

INTISARI

Ketersediaan air bersih menjadi kepentingan di berbagai sektor industri, rumah tangga, perkantoran, dsb. Pencemaran air menjadi salah satu penyebab berkurangnya kualitas air bersih. Proses pemurnian air dan peningkatan kadar oksigen menjadi jawaban atas peningkatan kualitas air. *Microbubble generator (MBG)* adalah teknologi alternatif yang efisien guna meningkatkan kadar oksigen dalam air dan pengangkatan residu yang dapat mencemari air. MBG dapat di implementasikan di lahan yang sempit, konsumsi daya listrik rendah, dan proses manufaktur yang mudah.

Pada penelitian ini menggunakan *microbubble generator* tipe *swirl* dengan diameter *nozzle gas* 1,2 milimeter dan jarak *nozzle gas* dengan *outlet* 10 milimeter. Untuk meninjau performa dari *microbubble generator* digunakan 4 parameter yaitu, *hydraulic power* (L_w), *pressure drop* (ΔP), efisiensi (η), dan distribusi diameter *bubble* yang terbentuk terhadap perubahan debit air (Q_L) 20 lpm – 70 lpm dan debit udara (Q_G) 0,1 lpm – 0,8 lpm. Selain itu penelitian ini menggunakan *signal analysis* untuk mengolah data *pressure drop* dalam bentuk data statistik berupa *Probability Density Function (PDF)* dan *Power Spectral Density (PSD)*. Alur penelitian dimulai dari desain ulang, simulasi, hingga pengambilan data eksperimen.

Proses desain ulang dan simulasi menghasilkan data yang sama dengan penelitian. Kenaikan debit air akan menyebabkan frekuensi rata – rata PSD pada nilai *pressure drop* meningkat, kurva PDF semakin lebar dan menurun, probabilitas terbentuknya *bubble* pada diameter 150 μm semakin tinggi, kebutuhan daya listrik meningkat namun efisiensinya menurun. Kenaikan debit gas menyebabkan diameter rata – rata *bubble* meningkat dan waktu pembentukan *bubble* semakin singkat.

Kata kunci : *Microbubble generator*, aliran *swirl*, *pressure drop*, *hydraulic power*, efisiensi, distribusi *bubble*, *Probability Density Function*, *Power Spectral Density*.

ABSTRACT

The availability of clean water has become the interest in various industrial sectors, households, offices, etc. Water pollution is one of the causes of reduction the quality of clean water. The process of purifying water and increase dissolved oxygen levels are the answer to improving water quality. Microbubble generator (MBG) is an efficient alternative technology to increase dissolved oxygen levels in water and removal of residues that can pollute water. MBG can be implemented in tight spaces, low electricity consumption, and easy manufacturing processes.

This research use the microbubble generator swirl type with nozzle gas diameter 1,2 milimeters and distance nozzle gas from outlet 10 milimeters. To calculate the performance of microbubble generator, 4 parameters are used, namely hydraulic power (L_w), pressure drop (ΔP), efficiency (η), and distribution of bubbles diameter formed in changes of water flow rate (Q_L) 20 lpm – 70 lpm and air flow rate (Q_G) 0,1 lpm – 0,8 lpm. In addition this research uses signal analysis to process pressure data to statistical data in the form of Probability Density Function (PDF) and Power Spectral Density (PSD). The flow of research starts from design, simulation, until collect experimental data.

The re-design and simulation process result has the same data with the research. The increase in water flow rate will cause the average frequency of PSD in pressure drop has increase, the PDF curve to widen and decrease, the probability of bubble forming at diameter 150 μm has increase, the needs for electricity increase but the efficiency has decrease. The increase in gas flowrate causes the bubbles average diameter become increase and the bubble formation time to decrease.

Keywords : Microbubble generator, swirl flow, pressure drop, hydraulic power, efficiency, bubble distribution, Probability Density Function, Power Spectral Density