Kajian Pemilihan Teknologi Pengolahan dan Simulasi Laboratorium untuk Penyisihan Fenol dan COD Air Limbah RSUI = Study of Selecting Treatment Technology and Laboratory Simulation for Phenol and COD Removal of UI Hospital Wastewater

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Abstrak

IPAL Rumah Sakit Universitas Indonesia sudah lama mengalami tantangan dalam menyisihkan kandungan fenol yang sering melebihi baku mutu. Anomali nilai COD pada penelitian sebelumnya dan kecenderungan efluen yang lebih tinggi dibandingkan influen mengharuskan COD sebagai parameter yang juga membutuhkan perhatian. Penelitian ini bertujuan (1) menganalisis teknologi pengolahan air limbah potensial berdasarkan kajian literatur dan kondisi eksisting IPAL; (2) Menganalisis konsentrasi fenol dan COD di sump pit, netralisasi, sterilisasi, grease trap, inlet, dan outlet IPAL; dan (3) mengevaluasi efektivitas penyisihan fenol dan COD teknologi terpilih dengan simulasi laboratorium. Penelitian ini menggunakan decision matrix untuk memilih lima teknologi potensial (adsorpsi, fotokatalisis, fitoremediasi, ion exchange, dan chemical precipitation). Hasil menunjukkan teknologi yang terpilih adalah adsorpsi dan chemical precipitation. Kemudian, hasil sampling menyatakan bahwa sumber konsentrasi fenol tertinggi adalah toilet (sump pit) sebesar 0.258 mg/L. Eksperimen jar test dilakukan dengan dosis yang berbeda, baik untuk FeCl3 (40, 80, 120, 160, dan 200 mg/L), maupun PAC (0.09, 0.18, 0.45, 0.90, dan 1.80 g/L). Pengadukan cepat (40 rpm) dan lambat (120 rpm) masing - masing dilakukan selama 1 menit dan 20 menit untuk chemical precipitation, sedangkan pengadukan sebesar 150 rpm selama 3 jam untuk adsorpsi. Sampel dianalisis, ketika waktu pengendapan mencapai 15 menit (chemical precipitation) dan 30 menit (adsorpsi). Simulasi menunjukkan dosis optimum (160 mg/L) FeCl3 mampu menyisihkan 68% fenol dan 43.6% COD. Sedangkan adsorpsi mengungkapkan bahwa PAC pada dosis optimum 1.8 g/L mengeradikasi fenol (92%) dan COD (70%). Secara keseluruhan dapat disimpulkan bahwa adsorpsi merupakan teknologi potensial terbaik untuk IPAL Rumah Sakit Universitas Indonesia.

.....Universitas Indonesia Hospital WWTP has long experienced challenges in removing phenol content which often exceeds quality standards. The anomaly in the COD value in previous studies, as well as the tendency for the effluent to be higher than the influent which requires COD to be a parameter that also needed attention. For this reason, research was carried out on optimizing phenol and COD levels in WWTP RSUI. This study aims to (1) analyze the potential wastewater treatment technology based on a review of the literature and the existing WWTP conditions; (2) Analyze the concentration of phenol and COD in the sump pit, neutralization, sterilization, grease trap, inlet and outlet of WWTP; and (3) evaluating the phenol and COD removal effectiveness of the selected technology with laboratory simulations. This study uses a decision matrix to select five potential technologies (adsorption, photocatalysis, phytoremediation, ion exchange, and chemical precipitation). The results show that the technology that has been selected through a decision matrix are adsorption and chemical precipitation. Jar test experiments were carried out with different doses, both for FeCl3 (40, 80, 120, 160, and 200 mg/L), and PAC (0.09, 0.18, 0.45, 0.90, and 1.80 g/L). Rapid (40 rpm) and slow (120 rpm) mixing were carried out for 1 minute and 20 minutes respectively for chemical precipitation, while mixing at 150 rpm for 3 hours for adsorption. Samples were analyzed,

when the settling time reached 15 minutes (chemical precipitation) and 30 minutes (adsorption). Simulation of the optimum dose (160 mg/L) of FeCl3 was able to remove 68% phenol and 43.6% COD. While adsorption revealed that PAC at the optimum dose of 1.8 g/L eradicated phenol (92%) and COD (70%). Overall, it can be said that adsorption is the best potential technology for Universitas Indonesia Hospital WWTP.