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IoT Based Industrial Sewage Water Purity Indicator

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Abstract – *In order to ensure the safe flow of the industrial sewage water the quality needs to be monitored in real time. Here, we present a design and development of a low cost system for real time monitoring of the water quality in IoT (internet of things). The system consists of several sensors which is used to measure physical and chemical parameters of the water such as temperature, pH, turbidity and salinity. The measured values from the sensors can be processed by the core controller. The IoT device can be used as a core controller. The processed data is stored in the cloud. Further calculations are done at the server side by retrieving the values from the cloud and reports are generated accordingly.*

Key Words: **IoT, Aurdino, Sensors**

1.INTRODUCTION

With the coming of the Industrial Revolution, humans were able to advance further into the 21st century. Technology developed rapidly, science became advanced and the manufacturing age came into view. With all of these came one more effect, industrial pollution. Earlier, industries were small factories that produced smoke as the main pollutant.

However, since the number of factories were limited and worked only a certain number of hours a day, the levels of pollution did not grow significantly. But when these factories became full scale industries and manufacturing units, the issue of industrial pollution started to take on more importance.

Industrial pollution takes on many faces. It contaminates many sources of drinking water, releases unwanted toxins into the air and reduces the quality of soil all over the world.

Water pollution and soil pollution are often caused directly due to inefficiency in disposal of waste. Long term exposure to polluted air and water causes chronic health problems, making the issue of industrial pollution into a severe one. It also lowers the air quality in surrounding areas which causes many respiratory disorders.

The effects of industrial pollution are far reaching and liable to affect the eco-system for many years to come. Most industries require large amounts of water for their work. When involved in a series of processes, the water comes into contact with heavy metals, harmful chemicals, radioactive waste and even organic sludge.

These are either dumped into open oceans or rivers. As a result, many of our water sources have high amount of industrial waste in them which seriously impacts the health of our eco-system. The same water is then used by farmers for irrigation purpose which affects the quality of food that is produced.

Industrial waste water contains pollutants which when freely discharged into river bodies leads to both physical and chemical changes to the environment such as coloration, biological condition, reduction in quality and quantity of the biotic floral of the human aesthetical assets. As a result of this the cost of pollution control is climbing rapidly.

If untreated waste water is allowed to accumulate, the decomposition of the organic materials it contains can lead to the production of large quantities of the malodorous gases. The untreated waste water usually contains numerous pathogenic or disease causing micro-organisms that dwell in the human intestinal track or that may be present in certain industrial waste. Waste water also contains toxic components which are let out from the industries.

The motivation behind the proposed system was to design a real time monitoring of water quality in a simplest and cost effective manner by measuring Temperature, Turbidity, pH , Salinity in water using Aurdino Board and different sensors in IoT Environment and notifying respective authorities about their water quality. In our design Aurdino Board is used as a core controller. The design system applies a specialized IoT module for storing sensor data (simulated)

from core controller to the cloud. The sensor data can be viewed on the cloud using a special IP address. Test results are recorded in cloud so that any previous data of testing can be fetched easily. Results are sent to owners so that required action can be taken by the operator. The factory detail will be uploaded in a social media if necessary action is not taken.

2. SYSTEM ANALYSIS

2.1 Literature survey

1. "A low-cost system for real time monitoring and assessment of potable water quality at consumer sites" paper presented by T.P.Lambrou, C.G. Panayiotou and C.C. Anastasiou This paper says how water can be monitored in real time. From this we got a idea of how the water quality can be monitored in real time, also how using internet the results of the tested water could be viewed and further actions could be taken up.

2. Solid-state sensors monitoring parameters of water quality for the next generation of wireless sensor networks." paper presented by S. Zhuiykov. This paper gives information about using sensors to test the quality of water. From this paper we got to know that we could use sensors or simulated module to test the quality of water from the various simulated sensor values.

3. A Portable Sensor With Disposable Electrodes for Water Bac-terial Quality Assessment." paper presented by Marco Grossi, Roberto Lazzarini, Massimo Lanzoni, Anna Pompei, Diego Matteuzzi, and Bruno Ricco. Based on impedance measurements, this paper presents a portable sensor implemented as an electronic embedded system featur-ing disposable measurement cells, which is suitable of measuring bacterial concentration in water samples. From this paper we got to know that different sensors available in the market could be used to test different parameters of the water quality. Our testing of water quailty involves parameters like temperature, pH, conductivity and turbidity from the simulated values generated through software at the IoT core.

4. What is the Internet of Things: An Economics Perspective, Auto ID Labs White Paper paper presented by E. Fleisch

   This paper is targeted towards students, practitioners and researchers who are interested in understanding and contributing to the ongoing merge of the physical world of things and the Internet. From this paper we learnt that the sensors and physical elements like water could be combined with internet for its testing. This reduces a lot of manual work involved in traditional system of water testing.

5. The Five Characteristics of Cloud Manufacturing Things "paper presented by M.Spinola. This paper is about the essential things on cloud computing we need to be aware of before using cloud computing. From this paper we learnt that using cloud would be better than using the local server as the storage space in could is vast and data could be fetched from cloud whenever necessary.

2.2 Drawbacks of the current system

Traditional methods of water quality involve the manual collection of water sample at different locations, followed by laboratory analytical techniques in order the character the water quality. Such approaches take longer time and no longer to be considered efficient. Although the current methodologies analysis the physical, chemical and biological agents, it has several drawbacks:

(a) Poor spatiotemporal coverage.

(b) It is labor intensive and high cost (labor, operation; and equipment)

(c) The lack of real time water quality information to enable critical decisions for public health protection. Therefore, there is a need for continuous online water quality monitoring.

2.3 Proposed System

By focusing on the above issues we have developed a low cost system for real time monitoring of the water quality in IOT environment. In our design aurdino is used as a core controller. The design system applies a specialized IoT module for accessing sensor data (simulated) from core controller to the cloud. The sensor data can be viewed on the cloud using a special IP address.

The advantages of the proposed system are*:*

• To develop an efficient IOT based monitoring of water quality for better results, low cost, easy handling, less manual work and to reduce the time involved in lab testing**.**

• It minimizes the time required for testing the quality of water

• This system removes need of laboratory testing

• Test results are recorded in cloud so that any previous data of testing can be fetched easily

• Results are sent to owners so that required action can be taken by the operator

• The factory detail will be uploaded in a social media if necessary action is not taken.

3. SYSTEM DESIGN DETAILS

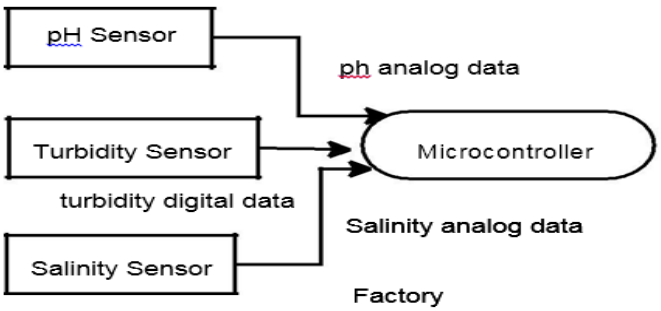


Fig -1

Here all sensors are connected to the microcontroller to extract the data of the sensors which are dipped in the industrial sewage water. The data fetched from the sensors are converted into digital signals.

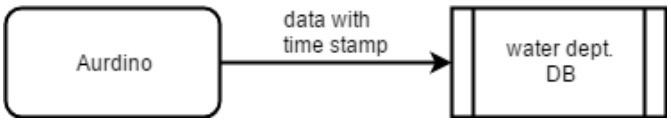
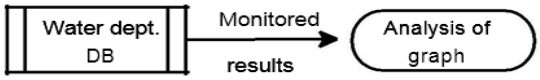


Fig -2

The Aurdino board(IOT) reads all the digital values and stores it to the cloud.



Data Flow Diagram of Water Quality Monitoring Module

Fig -3

The water department at the server side receives, analyses, calculates the average value at regular intervals of time ,applies standard formulae and compares these values with the standard ones. Finally a graph is generated based on the result.

Data Flow Diagram of Notification Module

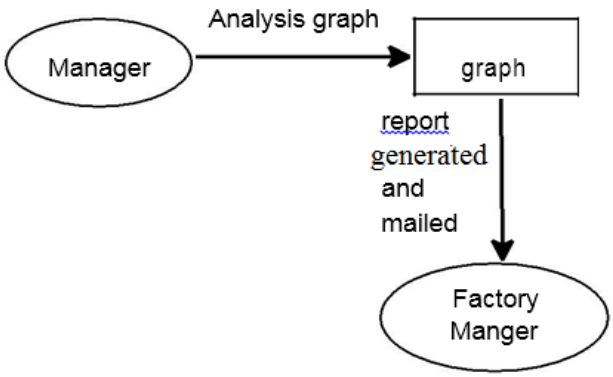


Fig- 4

A report is generated from the water department by analysing the graph and is mailed to the factory owner.

Dataflow Diagram of Further Action Module

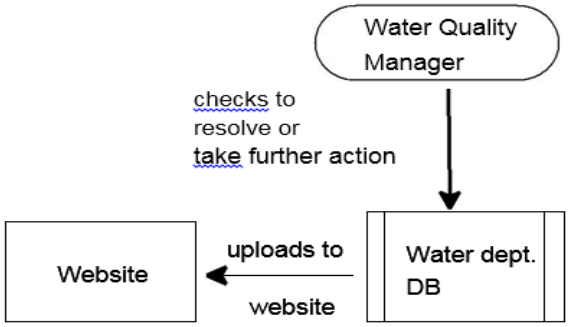


Fig- 5

The generated report is also stored into the cloud. If necessary action is not taken by the industry, that particular industry's report is uploaded onto the social websites

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