

## INTISARI

Indonesia sebagai salah satu produsen batu bara terbesar di dunia menghadapi tantangan signifikan dalam pengelolaan air *run-off* tambang. Air *run-off* ini mengandung padatan tersuspensi (TSS), logam berat, dan senyawa organik yang dapat mencemari sumber air dan merusak ekosistem. Selain itu, pengolahan *run-off* air tambang menghasilkan *sludge* dengan *filterability* rendah yang menyulitkan proses *dewatering*, sehingga dipilihlah metode aerasi-ozonisasi sebagai tahap pengolahan air *run-off*. Penelitian ini bertujuan untuk menganalisis pengaruh variasi dosis ozon dalam kombinasi proses aerasi-ozonisasi terhadap *oxidation-reduction potential*, pH, *filterability sludge*, dan penyisihan kekeruhan, serta menentukan dosis optimum ozon.

Penelitian ini menggunakan metode eksperimen laboratorium dengan lima variasi dosis ozon (1,2; 1,5; 2; 3; dan 6 g/L). Aerasi dilakukan menggunakan aerator elektrik dan generator ozon selama 60 menit, dilanjutkan dengan karakterisasi fisik-kimia awal dan akhir, pengukuran laju filtrasi, serta analisis kekeruhan. Data dianalisis secara deskriptif melalui tabel dan grafik, serta uji ANOVA satu arah untuk mengetahui pengaruh signifikan antar perlakuan ( $\alpha = 0,05$ ).

Hasil menunjukkan bahwa dosis ozon berpengaruh signifikan terhadap ORP dan pH ( $p < 0,05$ ), serta memengaruhi *filterability sludge* dan kekeruhan. Dosis optimum 1,5 g/L pada sampel M4 memberikan peningkatan laju filtrasi sebesar 37,6% dan penyisihan kekeruhan hingga 88,19%. Namun, seluruh sampel belum memenuhi baku mutu kekeruhan air *higiene* sanitasi ( $< 3$  NTU) sesuai Permenkes No. 2 Tahun 2023. Penelitian ini memberikan dasar ilmiah untuk pengembangan teknologi pengolahan air *run-off* tambang yang lebih efektif dan berkelanjutan.

**Kata kunci:** aerasi, dosis, *filterability*, *run-off* batu bara, ozonisasi

## *ABSTRACT*

Indonesia, as one of the world's largest coal producers, faces significant challenges in managing mining runoff. This run-off typically contains suspended solids (TSS), heavy metals, and organic compounds, which degrade water quality and threaten ecosystems. Additionally, the treatment of mine run-off generates sludge with low filterability, which complicates the dewatering process; therefore, the aeration–ozonation method was chosen as the treatment stage for mining runoff water. This study aims to analyze the effect of varying ozone doses in the combined aeration–ozonation process on oxidation–reduction potential (ORP), pH, sludge filterability, and turbidity removal, and to determine the optimal ozone dose.

The research employed a laboratory experimental method using five ozone dosage variations (1.2; 1.5; 2; 3; and 6 g/L). Aeration was performed using an electric aerator and ozone generator for 60 minutes, followed by initial and final physic-chemical characterization, filtration rate measurement, and turbidity analysis. Data were analyzed descriptively (tables and graphs) and statistically using one-way ANOVA to determine significant differences among treatments ( $\alpha = 0.05$ ).

Results showed that ozone dosage significantly affected ORP and pH ( $p < 0.05$ ) and influenced sludge filterability and turbidity reduction. The optimal result was found at 1.5 g/L on sample M4, with a 37.6% increase in filtration rate and 88.19% turbidity removal. However, turbidity values of all samples remained above the hygiene-sanitation threshold ( $< 3$  NTU) set by Indonesian Regulation Permenkes No. 2 of 2023. This study contributes scientific insight toward the development of more efficient and sustainable mining wastewater treatment technologies.

**Keywords:** aeration, dose, filterability, mine runoff, ozonation