

Effects of Hydraulic Retention Time and Solid Retention Time of POME on COD Removal Efficiency

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ABSTRACT

The aim of this paper is to report on the effects of Hydraulic Retention Time (HRT) and Sludge Retention Time (SRT) on the removal of Chemical Oxygen Demand (COD) from palm oil mill effluent (POME). In this study, an upflow anaerobic reactor was used to evaluate the effects of HRT at 6, 8 10, 12 and 15 days. In order to measure the effects of SRT, the 10, 15 and 20 days aged sludge were used. The differences in COD value of POME and effluent at inlet and outlet of the anaerobic reactor were used to measure the effects of HRT and SRT. The experiments were conducted at 35°C for a length of 60 days, and input-output data of COD were used to achieve the research objectives. The estimated results show that the COD removal was optimum at 12 days of HRT and the estimated COD removal performance was at 40.4 percent. It was also found that COD removal was optimum at 20 days of SRT and the estimated COD removal performance was at 34.1 percent. The study concluded that anaerobic reactor is an effective method to remove COD from POME. This study recommends future researches which aim to increase COD removal to level that is economically and environmentally sustainable.

Keywords: Hydraulic retention time; solid retention time; COD removal; palm oil mill effluent; anaerobic reactor.

INTRODUCTION

Malaysia is the largest palm oil producer in the world, which accounts for 17.73 million tonnes of palm oil and 2.13 tonnes of palm kernel oil a year [1-3]. During palm oil production, a huge amount of wastes is produced including POME. Basically, POME is a by-product of palm oil mills. POME is identified as hazardous effluent due its toxic properties. POME has acidic properties ($\text{pH} \leq 4$) with high level of biological oxygen demand (BOD), chemical oxygen demand (COD), emission of greenhouse gas (GHG) including methane and carbon dioxide make this effluent unfit for the environment. Despite its hazardous characteristics, POME is also a potential source of soil, water and air pollution which if not treated well, can reduce health quality of people and contributes to reduce economic growth [3-5]. The outputs of palm oil mill process and POME generation are shown in Figure 1.