

**AUTOMATED WATER DISTRIBUTION SYSTEM
AND THEFT DETECTION**Ankita Rahate¹, Ashwini Gaikwad², Dhruv Rehu³, Ashutosh Raichurkar⁴, Rakhi Jadhav⁵*B.E Students^{1,2,3,4}, Assistant Professor⁵**Department of Electronics Engineering, V.E.S.I.T, Mumbai-400074*

Abstract: Growing Population has led to a substantial increase in the demand for water, even leading to theft. Due to unequal distribution of water across the city has caused discontent among the locals. People living among the primmest locations are unable to avail 24 hours water supply. Unorganized and unaccounted use of water can lead to more severe problems. The paper proposes an implementation of adequate and resourceful use of water using a PROGRAMMABLE LOGIC CONTROLLER (PLC). PLC is an essential part of this system which is helps to reduce manual interference and wastage of water. The key components used are the level sensor, solenoid valve and the relay circuit. The level sensor senses the level of the water and signals the PLC to stop the flow of water through the solenoid valve, thus restricting the flow from the main tank. The time base feature enables to detect any theft done by way of pressure manipulation and thus ensuring equal water to all consumers. In theft as well as equal distribution mode when water reaches a stipulated level the water flow is cut-off by closing the solenoid valve.

Keywords—PLC; Level Sensor; Flow Sensor; Solenoid Valve.

I. INTRODUCTION

As the world is progressing towards the future with an ever growing population and crave to the consumption of water, there would be a need to introduce uniform water distribution in order to avoid imbalance of water in various areas. Over the year the world has been facing with water shortage problems at various locations. As per the statistics the people suffering from shortage of water have been seen underperforming at work and reduction in delivering efficiency. In populated areas theft of water is witnessed through external pumps and manipulation of pressure thus leading to exploitation and keeping some people deprived of continuous supply of water. So our idea is to make fully automated system using PLC to improve the performance of water distribution system minimum human efforts and also ensures proper monitoring in case of water theft and illegal use of water.

II. LITERATURE REVIEW

Recent studies has shown that due to carelessness water is being wasted and is galling commodity for many household at various geographical areas. Considering theft of water through pumps and other means has caused a lot of resentment among those who are exploited. As consumption of water is a basic essential and a birth right of every living being it has encouraged us to proposed solution to the current incommensurate system.

2.1 Existing methodology

The water wastage is due to many reasons such as leakages, carelessness, operation error etc. There is also problem of irregularity of water supply i.e. the schedule of water supply is not fixed. We are unable to identify the theft of water in urban areas. The water supply systems are part of the urban infrastructure which must assure the continuity of the supply of water. In existing system, urban water is supplied to homes with the help of human supervision. In the present situation a person has to repeatedly control the valve when the tanks get full or when they are emptied. This type of operation needs human intervention. This would prove a tedious task to go and open / close the valve repeatedly. Also there is a probability that people may try to attract excess water for their personal use with the help of motor or some other equipment. Hence many people won't receive sufficient water for their use. Currently theft can be detected only through proper scrutinization which is quite ineffective when considering a large geographical area.

2.2 Need for PLC

The PLC offers a trade-off between advanced control technique and the existing technologies .PLC is wildly used in automation industries. Due to its high endurance and high power handling capacity its preferred in most of the industrial modules . Implementing ladder diagram is useful as it can be simulated several times and can make a convention relay circuit redundant. [1]

III.BLOCK DIAGRAM

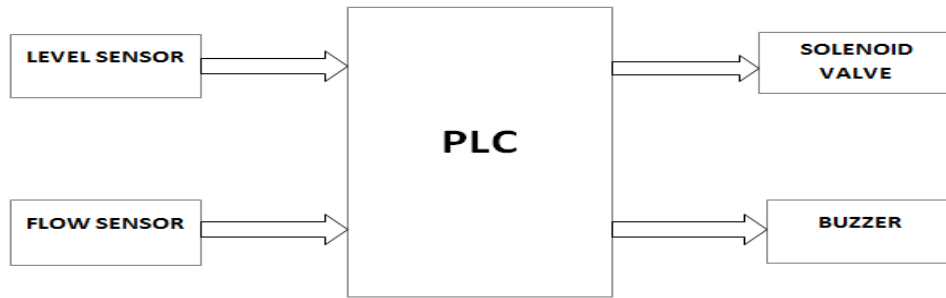


Fig 3.1 Block Diagram

3.1 METHODOLOGY

The figure3.1 shows the block diagram of the system. PLC (Programmable Logic Controller) is the core element of the system. All the logic functions are controlled through PLC. Ladder Logic is the programming language used for PLC. All the sensors and actuators included in the water distribution system are interfaced to the PLCs input /output modules. The logic can be stored in thumb drive and loaded into the PLC.[2]

Two press- switches are used in order to carry out Start and Stop operation. When start switch is pressed it gives logic one i.e. 24VDC to PLC and in order to terminate the operation the stop switch is pressed.

Level sensor shown in (figure3.2). The level sensor is made up of a styrofoam disk which makes it easier to detect most of the fluids. The level measurement can be either continuous or point values. Point-level sensors only indicate whether the substances above or below sensing point. When level reaches to set point buzzer indicates the tank is full. Once the water reaches to the sufficient level solenoid valve will be automatically turn off to disconnect water supply form tank.[4]



Fig 3.2 Level sensor

A solenoid valve is an electromechanically operated valve. The valve is controlled by an electric current through a solenoid: in the case of a two-port valve the flow is switched on or off; in the case of a three-port valve, the outflow is switched between the two outlet ports.



Fig 3.2 Solenoid Valve

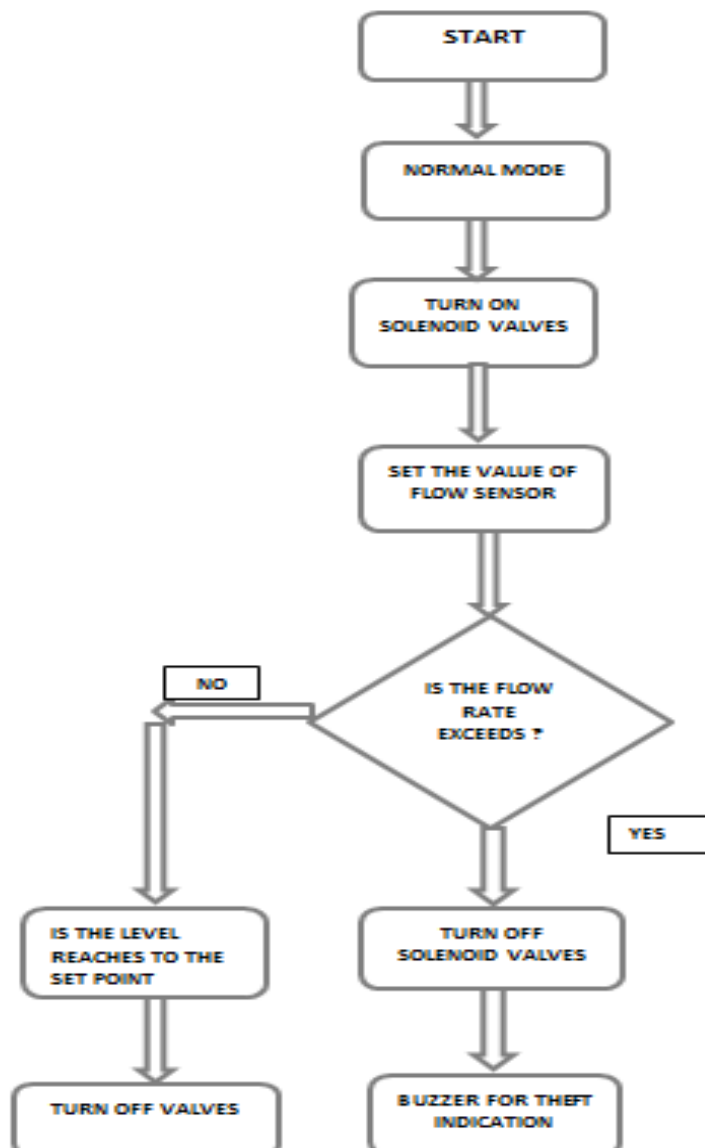
YF-S201 type of flow sensor is used (Shown in figure 3.3) Flow sensor contains pin wheel in its. Pinwheel contains 6 teeth. The pulse output is comes from the pin wheel sensor. If the teeth rotate at one time, it will give the pulse output according to the specification of the flow sensor. From the pulse output easily measure the amount of water passed through the pipe. The pulse is converted to voltage with the help of Hall Effect sensor.

Flow sensor is used to measure flow rate of water, if flow rate exceeds then solenoid valve will be automatically turns off indicating water extracted from external source using pump motor and this indicates theft during water distribution.[3]



Fig 3.3 Flow Sensor

4.2 FLOW CHART FOR PROGRAM



V.CONCLUSION

This PLC based automated water distribution system provides better solution to overcome the problems faced by conventional method and also an effort to make human supervision redundant. The automation of water distribution system eliminates water wastage and also provides continuous water flow measurement which helps to prevent water theft. It is an intelligent, adaptable and fully automated system, which can be used as solution for water distribution problem and water theft vandalism.

VI. FUTURE SCOPE

1. In future work the system can be modified using SCADA along with PLC. So that it is possible to monitor and control whole system from main control units. SCADA gives graphical interface which will be beneficial for the unskilled operators to understand and stores data for future use.
2. Field devices can be interfaced with PLC using various wireless communication technologies.

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