

ABSTRACT

Shrimp farming has become the livelihood for many people in Indonesia. However, sometimes the tropical Indonesian climate change the dissolved oxygen (DO) levels in the pond, as well as the water temperature decreases. These conditions will potentially result in crop failure. To date, shrimp farmers have performed various ways to avoid crop failure, includes the use of chemical substances, install the aerator, and increase the number of aerators and run it continuously. If DO level is not in its optimum condition, the shrimp will not grow well, and the worst case is crop failure. Another effort to avoid the crop failure is, by adding the marine plants to produce oxygen. In addition to this method, always monitor the state of the water with a DO meter manually. However, these methods need to improve further, in term of efficiency and effectivity. An automatic monitoring and controlling device for shrimp farming is required to reduce the risk of crop failure in shrimp ponds.

In this research, an automatic device of DO level adjustment with PID control system and temperature monitoring is designed. The system is consisted of DO sensor, temperature sensor that connected to a microcontroller and an aerator as actuator. The system could control DO levels through a windmill aerator (as actuator for DO level adjustment) that embedded with PID control, to always maintain DO the levels at set point of 7.5 ppm (it is known the optimum DO level for shrimp farming is 4 ppm - 8 ppm). Based on the experimental results, the DO levels remain at the specified set point, with value of $K_p = 0.5$, $K_i = 0.26$, and $K_d = 1$. When the setpoint was reached, the system will maintain the DO level at around the setpoint. It is hoped that this system will be useful to reduce the risk of crop failure in shrimp ponds and help the farmer to reduce the risk of crop failure in shrimp ponds.

Keywords: Shrimp Farms, Risk of Failure to Harvest, Monitoring, Controlling, Dissolved Oxygen, Temperature, Aerator, PID control system, IoT