

ABSTRAK

PENURUNAN *TOTAL SUSPENDED SOLID*, *TOTAL DISSOLVED SOLID*, DAN KEKERUHAN DENGAN FILTRASI PASIR SILIKA DAN ADSORPSI KARBON AKTIF PADA AIR VOID TAMBANG

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Air merupakan sumber daya vital yang memengaruhi berbagai aspek kehidupan, termasuk kebutuhan domestik di wilayah pertambangan. Penelitian ini bertujuan untuk mengevaluasi kualitas air void tambang di PT. Madhani Talatah Nusantara Site SBS 050C, Sumatera Selatan, serta menganalisis efektivitas media filtrasi pasir silika dan adsorpsi karbon aktif dalam menurunkan parameter kualitas air yaitu Total Suspended Solid (TSS), Total Dissolved Solid (TDS), dan kekeruhan, sesuai baku mutu PERMENKES No. 2 Tahun 2023. Metode penelitian menggunakan pendekatan eksperimental dengan unit kolom filtrasi vertikal yang terdiri dari tiga jenis media: campuran pasir silika–karbon aktif, pasir silika, dan karbon aktif. Hasil penelitian menunjukkan bahwa media campuran memiliki efektivitas tertinggi, menurunkan TSS, TDS, dan kekeruhan hingga 100% pada menit ke-60, dengan kapasitas adsorpsi masing-masing 0,0192 mg/g; 0,6402 mg/g; dan 0,0007866 mg/g. Laju filtrasi pada media campuran mencapai 0,00016 m/jam (pasir silika) dan 0,00048 m/jam (karbon aktif), dengan *Hydraulic Loading Rate* (HLR) sebesar 0,24 m/jam dan *Hydraulic Retention Time* (HRT) sebesar 23 menit. Hasil ini memenuhi standar SNI 3981:2008 dan menunjukkan potensi penerapan unit *Slow Sand Filter* (SSF) sebagai solusi pengolahan air bersih sederhana untuk kebutuhan higiene dan sanitasi. Unit SSF dirancang dengan dimensi 13 m × 6 m × 2,45 m, dan diarahkan untuk ditempatkan di area aman dari aktivitas tambang. Penelitian ini merekomendasikan pengembangan lanjutan dengan karakterisasi parameter kualitas air lainnya guna optimalisasi pengolahan.

Kata kunci : Filtrasi, adsorpsi, pasir silika, karbon aktif, air void tambang, TSS, TDS, Kekeruhan, SSF

ABSTRACT

REDUCTION OF TSS, TDS, AND TURBIDITY USING ACTIVATED CARBON AND SILICA SAND FILTRATION IN VOID WATER OF COAL MINING AT PT. MTN SOUTH SUMATERA

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Water is a vital natural resource that influences various aspects of life, including domestic needs in mining areas. This study aims to evaluate the initial water quality of void ponds at PT. Madhani Talatah Nusantara, Site SBS 050C, South Sumatra, and to analyze the effectiveness of silica sand filtration and activated carbon adsorption media in reducing Total Suspended Solids (TSS), Total Dissolved Solids (TDS), and turbidity, in accordance with the water quality standards set by the Indonesian Ministry of Health Regulation No. 2 of 2023. The research employed an experimental approach using vertical filtration columns with three types of media: a mixed media of silica sand and activated carbon, silica sand alone, and activated carbon alone. The results showed that the mixed media achieved the highest performance, reducing TSS, TDS, and turbidity by 100% within 60 minutes, with corresponding adsorption capacities of 0.0192 mg/g, 0.6402 mg/g, and 0.0007866 mg/g, respectively. The filtration rates for the mixed column were 0.00016 m/h for the silica sand layer and 0.00048 m/h for the activated carbon layer. The system achieved a Hydraulic Loading Rate (HLR) of 0.24 m/h and a Hydraulic Retention Time (HRT) of 23 minutes. These results comply with SNI 3981:2008 and demonstrate the potential application of a Slow Sand Filter (SSF) unit as a simple and effective water treatment solution for hygiene and sanitation needs. The proposed SSF unit is designed with dimensions of 13 m × 6 m × 2.45 m and is recommended to be placed in a secure area away from mining operations. Future research is recommended to include broader water quality parameters for improved treatment efficiency.

Keywords : Filtration, adsorption, silica sand, activated carbon, mining void water, TSS, TDS, Turbidity, SSF