Automatic and Realtime Control of pH Level in Water Catfish Cultivation

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Abstract. A water pH control device in catfish cultivation has been successfully made and tested. The working principle of this device has been designed to maintain the pH of catfish pond water in the range of 6.5-8.5. It was found that if the pH value was outside this range, the sensor ordered the water pump to automatically and in the realtime drain the pond water through a filter to return the pH to the specified value. Thus, the application of this sensor has succeeded in reducing catfish deaths due to stress.

Keywords: pH Level, Catfish Cultivation, Real-Time, Mikrokontroler328.

1. Introduction
One type of freshwater fish widely cultivated is Catfish (Claries) \cite{1,2}. Catfish cultivation is not only cultivated by the community as a source of income but has also been carried out by entrepreneurs because it has a high economic value, reaching \$ 660-770 per metric ton \cite{3,4}. To obtain maximum results, there are several factors that need to be considered, one of them is the water quality of catfish cultivation media \cite{5,6}. One of the water quality of catfish culture media which is very important to control is the water pH. pH itself is an important parameter and influences the quality of the living environment of living things in the water media cultivation of fish. The suitable pH level of water for catfish culture media as a place for growth and development of catfish is in the range 7-8 \cite{7,8}.

In general, the pH of catfish cultivation water media can change quickly because it is influenced by several factors, one of which is the result of the long-term deposition of the leftovers from food and also the metabolism of fish \cite{9,10}. fast and measurable in order to obtain good quality and quantity of fish yields.

So far, the control of pH levels in catfish cultivation media is still done manually and not measured, so it is feared it can have a negative effect on catfish. Negative effects caused by the uncontrolled level of acidity of catfish aquaculture media include slowing down of growth, breeding to harvest failure.
With this background in this research, an ammonia level controller that works automatically every time (real-time) by combining the AT 328 microcontroller based AT Mega 328, pH sensor, Relay and water pump and monitoring using LCD.

2. System Description
This system is constructed by combining the AT Mega 328 Microcontroller, pH Sensor, Relay, water pump and, LCD. The control process begins with the Ammonia sensor which is dipped in catfish culture water media and then detects the level of water acidity in real-time. This data is then sent to the microcontroller for decision processing. If the pH in the water media is not in the ideal condition of catfish culture, which is a pH value of 7.0-8.0, the microcontroller will control the relay in the ON condition so that the water pump will live and replace pond water instantly. This is done until the water conditions of the catfish culture media return to the ideal conditions and carried out at any time (realtime).

![Figure 1. Block Diagram of The Electronic system](image)

pH sensor which was used in this tool is a Gravity Master Kit V2 produced by EROBOT with specifications namely Power Module (5.00V), Measuring Range (0-14PH), Measuring Temperature (0-60 °C), Response Time (≤ 1min) and, Module Module Power (5.00V). In its application, this pH sensor is dipped into catfish culture media to measure the pH condition of the water media in real-time to be used as an indicator of the pH control of water catfish culture media.
3. Result And Discussion
The results of pH control of catfish culture media for six days of control are shown in Figure 2 below.

![Figure 2. pH control data of catfish pond water media for six days](image)

In Figure 2 above is the measurement and control data of the pH level of catfish cultivation water media for six days. The results in Figure 2 show that the tool has been able to work automatically to control the pH level of water media in real-time, where the tool controls the pH at a value of ± 7-9. If the pH of the water media exceeds the maximum limit of 9, the microcontroller activates the relay and starts the water pump. The water pump activates and sucks water from the pond and then pumps it to the filter for pH neutralization. The water that has been neutralized by the filter process is then returned to the pond through a water pipe that has been made. In addition to showing that the tool has been able to control the pH of pond water media automatically and in real-time, these results also show that in catfish culture, an increase in the pH of the water media takes place quickly on a daily basis. This provides information that a pH control device is needed to avoid crop failure in catfish farming.

4. Conclusion
pH control tool in catfish farming has been successfully tested and applied to catfish culture media in real-time. The test results show that the tool has been able to control the pH level of catfish culture water automatically and in real-time. The success of this study is very beneficial for catfish farmers that provide technology to control the pH level of catfish water media so that it can improve the quality and quantity of catfish yields.
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