



INTISARI

Lindi sampah merupakan suatu limbah cair yang dihasilkan dalam kuantitas dan konsentrasi pencemar yang signifikan. Karena pencemar lindi sangat tinggi, lindi perlu diolah terlebih dahulu sebelum dilepas ke badan air. Sistem pengolahan biologis merupakan suatu sistem pengolahan lindi yang paling umum digunakan. Akan tetapi, karakteristik lindi dengan biodegradabilitas rendah menyebabkan pengolahan biologis tidak berjalan secara efektif. Oleh karena itu, pengolahan biologis perlu suatu *pre-treatment* untuk menyesuaikan biodegradabilitas lindi dengan suatu pengolahan kimia, salah satunya adalah Elektro-Fenton. Karena efektivitas pengolahan Foto-Elektro-Fenton bergantung pada variasi kondisi operasi, kondisi optimum dari variasi voltase yang diekspresikan sebagai *current density*, konsentrasi H_2O_2 , dan daya lampu UVC dianalisis berdasarkan penurunan *Chemical Oxygen Demand* (COD) maksimum. Studi ini dilakukan untuk menganalisis kondisi operasi dari variasi voltase, konsentrasi awal H_2O_2 , daya lampu UVC yang paling optimum dalam memberikan penurunan COD signifikan serta mengevaluasi biodegradabilitas dari penggunaan Foto-Elektro-Fenton sebagai *pre-treatment*. Konsentrasi *Biological Oxygen Demand* (BOD) juga dianalisis guna melihat karakteristik biodegradabilitas *raw leachate* dan lindi hasil eksperimen Elektro-Fenton. Berdasarkan eksperimen, kondisi optimum Foto-Elektro-Fenton tercapai pada *current density* 47,184 A/m², konsentrasi H_2O_2 awal 1.000 mg/L, dan daya lampu UVC 9 Watt pada persentase penurunan OCD sebesar 59,67%. Unit Foto-Elektro-Fenton juga terbukti mampu meningkatkan rasio BOD/COD dari semula 0,14 menjadi 0,32. Dengan diteruskannya efluen Foto-Elektro-Fenton ke sistem pengolahan biologis eksisting, konsentrasi COD dan BOD lindi diproyeksikan sudah memenuhi baku mutu sehingga dapat dilepas ke lingkungan. Dengan demikian, Foto-Elektro-Fenton dinilai fisibel untuk dijadikan *pre-treatment* pengolahan biologis.

Kata Kunci: Lindi sampah, Elektro-Fenton, *Chemical Oxygen Demand* (COD), *Biological Oxygen Demand* (BOD)



ABSTRACT

Landfill leachate is produced in significant quantities with high pollutant concentrations and complex characteristics. Due to its significant contamination, landfill leachate needs to be properly treated before being discharged into the water body. The most common landfill leachate treatment system used is biological treatment. Unfortunately, due to landfill leachate's low biodegradability, the biological treatment as a whole landfill leachate treatment system often did not run effectively. Therefore, prior biological treatment needs to be done to enhance its biodegradability and reduce organic loading with Electro-Fenton as one of the chemical treatment options. Due to operation dependency, the optimum condition from voltage, which is expressed as current density, initial H_2O_2 concentration, and UVC power analyzed based on the significance of Chemical Oxygen Demand (COD) removal percentage. Also, biodegradability enhancement being discussed to justify the feasibility of Electro-Fenton as biological pre-treatment. Therefore, Biological were Oxygen Demand (BOD) concentration also being analyzed. Based on the study, the optimum condition for Electro-Fenton experiment achieved at a current density of 47.184 A/m^2 , an initial H_2O_2 concentration of 1000 mg/L , and a UVC lamp power of 9 Watt at $59,67\%$ of COD removal. Electro-Fenton was also found to be feasible as biological pre-treatment, as the BOD/COD increased from 0.14 to 3.2 . As the effluent of Electro-Fenton being proceeded to the biological as the existing treatment plant, the BOD and COD concentration was found to comply with the national regulation and safe to be released to the water body. Thus, Electro-Fenton treatment was found to be feasible as a biological pre-treatment based on its biodegradability enhancement ability.

Keywords: Landfill leachate, Electro-Fenton, Chemical Oxygen Demand (COD), Biological Oxygen Demand (BOD)