# Analisis Efektivitas Penyisihan Mikroplastik pada Instalasi Pengolahan Air: Studi Kasus Instalasi Pengolahan Air Cibinong, Perumda Tirta Kahuripan = Analysis of Microplastic Removal Effectiveness in Water Treatment Plants: A Case Study of Cibinong Water Treatment Plant, Perumda Tirta Kahuripan

Dimas Nugraha Koswara, author



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Abstrak

Mikroplastik merupakan partikel plastik yang berukuran lebih kecil dari 5 mm. Mikroplastik ditemukan telah mencemari lingkungan dan paling banyak terakumulasi di lingkungan perairan, salah satunya adalah Sungai Ciliwung. Padahal, Sungai Ciliwung merupakan sumber air baku utama bagi Instalasi Pengolahan Air Cibinong. Keberadaan mikroplastik di sungai dapat dipengaruhi oleh curah hujan. Namun, penelitian terkait keberadaan mikroplastik di instalasi pengolahan air berdasarkan curah hujan masih sangat terbatas. Oleh karena itu, penelitian ini dilakukan dengan tujuan untuk menganalisis kelimpahan dan karakteristik mikroplastik, menghitung efisiensi penyisihan mikroplastik, serta menentukan korelasi antara pH dan kekeruhan dengan kelimpahan mikroplastik pada IPA Cibinong dengan mempertimbangkan curah hujan. Ekstraksi mikroplastik dilakukan berdasarkan metode NOAA. Pengujian dan pengamatan mikroplastik dilakukan dengan bantuan mikroskop binokuler dan FTIR. Pengambilan sampel air dilakukan di 5 titik, yakni air baku, koagulasi-flokulasi, sedimentasi, filtrasi, dan air produksi, sedangkan pengambilan sampel lumpur dilakukan pada unit sedimentasi. Kekeruhan dan pH air diukur secara insitu. Berdasarkan hasil penelitian, ditemukan kelimpahan mikroplastik di air baku dan produksi secara berturut-turut sebesar 344 partikel/L & 205 partikel/L pada hari kering dan 310 partikel/L & 256 partikel/L pada hari basah. Mikroplastik didominasi oleh bentuk fragmen (88.84 – 89.41%), warna hitam-abu (69.55 – 71.89%), dan ukuran dengan rentang 7 – 1985 Î¼m. Jenis polimer mikroplastik yang ditemukan pada keseluruhan sampel air baku dan produksi adalah PFVM, PVB, poliamida, Poly (Trimethyl Hexamethylene Terephthalamide), aramid, nilon amorf, PEI, nilon MXD6, dan PVC. Efisiensi penyisihan mikroplastik tertinggi dihasilkan oleh unit sedimentasi, yaitu 21.74 – 36.73%. Sementara itu, efisiensi secara kumulatif pada hari kering dan basah secara berturut-turut adalah sebesar 40.41% dan 17.42%. Kelimpahan mikroplastik memiliki korelasi yang kuat dan positif dengan pH (Ï = 0.872) (sig. = 0.054) dan kekeruhan (r = 0.846) (sig. = 0.071).
.....Microplastics are plastic particles smaller than 5 mm. They have been found contaminating the environment, particularly accumulating in aquatic environments such as the Ciliwung River, which is the primary raw water source for the Cibinong Water Treatment Plant (WTP). Additionally, rainfall can influence the abundance of microplastics in the river. However, studies on the abundance of microplastics in water treatment plants based on rainfall are limited. Thus, this study aims to analyze the abundance and characteristics of microplastics, calculate their removal efficiency, and determine the correlation between pH and turbidity with microplastic abundance at the Cibinong WTP, considering rainfall. In this study, microplastic extraction was performed based on NOAA method. Microplastic observations were conducted using a binocular microscope and FTIR. Water samples were collected from five points: raw water, coagulation-flocculation, sedimentation, filtration, and produced water, while sludge samples were taken from the sedimentation unit. Turbidity and pH of the water were measured in situ. The results showed that

the abundance of microplastics in raw and produced water of 344 particles/L & 205 particles/L on dry days and 310 particles/L & 256 particles/L on wet days. Microplastics were predominantly fragments (88.84 – 89.41%), black-gray in color (69.55 – 71.89%), and ranged in size from 7 – 1985 Î¼m. The types of microplastic polymers found in all raw and produced water samples were PFVM, PVB, polyamide, Poly (Trimethyl Hexamethylene Terephthalamide), aramid, amorphous nylon, PEI, nylon MXD6, and PVC. The highest microplastic removal efficiency was achieved by sedimentation, at 21.74 – 36.73%. Cumulative removal efficiency on dry and wet days was 40.41% and 17.42%, respectively. Microplastic abundance showed a strong positive correlation with pH (Ï = 0.872, sig. = 0.054) and turbidity (r = 0.846, sig. = 0.071).