Some Aspects of Lake Water Treatment to Produce Clean Water Using Integration Processes of Adsorption, Filtration and Ozonation

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Abstract: An integrated water and wastewater treatment methods for lakes and surface water resources are implemented in the University of Indonesia Campus (UIC) area to provide clean water. Basically, the water treatment system designed is a successive-combining process system involving filtration, micro-flocculation, adsorption and ozonation. As a preliminary study, each process of water and wastewater treatment is operated in batch system with 3 hours running time and 50 liter of water per batch. The experimental analysis for treated water quality has been demonstrated that there were improvements for some parameters with different values. As for instance, the concentration of iron and manganese can be reduced up to 97.7 and 99.0 %, respectively. Furthermore, by the same method, organic compound can be removed just for about 65.0 %, especially by analyzing of BOD and COD parameters. In general, the integrated process can improve the quality of lakes and surface water resources in the UIC area in terms of iron, manganese, TDS, pH and turbidity parameters.

Key words: Ozone • Water treatment • UI Lake • Iron removal • Manganese removal • Micro-flocculation

INTRODUCTION

Clean water accessibility is a crucial problem in urban and suburb areas, especially for clean water which comply with health requirement for daily uses. In addition, clean water shortage will be more stringent at dry season in Indonesia included Java island and its remote areas, where there are only a few rains and lead to many surface water resources including ground water suffers from dryness. Such phenomenon also occurs at campus area of the University of Indonesia, Depok. In dry season, water supply from ground water (collected in an only water tower at UI campus) suffers from shortage. Meanwhile, the need for clean water in campus area is increased through the years, represented by the more number of new students enrolled in the last decade. This phenomenon emerges anxiety of clean water deficiency from UI water sources.

The treatment of water from some lakes located in campus area can be one of promising alternatives. This treated water can be further used as water source for drinking water and or for fulfilling water daily needs in campus area. Regrettably, research about treatment of UI lake water has not been conducted either sectorally or integrally yet neither for local nor for national interests. Therefore, as a preliminary study, water treatment process proposed in this study is an integrated and combination processes of adsorption (including micro flocculation), filtration and ozonation.

Filtration process has been chosen due to its simplicity and ease in application and has relatively high separation range. The main problems in filtration treatment of UI lake water are as follows:

• UI lake water may contains various dangerous pollutants, in the form of physicals, organic and inorganic chemicals and microorganisms from macro to sub-micro molecules.
• Generally, pre-filtration process can only remove macro size particles (macro-filtration), while sub-micro size particles cannot be removed by conventional filtration process.

The ozonator being used in this research has been engineered prior during 1999 – 2004 research period and has been reported in London, Hong Kong and in national wide by Bismo et al., [1-3]. The principle engineering design of the ozonator is oxygen conversion from
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