AUTOMATIC WATER UTILITY SYSTEM USING PLC

Ms. Siddhi Bhosale[1], Mr. Akshay Hotkar[2], Mr. Anil Sawant[3],

Mrs. Sucheta Yadav[4]

[1]Department of electrical engineering, Vishwaniketan'siMEET, Khalapur
E-mail: siddhibhosale93@gmail.com
[2]Department of electrical engineering, Vishwaniketan'siMEET, Khalapur
E-mail: hotkarakshay123@gmail.com
[3]Department of electrical engineering, Vishwaniketan'siMEET, Khalapur
E-mail: anilsawant2222@gmail.com
[4]Department of electrical engineering, Vishwaniketan'siMEET, Khalapur
E-mail: ssyadav@vishwaniketan.edu.in

Abstract -

Now a day, there is rapid growth in wide urban residential areas. Water is important resource for all the livings on the earth. Therefore, it is a need to provide better water supply. But, many people are not getting sufficient amount of water because of unequal distribution of water. Also, water theft is a big problem occurring during the distribution period. In the conventional methods, the in-charge person has to go to the places to open or close the valve leading to wastage of time. Because of these reasons, it is necessary to make the system automated. It is possible to implement the same system using Programmable Logic Control (PLC). This will replace much amount of manual work with automated process. In this project manually operated valves are replaced with electrically operated valves. These are placed at the outlet of tank, at the end of main pipe line and separate valve for different areas. Flow meters are placed at every line and used for measurement of water provided to consumers. With the help of flow meters, measurement of flow and consumption of water can be done. With the help of valves leakage is being created and this leakage is detected by pressure switch and is getting communicated with PLC. Fault confirmation can be given to operator and maintenance team through alarm system. Also, type of fault and location will be displayed on monitoring system.

Keywords: PLC, Automation, Distribution, Flow Meter, Solenoid Valves

1. INTRODUCTION

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, we decided to implement this project. This project can be used for 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. In previous method, person in charge will go to that place and open the valve for a particular time period. Once the distribution time is over, the in-charge person has to go to the same placesto close the valves. This is time consuming process. The proposed system is fully automated. Here, human work as well as time is reduced.

By using this project, water wastages such as leakages, mankind laziness and operating error can be avoided.For fault detection in distribution network, their line staff has to finding out the fault by patrolling the line from storage tank to end of main line. Time, man power and money required for this process is more.

During hazardous conditions like damaging of pipeline, dirt and garbage get mixed into the water. This makes water impure which is harmful for the lives. The system is not cost effective, too. This project aims on dealings with behaviour of water distribution under normal operating condition. Here, PLC, power supply, flow meter and solenoid valve are the main components of the system. (Ref.figure.1)

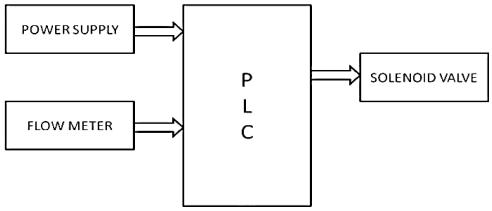


Figure 1: Block Diagram

2. PROBLEM DEFINITION

Leakage in pipes is animportant reason for water shortage. This may occur due to lack of maintenance of pipes and other parts of the system. Due to leakage in pipes, impurities like dirt, dust, mud and garbage get mixed with the water. This causes contamination of whole water body.

Incomplete valve opening is also a reason for uneven distribution of water. When the valves are manually opened, there is a chance that, the valves may not get open completely. This leads to less water flow.Availability of water is main reason for water shortage. Water shortage occurs due to lack of water in reservoirs. Also, due to lack of water planning. This can cause low water pressure.

3. SURVEY

We have observed the conventional water distributed system in village. For fault detection, in distribution network their line staff finding out the fault by patrolling the line from storage tank to end of main line.Time and man power required for this process is more and unnecessary. As earlier said there is wastage of time in opening and closing operation of valves.Uneven distribution of water takes place in many areas which leads shortage of water.Also, wastage of water is occurring while distributing. In some conditions such as leakage of water considerable amount of water is getting wasted.During hazardous conditions like damaging of pipeline dirt and garbage get mixed into the water. This makes water impure which is harmful for the lives. The system is not cost effective, too.

4. WHY PLC??

As the person has to go to places to operate the valve and also is time wasting process of finding faults and repairing it, the system has to be automated. This reduces manpower and manual operations.Other advantages of PLCs are that they are highly reliable, fast and flexible.They can handle and work in severe conditions such as dust, humidity, etc. PLCshave opportunities to communicate with other controllers. Programming of PLC is much easier and also provide easy troubleshooting.They include display units through which operations can be observed.

5. OPERATION

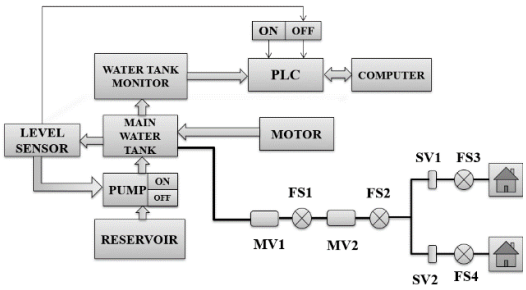
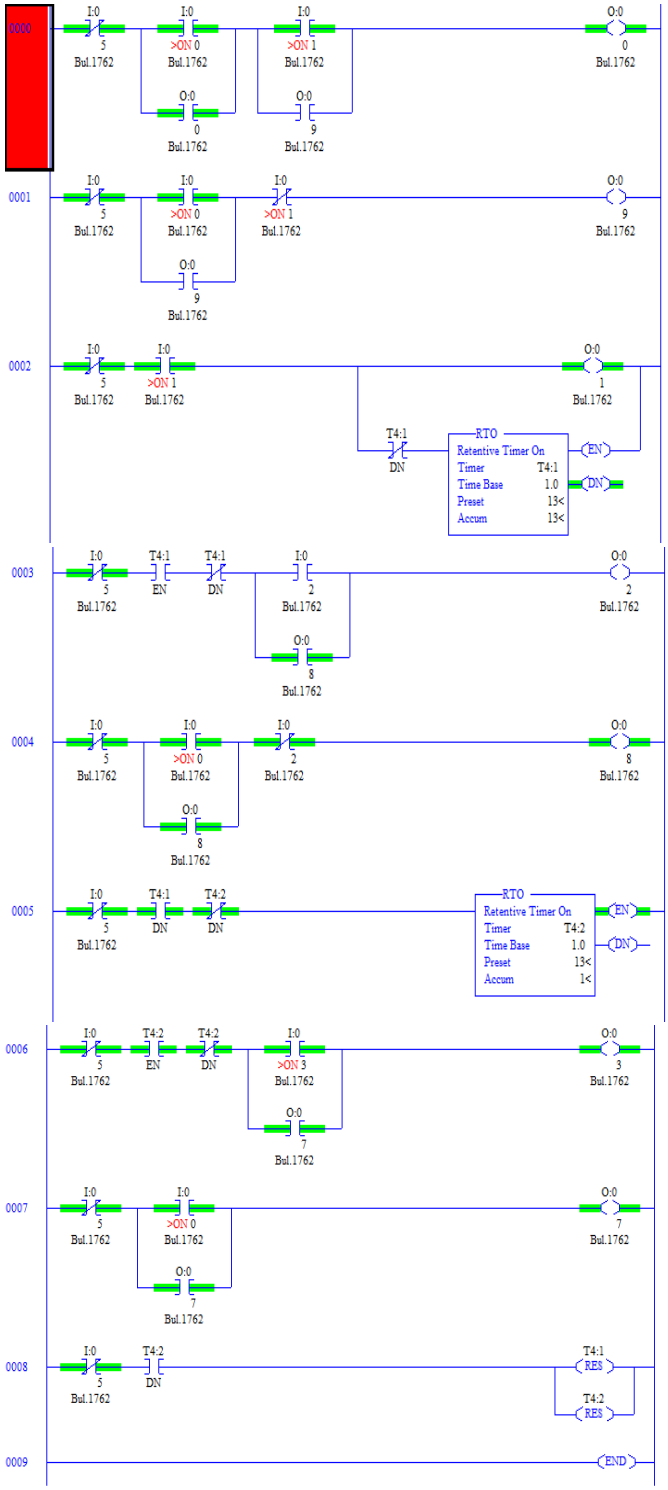


Figure 2: Schematic Diagram

All the manually operated valves are replaced with electrically operated valves.These are placed at the outlet of tank, at the end of main pipe line and separate valve for different areas. MV1 and MV2 are main solenoid valves placed on the main line. SV1 and SV2 are solenoid valves at consumer's side.FS1 and FS2 are flow sensors of main line also, FS3 and FS4 are flow sensors at consumer side. Flow meters are placed at every line and used for measurement of water provided toconsumers.With the help of flow meters, we are measuring flow and consumption of water.With the help of valves leakage is being created and this leakage is detected by flow meter and gets communicated with PLC.Fault confirmation is given to operator and maintenance team through alarm system.Also, type of fault and location is displayed on monitoring system.

6. PROGRAM LOGIC



7. HARDWARE

Figure 3: Hardware Setup

8. RESULTS

- Solenoid valves opening is 100% which was a major issue is conventional distribution system.
- Flow meters are working properly and every tap gets sufficient amount of water.
- Leakages are eliminated by establishing all the connections properly.
- Also, no issue of theft is present due to use of flow meters.

9. CONCLUSIONS

- As the system uses PLC, the system becomes more reliable and rugged. It provides better system support to Water Distribution Network.
- This project is automatic, thus reduces mazn power. It also ensures to avoid wastage of water and reduces time.
- It has become possible to avoid water theft to get equal share of water which makes the system excellent and cost effective, too.
- This system can be used effectively in rural areas where the distribution system is small or medium and it may become complex for urban area areas.

10. FUTURE SCOPE

- To make the system optimal, we can install solar panels at consumer side. This will provide sufficient supply to solenoid valves for operation.
- Motor can be installed at reservoir side so that when the water starts flowing from reservoir, the pressure of water will be used to generate electricity which can be utilized for operating main solenoid valve.
- Also, solar panels can be installed at each flow meter, placed at every 1 kilometre on the main line.
- For easy observation and monitoring, SCADA system can be used. This will also help in finding faults and leakages easily.
- Moreover, billing system can be introduced which will produce automatic bills. This may reduce manpower required in billing section.

REFERENCES

[1] Mr. Patil.D.A, Mr. S. N. Peerjade, Mr. J. S. Bhandare, Mr. T. K. Shikalgar, Mr. A. M. Sutar, "Automated Water Distribution System Using PLC And SCADA", IJARIIE-ISSN(O)-2395-4396, Vol-3 Issue-2 2017

[2] Abhijeet Mancharkar, Rakesh Kulthe, Ishan Shewale, Automated Water Distribution System for Smart City Using PLC and SCADA, International Journal of Emerging Technologies and Engineering (IJETE) Volume 3 Issue 3, March 2016, ISSN 2348 – 8050

[3] Gaikwad Sonali Ashok; "Water Anti-theft and Quality Monitoring System by Using PLC & SCADA",International Journal of Electrical and Electronics Engineering Research, Vol.3, Issue.2, pp:355-364, June,2013.

[4] Aunbha Panchal, KetakeeDagade, ShubhangiTamhane, KiranPawar&ParadnyaGhadge; "Automated water supply system & Water theft Identification Using PLC and SCADA", International journal ofEngineering Research and Applications, Vol.4, Issue.4, pp: 67-69, April 2014

[5] T. Baranidharan, A.Chinnadurai, R.M.Gowri, J. Karthikeyan, "AUTOMATED WATER DISTRIBUTION SYSTEM USING PLC ANDSCADA" in International Journal of Electrical and Electronics Engineers, IJEEE, Volume 07, Issue 01, Jan- June 2015.