cut off grade* dan menentukan kapasitas timbunan *waste* sesuai dengan rancangan perusahaan. Adapun metode yang dilakukan yaitu mengelompokkan area yang mengandung *ore* dengan kadar mineral tinggi dan area *waste* dengan kadar mineral rendah. Kemudian dilakukan pencampuran antara area kadar mineral tinggi dan rendah dalam komposisi tertentu (*blending*). Penentuan komposisi *blending* menggunakan metode simpleks untuk mendapatkan kadar campuran bijih diatas nilai *cut off grade*. Sisa area kadar bijih rendah yang tidak termasuk dalam komposisi *blending* dipisahkan untuk dilakukan penimbunan.

Berdasarkan hasil perhitungan komposisi *blending* dengan metode simpleks pada tahun 2023, *ore* diperoleh sebanyak 135.504 ton dari area *production crosscut*, 71.195 ton dari area *access crosscut*, dan 3.301 ton dari area *footwall drift* dengan kadar rata-rata 1,9829% EqCu. Sedangkan *waste* yang dipisahkan sebanyak 98.727,7 ton. Pada tahun 2024, *ore* diperoleh sebanyak 157.540,7 ton dari area *production crosscut* dan 67.459,3 dari area *access crosscut* dengan kadar rata-rata 1,9438% EqCu. Sedangkan *waste* yang dipisahkan sebanyak 95.001,5 ton. Pada tahun 2025, *ore* diperoleh sebanyak 176.611,9 ton dari area *production crosscut*, 63.365,2 ton dari area *access crosscut*, dan 27.022,9 ton dari area bagian selatan *footwall drift* dengan kadar rata-rata 1,9471% EqCu. Sedangkan *waste* yang dipisahkan sebanyak 65.488,76 ton. *Waste* yang dipisahkan akan ditimbun ke *stope secondary* kosong dengan total kapasitas timbunan selama tiga tahun sebesar 124.875 m³.

Kata kunci : *Development, Cut off Grade, Blending, Ore, Waste*

SUMMARY

PT Freeport Indonesia (PTFI) is a company that holds a special mining business license (IUPK) for copper ore production operations using the underground mining system. One of the underground mines operating at PT Freeport Indonesia is Big Gossan. The underground mining at Big Gossan employs the open stope mining method with paste backfill. In 2023, the production target of copper ore at Big Gossan is 7,500 tonnes per day from mining and development activities. The copper ore production from development activities includes the footwall drift area, the south side of the footwall drift, access crosscut, and production crosscut, with an average grade of 1.4% EqCu. This average grade is still below the company's set cut off grade value, which is 1.77% EqCu. The production results from development activities falling below the cutoff grade are due to the mixing of ore and waste, as well as the absence of an optimal blending composition to achieve production grades above the cutoff grade. To improve the grade of the mixed production results, it is necessary to optimize the planning for separating ore and waste during development activities.

The objective of this research is to determine the optimal blending composition with grades above the cutoff grade and to determine the waste storage capacity according to the company's design. The method employed involves categorizing areas containing high-grade mineral ore and areas containing low-grade mineral waste. Then, a certain composition of blending is performed between the areas with high and low-grade minerals. The blending composition is determined using the simplex method to achieve a mixed ore grade above the cut off grade value. The remaining low-grade ore area that is not included in the blending composition will be separated and stacked.

Based on the blending composition calculation using the simplex method in 2023, 135,504 tonnes of ore are obtained from the production crosscut area, 71,195 tonnes from the access crosscut area, and 3,301 tonnes from the footwall drift area, with an average grade of 1.9829% EqCu. Meanwhile, 98,727.7 tonnes of waste are separated. In 2024, 157,540.7 tonnes of ore are obtained from the production crosscut area and 67,459.3 tonnes from the access crosscut area, with an average grade of 1.9438% EqCu. Meanwhile, 95,001.5 tonnes of waste are separated. In 2025, 176,611.9 tonnes of ore are obtained from the production crosscut area, 63,365.2 tonnes from the access crosscut area, and 27,022.9 tonnes from the south side of the footwall drift area, with an average grade of 1.9471% EqCu. Meanwhile, 65,488.76 tonnes of waste are separated. The separated waste will be stacked in empty secondary stopes with a total stacking capacity for three years of 124,875 m³.

Keywords: Development, Cut off Grade, Blending, Ore, Waste