International Journal of Electronics, Electrical and Computational System
IJEECS
ISSN 2348-117X
Volume 6, Issue 7
July 2017

Academic Science

Industrial Waste Water Online Monitoring System

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ABSTRACT:
The importance of industrial waste water monitoring is undoubted in this age. Industrial waste water monitoring is very important to know as to check whether the quality of our water is getting better or worse. Information gathered through industrial waste water monitoring is important to many different decision makers. So it is necessary to develop a system that monitors the industrial waste water conditions. Industrial waste water monitoring is a system of devices which collects the data in real time and transfers it through a Wireless Sensor Network (WSN) to the particular company web site or environmental department for analysis. System generally combines embedded system hardware techniques that are useful for online monitoring industrial waste water and send this information to company web site. pH, Chemical Oxygen Demand (COD), Biological Oxygen Demand (BOD), Total Dissolved Solids (TDS) and Total Suspended Solids (TSS) are the most common parameters which are present in the industrial waste water, and it causes significant damage to life, agriculture and economy. In this work, WSN and embedded based system is proposed to measure different parameters of industrial waste water to predict the parameters of waste water like pH level of water, TDS level of water, flow of water and TSS level of water etc. The proposed system uses a mesh network connection over Wi-Fi for the WSN to collect data, and a Wi-Fi module to send the data over the internet and also consumes low power. The data sets from array of sensors are recorded, monitored using Raspberry Pi to forecast the different industrial waste water parameters.

Keywords:industrial waste water, Wireless Sensor Network, Wi-Fi.

INTRODUCTION:

The term waste water is commonly used to describe liquid wastes that are collected and transported to a treatment facility through a system of sewers. Waste water is generally divided into two broad classifications: domestic waste water and industrial waste water. Domestic waste water comes from communities of homes, businesses, and institutions. Domestic waste water is 99.9 percent water and only 0.1 percent solids. Milligrams per liter (mg/L) is the metric equivalent of parts per million (one part in a million parts). One percent is equal to 10,000 mg/L. So a 0.1 percent solids concentration is equal to 1000 mg/L. The solids in domestic waste water are both dissolved and suspended solids. Suspended solids can be settled out or filtered but dissolved solids will have to be converted to suspended solids during the treatment process.

Industrial waste water may contain organic pollutants, metals, nutrients, sediment, bacteria, and viruses. Industrial processes, such as steel or chemical manufacturing, produce billions of gallons of waste water daily. Some industrial pollutants are similar to those in municipal sewage, but often are more concentrated. Other industrial pollutants are more exotic and include a variety of heavy metals and synthetic organic compounds. In sufficient dosages, they may present serious hazards to human health and aquatic organisms.

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organic compounds. In sufficient dosages, they may cause serious hazards to human health and aquatic organisms.

The industry is of importance in terms of its impact on the environment. The waste water from industry is generally strong and may contain toxic pollutants. Industrial wastes usually contain organic and inorganic matter in varying degrees of concentration. It contains acids, bases, toxic materials, and matter high in biological oxygen demand, color, and low in suspended solids. Many materials in the chemical industries are toxic, mutagenic, carcinogenic or simply hardly biodegradable. Surfactants, emulsifiers and petroleum hydrocarbons that are being used in industry reduce performance efficiency of many treatment unit operations.

The best strategy to clean highly contaminated and toxic in industrial waste water is in general to treat them at the source and sometimes by applying on site treatment within the production lines with recycling of treated effluent. Since these wastes differ from domestic sewage in general characteristics, pretreatment is required to produce an equivalent effluent. In chemical industry, the high variability, stringent effluent permits, and extreme operating conditions define the practice of waste water treatment.

OBJECTIVE:

1. To sense the waste water parameters like pH, TDS, TSS, FLOW etc.
2. To collect data from array of sensors and to send the measured data to the micro-controller via internet.
3. To monitor continuously changes in industrial waste water, update the old values with new ones, after a specified period of time.
4. To collect data on real time basis without any human intervention.
5. To generate, pick up, transmission and data integration automatically at the server end.

LITERATURE SURVEY:

1. Mr. KiranPatil et.al research on Monitoring of Turbidity, PH & Temperature of Water Based on GSM. The traditional method of testing Turbidity, PH & Temperature is to collect samples manually and then send them to laboratory for analysis. However, it has been unable to meet the demands of water quality monitoring today. So a set of Monitoring of Turbidity, PH & Temperature of Water quality has been developed. The system consists of Turbidity, PH & Temperature sensor of water quality testing, single-chip micro-controller data acquisition module, information transmission module, monitoring center and other accessories. Turbidity, PH & Temperature of water is automatically detected under the control of single chip micro-controller all day. The single chip gets the data, and then processes and analyzes them. After that, the data are instantaneously sent to monitoring center by GSM network in the form of SMS. If the water quality is abnormal, the data will be sent to monitoring center and management department at the same time [1].

2. Meng et.al. in the paper “Research of on-line monitoring system of COD in waste water based on the light absorption method”, Introduces as online monitoring system of COD in waste water based on the optical absorption method. The system uses advanced processor STM32F103, advanced sequential injection platform, accurate optical measurement structure, efficient pressure digestion method, high resolution colorimetric module [2].

3. S.Harivardhaginiet. al. in the paper “developing a control technique using Variable Structure control [VSC] methodology for a pH control plant”, The pH control process involves a prototype model in which acidic and alkaline streams are mixed into a Continuous Stirred Tank Reactor [CSTR] in proper proportions so as to control the pH of the plant [3].

4. Adrian Korodiet. al. Introduces the lack of well-trained automation and SCADA works designers causes delays in project implementation and adds difficulties to supervise the developments for both the consultant and the beneficiary. The paper proposes to integrate in the curriculum of students a course material regarding the steps to be followed in order to produce correct automation and SCADA technical documentation. The paper divides the technical documentation considering the types of documents regarding

the rules that governs the relation between the entrepreneur, the consultant and the beneficiary. Finally a case study is presented focused on waste water treatment plants [4].

5. Amanda J. Byrne et. al. Introduces Absorbance data collected from an online UV absorbance spectrophotometer installed for water quality monitoring at a conventional drinking water treatment plant was used to develop surrogate parameters for treatment process monitoring and optimization. Surrogate parameters were developed via data analysis of collected online data as well as by targeted selection from previous research knowledge. These parameters were validated in the field using the same online spectrophotometer to gauge their response to events caused by operational changes, such as high chlorine demand and changes in natural organic matter (NOM) [5].

PROPOSED SYSTEM:

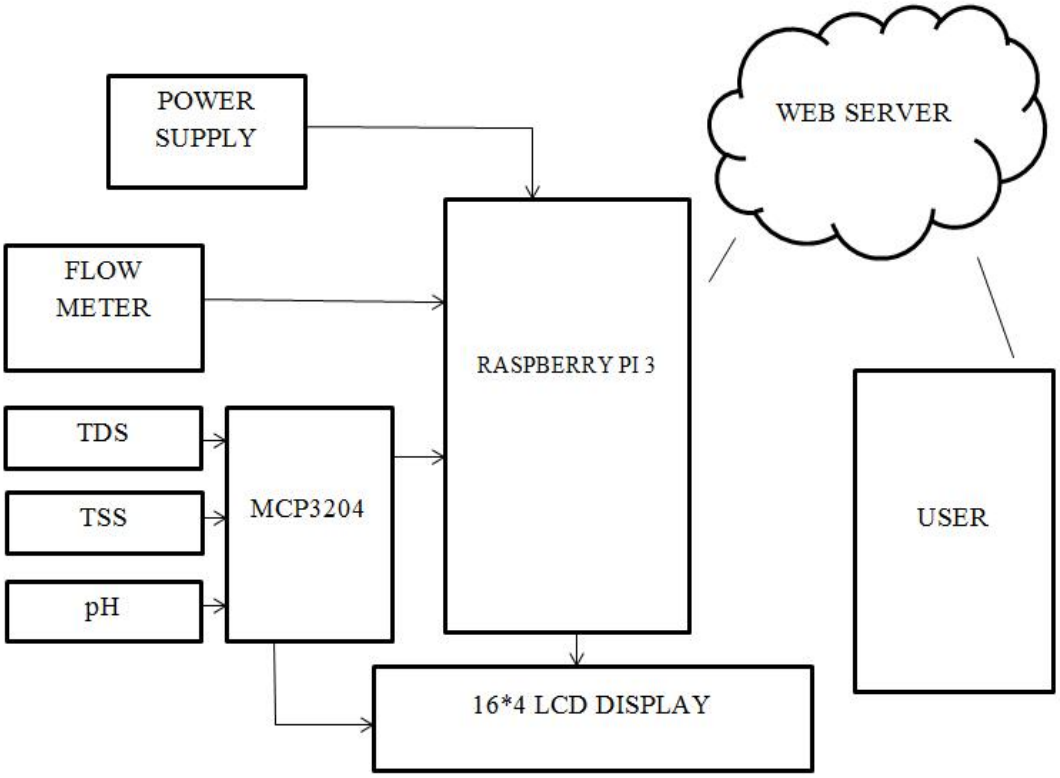

Fig.1 Block Diagram of proposed system

The system consists of various sensors: pH sensor, TDS sensor, TSS sensor, FLOW sensor, etc. All above sensors are connected to Raspberry-pi via 4-Channel 12-Bit A/D Converters (MCP3204) with SPI Serial Interface unit as shown in the Fig.1. These sensors can appear in any combination attached to a Wi-Fi device, with an LCD for the local visualization of the measured values.

The aim is to monitor industrial waste water parameter like pH, TDS, TSS, FLOW, etc and display the level of all parameters present in the industrial waste water on the display. Finally all collected data will be continuously transmitted through the Internet communication infrastructure to industry web site or environmental department for further analysis in treatment of industrial process. The data coming from various sensors such as pH sensor, TSS sensor, TDS sensor, and FLOW meter will be sent to the server and examined by a decision making system implemented in the industries.

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FLOWCHART:

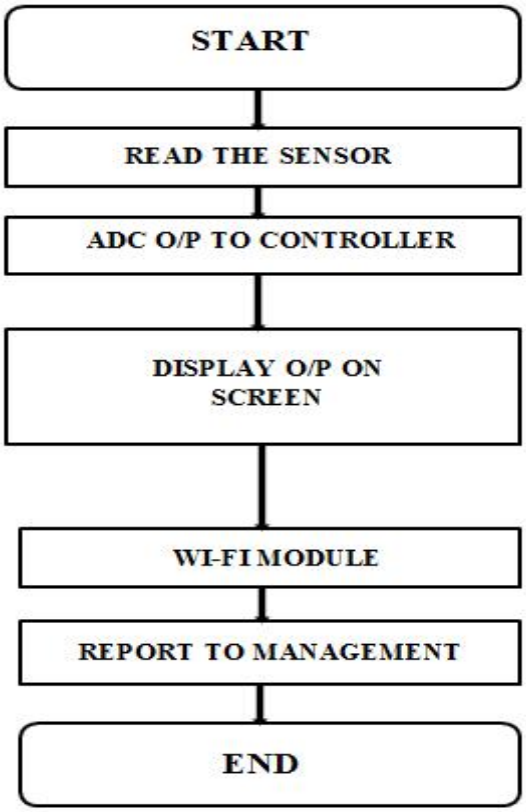

Fig.2 Flowchart

RESULTS:

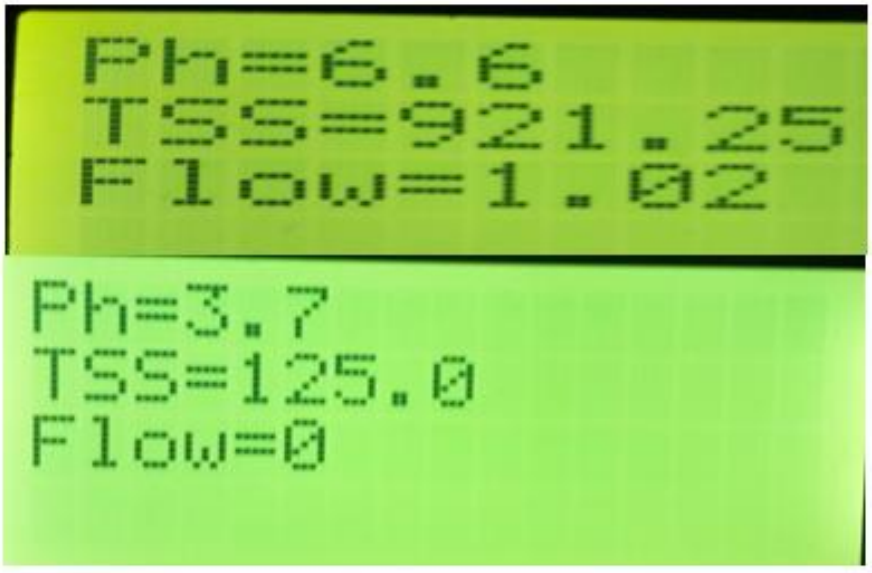

Fig.3 Waste Water Parameter reading on the field.

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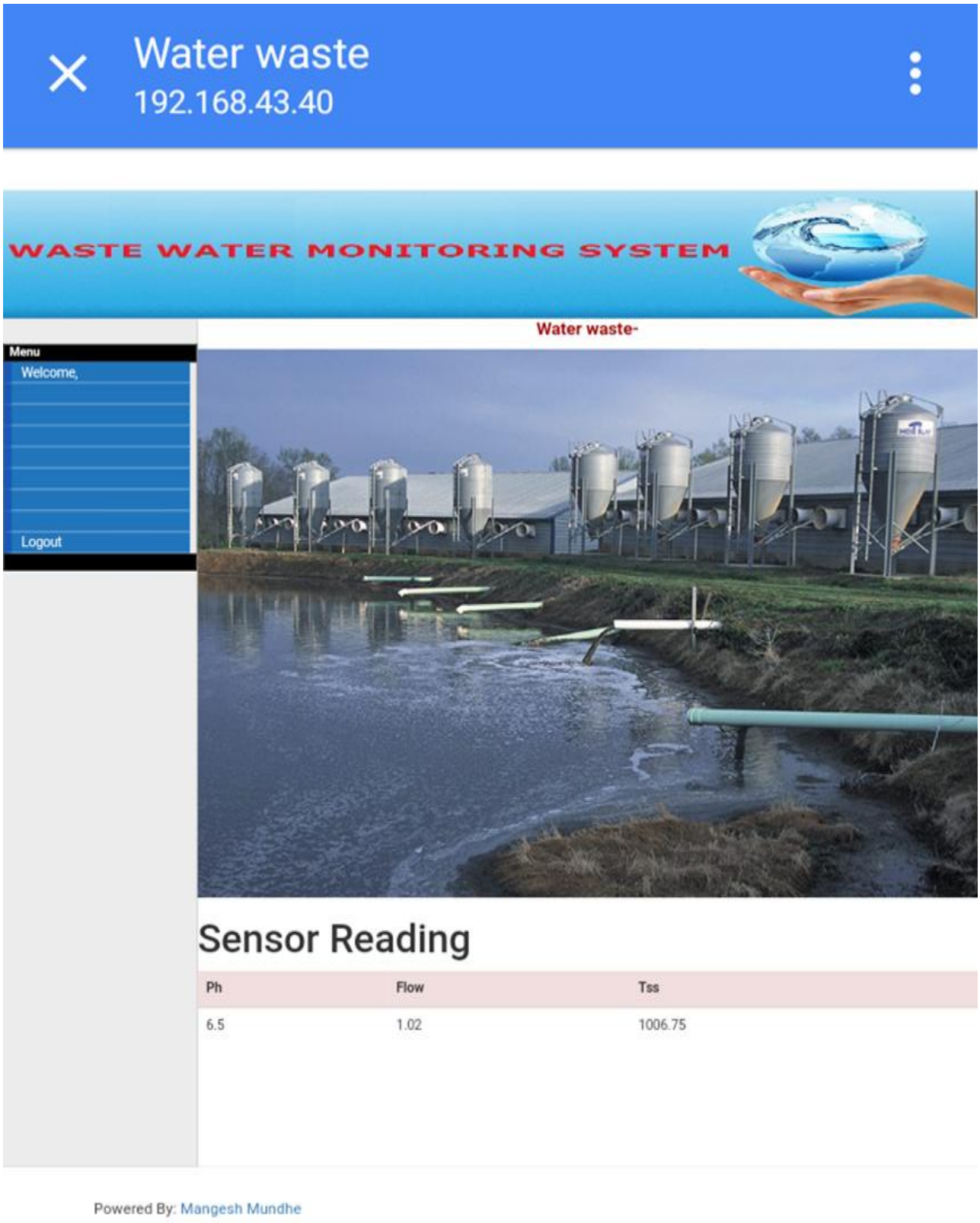

Fig.4Waste Water Parameters reading on the web server.

CONCLUSION:

The implemented system monitors industrial waste water through the use of low-power, low-cost sensors. The parameters monitored by the system are pH, total dissolved solids (TDS), total suspended solids (TSS) and flow of the waste water. It makes use of low-cost single board computer for design and development and communicates through Wi-Fi (IEEE 802.11). It does real time monitoring of waste water quality and the data is updated to the industrial web server.

This effective waste water online monitoring system will enable the control system of company in identifying the problems from the bottom line and helps in establishing effective control system by eliminating errors. Further, proper control and testing can be implemented by the company in order to eliminate the problems and to rectify the mistakes with the developed system. The system can be expanded with the help of other sensors for monitoring other waste water parameters according to the needed applications.

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