Web Based Service to Monitor Water Flow Level in Various Applications Using Sensors

Usha Rani. M, Kamalesh. S, Preethi. S, Charulekha Shri. C.K, and C. Suganya

Abstract— The paper describes the web based service to monitor water flow level in various applications using the level sensor, water flow sensor and temperature sensor with the arduino microcontroller. The communication will be established using the Zigbee and the control will be sent based on the water flow level when it will be above the default flow range and the pressure available on that cooler using the arduino microcontroller with low cost implementation. In this system the master and slave communication will be established in the combination of arduino, Zigbee series 1, in which the zigbee, arduino and the combination of water flow sensor, level sensor, temperature sensor acts as a master and finally when a particular water flow level is reached, depending on the value the water flow will be allowed in the pipe and the flow range, water pressure will be updated along with the time in a database and also displayed in the web portal. The owner of the sensor field can anytime check the water flow level, temperature on the cooler. The status will also be a sent to the owner mobile using GSM.

Keywords— Arduino, GSM, Water flow sensor, Web portal

I. INTRODUCTION

WIRELESS Sensor Networks (WSN) has emerged as an important area for research and development. Though WSN is in its early stages, its impact is envisaged to be far reaching, from daily life, to remote monitoring of environment, habitat, agriculture, health care, automobiles, hazardous zones, disaster prone zones, defense applications to probing of planets. Moreover they can be used for monitoring as well as control. In fact, they form the basic constituent of ubiquitous sensing, communication, computing, and control. WSN is great enabling technology that can revolutionize information and communication technology. In fact, it has the potential to significantly change the way we live – just like the Internet and World Wide Web. The power of WSN lies in creating a pervasive environment capable of remote sensing, monitoring and control. There are so many applications are developed with the base of this Wireless Sensor Network research area. The main objective is to implement this aspect based on that we can develop so many applications.

A Web portal is a website created for any particular purpose. It gathers information from several other public sources. Unlike a usual website, web portal can be accessed by individual user by just registering in that portal and logging in. Examples of web portal are yahoo, Netscape, CNET etc. The access is restricted in web portal and the information is shared for individual purpose or for any organization. It is possible to select and organize the resources present in a portal. Web portals are considered to be gateway for World Wide Web. Web portal differs in their types depending upon the resources that they share and to whom they share with. [2] It can be Government web portal, cultural portals, corporate, stock, general portals etc. A personal web portal provides information only to any particular user or visitor whereas a regional web portal may serve information to particular geographical area. A large number of access providers are present for providing portals to web.

II. POWER PLANTS WITH SENSORS

Power plants are the place where the power is generated from a given source. Here electrical energy is obtained by converting other forms of energy. They are the source of power generation in many countries. Water plays an important role in generating electrical energy as well as for cooling purposes .In thermo electric power plants water is used to produce steam which in turn runs a turbine to generate electricity. The hydroelectric power plants converts the energy in falling water into electricity by passing it through the turbines. In some cases like thermo electric power plants , water is used for pollution control strategies as it emits sulphur, mercury, particulates, carbon dioxides , water and other pollutants. The water use in power plants has two components such as withdrawal and consumption. Withdrawal is nothing but the act of removing water from the nearby resources and transporting it to the power plant through pipes. The consumption involves usage of water in power plant such that water is not returned and lost due to evaporation. The cooling systems in power plants draw water from lakes to cool the steam and then return virtually all of it particularly at high temperature. In nuclear power plant, the reactor contains a large pool of water and the fuel rods are immersed in it. This water is used to slow down the neutrons and to initiate further fissions. The cooling water flowing into the reactor gets heated up by contact with the fuel rods. This water at high

Usha Rani. M, M.E. Network Engineering, Velammal College of Engineering and Technology, Madurai-625009, Tamilnadu, India. (e-mail: vairausha@gmail.com).

Kamalesh. S, Assistant Professor in Velammal College of Engineering, Madurai, Tamilnadu, India (e-mail: skl@vcet.ac.in).

Preethi.S, B.Tech, Velammal College of Engineering, Madurai, Tamilnadu, India. (e-mail: preethivcetit@gmail.com).

Charulekha Shri. C.K, B.Tech, Velammal College of Engineering, Madurai, Tamilnadu, India. (e-mail: *charuvcetit@gmail.com*).

Suganya.C, M.E. Network Engineering, Velammal College of Engineering and Technology, Madurai-625009, Tamilnadu, India.

temperature flows out of the reactor. The water temperature is in the range of 300°C.But this is higher than the boiling point of water. This temperature can be achieved if water is kept under high pressure usually above the atmospheric pressure of about 76 cm.This water produces electricity. Outside the nuclear reactor water pool, water is allowed to vaporize forming steam under high pressure .This steam causes the rotation of coils of wire that turn in space between the poles of a magnet. This causes electrodynamics effect causing flow of electric current.

Water which is of utmost importance for the nuclear power plant should be monitored frequently for the proper functioning of the reactor. There had been occurances of accidents due to the malfunctions in the water circulating pipes in the power plants. For this we can use the sensors like level sensors and water flow sensors. The water flow sensor is used to measure the rate of flow of water in the circulating pipes. When a given amount of water flows through it creates an electric pulse. It connects up to the water flow controller to turn on and off the water supplied to control the rate of flow. There are certain high end models of water flow controller that has ability to monitor number of pulses from the sensor and it uses the data to determine how much water is flowing at that particular moment and also the total amount of water that is used. Using this, the water flow controller evaluates the water circulating system's performance. The level sensor is used to detect the level of water flow in the circulating pipes. The level measurement can be continuous or point values. The continuous level measurement, measures the level of water within the specified range and determine the exact level of water in the circulating pipes. The point value is used to indicate whether the water level is above or below the sensing point. The temperature of the water is also an important factor to be considered. Temperature sensors are used to measure the temperature of the water circulating through the pipes. The controller indicates the water flowing through the pipes is within the desired limit.

III. Proposed Architecture

The proposed architecture can be explained as follows, the sensors are deployed in the water circulating pipes in the power plant and the water flow sensor is responsible to retrieve the total amount of water flowing through these pipes. Depending on the amount of water flow, the water flow sensors sense the flow range and operating pressure. Depending on that reading the water will be allowed either forcefully or in a limited manner. The sensor data will be stored in the database.

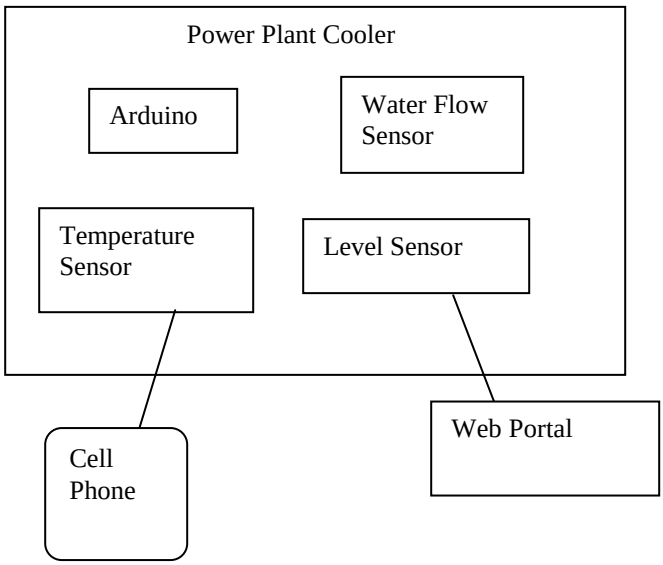

Fig 1. Sensors deployed in the sensor field.

Fig 2. LCD display function for the water flow

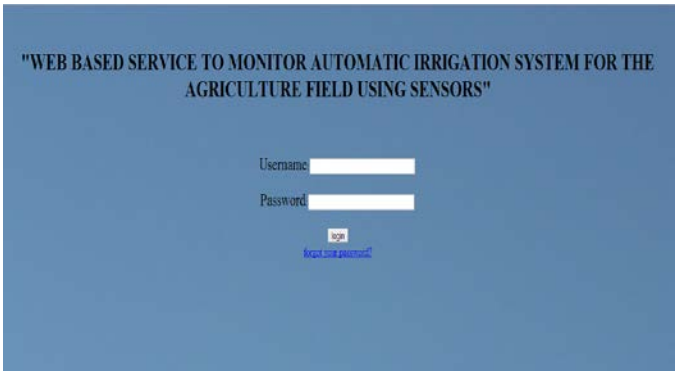

Fig 3. Login page to the user

This figure shows the front page of the web service that the user has to log in so that he can get the sensor information which is updated on the database. Other than that the overall description about the water flow detections in power plants , why there is a need to use wireless sensor networks in the power plants. The default sensor details for the water flow sensor are mentioned in the table 1,and based on the condition it is displayed.

TABLE I
DEFAULT SPECIFICATION OF WATER FLOW SENSORS

Flow rate range	**1～30 L/min**
Operating temperature	**0℃～80℃**
Liquid temperature	**<120℃**
Operating humidity	**35%～90%RH**
Operating pressure	**< 2.0MPa**

The table I describes the overall default sensor data information about the water flow sensor. The retrieved sensor data information will be available between the default sensors readings mentioned for the water flow sensor in table I.

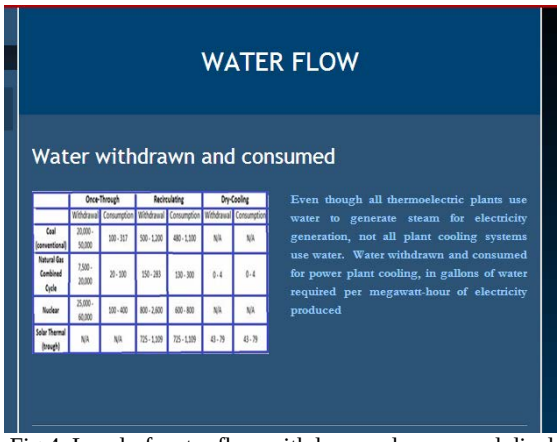

Fig 4. Level of water flow withdraw and consumed display

If the retrieved sensor data readings are greater than the default measurement which is available in the web service then it will be updated by the sensor and the water flow will be controlled by sending the SMS else only the sensor data will be updated on the database.

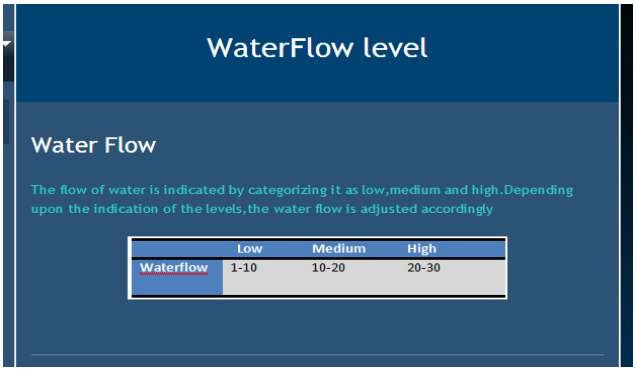

Fig 5. Display the level of waterflow

The GSM is the responsible to send the water flow status to the user who is operator of the power plant. The retrieved sensor data is maximum when compared to the default readings then it will sent the SMS to the operator otherwise it simply updates the sensor data information on the web portal.

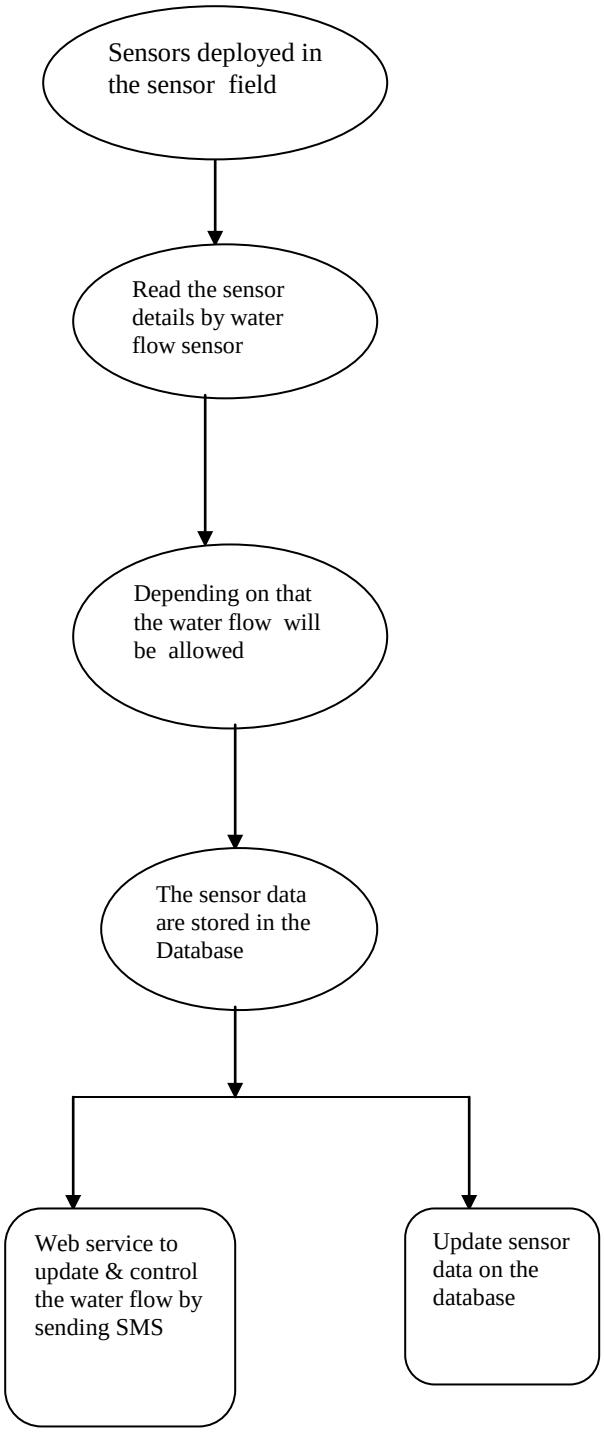

Fig 6. Flowchart

This is the overall implementation to develop this process. First the sensors are deployed on the sensor field and then the combination of arduino, Zigbee, water flow sensor is responsible to capture the water flowing through the circulating pipes. Depending on the water flow readings in the sensor, the amount of water flow will be controlled or allowed in the circulating pipes and the corresponding level of the water ,operating pressure ,temperature of the water will be displayed on the web portal.

IV. CONCLUSION

The process needs of water flow in the environmental monitoring system and analyzing those problems with existing monitoring system; we implemented a wireless sensor network based on the soil moisture level monitoring system to control the water flow available on the pipe. This system can rapidly realize the automatic networking irrigation system, transmission and display. Through the technologies and Web Services technology, we can realize the function of remote monitoring and the retrieved sensor details are updated via web technology. It shows that the system can meet the requirements of the moisture level of the soil and water flow level for the agricultural field monitoring and the updated information will be available on the webpage. The user can anytime view their sensor data details and the intimation about the water flow level will be sent via SMS to the user's mobile phone.

REFERENCES

[1] I. A. Aziz, M. H. Hasan, M. J. Ismail, M. Mehat, and N. S. Haron, "Remote monitoring in agricultural greenhouse using wireless sensor and short message service (SMS)," International Journal of Engineering & Technology IJET Vol: 9 No: 9

[2] G. W. Irwin, J Colandairaj, and W. G. Scanlon, "An overview of wireless networks in control and monitoring," International Conference on Intelligent Computing, Kunming , CHINE (2006), Vol. 4114, 2006, pp. 1061-1072.

[3] R.F.M. Inc., "Wireless temperature sensor, application note AN80201, 2009," http://www.RFM.com/.

[4] Baumgartner K, Robert S (2006) Architecture of a scalable wireless sensor network for pollution monitoring. In Proceedings of the 3rd European Workshop on Wireless Sensor Networks.

[5] Beckwith R, Teibel D, Bowen P (2004) Report from the field: Results from an agricultural wireless sensor network. In Proceedings of the 29th Annual IEEE International Conference on Local Computer Networks, pp. 471–478.

[6] T. P. C. de Andrade, L. B. Oliveira, N. L. S. da Fonseca, Senior Member, IEEE and O. C. Branquinho "HMARS: A MAC Protocol for Integration of Radio-over-Fiber and Wireless Sensor Networks" IEEE LATIN AMERICA TRANSACTIONS, VOL. 10, NO. 4, JUNE 2012

[7] D. Estrin, R. Govindan, J. Heidemann e S. Kumar, "Next Century Challenges: Scalable Coordination in Sensor Networks", International Conference on Mobile Computing and Networking - MobiCom, p.263-279, 1999.

[8] I. F. Akyildiz, W. Su, Y. Sankarasubramaniam e E. Cayirci, "WirelessSensor Networks: A Survey", Computer Networks, v.38, p.393-422,March, 2002.

[9] A. Woo e D. E. Culler, "A Transmission Control Scheme for Media Access in Sensor Networks", International Conference on Mobile Computing and Networking – MobiCom, p.221-235, 2001