

ABSTRAK

OPTIMALISASI PENGOLAHAN AIR LIMBAH KOLAM PENGENDAPAN LUMPUR TAMBANG BATUBARA PT BANYAN KOALINDO LESTARI, SUMATERA SELATAN MENGUNAKAN ECENG GONDOK (*Eichhornia crassipes*)

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Air limbah tambang batubara sering memiliki pH rendah, kandungan TSS tinggi, dan kandungan logam berat Fe dan Mn yang dapat mencemari lingkungan jika tidak dikelola dengan baik. Penelitian ini dilakukan di Kolam Pengendapan Lumpur (KPL) BKL 1, PT Banyan Koalindo Lestari. Penelitian bertujuan untuk menganalisis karakteristik air limbah kolam pengendapan lumpur pada kompartemen 5 KPL BKL 1, menganalisis perubahan kualitas air limbah kompartemen 5 KPL BKL 1 (pH, TSS, Fe, dan Mn) dengan perlakuan penambahan tanaman eceng gondok, dan merekomendasikan arahan pengelolaan dalam optimalisasi KPL BKL 1 dengan penambahan tanaman eceng gondok agar sesuai baku mutu berdasarkan Pergub Sumatera Selatan Nomor 8 Tahun 2012.

Penelitian diawali dari pengambilan sampel air kompartemen 5 KPL BKL 1 dengan metode *composite sampling* untuk diuji karakteristik awal air limbah dari parameter pH, TSS, Fe, dan Mn. Selanjutnya, dilakukan perlakuan pada air limbah dengan variasi kontrol (tanpa tanaman), 3 tanaman (25% luas tutupan permukaan), dan 6 tanaman (50% luas tutupan permukaan), serta variasi waktu 5 dan 15 hari. Hasil uji dianalisis menggunakan metode deskriptif (grafik). Efektivitas perubahan nilai parameter dihitung dengan persamaan matematis dan deskriptif. Faktor biokonsentrasi (FBK) dihitung berdasarkan perbandingan konsentrasi Fe dan Mn di air limbah dan tanaman. Perubahan morfologi eceng gondok diamati selama perlakuan. Arahan pengelolaan dibuat berdasarkan variasi terbaik yang didapatkan dari percobaan dan disesuaikan dengan kondisi lapangan.

Hasil penelitian menunjukkan bahwa karakteristik air awal kompartemen 5 KPL BKL 1 memiliki pH yang masih rendah (3,7), TSS tinggi (1127,40 mg/L), Fe (3,20 mg/L) dan Mn (3,60 mg/L). Penambahan eceng gondok mampu menurunkan TSS hingga 97,960% pada variasi 25% dan menurunkan Fe hingga 97,188% pada variasi 50%. Perlakuan eceng gondok belum mampu menurunkan pH dan Mn. Kondisi fisik eceng gondok masih cukup baik hingga 15 hari percobaan. FBK Fe bernilai 3.119,2857 (tinggi) dan Mn bernilai 206,7556 (rendah). Dalam penerapan di lapangan diperlukan penambahan kapur di kompartemen 4 (0,2028 gr/liter) dan pemberian eceng gondok di kompartemen 5 (8.056 tanaman/181,25 m²) sesuai dengan SOP yang telah dirancang.

Kata kunci: Air Asam Tambang, Eceng Gondok, Lahan Basah Buatan

ABSTRACT

OPTIMIZATION OF WASTEWATER TREATMENT IN COAL MINE SETTLING PONDS AT PT BANYAN KOALINDO LESTARI, SOUTH SUMATERA USING WATER HYACINTH (*Eichhornia crassipes*)

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Coal mine wastewater often has low pH, high TSS content, and heavy metal content of Fe and Mn, which can pollute the environment if not managed properly. This study was conducted at the Sediment Pond (KPL) BKL 1, PT Banyan Koalindo Lestari. The study aimed to analyze the characteristics of sediment pond wastewater in compartment 5 of KPL BKL 1, analyze changes in the quality of wastewater in compartment 5 of KPL BKL 1 (pH, TSS, Fe, and Mn) with the addition of water hyacinth plants, and to recommend management guidelines for optimizing KPL BKL 1 with the addition of water hyacinth plants to meet quality standards based on South Sumatera Gov. Regulation No. 8 of 2012.

The study began with the collection of water samples from compartment 5 of KPL BKL 1 using the composite sampling method to test the initial characteristics of wastewater from the parameters of pH, TSS, Fe, and Mn. Wastewater treatment was carried out with variations in control (without plants), 3 plants (25% surface coverage), and 6 plants (50% surface coverage), as well as variations in time of 5 and 15 days. The test results were analyzed using descriptive methods (graphs). The effectiveness of parameter value changes was calculated using mathematical and descriptive equations. The bioconcentration factor (BCF) was calculated based on the comparison of Fe and Mn concentrations in wastewater and plants. Changes in water hyacinth morphology were observed during treatment. Management guidelines were developed based on the best variations obtained from the experiment and adjusted to field conditions

The results showed that the initial water characteristics of compartment 5 KPL BKL 1 had a low pH (3.7), high TSS (1127.40 mg/L), Fe (3.20 mg/L), and Mn (3.60 mg/L). The addition of water hyacinth was able to reduce TSS by up to 97.960% at a variation of 25% and reduce Fe by up to 97.188% at a variation of 50%. Water hyacinth treatment was not yet able to reduce pH and Mn. The physical condition of the water hyacinth was still quite good up to 15 days of experimentation. FBK Fe had a value of 3.119,2857 (high) and Mn had a value of 206,7556 (low). In field application, lime addition is required in compartment 4 (0.2028 g/liter) and water hyacinth application in compartment 5 (8.056 plants/181,25 m²) according to the established SOP.

Keywords: Acid Mine Drainage, Water Hyacinth, Wetland