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Design an Automatic Ph Controller Based on the Internet of Think

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ABSTRACT

The pH level in pond water has a very important role for the life of the fish in it. Moreover, the pond water functioned as a medium for fish cultivation. Appropriate pH levels have many benefits for fish farming. One of them is to increase fish productivity. This study aims to develop appropriate technology that can be applied to pond water. The result obtained is the creation of appropriate technology in the form of an automatic pH controller based on the Internet of Think (IoT). In simple terms, the workings of the automatic pH controller are that the pH sensor will detect levels of hydronium ion exchange (H+) in pool water so that the sensor can determine the pH level in pool water, then data from the sensor will be received by Arduino and will be processed so that it can be visualized on the display. LCD. The existence of this technology is able to make catfish grow optimally, so that freshwater aquaculture ponds become more productive.

Keywords: Design, pH, Pool Water, IoT.

ABSTRAK

Kadar pH pada air kolam mempunyai peran yang sangat penting bagi kehidupan ikan yang terdapat di dalamnya. Terlebih lagi air kolam tersebut difungsikan sebagai media budidaya ikan. Kadar pH yang sesuai mempunyai banyak manfaat bagi budidaya ikan. Salah satunya adalah dapat meningkatkan produktifitas ikan. Penelitian ini bertujuan untuk mengembangkan teknologi tepat guna yang dapat diterapkan pada air kolam. Hasil yang didapatkan adalah terciptanya teknologi tepat guna berupa automatic pH *controller* berbasis *Internet of Think* (IoT). Secara sederhana, cara kerja dari *automatic* pH *controller* adalah sensor pH akan mendeteksi kadar pertukaran ion hydronium (H+) pada air kolam sehingga sensor dapat mengetahui kadar pH pada air kolam, kemudian data dari sensor akan diterima oleh arduino dan akan diolah agar dapat divisualisasikan pada *display* LCD. Keberadaan teknologi ini mampu membuat ikan lele dapat tumbuh secara optimal, sehingga kolam *freshwater aquaculture* menjadi lebih produktif.

Kata Kunci: Rancang Bangun, pH, Air Kolam , IoT.

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1. Introduction

One type of food that is often consumed by the people of Indonesia is processed dishes from fresh water fish. This is inseparable from the delicious taste of the meat, besides that there is also the easy factor of cultivating fish that can live in fresh water [1-2]. The types of freshwater fish that are often consumed include catfish, carp, tilapia, snakehead fish, mujair fish, and tawes fish [3].

In Indonesia, there are many regions that have freshwater fish cultivation centers. One area that cultivates fresh water is Malang. Based on the records of the Malang Regency Fisheries Service in 2021, it will be able to produce at least 10,066 tons with details of 5,530 tons of catfish, 4,502 tons of tilapia, and the rest are carp, goldfish, mujair fish, tawes and other fresh water fish [4]. The areas in Malang Regency that have cultivated freshwater fish include Gondanglegi District, Tumpang District, Wonosari District, Turen District, and Pagak District.

The popularity of freshwater fish farming continues to grow [5-6]. Even in the area of Malang City also began to develop this cultivation. Bakalan krajan is one of the sub-districts in Sukun District, Malang City which has started the cultivation process. Based on the results of observations, it is known that the residents in Bakalan Krajan have activities in the form of freshwater fish farming as shown in Figure 1.

Figure 1 Freshwater Fish Ponds in the Bakalan Krajan Area

Figure 1 shows the condition of the Tilapia fish cultivation area in the Bakalan Krajan area, Sukun District, Malang Regency. From the results of these observations, problems were also found, namely regarding fish productivity that was not optimal. The causal factor of this problem is the presence of unstable or frequently changing pH levels. Agusta explained that in order to optimize yields in tilapia cultivation, special treatment is needed for this freshwater pond [7]. In addition to considering fish seeds, it is also necessary to treat the freshwater pond environment. In this case is the pH level contained in it [8-10].

By knowing these problems, it is necessary to develop appropriate technology which has the main function of controlling the pH levels found in these freshwater ponds. For optimal growth, a good pH level for tilapia cultivation is between 6.5 to 8.5 [11-13].

2. Methodology of Research

This research is included in development research, which is a type of research method used to develop certain products and test the effectiveness of these products.

2.1. Materials

The materials used in this development research are shown in Table 1 below.

Table 1. Materials Used

No	Name
1	Measuring Instrument Water Quality Monitor PH
2	Boreholes
3	Water hose
4	Spuyer
5	Adaptor 12V
6	Electrical cable
7	Super pH Down
8	pH Calibration Solution

3. Result and Discussion

The following are the results of research on the development of an Internet of Thought (IoT) based automatic pH controller. In simple terms, the workings of this Internet of Think (IoT)-based automatic pH controller are that the pH sensor will detect the exchange rate of hydronium (H+) ions in pool water so that the sensor can determine the pH level in pool water, then data from the sensor will be received by Arduino. and will be processed so that it can be visualized on the LCD display.

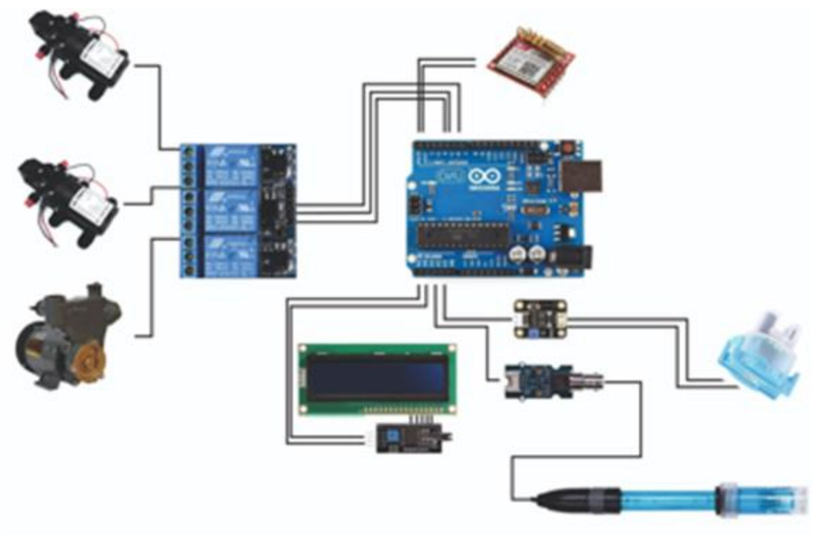

Figure 2 Diagrams of Automatic pH Controllers

Gambar 3. Tampilan *Automatic* pH *Controller*

Based on Figure 3 it can be seen that the display contained in the appropriate technology automatic pH controller based on the Internet of Think (IoT) can display the pH value found in freshwater ponds. In accordance with the appropriate pH value for tilapia aquaculture which states that a good pH is between 6.5 to 8.5, then the value shown in Figure 4 will notify the user that his freshwater pond is in acidic conditions. At the same time this condition will also trigger the relay to become active.

Specifically, the way this technology works is that the pH sensor will detect the level of hydronium ion exchange (H+) in pool water so that the sensor can determine the pH level in pool water, then data from the sensor will be received by Arduino and will be processed so that it can be visualized on the LCD display. . The ideal water pH level for Tilapia fish ponds is pH 6.5-8.5, to deal with a pH level that is too high requires an acidic solution that has a low pH level for that Arduino will be set when the pH level exceeds 8.5 to trigger the relay to On condition and turn on the pump which sprays acid liquid into the pond evenly using a spuyer until the pH level is not more than 8.5 followed by sending a message via the GSM module to the pond owner's smartphone that the pH condition of the fish pond is unstable due to alkaline, this stable state will be read by arduino through the sensor so that arduino will trigger the relay which was originally On to the Off position and the GSM module will send a message back to the pool owner's smartphone that the pool is stable and does not require further action.

Alkaline conditions in tilapia ponds are caused by high levels of CO2, which is the result of excretion from the respiratory system of fish and micro-organisms in the pond so that in order to create an equilibrium point from an alkaline state that can last a long time, it is necessary to replace the pond water with clean water as much as 10-30% of the total volume of water in the pond, with the aim of reducing the number of micro-organisms in the pond and the aerator to inject O2 from the air into the fish pond, the clean water pump and the aerator will work simultaneously with the acid liquid pump, but the clean water pump is set at a certain time according to discharge water from pump output and total pond volume.

In the case of the rainy season, because the main factor for pond water to become acidic is rainwater, the handling is enough to spray alkaline liquid on the fish pond until the water pH is above 6.5 with the same working system as spraying acidic liquid, and this situation will also be conveyed to the pond owner's smartphone via a message from the GSM module so that pond owners will receive detailed information on the pH conditions of their fish ponds. In addition, the GSM module can also turn off and turn on pond electrical installations such as filter pumps and pool lighting by sending a special message to the GSM module that corresponds to the coding on Arduino, after receiving the message Arduino will trigger the relay to be On or Off depending on the message sent. The following is the application of an Internet of Think-based automatic pH controller in one of the fresh water ponds of Bakalan Krajan Village, Sukun District, Malang City.

Figure 4. Application of Automatic pH Controller in One of the Tilapia Aquaculture Freshwater Ponds

4. Conclusion

Research on the development of appropriate technology in the form of an automatic pH controller based on the Internet of Think (IoT) has been successfully developed and implemented. Based on the results and discussion that has been submitted, the conclusions that can be drawn are as follows.

a. An Internet of Think (IoT)-based automatic pH controller will monitor pH levels in tilapia aquaculture ponds by displaying the pH value on the appropriate technology display and sending a message to a smartphone.

b. The Internet of Think (IoT)-based automatic pH controller will activate the relay if the pH level is outside the range of 6.5 to 8.5

c. If the pH level is below 6.5, then the alkaline liquid will come out and neutralize the pH again with levels between 6.5 to 8.5

d. If the pH level is above 8.5, then the acidic liquid will come out and neutralize the pH again with levels between 6.5 to 8.5.

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