

# AMR and Controlling Water Supply Using PLC

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**Abstract**— The goal of this paper is to measure the amount of water flowing through pipeline and control it to cut off the water supply by closing the Solenoid valve using PLC after supplying the desired amount of water to respective consumer. A PLC is used to automate electromechanical processes. The main function of PLC is to control the Solenoid Valve by calculating the amount of water used using AMR and also by taking the knowledge of amount of water filled in tank using high and low level sensors. The Auto meter of Magnetic Flow Meter sends the data, i.e. the amount of water flowing through pipeline to PLC. The Auto meter of magnetic flow meter needs to be attached to water pipeline given to every consumer. Further using GPRS module the system is represented using SCADA where it can be controlled from a distant location. This project is based on water distribution system from water treatment plant.

It is very important to automate the existing water distribution system for even supply of water to all areas. Automatic control of water pipeline can work continuously and can provide required amount of water without any overuse.

In such process there is no need of labor so there is no human error which leads to decreased cost and consumption of time.

This project if successful can be implemented to all the housing societies and other institutions like schools, colleges, hotels and hospitals. In our city wastage of water can be controlled by giving needed and desired amount of water.

This will inculcate the habit of using the water only for required purpose in every individual in our society. Every citizen will use water carefully and thus we can save wastage of water which we find scarce in summer season.

**Index Terms**— PLC, ARM, Solenoid

## I. INTRODUCTION

Water is an important element in all walks of life. In metropolitan cities like Mumbai, Pune, Bangalore and other metro cities municipal corporation provides water to all households, industries, garages, hotels, schools and colleges in large quantity. For example Municipal Corporation provides a specific amount of water to individual person and

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accordingly we calculate the total amount of water needed to family or organization.

Now we always see the wastage of water carried out by citizens on large scale. Some people use domestic water provided to them so carelessly that they waste hundreds and hundreds litres of water than an average they must use.. Due to such improper handling of water and wastage of water we find scarcity of water in summer season. We have built so many dams and reservoirs in our state still we find water scarcity during summer season. The actual problem is that we do not possess the habit of using water carefully and at optimum level.

Throughout the year we use water so carelessly that during summer season our corporation provides water only for one time a day or an alternate day or even after a gap of two days. So this project aims at providing desired amount of water to consumers.

## II. OBJECTIVE OF OUR SYSTEM

1. Water Saving
2. Fair use of water by every single citizen of PCMC
3. Motivation for recycling and reusing waste water
4. Theft control
5. To use data coming from each house for further water management
6. To be prepared for future water crisis.

The system which we are implementing is an automate system. This system automatically generates the reading of the amount of water which is flown through pipeline using Automatic Meter Reader (AMR).

AMR send this data to PLC. The desired amount of water is set according to the consumer. Giving suitable programming to PLC we are going to control the solenoid valve. Solenoid valve is attached across the water supply pipeline. When desired amount of water is supplied to respective consumer AMR will notify this to PLC, then according to programming given to PLC, it will close the Solenoid valve. Also high and low level sensors are placed in tank. When water fills tank full, the high level sensor signals PLC, PLC in turn signals Solenoid valve to close. Further this system is represented on SCADA where this system is controlled from a distant location.

Use of AMR will help consumer to know the amount of water they have used. It will help them to use water carefully if they are using haphazardly.

Implementing this system will help consumer to use water carefully. This will reduce wastage of water.

III. AMR



Fig.1

Automatic meter reading, or AMR, is the technology of automatically collecting consumption, diagnostic, and status data from water meter or energy metering devices (gas, electric) and transferring that data to a central database for billing, troubleshooting, and analyzing. This technology mainly saves utility providers the expense of periodic trips to each physical location to read a meter. Another advantage is that billing can be based on near real-time consumption rather than on estimates based on past or predicted consumption. This timely information coupled with analysis can help both utility providers and customers better control the use and production of electric energy, gas usage, or water consumption. AMR technologies include handheld, mobile and network technologies based on telephony platforms (wired and wireless), radio frequency (RF), or power line transmission.

**Advantages of AMR over Ordinary Meters:**

- AMR offers an accurate, affordable way to measure water usage.
- Traditional meters, must be read and inspected visually each month.
- Usage data from AMR meter can be downloaded through the mobile collector or handheld units.
- AMR meters make easy to gather usage data more frequently.
- Aggregated hourly readings from AMR meters can be used to track water usage.
- No need of operator to come manually to read the meter reading to customer’s location.

IV. SOLENOID VALVE



Fig.2

We are going to use Two way controlled Solenoid Valve because we are directly going to pass and cut off the supply of water flowing through pipeline. Three way valve and Four way valve is used where water comes from one input directions and is passed to two output directions. Such system does not exist in our system. So Two way valve which is less expensive than other mentioned valves is highly suitable to implement in our system. So we are going to use Two way valve.

**Advantages of Solenoid Valves:**

- Fast and safe switching
- High reliability
- Long service life
- Good medium compatibility of the materials used
- Low control power
- Compact design

V. BLOCK DIAGRAM

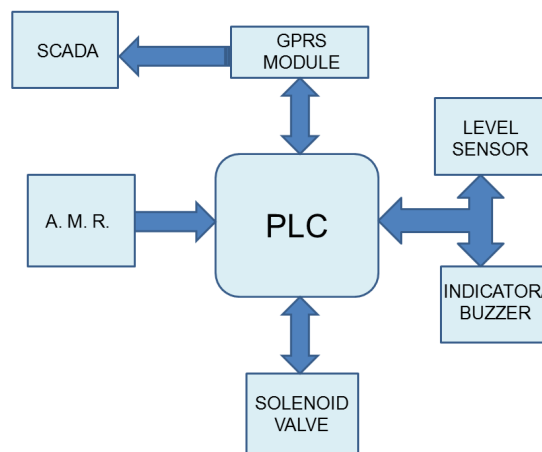


Fig. 3

The water pipeline is given to every housing building and houses. For domestic purpose water given to every individual by Municipal Corporation is 200lpcd. The Municipal Corporation provides more than sufficient water to each family. The water is given to each household for specific time. In mentioned block diagram the flow in pipeline is measured which gives result of amount of water is passed through pipeline. Water flowing through pipeline is measured using AMR meter.

This AMR meter automatically sends data of amount of water used to PLC. The amount of water passed through pipeline is displayed on display of AMR meter. This will give us the status of water remained for domestic usage. The status displayed on AMR about water usage will give an idea to consumer the amount of water he has left with for usage.

We set the values in PLC of the optimum amount of water needed for consumer. This value is given from AMR to PLC and checked constantly. Solenoid valve is attached across the water supply pipeline.

Solenoid valve and AMR both are interfaced with PLC. PLC is programmed accordingly to control AMR and Solenoid Valve.

The fixed amount of water which is assigned for the respective building is when passed through pipeline AMR notify it to PLC, thus PLC closes the solenoid valve across the pipeline.

## VI. FUNCTIONAL BLOCK DIAGRAM

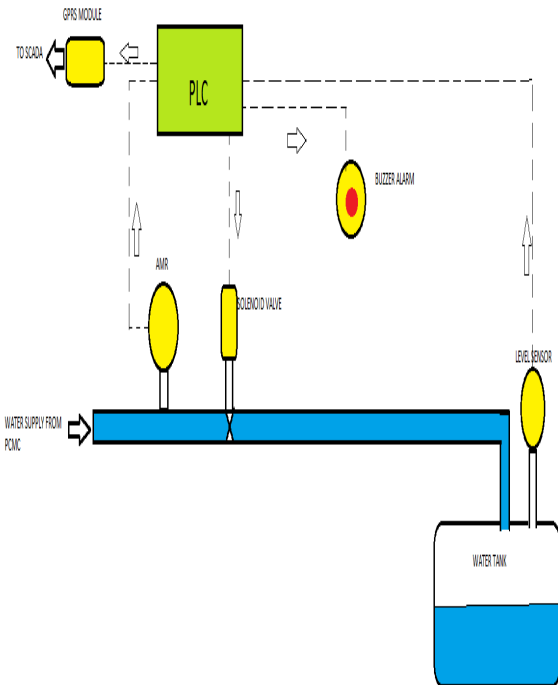
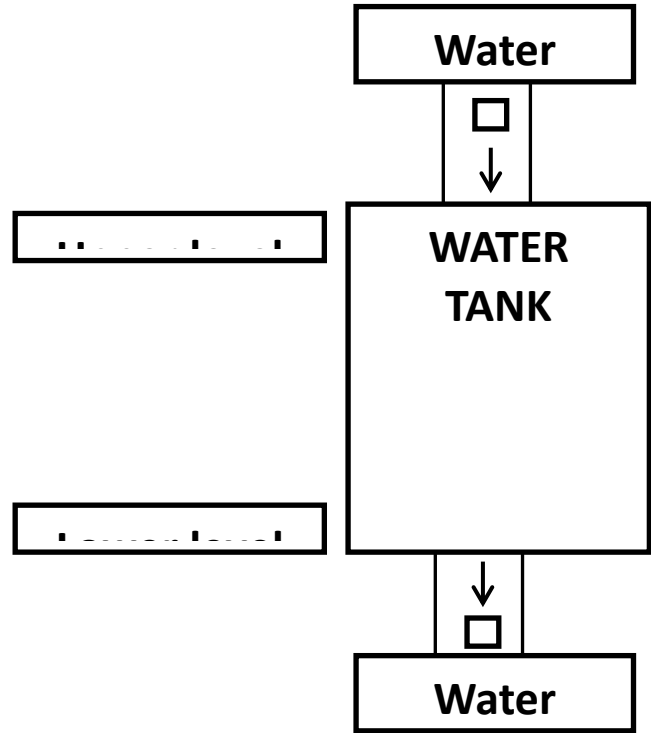


Fig.4

We are using two level sensors. One sensor is to detect lower level of tank and other is to detect upper level of tank. Following fig shows cross sectional view of tank:



The level Measurement can be either continuous or point values. Continuous level sensors measure level within a specified range and determine the exact amount of substance in a certain place, while point-level sensors only indicate whether the substance is above or below the sensing point. Generally the latter detect levels that are excessively high or low. Here we are using point-level sensor that sense the upper and lower of water in the tank.

This whole system is represented on SCADA. Using SCADA we can monitor as well as control the system. SCADA also help us to give the limited access to user to control the actual component of the system.

Using GPRS module MAESTRO M100 2G the actual system is interfaced wirelessly to SCADA.

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