

Automated Water Distribution System Using PLC And SCADA

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Abstract

There is rapid growth in wide urban residential areas, therefore it is a need to provide better Water Supply. To fulfill the customers requirement as well as to avoid faulty conditions there must be a better water supply management. Problem arises in the water supply management system due to pressure drop creation in channel or pump used to suck the

water directly from the channel of their home street. This paper presents a prototype for water distribution system comprising a control system, communication means, piping, actuators, sensors and valves. This system utilizes a communication bus for controlling and monitoring water flow through the piping via control of the actuator and valves.

Control System is further coupled to Supervisory Control & Data Acquisition (SCADA) unit. This paper focuses particularly to a control system for controlling and monitoring components within a Water Distribution System. This system includes Man Machine & Electrical Interfaces to PLC (Programmable Logic Controller) for transmitting/receiving control and status data over communication bus.

1. INTRODUCTION

1.1 Problem Definition:

The water wastage is due to many reasons such as wastage of water, human laziness, operator fault etc. There is also problem of indiscretion of water supply i.e. the list of water supply is not secure. Now-a-days, water storage and distribution system, controlling temperature, pressure and for every stage for measuring and analyzing. We can't able to identify the robbery in urban drinking water supply. Water flow control is impossible and not controlling. The water supply systems are part of the urban structure which must assure the continuity of the water distribution, the water quality control and the displaying. In existing system, urban water is supplied to the home with the help of some human power. The person to take the charge will go to the place and then open the valve to that exact area. Once the time is over the person will go again to that place and close the valve immediately. This type of operation needs human power. This is excess of time and to go to that place and come back often. Also the people may take extra water for their personal use with the help of motor. Due to this many people will not receive sufficient water for their use. Water is the basic and important needs of the human life. The water theft prevented only when any public inform the officials about the theft.

1.2 Solution and Effect

Water supply systems are the crucial part of urban infrastructure; therefore system must assure the continuity of the water distribution, water quality monitoring and control of technological parameter. Appropriate flow rate, pressure, and water quality are necessary for effective use. Best policy to save water is to use it properly. For all domestic, agricultural, industrial areas there is excessive need of water therefore peoples used to suck the water from main street pipeline with the help of motor to their drain point. This creates more water to flow from tank through pipeline to their drain point. In order to catch this "Water Theft" there must be provision to sense differential pressure between two points within pipeline and close the valve directly to avoid unnecessary flow of water. Water is important resource for all the livings in the earth. In that some people are not getting the sufficient amount of water because of unequal distribution of water. So only we implement this project. This project is used to distributing the water equally. So that everyone gets the equal amount of water. It also used to prevent the water theft during the distribution period. Problem arises in the water supply management system due to pressure drop creation in channel or pump used to suck the water directly from the channel of their home street. This project presents a prototype for water distribution system comprising a control system, communication means, piping, actuators, sensors and valves. This system utilizes a communication bus for controlling and monitoring water flow through the piping via control of the actuator and valves. Control System is further coupled to Supervisory Control & Data Acquisition (SCADA) unit. This paper focuses particularly to a control system for controlling and monitoring components within a Water Distribution System. This system includes Man Machine & Electrical Interfaces to PLC (Programmable Logic Controller) for transmitting/receiving control and status data over communication bus.

1.3 Proposed Work

This proposed advanced system is three layer architecture which not only monitor and control water distribution but also find out water theft and takes preventive and corrective action to obtain proper distribution of water. Figure 1 shows

the proposed system. This system mainly consists of PLC (Programmable Logic Controller) which is the central and important part of the system. All the logic functions are carried through PLC, by developing a ladder logic program. Sensors and Actuators included in the water distribution network are interfaced to PLC's input and output module. The logic can be easily stored on a disk so that it can be loaded into a PLC. Program logic can be changed according to the requirement of system. PLC is again interfaced to SCADA (Supervisory Control and Data Acquisition) unit so as to monitor and control the water distribution network. SCADA system is designed in order to realize the automatic controlling of valve and parameter transformation such as pipeline pressure and water quality. Actual process takes place within water supply and distribution network. Water supply systems consist of one storage tank consisting level sensor. Distribution network consist of pipeline for water flow and pressure switch in order to open and close the valve.

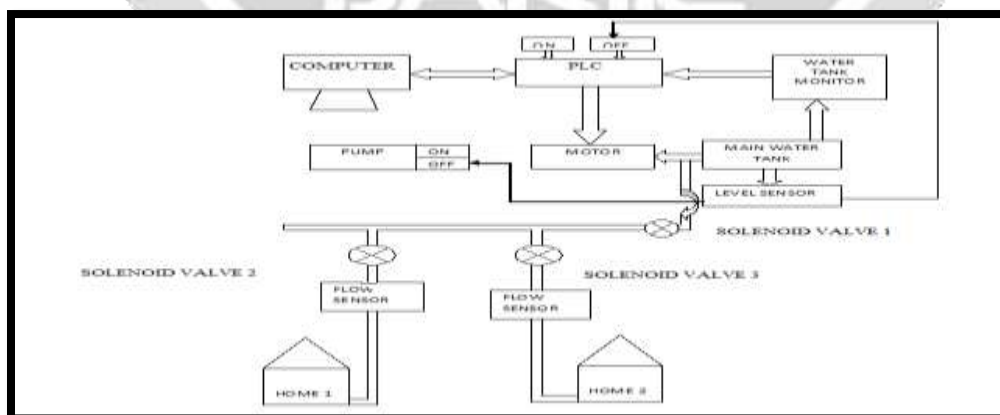


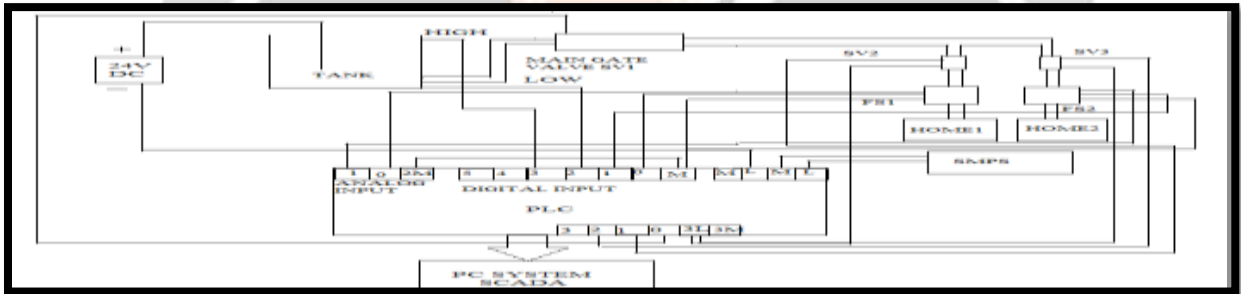
Fig.1 Block Diagram

2.1 Hardware Implementation

Hardware model is as shown in below figure. Figure 2 shows the experimental setup of a system. This setup consists of one storage tank, piping distribution network, PLC interfaced with PC (SCADA dispatching) unit. System give results for the normal water contents. Outlet valve open if and only if the water contents are within normal range. If the water has acidic contents then outlet valve immediately closed and distribution of water stop. This system also gives the result to identify excessive flow of water. If actual water flow is different from set flow then we can there is thefting of water, this can be observed through flow sensor.

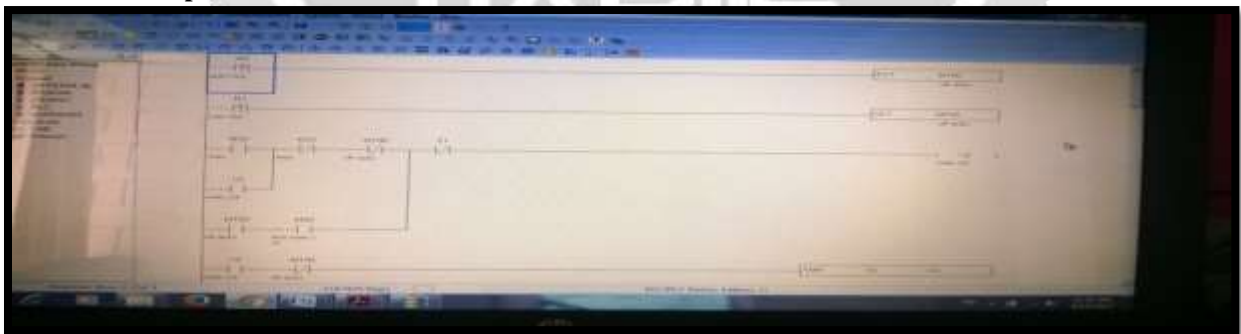


Fig 2: Hardware model



Wiring diagram

2.2 Software Implementation



(Fig 3. ladder diagram)

Above Figure shows the ladder diagram for the main organization block. It consists of three types of functions. Input function, output function and logic function these three functions are like a subroutine. Input FC and Output FC are used to read and write the input and output status according to the process change. This process status is passed to logic functions and corrective actions are takes place. As modular structure is used for programming it is easy to update, modification of program code is easier and quicker. It provides standardize design therefore design of program can be easier to understand and monitor. Functionality of each code block is tested after its development.

2.3 Hardware Result

Below is procedure of operating the proposed system. The system gives the result of accurately. The time consumed by the system is very less. All the operation is automatic. We have to just operated the system through PC.



Fig 5



Fig 6

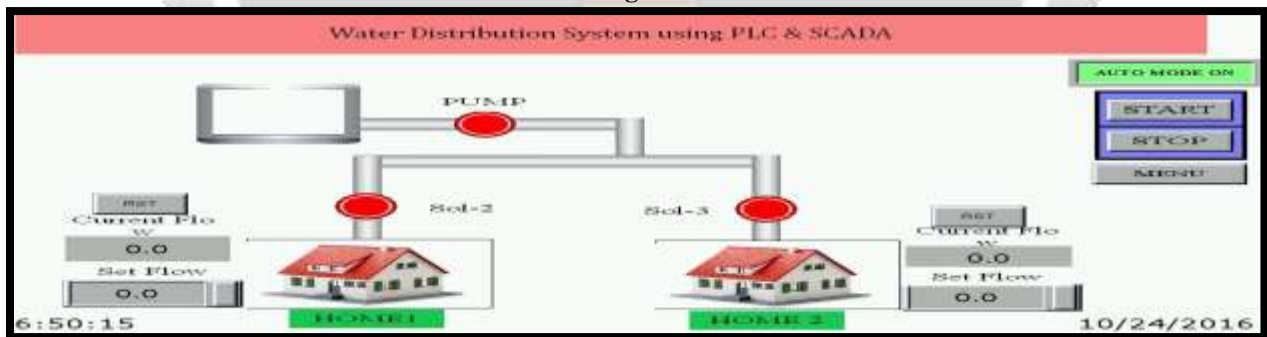


Fig 7: output

Figure (7) shows the control window of proposed system.

Conclusion

As the system uses PLC and SCADA the system becomes more reliable and rugged. It provides better system support to Water Distribution Network. SCADA provides a real-time change into the system from operator's desk. Corrosion of a water carrying pipe can be avoided due to the acidic nature of water. Water is saved as it detects the excessive flow. The automation of water distribution system eliminates water wastage. Automation system provides continuous water flow according to the set point. This project is automatic so it reduces lots of man power. The automation implemented in water distribution system ensures to avoid wastage of water and reduces time. And

also we can completely avoid the water theft in the pipelines. So that people could get equal share of water. This system is excellent and cost effective to prevent the drinking water from the theft.

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