Microcontroller based Monitoring and Reprocessing System for Waste Water Management

Su.Suganthi, P. Pavithra, C. Sri Lakshmi Priya, T. Thayamma

Abstract--- ***Monitoring systems are not able to monitor the water quality in all aspects of sectors like water emitted by industries, drinking water, sea water etc., The aim of our project is to monitor the necessary quality parameters of the water and reprocess it into Plasma Activated Water[PAW]. For knowing the purity content of water in day to day lives, the system implemented, continuously checks and provides the data to the microcontroller. In order to ensure the safety supply of the drinking water the quality needs to be monitored in real time. The system consists of serval sensors is used to measure the physical and chemical properties of the water. The parameters such as temperature, pH, turbidity, flow of the water can be measured. Furthermore, it is essentially converted to Plasma Activated Water[PAW] that acts as an preservative for microbial infections. Non thermal plasma has been widely considered as an effective method for bacterial inactivation in food safety. The bactericidal efficiency of Plasma Activated Water[PAW] was found to be strongly dependent on PAW treatment intervals. Significant reduction in microbial populations were achieved in all cases demonstrating the effectiveness of this new approach to treat contaminated media. Therefore Plasma Activated Water [PAW] is a promising solution with potential application to the decontamination of equipment and surfaces.***

Keywords--- Temperature sensor, pH sensor, Turbidity sensor, Flow sensor, WI-FI module, Plasma Activated Water [PAW], Microbial disinfection.

I. INTRODUCTION

Nowadays, water quality monitoring in real time faces challenges because of global warming limited water resources, growing population, etc. Hence there is need of developing better methodologies to monitor the water quality parameters in real time. The water quality parameters pH measures the concentration of hydrogen ions. It shows the water is acidic or alkaline. Pure water has 7pH value, less than 7pH has acidic, more than 7pH has alkaline. The range of pH is 0-14 pH. For drinking purpose it should be 6.5-8.5pH. Turbidity measures the large number of suspended particles in water that is invisible. Higher the turbidity higher the risk of diarrhoea, cholera. Lower the turbidity then the water is clean. Temperature sensor measures how the water is, hot or cold. Flow sensor measures the flow of water through flow sensor. The traditional methods of water quality monitor involves the manual collection of water samples from different locations.

The search for novel techniques for microbial decontamination is currently the subject of considerable investigation. New disinfectants are under study and nonthermal inactivation technologies (pulsed electric fields, high-intensity light) have been proposed. This PAW retains its biological activity, measured on the mouse neuroblastoma cells culture, even after storage for more than one year. The highest hydrogen peroxide content was found in PAW. It is concluded that the long-lasting biological effects of PAW is mediated by hydrogen peroxide, whereas other possible active components decompose rapidly.

Non thermal plasma (also cold plasma or low-temperature plasma) is produced by various electric discharges (for basic review) and widely used in various fields of biological and life sciences. Nonthermal plasma interacts with various biological objects. Starting from the probably first reference describing inactivation of bacteria, a huge number of original articles describe new applications in life sciences and biotechnology. They are summarized in specialized reviews, such as the fundamental review. The nature mechanism of PAW action was recently subject of many works, but the conclusions of research are sometimes controversial. The character of plasma used for water treatment was also different: almost complete spectrum of sources and discharges was engaged to generate the plasma used for the water treatment. The bacterial cultures mostly served as the model for the PAW biological activities testing.

II. BLOCK DIAGRAM

The block diagram consists of following parts:
1: PIC microcontroller
2: Temperature sensor
3: Flow sensor
4: Turbidity sensor
5: pH sensor
6: Driver circuit
7: UART
8: IOT
9: Heating mechanism
10: Air pumping to PAW mechanism
11: Pumping mechanism
12: Power supply

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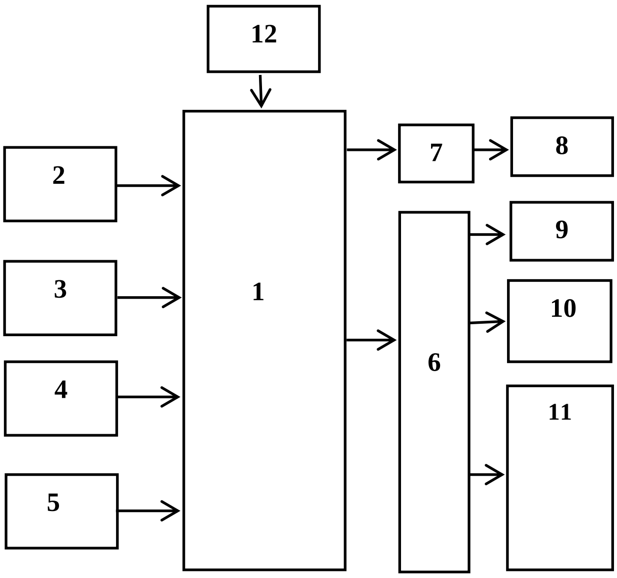

Fig. 1: Block Diagram

III. TOOLS AND TECHNIQUES

pH sensor: The pH of a solution is the measure of the acidity or alkalinity of that solution. The pH scale is a logarithmic scale whose range is from 0-14 with a neutral point being 7. Values above 7 indicate a basic or alkaline solution and values below 7 would indicate an acidic solution. It operates on 5V power supply and it is easy to interface with microcontroller.

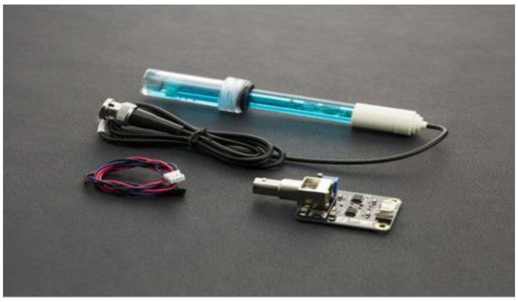

Fig. 2: pH sensor

Turbidity sensor: Turbidity is a measure of the cloudiness of water. Turbidity has indicated the degree at which the water loses its transparency. It is considered as a good measure of the quality of water. Turbidity blocks out the light needed by submerged aquatic vegetation. It also can raise surface water temperatures above normal because suspended particles near the surface facilitate the absorption of heat from sunlight.

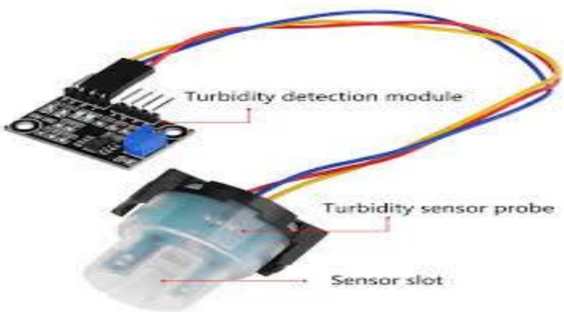

Fig. 3: Turbidity sensor

Temperature sensor: Water Temperature indicates how water is hot or cold. The range of DS18B20 temperature sensor is -55 to +125 °C. This temperature sensor is digital type which gives accurate reading.

Fig. 4: Temperature sensor

Flow sensor: Flow sensor is used to measure the flow of water through the flow sensor. This sensor basically consists of a plastic valve body, a rotor and a Hall Effect sensor. The pinwheel rotor rotates when water / liquid flows through the valve and its speed will be directly proportional to the flow rate. The Hall Effect sensor will provide an electrical pulse with every revolution of the pinwheel rotor.

Fig. 5: Flow sensor

IV. IMPLEMENTATION METHODOLOGIES

PIC16F877A

The term PIC, or Peripheral Interface Controller, is the name given by Microchip Technologies to its single – chip microcontrollers. PIC micros have grown to become the most widely used microcontrollers in the 8- bit microcontroller segment. The PIC16F877A CMOS FLASH-based 8-bit microcontroller is upward compatible with the PIC16C5x, PIC12Cxxx and PIC16C7x devices. It features 200 ns instruction execution, 256 bytes of EEPROM data memory, self programming, an ICD, 2 Comparators, 8 channels of 10-bit Analog-to-Digital (A/D) converter, 2 capture/compare/PWM functions, a synchronous serial port that can be configured as either 3-wire SPI or 2-wire I2C bus, a USART, and a Parallel Slave Port.

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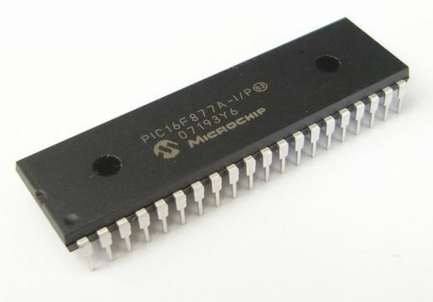

Fig 3: PIC microcontroller

Water pump motor

Vehicle water pumps help regulate the flow of water through a vehicle's cooling system; when the seal on these go bad, the whole pump must be replaced. Located within the home or business, pressure water pumps regulate the water pressure year round, controlling water flow to different areas of the location. A pump motor is a DC motor device that moves fluids. A DC motor converts direct current electrical power into mechanical power. DC or direct current motor works on the principal, when a current carrying conductor is placed in a magnetic field; it experiences a torque and has a tendency to move. This is known as motoring action.

Fig 4: Water pump motor

IOT

The Internet of things (IoT) is the network of everyday objects — physical things embedded with electronics, software, sensors, and connectivity enabling data exchange. Basically, a little networked computer is attached to a thing, allowing information exchange to and from that thing. Be it light bulbs, toasters, refrigerators, flower pots, watches, fans, planes, trains, automobiles, or anything else around you, a little networked computer can be combined with it to accept input (especially object control) or to gather and generate informational output (typically object status or other sensory data). This means computers will be permeating everything around us — ubiquitous embedded computing devices, uniquely identifiable, interconnected across the Internet. Because of low-cost, networkable microcontroller modules, the Internet of things is really starting to take off.

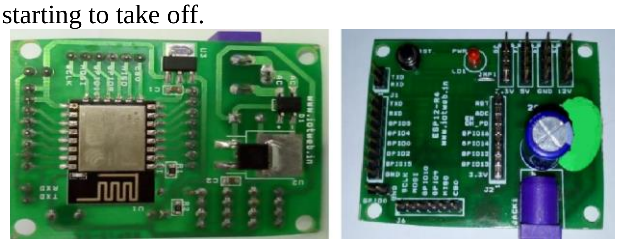

Fig 5: IOT module

Water level sensor

The water level sensor connected to the microcontroller and it is made up of floating type of plastic, which floats in water to sense the level of water. When the water is full in the land the floating type sensor will float in water and reaches the top edge which used to indicate the water is full. Likewise when water is low in the land it reached the bottom and indicate the microcontroller that water is low. All the data will be send to the particular person through GSM which is programmed in our microcontroller.

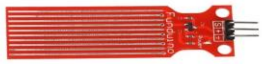

Fig 6: Water level sensor

V. BASIC WORKING

Based on investigating the spatially distributed input-output relationship of disinfectant residual in water distribution networks, this brief paper formulates the water quality control problem of multiple nodes in a decomposed adaptive control framework, with special consideration on the periodic variation of parameter uncertainty due to varying consumer demands. The water distribution network is decomposed to subnetworks based on the effect of the decay of chlorine concentration. With the help of water pump motor and heating elements the acidity content of the water is neutralized to a possible level and is reprocessed as plasma activated water (PAW).

VI. CONCLUSION

The real time water quality monitoring system for real time applications which is efficient and low cost has been tested after the implementation. The level of pollutions in the water bodies is governed and the sudden warnings are sent to the public through messages and alarm. The diseases that are caused due to the presence of metals and pollutants in the water can be protected by this system. The severe level of pollutants in the Ganges and Yamuna rivers can be taken immediate actions. The task of monitoring can be done by using the less trained individuals. The installation of the system can be done easily when it is near the target area. Rural people can be indicated in prior with the toxic effluents of nearby industrial plants. PAW proves itself useful in waste water management and in preserving features.

The results are tabulated:

WORDS	ATTENTION	MEDITATION
HELP ME	**63-70**	**69-79**
EMERGENCY	20-25	20-30
IMMEDIATE	8-20	8-16
URGENT	60-70	50-70

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VII. FUTURE SCOPE

Internet of Things (IoT) and its services are has become a part of our everyday life, ways of working, and business. The research is going on, in developing crucial building blocks and models for the next generation. Internet services are supported by a plethora of connected things and with the help of efficient and intelligent mobile network usage IoT has revolutionized the world. IoT is changing the future of technologies and how objects behave around us. Hence we can access any kind of information and command objects at the touch of fingertips. On the whole, the present water scarcity issue can be addressed to in a simple and efficient way.

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