ABSTRAK

Stabilitas kualitas air pada akuarium sangat krusial untuk menjaga kelangsungan hidup ekosistem akuatik di dalamnya, yang diukur melalui parameter suhu, pH, dan Total Dissolved Solids (TDS). Penggunaan filter canister sangat efektif untuk menjaga kejernihan air, namun kinerjanya rentan menurun akibat penumpukan kotoran (*Fouling*) yang menyumbat pori-pori media filter jika tidak dibersihkan secara berkala. Pemeliharaan secara manual sering kali menghadapi kendala keterlambatan yang berdampak buruk pada biota air. Oleh karena itu, penelitian ini bertujuan untuk merancang dan membangun *Prototype* sistem *Backwash* otomatis pada filter canister dengan memanfaatkan mikrokontroler Arduino Mega berbasis *Internet of Things* (IoT). Sistem ini dilengkapi dengan sensor suhu DS18B20, sensor TDS, sensor pH 4502C, serta sensor ultrasonik HC-SR04 untuk memantau level air selama proses pengurasan dan pengisian ulang (*Refill*). Data parameter kualitas air dikirimkan secara Real-time oleh Wemos D1 Mini ke platform Blynk agar dapat dipantau dari jarak jauh. Hasil pengujian menunjukkan bahwa sistem berhasil mengotomatisasi siklus pembalikan aliran air (*Backwash*) melalui kendali *Solenoid Valve* dan pompa, serta melakukan pengisian air kembali secara presisi. Meskipun pengujian awal sensor pH mengalami kendala fluktuasi akibat interferensi elektrik (*noise*) dan *Ground loop* dari motor pompa di dalam air, kendala tersebut berhasil diatasi dengan memodifikasi algoritma pemicu (*Trigger*) utama menjadi berbasis interval waktu berkala (per 3 hari) dan tombol manual melalui aplikasi IoT. Sistem ini terbukti mampu meningkatkan efisiensi perawatan akuarium, mencegah penyumbatan filter, serta menjaga stabilitas kualitas lingkungan akuatik secara berkelanjutan.

Kata Kunci: *Backwash* Otomatis, Filter Canister, Arduino, *Internet of Things* (IoT), Kualitas Air, Akuarium.

ABSTRACT

The stability of water quality in an aquarium is crucial for maintaining the survival of the aquatic ecosystem inside, which is measured through temperature, pH, and Total Dissolved Solids (TDS) parameters. While canister filters are highly effective in maintaining water clarity, their performance is prone to decline due to dirt accumulation (*Fouling*) that clogs the filter media pores if not cleaned regularly. Manual maintenance often faces delays that adversely affect aquatic life. Therefore, this study aims to design and develop a *Prototype* of an automatic *Backwash* system for canister filters using an Arduino Mega microcontroller integrated with the *Internet of Things* (IoT). The system is equipped with a DS18B20 temperature sensor, a TDS sensor, a 4502C pH sensor, and an HC-SR04 ultrasonic sensor to monitor water levels during the draining and *Refilling* process. Water quality parameter data is transmitted in Real-time by Wemos D1 Mini to the Blynk platform for remote monitoring. The experimental results demonstrate that the system successfully automates the water flow reversal cycle (*Backwash*) via *Solenoid Valve* and pump controls, and performs water *Refilling* precisely. Although the initial testing of the pH sensor encountered fluctuation challenges due to electrical *noise* interference and *Ground loop*s from the submersible pump motor, these issues were successfully resolved by modifying the main *Trigger* algorithm to a periodic time-interval basis (every 3 days) and manual operation through the IoT application. This system is proven to improve aquarium maintenance efficiency, prevent filter clogging, and sustainably maintain the stability of the aquatic environment.

Keywords: Automatic *Backwash*, Canister Filter, Arduino, *Internet of Things* (IoT), Water Quality, Aquarium.