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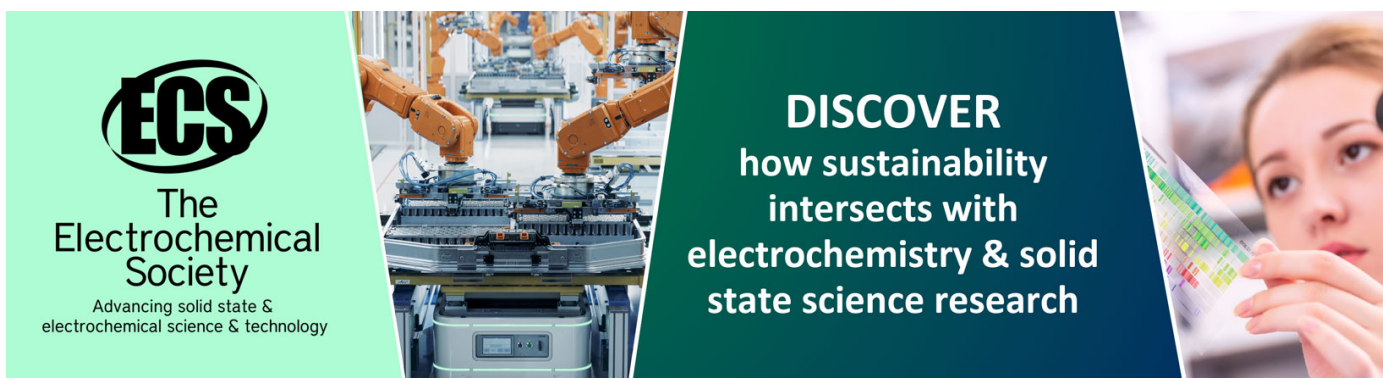
Study of wastewater treatment for fulfilment of clean water

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Study of wastewater treatment for fulfilment of clean water

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Abstract. The problem of the need for clean water is one of the issues that occur in urban areas due to an increase in urbanization from time to time. Jakarta, with the most populous population in Indonesia, causes the need for clean water in this city to increase. The fulfillment of clean water is one indicator of sustainable development. The method of water pollution is generally described by the pollution caused by industrial activities and various types of human activities. Usually, the process of pollution occurs in the form of colour pollution to particulate matter pollution resulting from various activities. Some things in the effort to meet the needs of clean water continue to experience growth. Processing to reuse water into clean water is one of the efforts that can be done. Membrane bioreactor is one method of processing wastewater to get an ideal condition like clean water. This research was conducted to find out how the potential of wastewater that has been previously treated is carried out by another treatment into clean water. The results were based on a literature study to see the potential of the wastewater process to be clean water by using membrane bioreactors.

1. Introduction

The need for clean water will continue to increase along with population growth. But in reality, the process of fulfilling clean water often experiences problems. Limited resources with the level of demand for clean water that continues to increase resulting in a clean water crisis. This can affect the emergence of various kinds of problems, such as disruption of various sectors of activity, uneven distribution of water, and social conflicts. These main problems have already happened in urban areas [1]. Based on these problems, some improvements are needed to solve the problems of clean water fulfillment. The development of science and technology has the ability to reduce the problems in the fulfillment process of clean water from other resources. Water treatment, such as water reuse, can be one solution that can be done and need for clean water production [2,3].

One alternative process that can be used and already popular to use is the membrane bioreactor process. Membrane bioreactors (MBR) are one treatment process with several mechanisms that are often used in treating water and wastewater [4]. The mechanism that included on the MBR systems are such as feeding tanks, air compressors, recirculation pumps, bioreactors, valve systems, membrane modules, timers, effluent pumps, backwash pumps, timers, pressure gauges, effluent tanks, and excess sludge [5].

Technological and scientific developments in managing treating wastewater are still growing up along with the level of problems that are happened. So that the process of handling needed is adjusted to the level of complexity of the existing problems. Limited of knowledge and ability the fulfillment of



clean water are needed some solutions like reusing water process in any activities every day, and membrane bioreactors are one of the solutions that can be done [6].

2. Materials and Methods

This research was conducted with a literature study process on bioreactor membranes in the process of treating wastewater and air resources. The data used in this study were obtained from previous studies. The data source used and discussed in this study discusses the technical application of the membrane bioreactor with a development scale that can be used to improve the efficiency obtained. Furthermore, the level of data validation used is research in the last 10 years so that the level of data disclosure can be agreed with current issues and debates.

3. Result and Discussion

3.1 Result

The current wastewater treatment process has increased along with the development of technology and science. Biological, chemical, physical, physiochemical, and membrane technological processes are some of the processes that are available and can be used today and adapted to their needs [7]. Some processes for developing membrane bioreactors that already used and improvements like anaerobic membrane bioreactors, aerobic membrane bioreactors, bed fluidized anaerobic membrane bioreactors, dynamic anaerobic membrane bioreactors, combined ozone ultrafiltration, and reverse osmosis [7]. Anaerobic membrane bioreactors are known as an alternative in the process of treating wastewater with a high level of efficiency with a combination of anaerobic technology and modern membrane systems [8]. Furthermore, it was developed in research [9] that bioreactor processes can be carried out and developed with electrochemical processes.

Water reuse is one system that can be used with the aim of increasing the fulfillment of water requirements by considering environmental, economic, and social quality factors. But in the processing, it is necessary to consider the ability to store salt, nutrient content such as nitrogen, to the content of organic chemicals [10]. The method of treating wastewater using membrane bioreactors is one method that has been widely used and already has many improvements. In general, the membrane bioreactor process in wastewater treatment is defined as a system process consisting of an activated sludge treatment system using membrane filtration [11]. The bioreactor membrane application is carried out by a combination of several existing water methods.

Table 1. Type of wastewater and the process.

Wastewater Type	Processing	References
Palm oil	Baffled air flotation and membrane	[12]
Palm oil	Biofouling reducer and membrane bioreactor	[13,14]
Citrus wastewater	Membrane bioreactor	[15]
Domestic wastewater	Membrane bioreactor on membrane fouling	[16,17]
Tapioca wastewater	Membrane bioreactor	[18]
Industry wastewater	Membrane Bioreactor	[19]

The pattern of wastewater that can be processed with a membrane bioreactor shows that the focus bioreactor is to treat wastewater with the pollutant as organic material. But in research [19–21] said that the membrane bioreactor process can be used in the treatment of organic or non-organic waste in several types of special wastes such as pesticides, chemical industry materials, to antibiotics. The cause of the restoration of the MBR process has been around a long time but continues to increase to get maximum results in treating waste contained in wastewater from various activities discussed in table 1. However, in the process of using the membrane bioreactors are still limited to processing

waste caused by low pressure on membrane filtration systems that are applied, such as microfiltration and ultrafiltration [10,22].

3.2 Discussion

Fulfillment of clean water that is suitable with regulations of water quality is one of the indicators carried out in the process of sustainable development [23–25]. The balance between the demand for clean water and the supply of clean water is needed to be maintained throughout in any area and any condition. Considering that water is one of the most widely used resources in various sectors, including households, agriculture, transportation, to industrial activities. If this cannot be done properly and appropriately in accordance with its designation, it will result in various debates that can discuss various sectors that can result in social conflict due to an imbalance between the amount of clean air demand and the availability of clean water supply.

The pattern of population growth that continues increasing every year directly affects the number of clean water needed. In addition, there is an increasing pattern of urbanization, where two-thirds of the global population will settle in urban areas that encourage the fulfillment of clean water must be increased [26]. Jakarta is the region with the largest population in Indonesia. The number of clean water needs in Jakarta per year in 2017 reaches 413 million m³ per year, but the level of clean water that can be met is only 200 million m³ per year [27]. In 2010, Jakarta produced an average of 1,1316.11 m³ / day of wastewater per day [28]. The limited amount of water resources available with the level of demand of clean water that always increases makes some processes like water reusing are needed to increasing the supply number of clean water. The process of reusing water from wastewater is one of the improvements that can be done and developed at this time [2,3].

Based on the development of the water reusing process in clean water needed, the bioreactor mechanism is a process that is widely used in various wastewater treatment processes. The wastewater treatment process using MBR technology is one solution with a good level of processing efficiency in terms of quality produced for the costs required for the procurement process that is supported by conventional process wastewater treatment [19–21,29]. The development of the ability to use clean water in meeting the needs of clean water is in accordance with one of the main focuses in the SDG objectives, namely on clean water and sanitation. The target of SDGs fulfillment needs to be considered in three main aspects, namely environmental quality, social quality, and economic capacity that is built. The problems from the fulfillment of clean water need to be looking into three aspects that are needed to be carried out a balance between factors that can affect such as population growth patterns, purchasing power, to checking the access to clean air whenever and wherever. The use of MBR has been developed biologically in wastewater treatment in Jakarta [30].

The water treatment in the bioreactor membrane system is doing for processing and sorting of organic waste contained in wastewater [31,32]. But along with the development of technology and science, the processing and sorting process on wastewater treatment can be improving for inorganic waste. In general, a membrane is defined as a selective barrier with a relatively thin layer arranged in two phases, namely gases or liquids which cannot be passed by certain types of substances, molecules, or particles contained between liquids transported with liquid solvents [33].

There are some things that needed in treating wastewater into clean water because there are several types of substances, molecules, and particles in liquid that need to be carried out the process of filtration and selection. The process is adjusted to the level of particles contained in liquid substances because it needs to have different sizes between types of liquid substances with other types of liquid waste. Table 1 is explains how each wastewater treatment process will have a different mix of treating wastewater. It can be seen in accordance with the provisions and requirements of wastewater to be processed will be determined at the level that will be done. In addition, there are different structural patterns of substances that make wastewater treatment carried out will have the level of complexity of wastewater treatment between some types of wastewater.

Besides environmental aspects, consideration of economic aspects needs to be considered carefully. The wastewater treatment process is needed to be used as clean water, which is needed in terms of

costs that need to be spent with the value of the results obtained. The MBR that is built will require a higher cost compared with conventional sludge treatment processes but the level of MBR treatment has more value of efficiency [34]. But in the development of technology, the development of the effectiveness of MBR with the costs incurred has better value for money compared to conventional wastewater treatment processes [21].

From the consideration of environmental aspects and economic aspects, consideration of treating wastewater for reuse into clean water needs to consider the social aspects necessary for community acceptance of using recycled water. The reason for this needs to be considered by the community to discuss the level of clean water needs that increase the need for limited water resources. The development of technology and science is very much needed as the demanded number for clean water. Furthermore, another thing such as using water economically can be done as a participate to keep the quality of clean water resources in the best condition for the fulfillment process for the next generation. This process needs to be done and developed considering the pattern of this activity is an activity that needs to be built and familiarized by every community. The role of knowledge about the importance of environmental and ecological quality promised in water resources is urgently needed on compatibility not designed for behavior change [35]. The counseling process is one of the efforts that can be done to provide education for the wider community for using water economically. Because the process of treating water into clean water with MBR is still carried out on a communal and large scale, so it needs another development process in treating wastewater into clean water with an easier process with higher yields.

4. Conclusion

The wastewater treatment process for increasing clean water numbers can be done using the membrane bioreactor method. However, the application needs to be developed between methods to get maximum results. The method is carried out and adjusted to the level of wastewater to be processed. The development of the MBR method needs to be developed to get the best level of efficiency. The proper procurement and evaluation process is one of the things that need to be done in the development of supported air resources. Environmental, economic, and social aspects need to be considered to see the best efficiency from wastewater processing from the water reuse process.

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