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Remote Intelligent For Oxygen Prediction Content in Prawn Culture System

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ABSTRACT

In this work monitoring the Dissolved oxygen concentration in water tank. The problems caused by manual monitoring in prawn farming, a remote intelligent for oxygen content prediction in prawn culture system are proposed. The proposed system is on oxygen sensor in detecting the water quality and measuring the oxygen level in the water and Short Message Service (SMS) technology is delivering alert to the owner upon detection of water quality in oxygen level. The SMS can be send to the owner through Global System for Mobile Communication (GSM).Dissolved oxygen, Temperature, pH are the three water quality parameter that are critical to the prawn health. Remote 24 hour monitoring of the prawn tank to avoid the organism death caused by oxygen drops. If the oxygen level is low, the motor will be automatically ON / OFF, at the same time the message can be send to the owner. In this paper monitoring the oxygen level and SMS send to GSM by automation techniques.

Keywords : Global System for Mobile Communication (GSM), Automation, Oxygen Sensor

I. INTRODUCTION

Aquaculture is the farming of aquatic species in natural or controlled marine or freshwater surrounding environments. Since 24 years ago, aquaculture industry is blooming and it has been identified as the most popular method in fishery. However, one of the pertinent yet persistent issues faced by aquaculture farmers is how to efficiently monitor the water quality parameters of their ponds. Maintaining water quality parameter is the most important factor in determining the aquaculture farming. Many fish and prawn have been found dead organism due to oxygen drop perturbation in aquaculture ponds. In most of the aquaculture industries, manual water quality parameters monitoring in order to access the water quality of the pond. The monitoring activity includes inspection at the pond to ascertain the current water quality. The test is usually to monitor and measure the ammonia, temperature, pH level and dissolved oxygen (DO) level in water. Only trained persons can conduct the test. They have to take samples of the water and perform test. Each and every test takes between five and ten minutes. Thus, the process is time consuming and cost consuming. In addition, aquaculture farms are daily monitoring and inspecting of the ponds will be expensive, efficient and time consuming. Aquaculture farmers monitor the water quality parameters on a regular basis but without having to visit the ponds. It has also been discovered that aquaculture farms have requested for a system to monitoring the aquaculture environment and alert the owner when oxygen level is low. Therefore, to solve the problems, remote intelligent for oxygen in water quality monitoring systems were proposed. However most of the proposed systems, implementations were meant for others species and limited number of literatures are exists for prawn monitoring. Thus, this paper aims to present the details of the design and implementation of remote intelligent for oxygen content prediction in prawn culture system is proposed. The system is also equipped with an alert message to inform the owner on the degradation of water quality parameters via Short Message Service (SMS) through GSM modem. The three criteria that has been identified to measure and monitor and to detect water quality parameters changes are water temperature, pH level and DO.

II. METHODS AND MATERIAL

1. Related Work

2.1 Water Quality to Aquaculture

Water is also called as 'universal solvent' where various chemical reaction dissolved in the water, as well as all physical attributes affecting them combined to contribute to the water quality. Important facts of the water quality of parameters to be considered are; temperature, salinity, pH, DO, NH4, nitrite/nitrate, hardness, alkalinity, and turbidity .Aquaculture water quality does not equal to surrounding environmental water quality. Therefore different water quality parameters are used in monitoring and controlling aquaculture farm as compared to surrounding environmental water quality. It is also more than that good water quality criteria differ from organism to organism. Water quality level is determined by all attributes present in the good water at an appropriate value and not outside tolerable range. Biological, chemical, physical properties are interrelated and it affects survival, growth, and reproduction of aquaculture tanks. Aquacultures also have reverse effect to the environmental as aquatic organisms consume oxygen and produce by products, CO2 and NH4.

2.2. Quality Parameters for water

In their study recommended that temperature, DO, and pH be monitored directly basis since they tend to change value rapidly and have a significant effect on the system if allowed to operate out-ofrange value. Therefore, there are three parameters have been chosen to be monitored and controlling in this system. Water temperature needs to be monitored regularly as in inside of the temperature range. Among the temperature changes are: Photosynthetic activity, diffusion rate, amount of oxygen that can be dissolved in water, and physiological processes of the prawn spices and level of other quality parameters. Temperature refers to degree of hotness or degree of coldness and it can be measured in degree Celsius (oC). PH refers to the hydrogen ion concentration, how acidic or basic as water is and pH is defined as – log[H+]. PH value range from up to 0-14; pH 7 is neutral, PH<7 is acidic, and pH>7 is basic. Aquatic organisms are sensitive to pH Levels has below 5 and organism die. High pH levels (9-14) can harm fish due to the fact that ammonia. Very high pH value (greater than 9.5) or very low pH value (lower than 4.5) values are unsuitable for aquatic organisms. DO describe the concentration of dissolved oxygen molecular in the water and its dependent on the temperature of the aquaculture water and the biological demand of the system. DO is used by many organisms in the water, it tends to change rapidly. DO is supplied to aqua water through several method; direct diffusion of oxygen from the atmosphere, wind and water wave; and photosynthesis. It is used in aerobic decomposition, respiration, and chemical oxidation.

Table 1: Salinity is measured in ppt and the dissolved oxygen content in mg/l (ppm):

C(F)	0	5	10	15	20
18 (64.4)	9.45	9.17	8.90	8.64	8.38
20 (68.0)	9.08	8.81	8.56	8.31	8.06
22 (71.6)	8.73	8.48	8.23	8.00	7.77
24 (75.2)	8.40	8.16	7.93	7.71	7.49
26 (78.8)	8.09	7.87	7.65	7.44	7.23

Table 1 : below summarizes range of chosen water quality parameter for prawn farming

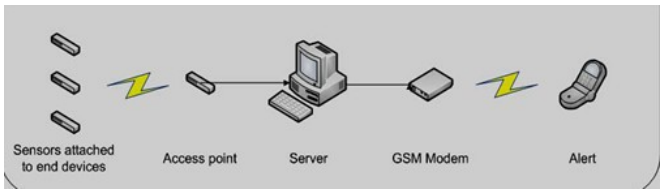
2.3 Monitoring Systems

Due to the criticality of monitoring water parameters of the aquaculture ponds, various systems have been proposed. In this paper proposed an eco-aqua farm system that monitors water in temperature, dissolved Oxygen, PH and salinity.

According to the surrounding environment, the system can be intelligently control the dissolved oxygen increasing and can remotely control the data will receive the report through mobile. The proposed method offer ubiquitous access to the monitored or measured data from the pond either from the internet or on the mobile. Other papers are studied and put forward a system that is based on RF and GSM to measure such parameters as oxygen and temperature.

Another paper as proposed an intelligent system to be monitors the water quality parameters remotely via SMS. The system can also send a message or alert to the farmers once the ranges of surrounding environmental information are found to be abnormal. Its present, a design on surrounding environment monitoring system for aquaculture farms. The system monitors and control records real-time data of two quality parameters: DO level and pH level are reported through centralized station using GSM network through Short Messaging Service (SMS).

SYSTEM ARCHITECTURE



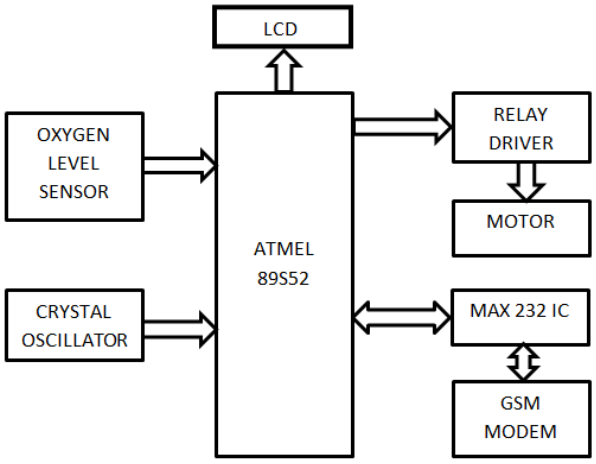


Figure 1: System Framework

3. System Design

3.1 Oxygen Level

Sensor:

An oxygen sensor is an electronic device and it is used to measures the oxygen level in water tank. By sensing oxygen level in water and check the conditions if the oxygen level is low or high.

Figure 2: Oxygen Sensor

3.2 Crystal Oscillator

The Crystal Oscillator is used to generate clock pulse. The clock pulse is used for timing calculation, which is to synchronize all the events**.**

3.3 Atmel 89S52

ATMEL 89S52 is based on 8051.This kit is to gather the readings of sensor from the tank and is used to convert analog signal to digital signal.

3.4 Relay Driver

Relay Driver is an electromagnetic switch and it is used to switch the motor to be ON/OFF. I t can be connected to 220v power supply by using automation techniques

Interfacing Relay with 8051 using Keil C – AT89C52

In some electronic applications we need to switch or control high voltages or high currents. In these cases we may use electromagnetic or solid state relays. For example, it can be used to control home appliances using low power electronic circuits.

RELAY

An electromagnetic relay is a switch used to switch High Voltage or Current using Low power circuits. It attractively isolates low power circuits from high power circuits and it is activated by energizing a electromagnet and coil wounded on a soft iron core. A relay would not be directly connected to a microcontroller and needs a driving circuit due to the following reasons.

- A microcontroller not able to supply current required for a relay. A relay needs about 50 – 100mA current.
- A relay is activated by energizing its coil. Microcontroller may stop working by the negative voltages produced in relay due to its back emf.

3.5 MAX 232 IC

MAX 232 IC is said to be Dual Transmitter/ Dual Receiver. It is used to transmit the data to the owner through GSM.

Construction of MAX232

MAX232 used in 16-pin DIP package. It consist of 3 major blocks .It can be powered by 5 volts to make it power supply compatible with the embedded systems. First block is the voltage doubler in this IC, switched capacitor techniques is used to create the voltage double.

Once the voltage is doubled second block which convert that voltage into +10 and -10. The third block consists of 2 transmitters and 2 receivers are to convert the voltage levels.

External Components

Max232 IC requires minimum 4 external capacitor. Their Value range from 1uf to 10uf and 16 volts. It contains many different versions of this versatile IC require different capacitor value for proper working.

Application and uses of MAX232:

MAX232 is used in Serial communication. Problem arises when we have to communicate between CMOS logic and TTL logic based systems. RS232 is internationally standard named as EIA/TIA-232-E and the standard logic 0 is the voltage between +3 to +15 and logic 1 is the voltage between -3 to -15.In TTL logic 0 is defined is by 0 volt and logic 1 is defined by 5 volt.

4 SYSTEM COMPONENTS

FOR PROJECT : Tools used to develop the system comprise both software and hardware components.

4.1 Software

The lists of software used in this project are as Kiel C Follows as:

4.1.1 SMS Gateway

SMS gateway is required to connect as interface between the system and GSM modem. SMS gateway enables message or SMS being received or sent from computer to or from mobile phone.

4.1.2 Programming Language

Keil C software is used as the programming language to create the user interface as well as to implement the data processing feature of the system. It is also C program

4.2 Hardware

The hardware of the system consists of two parts; data of the kits, and process of the communication system. The hardware design would focus on interfacing the oxygen sensors with the monitoring system.

The following will be hardware.

4.2.1 Atmel 89s52

The tools itself have a temperature sensor that detect surrounding temperature. Oxygen sensors such as dissolved oxygen and pH are connected to the tool to pick up values.

4.2.2 GSM modem

A GSM modem is a wireless modem works with GSM wireless network. The modem is connected to a kit so it could send SMS or mgs as an alert to farmer. The modem is attached to a relay driver.

GSM Modem Communication

There are different types of GSM modems are available in the market and the common GSM mode, which is common or mostly using in the market is TTL logic and sometimes some are using the RS232 standards by using this there is a problem in communication with GSM modem which is used by the microcontroller, Arduino, and some TTL platform. BY using the MAX 232 we can overcome the problems.

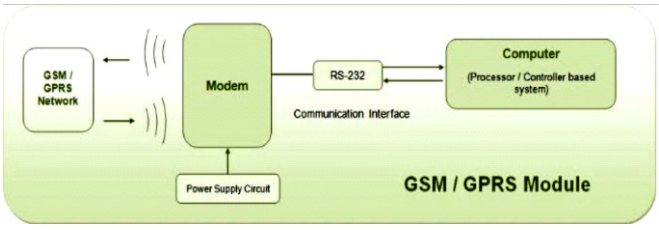


Figure 2. GSM Modem Communication GSM/GPRS is used for the communication between a computer and a GSM/GPRS system.

The GSM system is architecture; it is used in most of the countries for the communication purpose. The next extension of GPRS is GSM it shows the higher transmission rate. The GSM/GPRS is composed by the power supply circuit and communication interface by using MAX232 interface and USB etc.

The GSM/GPRS is a device of wireless modem that is used for the communication purpose by using the SIM (Subscriber Identity Module) card, we can activate the communication of the network and also by using the IMEI (International Equipment Identity) serial number we can identify. The operations of the GSM/GPRS are mentioned below.

- Receiver, send messages to a SIM
- Read, search phone book entries in the SIM
- Make or Reject the Voice calls

By using the AT commands the modem is interfacing with the processor and the Microcontroller which communicate with the serial communication. The commands are from the Microcontroller and microprocessor. After receiving the commands to the modem, gives the output. There are different types of AT commands used by the modem and they are sent through the processor, controller, computer to interface with the GSM/GPRS cellular network

4.2.3 Mobile Phone

A mobile phone is required for testing and checking purposes. The phone would act as user for this system. The system would send message to the phone once an alert.

III. RESULTS AND DISCUSSION

5.1 Preliminary Survey

The set of preliminary survey of the research to a group of farmers from prawn hatchery farms in Perak, Malaysia in order to solicit the requirements for the system.80 per cent of the defendants choose accuracy of the system, 60 per cent choose that the report must be informed frequently to the farmers to know the current status of the pond. Only 20 per cent of them agreed to have user-friendly and fast response. The can track and identify the water quality degradation. The water quality parameters are monitored for their prawn culture. The water quality parameters are dissolved oxygen concentration (DOC), PH and DO. The literature survey will to identify main water quality problem, track the changes in water quality, to create water changes plan and to predict future changes.

5.2 Record Interface

Two types of report that can be viewed are data recorded and alert sent. The Data Recorded will report and keeps track of all the sensor readings for every 20 seconds. The items recorded in the report are date and time when the reading takes place, temperature, pH, DO reading and status of water quality parameters.

5.3. Alert Interface

The alert which contains of the status of the water quality and the readings of all three Water quality parameters DO, Temperature, PH. By know the accurate reading of water quality parameters the farmers can assume which parameters add to the degradation of the water quality. The Alert which include the information such as message contents, receiver number, time and date of message being sent to the farmer.

IV.CONCLUSION

Remote intelligent for water quality parameters monitoring system using wireless sensors is developed to an aquaculture farmers in monitoring and controlling the water quality of their ponds. The aim of this system is to solving the problems caused by manual monitoring such as tedious colorimetric test and exhaustive inspection due to humid and spacious farm. Benefit of using this system includes more efficient monitoring and measuring of the pond water since the system would monitor the water parameters in a timely manner and alert the farmers (user) upon detecting oxygen level of the water quality. Three quality parameters are monitored in this system which are pH, temperature and dissolved oxygen. In this study process, the details of system design and implementation are presented to the mechanism of the proposed solution. The results obtained in the survey study served as the basis for the development of the process prototype. Meanwhile, the results through the usability testing implements that the system has proven to meet specific quality needs of what the farmers' required. While this study provides most notably, the

current system only monitors or measure three parameters. Therefore, more parameters are needed in order to obtain more accurate results. The proposed solution can also be further enhanced by allowing the system to detecting the water quality parameter suitable for various kind of aquaculture as the current system can only monitor the water quality suitable for the prawn spices. Further notable improvement that can be made on the system includes adding prediction feature into the prawn culture system so that the system can predict the water quality beforehand for the farmers to proactively monitor the ponds.

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