Optimization of Wastewater of Batik Buaran Pekalongan by Using Photocatalytic Membrane Bioreactor

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Abstract. The purpose of this study is to determine the final COD concentration reduction by changing COD and MLSS concentration on the performance of submerged membrane bioreactor (MBRs) as a waste treatment of Batik in Buaran Pekalongan. The method is covers the process of seeding, the acclimatization process and the main process. Description of the process that we take an active mud from IPLT Buaran Pekalongan, then we analyze the sludge MLSS, MLVSS, COD, BOD, and TSS. After that we enter the active sludge in the bath nursery that has been given aerator (a tool for aeration) and made provision in the form of NPK nutrients and glucose at a ratio of 1:10. Activated sludge from the acclimatization process is inserted into the MBRs (membrane bioreactor submerged) that is equipped with an aerator. Then prepare influent(waste to be lowered concentration of COD). How, liquid waste of Batik Pekalongan Buaran COD diluted concentration of 10,000 mg / l and 15,000 mg / l, and then inserted in influent tub. After that liquid waste of Batik Buaran Pekalongan influent flowed into Photocatalytic Membrane Bioreactor, of MPB effluent flowed into the tub (result).

1. Introduction

Nowadays, the development of technology in all fields to bring a considerable impact on human life. One negative aspect of these new technologies is the environmental degradation caused by the waste. Types of waste can be, among others, solids, liquids, and gas. Waste is very dangerous because it contains a high concentration of chemical substances, therefore it must be lowered levels of COD (Chemical Oxygen Demand) [1,2]. Process wastewater treatment with submerged membrane bioreactor, have many advantages over waste treatment with other membrane processes. It is seen from the standpoint of effectiveness and efficiency of the process itself is simple and automatic operating costs are also much smaller with better results.

Theoretically, the combination of activated sludge processing and submerged membrane will produce better processing performance than conventional activated sludge (sludge and clarifier) [3]. This is because the ability of the membrane filtration is not influenced by the characteristics biofloc formed. Membranes can be generally defined as a selective barrier between the two phases. Said selective here describe something that is typical of the membrane and the process by using a membrane, but did not explain matters related to the structure and function of the membrane itself. The membranes have different thicknesses. No structure or homogeneous. Transport of molecules across the membrane can be active or passive. Passive transport occurs because of differences in concentration, pressure, and temperature. Because of very varied shape and characteristics of the membrane, the membrane is carried classification. One classification, membrane divides into two parts, namely biological membranes and synthetic. Biological membrane is in the body of living creatures, as well as cell-cell life.

These membranes can be divided into the membrane life (living membrane), and the membrane inanimate (non-living membrane). Synthetic membranes can be divided into organic membrane (polymer) and inorganic. Separation techniques contained in membrane technology there are two kinds of cross-flow system (crossflow) and passing flow (dead end). Cross flow (crossflow) is the flow of the bulk solution including the parallel flow on the membrane surface and only a few solutions left on the surface of the membrane. Named "crossflow filtration" for bulk flow immediately follow the permeate flow. While applied in this study is a "dead-end". The flow of dead-end, including the bulk solution flow across the membrane surface and bulk solution including the solids trapped on the membrane surface. As a consequence, the collected solids filtered continuously and form clogging the membrane surface. In a membrane bioreactor, SS concentration of the bulk solution, such as activated sludge, which has a high concentration on a dead-end where the separation is
2. Methods
2.1 Seeding Phase

Seeding is done by taking an active Lumpur obtained from domestic unit in aerobic wastewater. Activated sludge obtained from a waste management unit Stool (IPLT) Sukolilo Surabaya. To increase the MLSS, the active Lumpur obtained aerated and added glucose substrate and nutrient required. The amount of glucose addition estimated to be sufficient for microbial energy needs for growth and maintenance. At this stage, MLSS analysis carried up to 25000mg/l

2.2 Acclimatization stage

Microorganisms are the adjustment phase to the surrounding environment that can degrade organic material from the waste Batik Buaran Pekalongan.
2.3 Characterization Membrane

To characterize the membrane to determine the permeability of the membrane. The feed solution that is used to characterize the membrane obtained from the mud that has acclimatized. Characterization of membrane also be obtained from the critical flux membranes used. To obtain the critical flux carried combinations using the technique of back flushing.

2.4. Top Trial Phase

Variables that are used to perform the main experiment are:
- Concentration of Microorganisms (MLSS): 15,000; 20,000 and 25,000 mg / l
- Organic Load (Concentration COD): 10,000 and 15,000 mg / l

3. Results And Discussion

The process of seeding is done to increase the number of microorganisms present in activated sludge. In this case, the mud used is derived from the waste treatment plant sludge Buaran Pekalongan. Mud obtained came from the OD (Oxidation Diet) and clarifier. In the initial condition is known that the amount contained in the sludge MLSS of 11880 mg / l, MLVSS of 6040 mg / l, COD of 710 mg / l, BOD of 285 mg / l, TSS of 5270 mg / l, having a pH of 7.8 and the temperature is 270°C.

![Figure 1. Relationship between MLSS seeding phase](image)

The process of seeding sludge is done by mixing the activated sludge from the clarifier plus of OD, then after that added nutrients in sludge with aeration process. Nutrients given consists of two kinds of substances, namely NPK and Glucose with a ratio of 1:10. Giving nutrient done to increase the number of MLSS in the activated sludge. Seeding process is stopped when the amount of MLSS has been fulfilled. Here's a picture chart of the process of seeding.

4. Conclusion

This study can conclude:
- On the MLSS concentration of 15,000 mg / l for initial COD concentration of 10,000 and 15,000 mg / l, the concentration of COD can be derived is 98.36%.
- In the MLSS concentration of 20,000 mg / l for initial COD concentration of 10,000 and 15,000 mg / l, the concentration of COD can be derived is 98.41%.
- In the MLSS concentration of 25,000 mg / l for initial COD concentration of 10,000 and 15,000 mg / l, the concentration of COD can be derived is 98.42%.

From the research results in decreased concentrations of COD by using active Lumpur with MLSS concentration of 15,000 mg / l, 20,000 mg / l, 25,000 mg / l for waste of batik in Buaran Pekalongan with COD concentration 10,000 mg / l and 15,000 mg / l obtained results in accordance with the standard quality standard, so this study was successful, and can be applied to industries that treat their own wastes. Especially for waste Batik BuaranPekalongan.

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