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Treatment of Leachate using Electrocoagulation Technology; Study case in Jatibarang Landfill-Semarang City

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Abstract. Leachate are dominantly recalcitrant organic pollutants, and thus before its discharge to the environment, leachate must be treated. In this study, electrochemical processes, using aluminum and iron electrode in electrocoagulation, were used to remove non-biodegradable compounds in leachate. The electrocoagulation was conducted as main treatment at flow rate 20 ml/minutes and 40 ml/minutes and constant voltage of 5 volt, and 10 volt. The results showed that aluminum electrocoagulation was effective to remove organic pollutant (measured as COD) 54,08% (2,5 g) using 10 volt and flow rate 20 ml/minutes, respectively, while maintaining its initial pH condition at 5,7-6,6. Applied voltage 20 ml/minutes using iron electrode provides results 33,7% (1,9 g) removal of COD, by using Fe electrode provides increasing pH 6,0 to 9,1. This implies that higher voltage and minimum flowrate at aluminum and iron electrode was likely to affect higher COD removal than minimum voltage and higher flowrate. Overall, electrocoagulation processes can be used as alternative method for the removal of recalcitrant organic pollutants of leachate in Jatibarang Landfill, Semarang City.

1. Introduction

The composition of leachate characteristics from the waste decomposition process is strongly influenced by several factors such as waste compaction, waste composition, climate and humidity in landfill [1]. In general, the characteristics of leachate are represented by the high content of COD, pH, Ammonium, and heavy metals. Among that factor in landfill, age is the most factor in parameter determining that changes the composition of organic content and BOD/COD ratio. Young landfill has characteristic relatively high BOD/COD ratio between (0.4-0.6) which shows a good level of biodegradability [2]. However, biodegradable levels from leachate will decrease followed the process of waste degradation that occurs in the landfill zone [3]. The biological treatment process is a very economical wastewater treatment process and is used to treat wastewater contains biodegradable organic compounds. However, the biological treatment process is susceptible for the treatment of such waste. The low removal efficiency of biological treatment process on the leachate is due to the high variability of the composition and differences in the compounds of solid waste in the landfill. For aerobic biological treatment in leachate consumes high energy and cost and environmentally sustainable treatment of leachate are in growing demand [4].

Electrochemical method can be used to treat leachate containing biodegradable and non-



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