PENGOLAHAN LIMBAH CAIR DENGAN SISTEM KOLAM MIKROALGA: PENGARUH KADAR *CHEMICAL OXYGEN DEMAND* (COD) TERHADAP KECUKUPAN SUPLAI OKSIGEN

IINTISARI

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Proses aerobik menggunakan kolam mikroalga diaplikasikan untuk pengolahan limbah cair. Pada sistem kolam mikroalga, terjadi simbiosis mutualisme antara bakteri aerob dan mikroalga. Melalui proses fotosintesis, bakteri menggunakan oksigen sebagai *acceptor electron* untuk mengoksidasi senyawa organik dan menghasikan karbondioksida. Sementara mikroalga menggunakan karbondioksida untuk reaksi fotosintesis. Maka, dalam hal ini kecukupan oksigen terlarut dalam sistem sangat penting. Di sisi lain, kecukupan oksigen ditentukan oleh laju produksi oksigen dan konsumi oksigen serta beban organik limbah cair.

Dalam penelitian ini, ketersediaan suplai oksigen direpresentasikan dalam bentuk nilai *dissolved oxygen* (DO). Nilai *chemical oxygen demand* (COD) 400-2000 mg/L digunakan sebagai variasi beban organik dalam kolam mikroalga. Hasil penelitian menunjukkan nilai laju produksi oksigen mikroalga *Chlorella vulgaris* sebesar 0,0651 mg O_2/g sel/menit, sedangkan laju konsumsi oksigen bakteri sebesar 0,9388 mg O_2/ g sel/ menit. Berdasarkan nilai *dissolved oxygen* (DO) pada setiap perlakuan, suplai oksigen yang ada dalam sistem kolam mikroalga dapat mencukupi kebutuhan oksigen yang diperlukan untuk mengolah bahan organik dalam limbah cair.

Kata kunci: limbah cair, kolam mikroalga, suplai oksigen, oksigen terlarut.

THE WASTEWATER TREATMENT BY MICROALGAE POND SYSTEM: THE EFFECTS OF CHEMICAL OXYGEN DEMAND (COD) ON SUFFICIENCY OF OXYGEN SUPPLY

ABSTRACT

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Aerobic process using microalgae pond system is applied for treating wastewater. In microalgae pond system, symbiosis mutualism can occur between aerobic bacteria and microalgae. The bacteria utilize oxygen from photosynthesis as an acceptor electron for oxidizing organic materials and produce carbondioxide. Meanwhile, the microalgae use carbondioxide for photosynthesis reaction. Hence, the availability of oxygen in the pond is important. In the other hand, the availability of oxygen is determined by the rate of oxygen production by microalgae, the rate of oxygen consumption by bacteria and the amount of organic matters in the wastewater.

In this study, the amount of dissolved oxygen was represented in term of dissolved oxygen. The value of chemical oxygen demand (COD) 400-2000 mg/L was used as the variation of organic load in the microalgae pond. The result showed that the rate of oxygen production of microalgae *Chlorella vulgaris* was 0.0651 mg O_2/g cell/minute, while the rate of oxygen consumption was about 0.9388 O_2/g cell/minute. Based on the value of dissolved oxygen measured, the supply of oxygen was sufficient for treating the liquid waste.

Keywords: wastewater, microalgae pond, oxygen supply, dissolved oxygen.