INTISARI

Kebutuhan air sangat penting bagi keberlangsungan hidup manusia seperti minum, mandi, dan dalam pertanian. Karena peran pentingnya, keberadaan air bersih sangat perlu dijaga. *Microbubble Generator* (disingkat MBG), mampu untuk mempertahankan *Dissolved Oxygen* (DO) pada aplikasi pengolahan air limbah dengan konsumsi daya yang rendah. Salah satu jenis MBG adalah tipe venturi yang simpel dan layak untuk digunakan. Penelitian ini bertujuan menginvestigasi efek derajat masuk venturi terhadap performa MBG tipe venturi dengan pipa berpori.

Pada penelitian ini, sebuah MBG type venturi digunakan. Laju aliran udara (Q_G) melewati pipa berpori pada besaran 0.2 lpm – 1 lpm. Laju aliran air (Q_L) pada 30 lpm – 80 lpm. Derajat masuk yang dipilih adalah 20^o dan 30^o dengan perbandingan $D_{in}/D_t = 2.5$. MBG diletakkan pada kolam berukuran 280 cm x 60 cm x 40 cm. *Image processing algorithm* dengan *watershed* digunakan untuk memproses gambar *microbubble* sampai didapatkan *Probability Density Function* (PDF). *High speed video camera* dipakai dan diseting pada 4000 fps. *Pressure transducer* dipilih untuk mengukur besar *hydraulic power* (L_W) dan *bubble generating efficiency* (η_B) tiap MBG. Perhitungan DO dilakukan pada titik 60 cm dan 180 cm dari MBG dengan tujuan mengukur *volumetric oxygen mass transfer coefficient* (K_La).

Hasil penelitian ini menunjukkan bahwa MBG dengan derajat 20^o membentuk *microbubble* berukuran lebih kecil dari derajat 30^o Karena fenomena turbulensi yang lebih kecil, tegangan geser yang lebih kecil, dan koefisien *minor losses* yang lebih kecil pula. *Hydraulic power* (L_W) lebih kecil di derajat 20^o daripada derajat 30^o sehingga *bubble generating efficiency*nya (η_B) lebih tinggi. *Volumetric oxygen mass transfer coefficient* (K_La) di MBG dengan derajat masuk 30^o lebih tinggi Dri 20^o. Hasil penelitian ini cocok dengan penelitian penelitian sebelumnya.

Kata kunci: MBG, derajat masuk, PDF, *hydraulic power, bubble generating efficiency, mass transfer coefficient.*

ABSTRACT

Water is absolutely important for living of human beings such as drinking, bathing, and agriculture. Because of its important roles, clean water have to be kept. A unique device, namely as microbubble generator (in short MBG), is capable to maintain more dissolved oxygen for the purpose of waste water treatment in less energy consumption. One of its types is venturi MBG that simple and feasible enough to be used. The present study aims to investigate the inlet angle effect to MBG venturi type with porous pipe performance. In the present works can be a consideration to choose microbubble generator.

In the present work, a venturi Microbubble generator was used. Air flow rates (Q_G) were in range of 0.2 lpm to 1 lpm that passed through porous pipe inside the MBG. Water flow rates (Q_L) were in range of 30 lpm to 80 lpm. The selected inlet angles (θ_1) that used in this work were 30^o and 20^o where inlet diameter and throat (D_{in}/D_t) was 2.5. MBG was put in the dept of 20 cm from water surface in an aquarium with the dimension of 280 cm x 60 cm x 40 cm. The developed image processing algorithm with watershed was selected to process captured video to get probability density function (PDF). A high speed video camera was used in the frame rate of 4000 fps. Pressure transducer recorded the inside pressure of MBG in order to calculate hydraulic power (L_W) and bubble generating efficiency (η_B). Disolved Oxygen (DO) measurenment were in point 60 cm and 180 cm from MBG's nozzle in order to measure volumetric oxygen mass transfer coefficient (K_La).

As the result shows that inlet angle of 20^o generates bigger diameter of microbubble due to the lower turbulence, shear stress, and coefficient of minor losses. Hydraulic power consumption (L_W) is lower than inlet angle of 30^o so that bubble generating efficiency (η_B) is higher. In the volumetric oxygen mass transfer coefficient, inlet angle of 30^o was higher K_La than 20^o. The result from this present work were in a good agreement to that available previous work.

Keyword: MBG, inlet angle, PDF, hydraulic power, bubble generating efficiency, mass transfer coefficient.