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Design of Online Monitoring Device for COD Parameters of Waste Water in Industrial Sewage

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Abstract— high quality water excellence is essential to human health, social and economic growth, and the ecosystem in the world. However, as population increases and existing environment is getting destroyed ensuring that there are adequate and water supply for everyone is becoming confront. The best tactic to clean highly polluted and noxious industrial waste water by handling them at the industry itself and sometimes by executing on-site treatment within the production lines with recycling of treated seepage. The project develops a system that monitors the industrial waste water conditions through a system of devices which collects the data in real time such as, COD parameters like pH level of water, TDS level of water and flow of water etc. and transfers it through a Wired Sensor Network or through a LAN to the care taker for analysis with the help of a mail alert. The process combines embedded system hardware techniques that are for online monitoring industrial waste water and send this information to company web site or to any control authority for remedial measures through MAIL alert.

Keywords— COD parameters, pH, TDS, Sewage, LAN

1. INTRODUCTION

The weighing reasons calling for immediate attention is a measure to change the structure of economy, industrialisation has rapidly impaired the quality of freshwater due to its pollutant discharge. Sufficient monitoring methods need to be implemented to keep the parameters under check. A recent survey states an increased shortage of freshwater for an estimated 10 billion people will be noticed in 2050, if present treatment methods are adopted.

2. LITERATURE SURVEY

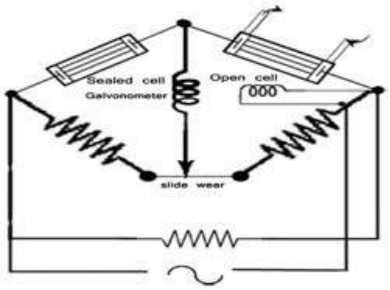
Pradeepkumar M et al., suggested the scheme for the "Real Time Monitoring of Water Quality in IoT Environment system" that deals with parameters like Turbidity, PH & Temperature sensor for water purity checking. In this scheme, Turbidity, PH & Temperature of water are automatically being detected every day. If the water quality is found to be aberrant, the message will be sent to supervising centre and provide warning to the communal at the same time. It is appropriate for administration to take consistent measures sensibly and be able to handle real-time condition of water worth.. But the disadvantage is that the current technology will be appropriate for specific area and not suitable for substantial system.

Meng Qingyi et al., proposed a system for on-line monitoring system of COD in waste water based on the light absorption method. This system is designed to analyze waste water to precisely calculate COD in waste water tasters. It is observed that the contents of COD provide more response in the UV-VIS wavelength spectrum. The drawback of this system is that, it cannot control real, chemical and instrument deviations.

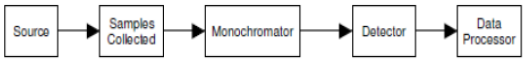
Mr. Kiran Patil et al., suggested a system deals with Turbidity, PH, water quality testing and signal conditioning unit. The perceived parameters are examined and information was conveyed through SMS using GSM network. The system is portrayed to the automate the water quality monitoring, information analysis using intelligent methods, and communicating the information via networking.

3. EXISTING APPROACH

In past era, traditional methods have been followed to access the water excellence attributes. Temperature, pH, Dissolved Oxygen, ammonia, Nitrate, Nitrogen, Dissolved Solids are few attributes decides the eminence level of water. Sampling and monitoring of water samples are the age-old methods need in the past decades. Sampling could be defined as a process of selecting a portion of volume of sample to be transported and handled in the laboratory. The next improvement was based on Laboratory Instrumental methods such as Weibel-Thuras Conductivity ratio consisting of wheat stone bridge to calculate the alkalinity in water. In this method, the time is saved and the results are given to the customer within few hours in the same day.



This was followed by a method called Atomic Absorption Spectroscopy. It is an advanced modus operandi used in the laboratory to analyse the trace elements, nutrients and major ions. The theory says that, the quantity of energy immersed in the flame is comparative to the dilution of element in the sample. Higher absorption and errors can also be corrected and avoided.



It has innumerable merits such as, it pprovides a reducing environment for easily oxidised environment in a relatively short measurement time. Smaller quantities of sample (typically 5-50µL) is used and ensures efficient atomization. Sample, slurries and solid samples can also be analysed.

LIMITATIONS OF EXISTING SYSTEMS

- The main difficulties in sampling are carrying out the samples to the laboratory. The error possibility involved in sample preparation is high than anything else.
- The titration method was time-consuming and followed in earlier days to test the water samples from the farms to testing in laboratory and the titration results cannot be determined in the same day.
- Carrying the samples to the laboratory without contamination was difficult.
- Low sample throughput.
- Less sensitivity compared to graphite furnace.
- Problems with refractory elements.
- Sample must be in solution or at least volatile.

This can be sufficiently replaced by, say for instance, a conductivity sensor in place of using chemical method and equations of PSS-78 or using Titration method and Wheatstone's bridge.

Thus, the manual monitoring of water quality parameters does not give the exact values and the process are time consuming and need more man power. The automated water quality parameters are monitored by the sensors and the data results are more accurate and quick remote access is possible.

4. PROPOSED METHODOLOGY

The proposed system consists of various sensors for measurement of pH , TDS, TSS and FLOW etc., All above stated sensors are interconnected to Raspberry-pi B+ with SPI (Serial peripheral Interface unit). Liquid crystal display is used for displaying the measured values.

The aim is to monitor industrial waste water parameter like pH, TDS, TSS, FLOW, etc and exhibit the level of all attributes present in the industrial sewage water on the LCD display. Lastly, all gathered information will be continuously communicated via the Internet to industry server or to the government for further analysis in treatment of industrial process. The data coming from various sensors such as pH sensor, TDS sensor, and FLOW meter will be sent to the server and examined by a decision-making system implemented in the industries.

4.1 HARDWARE

A. POWER SUPPLY

The power supply is essential for biasing and proper working of all the electronic components inside the system.

B. PH METER

pH transmitter and controller – model pH 600-1

pH 600-1 uses glass electrode like sensor probe transmitter for sensing the amount of hydrogen ions from the waste water. The sensed input is analog in nature. It is connected to alarm buzzer through relay 1 with a lower limit of 5 and upper limit of 8 within a known range of 2-16.It can produce accuracy up to 0.001pH 2 digit and with a manual/automatic temperature compensation of -20 to 1500 degree Celsius.

C. TDS METER

TDS transmitter and controller – model TDS 602-1 again uses a sensor probe transmitter in the form of 2-metal type glass electrode to sense the amount of turbidity/level of insoluble contaminants in waste water. It has 5 different ranges of 1-20ppm,5-200 ppm,10-2000ppm,1-20ppt and 5-200 ppt (user selectable). Designed in such a way to resolute up to 0.001 ppm depending upon range through cell inputs 1 & 2, it has the same accuracy as that of ph. It is again connected to alarm buzzer of 230V in inputs 6 & 7 in case of parameter shift.

D. FLOW METER

Flow rate indicator with totalizer – model FI 594 is a 3-wire figament wherin the 3 wires are connected to 4,5 & 6 for pulse input, 5-24 V DC and sensor signal for common (GND). The sensor used is a mechnical flowmeter of paddlewheel design type. It is used to measure the velocity of water streaming through the pipe that makes a piston or turbine to spin.

E. PIC 16774 MICROCONTROLLER

It is the central controller unit. It is controlled by software and programmed to perform different tasks with the help of eight channels and ten bit A/D converter. It has a program memory and a data memory. The overall system performs arithmetic and logic functions.

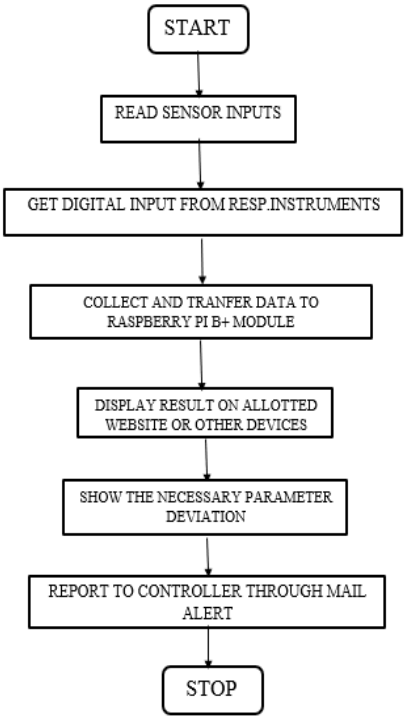
F. TWO CHANNEL RELAY MODULE

This is a low level 5 V 2- channel interface board and each channel need a 30-40 mA driver current. It has a standard interface that can be controlled directed by microcontroller.

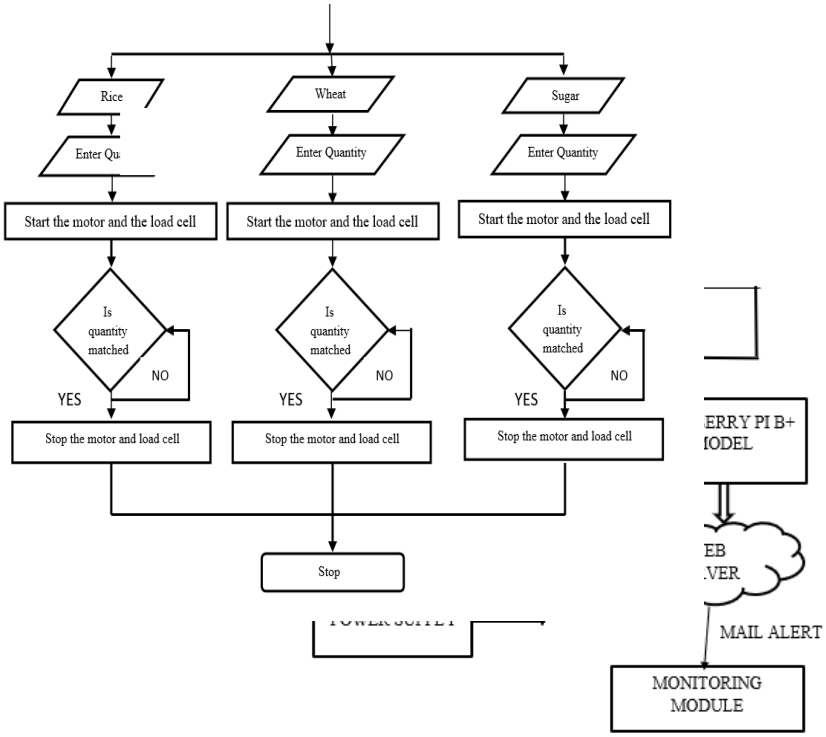
G. 16*4 LCD DISPLAY

The measured attributes are getting displayed using 14 pin LCD display. The pin 1 and 2 is used for ground and supply respectively. Contrast adjustment can be done in LCD display via pin 3.

4.2 FLOW CHART



4.3 FUNCTI



4.4 ALGORITHM

Algorithm of proposed systems is:

i. Initial node contains various sensors like pH, turbidity and helical wheel flow sensor for the purpose of ensuring the water standard. .

ii. The nodes sense the data and send to the database and the smart algorithm works on database for data recovery.

iii. If the algorithm concludes that the data sent is correct no further action is taken, the data is just recorded for specific intervals.

iv. If the algorithm concludes that the data sent is incorrect or higher than normal, the alarm settings are made on with the smart algorithm. To avoid the energy waste in the sending data the smart algorithm is designed in the way to detect the necessary data.

v. First the threshold value for each variable is set. Sensor gathers and save the data as the reference value. If the data value is equal to the threshold value or lesser the values will be stored in the database.

vi. If the value is higher the alarm and notification via database is sent to the controller.

vii. Thus, the parameters are checked and again goes through the processes to bring back to normal state.

4.5 METHODOLOGY

This diagram represents the real time circuit connection The proposed system is implemented,

PHASE 1:

Keeping the samples from the flowing waste water collected on one side, the sensor probes of the respective instruments are inserted into them by following each connection diagrams respectively.

PHASE 2:

The collected analog values are converted to digital formats, by sampling the value of the input at discrete intervals in time with the help of in-built ADC's. Necessary SETVALUES are configured in all the instruments by default, and in case of any hike in parameters, the alarm output is inbuilt audible buzzer with front key reset for warning.

Description of output displays are as follows:

- Hi - OUTPUT gives, if PV goes below the HIGH SETVALUE.
- Lo – OUTPUT gives, if PV goes above the LOW SETVALUE.
- HiLo - OUTPUT gives, if PV goes above the HIGH SETVALUE & below the LOW SETVALUE.

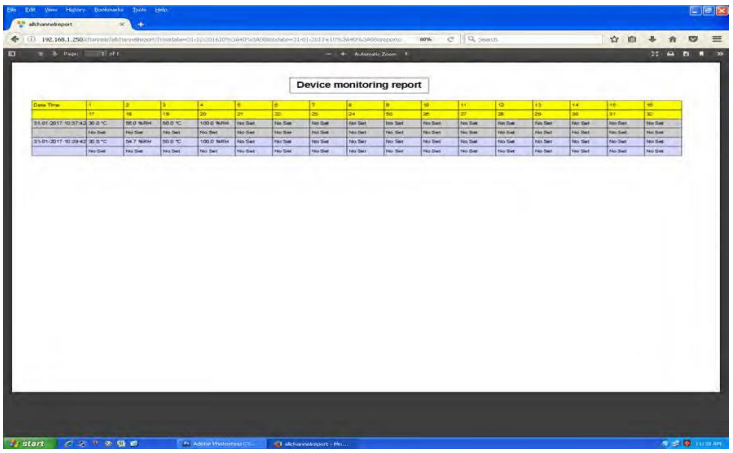
PHASE 3:

The instruments are further connected to PIC IC 16674 for consolidations and through a Multichannel Jumbo Indicator and Datalogger version 1.0 that enables to monitor & visualize data from one or more Instruments connected to the PC through RJ45 Ethernet.

By entering the needed IP address of the website and also to ensure security, Login ID and password need to be known. The software offers a multiple feature such as:

- Log Management to change the log intervals (4-12 hours) and to permanently delete logs.
- Log Reports to export, download Log PDF and in CSV formats.

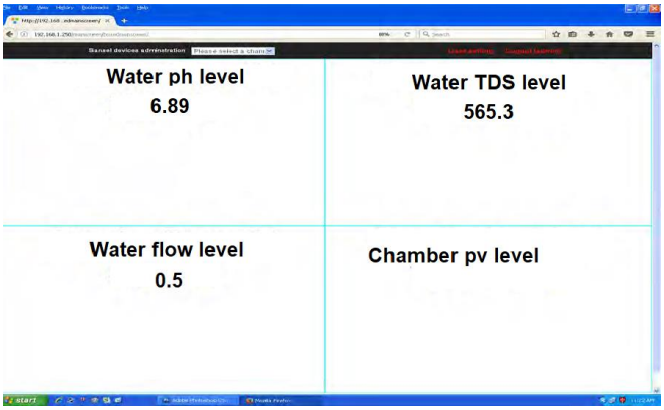
The examiner's mail ID is added to ensure that he gets the entire report each day. In case of emergencies, the mobile numbers are also added to keep the parameters in check and sufficient measures.



Daily report of parameter values

5. RESULTS AND DISCUSSION

The implemented system monitors industrial waste water through the use of low-power, low-cost sensors. The parameters monitored by the system are pH, TDS, and flow of the waste water. It makes use of low-cost single board computer for design and development and communicates through RS 485. It does real time monitoring of waste water quality and the data is updated to the industrial web server.



Outcome of the proposed system

Simulation results of the online monitoring device of COD parameters of wastewater

6. CONCLUSION

This paper proposed an efficient sewage water online monitoring system in industries to find the problems from the scratch and alleviating the problems. Efficient controlling and testing mechanism can be

implemented eradicate the problems in good manner. The proposed system can be enlarged according to the required applications. This system could be economical, requires lesser maintenance and tolerable by common people.

7. REFERECES

[1] Mr.Kiranpatil, Mr.Sachinpatil, Mr. Sanjay patil and Mr.Vikaspatil "Monitoring of Turbidity, pH & Temperature of water based on GSM" International journal for research in emerging science and technology, volume-2, issue-3, march-2015.

[2] MengQingyi, Zhou Wei, Zhang Sixiang "Research of On-line Monitoring System of COD in Waste Water Based on the Light Absorption Method" 2013 Fourth International Conference On Digital Manufacturing and Automation,©2013 IEEE DOI 10.1109/ICDMA.2013.239.

[3] S.Harivardhagini, A.Raghuram "Variable Structure Control of pH Neutralization of a Prototype Waste Water Treatment Plant using Lab VIEW" 2015 IEEE Conference on Systems, Process and Control (ICSPC 2015), 18 – 20 December 2015, Bandar Sunway, Malaysia.

[4] Adrian Korodi, IoanSilea "Specifying and Tendering of Automation and SCADA Systems: Case Study for Waste Water Treatment Plants" 2014 IEEE Multi-conference on Systems and Control October 8-10, 2014. Antibes, France

[5] Amanda J. Byrne, Christopher Chow, RinoTrolio, ArronLethorn, Jeremy Lucas, Gregory V. Korshin "Development and Validation of Online Surrogate Parameters for Water Quality Monitoring at a Conventional Water Treatment Plant Using a UV Absorbance Spectrolyser" Australian Water Quality Centre, SA Water, 250 Victoria Square, Adelaide, SA, Australia © 2011 IEEE.