INTISARI

Danau Rawa Pening menghadapi permasalahan eutrofikasi akibat akumulasi nutrien dari berbagai sumber, yang memicu ledakan populasi eceng gondok dan menurunkan kualitas air secara signifikan. Kondisi ini berdampak langsung pada Bendung Jelok sebagai *outlet* utama danau, dimana konsentrasi oksigen terlarut (DO) tercatat rendah dan beban organik tinggi. Keadaan tersebut berpotensi mengganggu fungsi bendung sebagai sumber air baku dan ekosistem perairan di sekitarnya. Oleh karena itu, dilakukan upaya peningkatan kualitas air melalui penerapan teknologi aerasi *Microbubble Generator* (MBG). Penelitian ini bertujuan menganalisis kondisi kualitas air dan status trofik, menilai kemampuan aerator *microbubble* dalam meningkatkan DO harian, mengevaluasi efektivitas aerasi terhadap perbaikan kualitas air, serta merumuskan strategi pengelolaan lingkungan. Penelitian dilakukan secara eksperimen lapangan di Bendung Jelok melalui pengukuran parameter fisik-kimia, pemantauan DO secara diurnal, perhitungan *Trophic Level Index* (TLI), serta kajian SWOT. Hasil penelitian menunjukkan bahwa kualitas air Bendung Jelok tergolong super-eutrofik, dengan beberapa parameter melebihi baku mutu seperti DO, BOD, COD, serta TSS pada Stasiun 3. Penerapan aerasi *microbubble* meningkatkan konsentrasi DO pada zona lokal di hilir aerator hingga mencapai 7,64 mg/L pada pengamatan sore hari. Jumlah oksigen yang tertransfer ke kolom air lokal dengan volume efektif sekitar 4,2 m^3 diperkirakan berkisar antara 0,0038–0,0135 kg/hari, dengan laju kenaikan DO sebesar 0,090–0,321 mg/L/jam. Nilai tersebut merepresentasikan kapasitas aerasi pada skala lokal dan waktu kontak yang sangat singkat, serta tidak menggambarkan peningkatan DO secara merata di seluruh volume bendung. Perubahan parameter kualitas air seperti BOD, COD, amonia, total nitrogen, dan total fosfat menunjukkan variasi antar hari, yang dipengaruhi oleh dinamika aliran, proses pencampuran hidraulik, serta faktor eksternal seperti kejadian hujan. Strategi pengelolaan lingkungan diarahkan pada pengurangan beban nutrien dan pencemar dari hulu hingga hilir melalui penataan keramba jaring apung dan warung apung, pengendalian eceng gondok, penguatan sistem monitoring kualitas air, serta peningkatan koordinasi lintas instansi. Aerasi *microbubble* diposisikan sebagai teknologi pendukung peningkatan oksigen terlarut pada lokasi strategis, yang efektivitasnya perlu dikombinasikan dengan pengendalian sumber pencemar untuk menjaga keberlanjutan fungsi Bendung Jelok.

Kata Kunci : Kualitas Air, *Microbubble* Generator, Oksigen Terlarut, Status Trofik

ABSTRACT

Rawa Pening Lake faces issues of eutrophication due to nutrient accumulation from various sources, which triggers a boom in water hyacinth populations and significantly lowers water quality. This condition directly affects the Jelok Dam as the lake's main outlet, where dissolved oxygen (DO) levels are recorded as low, and the organic load is high. This situation has the potential to disrupt the dam's function as a source of raw water and the surrounding aquatic ecosystem. Therefore, efforts have been made to improve water quality through the implementation of Microbubble Generator (MBG) aeration technology. This study aims to analyze water quality conditions and trophic status, assess the microbubble aerator's ability to increase daily DO, evaluate the effectiveness of aeration in improving water quality, and formulate environmental management strategies. The research was conducted through field experiments at Jelok Dam through measurements of physical-chemical parameters, diurnal DO monitoring, Trophic Level Index (TLI) calculations, and SWOT studies. The results showed that the water quality of Jelok Dam was classified as super-eutrophic, with several parameters exceeding quality standards, such as DO, BOD, COD, and TSS at Station 3. The application of microbubble aeration increased the DO concentration in the local zone downstream of the aerator to 7.64 mg/L in afternoon observations. The amount of oxygen transferred to the local water column, with an effective volume of approximately 4.2 m^3, was estimated to range between 0.0038 and 0.0135 kg/day, with a DO increase rate of 0.090–0.321 mg/L/hour. These values represent aeration capacity at a local scale and a very short contact time, and do not reflect a uniform increase in DO throughout the dam volume. Changes in water quality parameters such as BOD, COD, ammonia, total nitrogen, and total phosphate show inter-day variations, which are influenced by flow dynamics, hydraulic mixing processes, and external factors such as rainfall events. Environmental management strategies are directed at reducing nutrient and pollutant loads from upstream to downstream through the arrangement of floating net cages and floating stalls, water hyacinth control, strengthening the water quality monitoring system, and improving cross-agency coordination. Microbubble aeration is positioned as a supporting technology for increasing dissolved oxygen in strategic locations, whose effectiveness needs to be combined with pollution source control to maintain the sustainable function of the Jelok Dam.

Keywords: Water Quality, Microbubble Generator, Dissolved Oxygen, Trophic Status