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Volume 448

2020

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The 1st International Conference on Environment, Sustainability Issues and Community Development 23 - 24 October 2019, Central Java Province, Indonesia

Accepted papers received: 29 January 2020

Published online: 03 April 2020

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

To cite this article: W Oktiawan *et al* 2020 *IOP Conf. Ser.: Earth Environ. Sci.* **448** 012056

IOP Conf. Series: Earth and Environmental Science **448** (2020) 012056 doi:10.1088/1755-1315/448/1/012056

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-

IOP Conf. Series: Earth and Environmental Science **448** (2020) 012003 doi:10.1088/1755-1315/448/1/012003

Analysis of Electricity Generation from Landfill Gas (Case Study: Manggar Landfill, Balikpapan)

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Abstract. Despite of adverse impacts on the environment, landfill has big potency as renewable energy sources since it generates biogas from organic waste degradation process which can be used for power plant purposes. In 2017, the volume of waste disposed to Manggar Landfill was 128,000 tons, which mostly are organic waste (59.4%). Therefore, this study aims to estimate the amount of energy that can be generated from landfill as methane, by calculating biogas production in landfill based on waste generation, as well as composition using LandGem and Afvalzorg model. In 2017, Manggar landfill produced about 4×10^3Mg CH_4/year or about 5.31 to 6.44×10^6 m^3/year. The estimated methane then converted to electricity using gas engine and trigeneration methods. Using gas engine, methane from Manggar Landfill is predicted to produce electricity about 787 MWh/month. On the other hand, if trigeneration method applied (by keeping the same gas engine as before), it produces 41.8% of heat which convert to 29.3 kWh of cold. In conclusion, it will be beneficial if Manggar Landfill capture and treat methane for generating electricity since Manggar Landfill produces about 6.44×10^6 m^3/year which can be used for electricity purposes of around 10,000 people using gas engine.

1. Introduction

Landfilling is the most preferable method applied in developing countries, particularly in Indonesia, in handling its municipal solid waste. It is considered as cheap and convenient method since it is not restricted to advanced technology for treating and managing waste. Despite of its economics advantages, landfilling gives many adverse impacts on environment. The failure of landfilling methods may lead to many environmental contaminants due to leachate and which are soil pollution, ground water contamination and air pollution due to emission of greenhouse gases [1]. Therefore, waste management hierarchy put landfilling method as last option preferable due to its adverse effect to environment.

In Balikpapan, landfilling has been practiced many years ago, but proper landfilling area named Manggar landfill was opened in 2002. When opened in 2002, the volume of waste disposed to Manggar landfill was 69,000 tons and in 2017 it reached 128,000 tons. In a period of 15 years, the volume of waste has doubled. Urban waste that is directly piled up still contains a lot of organic waste at 59.4%. Followed by plastic waste, paper, and others, which have a composition respectively: 13.51%, 12.26%, and 10.62%. This high percentage of organic waste gives adverse impact from landfill gas produced by

Addition of Solid Recovered Fuel (SRF) to the Bio-drying Process and the Effects of Variation in Air Discharge on Temperature Parameters and Urban Waste Water Content

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Abstract. Bio-drying is a technology used to reduce water content in waste using microorganisms that naturally increase the temperature in the decomposition process. With this process, the water content can drop more within a month. Bio-drying produces a product in the form of Solid Recovered Fuel (SRF) which is produced from partially degraded waste. To obtain a waste that is not fully stabilized and maintains a high biomass content, degradation of organic compounds is carried out partially. During the bio drying process, temperature affects the degradation process. Temperature affects the bio drying, which will also affect the bio drying product that is indicated by the value of water content. Therefore, in this study, the change of process parameters will be explained, which is in the form of temperature and water content, that is caused by the difference in the air discharge entering the reactor (0, 2, 4, and 6 l/m) with the initial water content of 60%-65%. After 30 days, the optimum airflow is 4 l/m with a decrease in water content of 58.29%; on the last day of the bio drying process (30th day).

1. Introduction

Waste production in Indonesia has increased every year [1]. From the data of the Ministry of Environment and Forestry, it is noted that the total waste in 2017 was 65.8 million tons, and the total waste in 2018 was 65.752 million tons. This number is estimated to increase by an average of one ton per year. However, proper management efforts cannot yet be made because of the high investment required.

One alternative to reduce waste volume is by waste to energy (WTE) technology with an effectiveness of 90% [2]. Waste that can be converted into energy depends on the density, composition, and relative percentage of water content [3]. However, most of the waste in Indonesia is a wet waste with a lower calorific value, which makes it difficult to be burned [4]. Utilization of waste by increasing the calorific value of waste in the bio drying process is one of the excellent and effective solutions for reducing the level of municipal solid waste (MSW) in these conditions [5].

Bio-drying is the decomposition of partial organic substances by utilizing the heat generated by microorganisms that are helped by aeration [6]. The bio drying process only partially stabilizes waste.

IOP Conf. Series: Earth and Environmental Science **448** (2020) 012046 doi:10.1088/1755-1315/448/1/012046

Assessment of the efficiency of the wastewater treatment plant: a case of Gacuriro Vision City

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Abstract. Wastewater is the liquid waste generated after being used for different purposes. It has a great impact on the environment when discharged untreated or partially treated. The poor management of wastewater at Gacuriro wastewater plant leads to the discharge of subsequently untreated and partially treated wastes. Therefore, the research focused on the assessment of the efficiency of Gacuriro wastewater treatment plant. Samples of wastewater were collected at the inlet and outlet of the treatment plant for laboratory analysis. Parameters tested include pH, Temperature, Total Suspended Solids (TSS), Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Total Coliform (TC), Oil and Grease, and Total Phosphorus (TP). Inlet and outlet results are 112.5-364.5 mg/l, 60-190.2 mg/l for BOD; 447-820 mg/l, 46.6-300 mg/l for COD, 19-24 mg/l, 12-18 mg/l for TSS; 6.8-9.05 mg/l, 6.4-5.75 mg/l for TP, 2419.6-50000 counts/100 ml, 1730-30000 counts/100 ml for TC, and 1.012-1.079 mg/l ,0.75-0.923 mg/l for Oil and Grease. Their percentage reduction of efficiency were in the range of TSS (62.50-75%), COD (63.05-78.74%), BOD5 (69.97-83.70%), Oil and Grease (48.67-62.19%), TP (49.26-60.82%), TC (57.14-64.00%) while average inflow and outflow discharge are 2.5 l/s and 1.5 l/s, respectively. The effluent from the treatment plant needs improvement in disinfection systems to remove bacteria out of discharged effluent.

1. Introduction

Water is a valuable commodity, yet scarce in most countries and one of the challenges to engineers, hydrologists, technologists, and scientists is protecting the water resources [1]. World Health Organization (WHO) reported that 80% of illnesses and infections in the world are due to inadequate treatment of sewage, and more than 3.4 million people die annually because of pathogens living in the aquatic environment [2]. Wastewater is essentially the liquid waste conveyed after a variety of uses has fouled it. The water supplied to a given region or apartment has several chemical substances and microbial bacteria during its application such that the wastewater needs a polluting potential and becomes a health and environmental hazard. Communicable diseases of the intestinal tract such as cholera, typhoid, dysentery and water-borne diseases like infectious hepatitis are spread from uncontrolled disposal of wastewater, and therefore prevention of communicable diseases and protecting public health attracts the primary objective of sanitary wastewater disposal [2]. However, management and handling of wastewater have been one of the main challenges facing developing

IOP Conf. Series: Earth and Environmental Science **448** (2020) 012091 doi:10.1088/1755-1315/448/1/012091

Integrated Biomaterials Engineering of Oil Palm Fibres and Microalgae for Bioenergy, Environmental Remediation, and Conversion into Value-Added-Products

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Abstract. The 2030's core agenda for 17 Sustainable Development Goals aims to bring systems thinking and holistic solution to ensure that progress for People and Profit do not side-line planet as the major stakeholder. Discussion on the Economics issues should bring in the Environment and Socio-cultural diversity dimension as equal components. This may necessitate a complete revamp of human activities such that efforts to tackle famine and poverty and the emerging infectious diseases are not divorced from addressing the problems brought about by climate change and the destruction of eco-systems and habitat for wildlife. The focus of this review article is to highlight research and development in integrated biomaterials engineering of oil palm fibres and microalgae for sustainable bioenergy production, environmental remediation and conversion into value added-products *via* integrated palm oil milling processes and algal biorefinery. Eco-friendly extraction of cellulose and the development of composite materials for different applications will be highlighted. The use of microalgae for bioenergy, effluent remediation and the utilization of microalgal extracts in anticancer agent formulation will be discussed. This hopefully could bring forth insights towards collaboration among the policymakers, government agencies, industries and academics to tackle the immediate and pressing problems facing the world today.

1. Introduction

The increasing world population and the disastrous outcomes of global climate change necessitate a complete revamp of human activities to mitigate any potential calamity on the planet and its inhabitants. Global warming has been caused by greenhouse gas emissions, of which nearly 80% is from carbon dioxide, mainly from the energy sector, industries, transport, and wastes [1]. The impact on the environment from forest clearing, particulate matters in the air, heavy metal or plastic pollution have become a major concern especially on human health and on wildlife, and marine and aquatic eco-system.