

ABSTRAK

EFEKTIVITAS *CONSTRUCTED WETLAND* DENGAN TANAMAN ECENG GONDOK PADA LIMBAH CAIR TAHU AV TAHU PONG DESA PAREMONO, MUNGKID, MAGELANG, JAWA TENGAH

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Peningkatan jumlah industri tahu di Kabupaten Magelang menimbulkan permasalahan lingkungan akibat pembuangan limbah cair langsung ke badan air tanpa pengolahan terlebih dahulu, sehingga meningkatkan kadar BOD, COD, dan TSS yang melebihi baku mutu yang sudah ditetapkan pada Peraturan Daerah Jawa Tengah No 5 Tahun 2012 serta mengganggu kualitas ekosistem sungai. Kondisi ini menjadi dasar dilakukannya penelitian yang bertujuan untuk menganalisis kualitas limbah cair industri tahu av Tahu Pong di Desa Paremono, mengevaluasi efektivitas sistem *free water surface constructed wetland* (FWS-CW) dengan tanaman eceng gondok (*Eichhornia crassipes*) dalam menurunkan kadar BOD, COD, dan TSS, serta menyusun arahan pengelolaan efluen limbah cair berdasarkan kondisi eksisting di daerah penelitian.

Metode penelitian meliputi pengambilan sampel limbah cair dari outlet industri tahu, pengujian parameter kualitas air berdasarkan SNI 6989, dan proses pengolahan menggunakan reaktor *constructed wetland* tipe aliran bawah permukaan dengan dimensi 40 cm × 20 cm × 30 cm. Media filtrasi yang digunakan terdiri atas kerikil dan pasir, dengan tanaman eceng gondok sebagai agen fitoremediasi. Pengujian dilakukan dengan variasi waktu detensi 1, 3, dan 5 hari untuk mengetahui pengaruh lamanya waktu tinggal terhadap efektivitas penyisihan pencemar.

Hasil penelitian menunjukkan bahwa sistem FWS-CW mampu menurunkan kadar BOD sebesar 85,35%, COD sebesar 85,63%, dan TSS sebesar 85,83% pada waktu detensi 5 hari. Efisiensi tertinggi diperoleh pada waktu tinggal terlama karena proses biologis, filtrasi, dan penyerapan oleh tanaman berlangsung lebih optimal. Secara keseluruhan, sistem FWS-CW dengan eceng gondok terbukti efektif, ekonomis, dan ramah lingkungan, sehingga dapat dijadikan alternatif teknologi pengolahan limbah cair industri tahu skala kecil di Kabupaten Magelang.

Kata kunci: industri tahu, limbah cair, *constructed wetland*, eceng gondok

ABSTRACT

EFFECTIVENESS OF CONSTRUCTED WETLAND WITH WATER HYATONG PLANTS ON TOFU LIQUID WASTE AV TAHU PONG VILLAGE PAREMONO, MUNGKID, MAGELANG, CENTRAL JAVA

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*he increasing number of tofu industries in Magelang Regency has led to environmental problems due to the direct discharge of untreated liquid waste into water bodies, resulting in elevated levels of BOD, COD, and TSS that exceed the quality standards stipulated in Central Java Regional Regulation No. 5 of 2012 and disrupt river ecosystem quality. This condition forms the basis of this study, which aims to analyze the quality of liquid waste generated by the Av Tahu Pong tofu industry in Paremono Village, evaluate the effectiveness of a free water surface constructed wetland (FWS-CW) system using water hyacinth (*Eichhornia crassipes*) in reducing BOD, COD, and TSS concentrations, and develop effluent management recommendations based on existing conditions in the study area.*

The research method involved collecting wastewater samples from the tofu industry outlet, testing water quality parameters in accordance with SNI 6989 standards, and treating the wastewater using a subsurface-flow constructed wetland reactor with dimensions of 40 cm × 20 cm × 30 cm. The filtration media consisted of gravel and sand, with water hyacinth serving as the phytoremediation agent. Experiments were conducted with detention times of 1, 3, and 5 days to assess the effect of hydraulic retention time on pollutant removal efficiency.

The results showed that the FWS-CW system was able to reduce BOD by 85.35%, COD by 85.63%, and TSS by 85.83% at a detention time of 5 days. The highest removal efficiency was achieved at the longest retention time, as biological processes, filtration, and plant uptake occurred more optimally. Overall, the FWS-CW system using water hyacinth proved to be effective, economical, and environmentally friendly, making it a viable alternative technology for treating liquid waste from small-scale tofu industries in Magelang Regency.

Keywords: tofu industry, wastewater, constructed wetland, water hyacinth