Review Article

Literature Review for Automated Water Supply with Monitoring the Performance System

N.B. Bhawarkar[A*], D.P. Pande[A], R.S. Sonone[A], Mohd. Aaquib[A] , P.A. Pandit[A], and P. D. Patil[A]

[A]Department of Electronics & Tele-comm, Amravati University, PLITMS Buldana, India

Abstract

The increasing population and thus the wide expansion of urban residential areas have increased the need of proper distribution of water. This distribution of water in every house within different areas needs the control and monitoring for preventing the wastage of water and the water theft practices. Different technologies have been studied to distribute/supply the water to each and every house of residential areas. This paper deals with the Literature review for the automated water distribution with monitoring the performance of the system through various application applied through the embedded system. At the start the exact idea about automatic water distribution for different areas with its proposed system is discussed, and then its several implementations using different technologies are discussed.

Keywords: Relay driver, PIC controller, PLC/SCADA, ARM7, DTMF

1. Introduction

The growth of residential areas in great extent requires the increase in water supply facility with performance monitoring system [Gouthaan. J *et al*, 2011]. The use of ½ HP to 1 HP pump to extract water directly by connecting the tap supplied to each house results into the unbalanced distribution of water. Also the water thefts through any water channel are increased now days [Stancil *et al*,2008].

To supply the water equally to each house and to stop the water theft practice by people [Shaik. Kaja Rahamtulla *et al*, 2011] various technologies have been invented using embedded system [E.Vinothini *et al*, 2014]. Here a survey is presented to focus on an identified ways to increase the performance monitoring for the water distribution.

In second section, what are the needs of automatic water distribution system and how it can be achieved is discussed. In section third, different methods and its advantages are discussed to supply water automatically with increased performance. The conclusion and future scope are discussed in further section.

2. Proposed System

The detail working for the water distribution used in daily life is as shown in Fig.1. The proposed system gives the automatic implantation in water supply control and anti-theft technology for drinking water supply [Gowtham.R *et al*, 2014)]. Herein we have also introduced the self-power generation technique [Gouthaman.J *et al*, 2011].

Firstly the raw water is treated with alum and chlorine through the aerator. Here the manual technique of opening and closing of the valves in the existing system which

results in inappropriate amount of release of alum into the raw water is replaced by automatic open and close of valves with the help of different controllers. Here the filtration is done automatically. When the backwash process is to be done, the valves between the granular filter and storage are opened and closed automatically up to the sludge pit. The water theft and leakage are identified with the use of flow sensors. The controller calculates the difference in the flow rate of sensors. If the difference exceeds the particular limiting value, the leakage or theft is recorded and the valves behind the first flow sensor and water distribution motor are turned off automatically using the GSM modem technology a message regarding the leakage or theft is delivered to responsible officer in the control room [Mr. Prashant Palkar *et al*].

This proposed system has been implemented through different controllers such as microcontroller 89S52 and relay, PIC controller, ARM controller and also using PLC & SCADA as mentioned in the further sections.

3. Implementation of automatic water distribution with RTC using 89S52 microcontroller

Initial start for automatic water distribution for a city is designed using microcontroller 89S52 [Santosh A. Tamble *et al*, 2008]. Hence supply of water has done separately to the different areas. It removes the manual requirement of man power. It is implemented for three different regions as shown in fig.2

When the system become ON it ask for the time setting to turn OFF & ON the water supply for particular area. As the same instant the clock timer will start for the specified time period. When the specified time limit reach the system will become OFF for particular area.

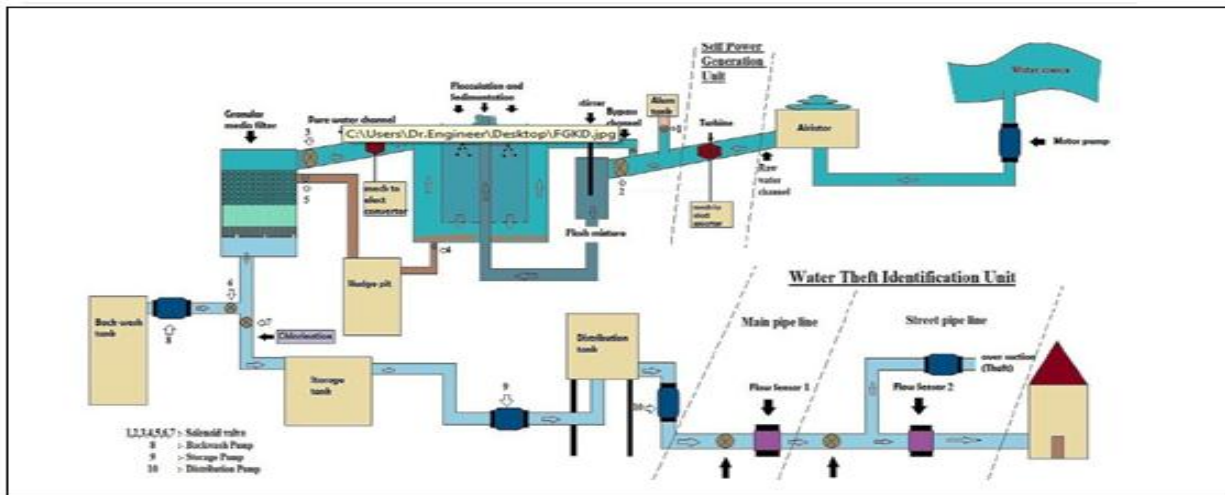*Corresponding author **N.B. Bhawarkar** is working as Lecturer

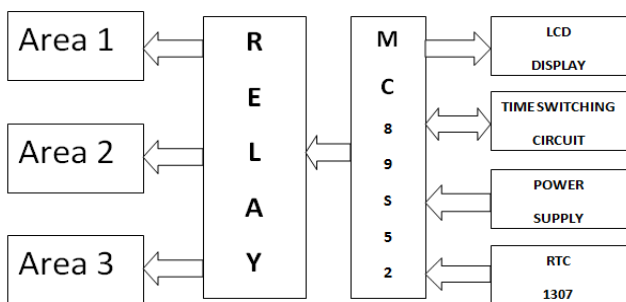**Fig.1** Proposed system for automatic water distribution

Fig.2 Automatic water distribution using Relay driver and 89S52 microcontroller

This technique has several disadvantages like water theft, improper distribution which gets overcome using further technology.

4. Automatic Water distribution system using PIC microcontroller

The above proposed system is also implemented using PIC controller [M.V.N.R. Pavankumar *et al*, 2014]. Here the level sensor senses the level of water. The speed of the motor is varied according to this water level. With the use of DTMF the water is supplied automatically to the targeted areas. The visual display is provided as graphical LCD for showing the necessary information and details. This system provided the given below function

- Mobile controlled water distribution
- Control of motor speed according to the tank water level
- Calculation of bill with respect to the water used
- GSM module is used for status updates on mobile

The tank is automatically filled from the water resource with the help of AC pump. The level sensor present inside the tank senses the level of water and accordingly AC pump to fill the tank is turned ON or OFF automatically [Rey, J.R.D *et al*, 2007]. The DTMF shows the status on the mobile phone. The respective solenoid valve gets turn

ON only if status of DTMF is 1. The status of DTMF reveals the image of the valve on the GLCD and this is used by GSM for sending SMS [Hua Jin *et al*, 2011].
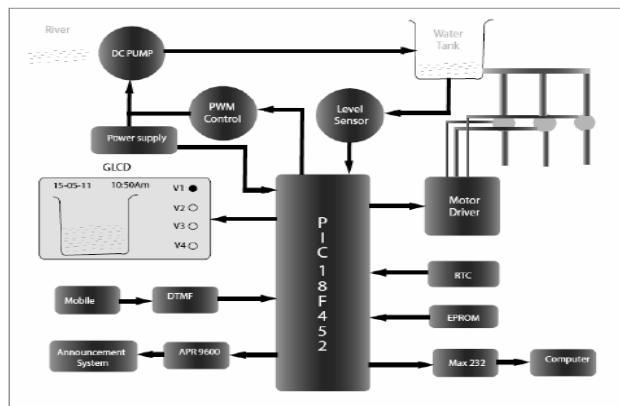

Fig.3 Automated town water management system using PIC controller

5. Water theft and quality monitoring system using PLC and SCADA

Water supply system is the vital part of urban infrastructure.
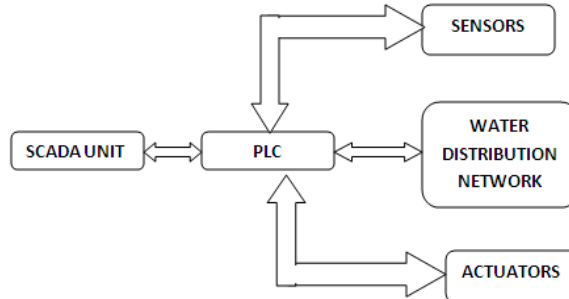

Fig. 4 Water distribution overview using PLC

The proposed system has been implemented using PLC/SCADA. The main objective of the atomization of the water distribution system is to avoid the wastage of

water due to vandalism. To keep an eye on the vandal and the water theft the SCADA unit has initiated red alarm pop-ups. [Gaikwad sonali ashok *et al*]

Fig.4 shows the water supply system which consists of PLC, distribution network, SCADA unit, sensors and actuators.

The storage tank contains field instruments connected to the device being controlled and monitored. These instruments convert physical parameters electrical signals. These instruments are connected to electronic devices through the PLC (Programmable logic Controllers) which transmits the data to the central dispatching station in order to offer dynamic behavior [J.P.Tharanaya *et al*] The PLC provides data to control room where the SCADA server s present to store data from PLC and regulate the control system. Connection between the PLC and SCADA server is established using direct technique [M.Duran-Ros *et al*, 2008].
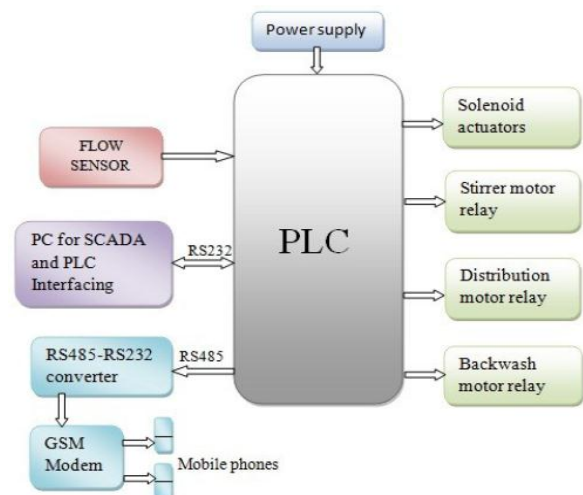

Fig. 5 Block diagram of water distribution system using PLC and SCADA

The above system consists of PLC and it carries out all the logic functions. The sensors, actuators present in the water distribution system are interfaced to PLC. The system is so flexible that the program logic can be changed or loaded according to the requirement. SCADA is also interfaced with the PLC [K.Gowri Shnakar *et al*, 2008]. SCADA works to supervise the control system to automatically control the valve, pipeline pressure and water quality. The stirrer motor is used for oxidation purpose at filtration tank. These motors are turned ON and OFF automatically according to purification of water using PLC. Backwash process is assigned to remove the accumulated dust particles which are also controlled by PLC. PLC records the water flow using water flow sensors located near distribution area. Difference in the flow rate records the leakage or water theft. This is passed to GSM modem through RS485 to RS232 converter. The information about leakage and water theft is passed to call phone in control room though GSM modem. The dispatching unit SCADA system elaborates daily, monthly and yearly diagrams, tables and reports related to operator requested parameters. The system stores the acquired data in database for later use.

6. Water distribution system using ARM 7

The water supply to residence and commercial establishment are provided at a fixed flow rate. The water Theft is a main problem which is done by the connecting a motor pump sets to the waterlines by a certain user [E. Stancel *et al*, 2008].

This is being implemented by ARM controller which keeps the records of the flow rates calculated by the flow sensor at the customer end. ARM controller sends the commands to the solenoid valve if the flow exceeds the given range [Ms. Trupti Patil *et al*, 2013].
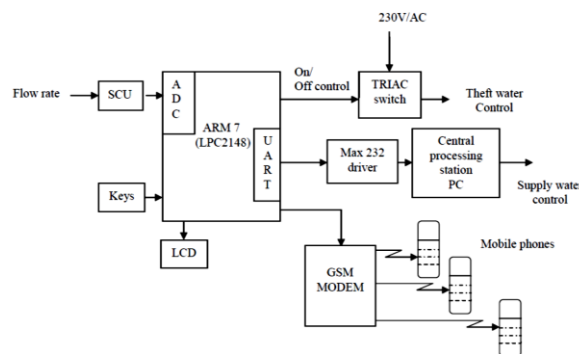

Fig.6 Block diagram of automatic water supply and theft detection

The ARM controller enables the transmitter signal for intimate to water supply board. At the same time they enable the driver unit to close the solenoid valve. The solenoid valve is ON/OFF by TRAIC .the flow rate condition are displayed by the PC and the GSM MODEM is used to provide information to the responsible officers to take the action [J.P.Shri Tharanyaa *et al*, 2013].

Conclusions

Extensive growth of population development and technology has leads to the need of proper utilization of the natural resources especially water. Thus our proposed system and the review of all the possible implementation of technology is the first step toward prevention and proper utilization of water. To overcome the problem of the water theft vandalism and mainly the automation in water distribution system is successfully implemented.

The review of automated water distribution system with the various controllers and parameters focuses on the entities such as proper supply, red alarm pop-ups, filtration, flow control, supervision using various protocols is concluded with the future aspects of real time implementation in the municipal corporations where scarcity of water is the huge issue.

Acknowledgment

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Mr. Nitish B. Bhawarkar B.E. (EXTC) from B.N.C.O.E,Pusad M.E.(Digital Electronics) S.S.G.M.C.E, Shegaon, SGBAU Amravati University Lecturer at Pankaj Laddhad Institute of Techn. and Management Studies,Buldana. Add: Vikram Shila Nagar, Sindi Meghe Wardha-442001 , Maharashtra, India

Mr. Deepak P. Pande B.E. Final Year, SGBAU Amravati University Pankaj Laddhad Institute of Techn. and Management Studies, Buldana. Dist.Buldana-443001, Maharashtra, India

Mr. Mahammad Aquib Mahd. Javed B.E. Final Year, SGBAU Amravati University Pankaj Laddhad Institute of Techn. and Management Studies, Buldana. Dist.Buldana-443001, Maharashtra, India

Mr. Rushikesh D.Sonune B.E. Final Year, SGBAU Amravati University Pankaj Laddhad Institute of Techn. and Management Studies, Buldana. Dist.Buldana-443001, Maharashtra, India

Ms. Priya D. Patil B.E. Final Year, SGBAU Amravati University Pankaj Laddhad Institute of Techn. and Management Studies, Buldana. Dist.Buldana-443001, Maharashtra, India

Ms. Pranali A.Patil B.E. Final Year, SGBAU Amravati University Pankaj Laddhad Institute of Techn. and Management Studies, Buldana. Dist.Buldana-443001, Maharashtra, India