

# SMART CONTROLLING AND MONITORING OF WATER SYSTEM

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**Abstract:** Commonly, we see water leaking in our homes, in public areas and colonies. A small steady water leak can cause a loss of 2, 26,800 liters of water per year. Unless we are aware and conscious of water wastage we will not be able to avail the basic quantity of water that we need to carry on with our normal lives. In this project, we are trying to minimize the over flow of water tank by controlling the valve using embedded systems. As water being an essential need for humans, it is also one of most under prioritized but over abused commodity. Water is central to our planning while we rapidly evolve into an urban society. Through time, early societies understood the importance and need for water and planned their lives around it. Civilization were born and lost on account of water. Today, we have the advantage of this knowledge and we still fail to value it and plan our society. Water has been wasted in several ways out of which leakage is also one of the factors.

## 1. INTRODUCTION

The present world has seen the introduction of a technology that has radically changed the way in which we analyze and control the world around us and that is the technology of replacing man by machines. It could be either in industry or domestic area. Water is the basic element for the life of all living organism on this world including human beings. Human being use water for various activities of every day's life such as agricultural activities, Industrial activities and household activities. As per the ministry of water resource, India has 18% of the world's population, but it has only 4% of total usable water resource. It is estimated that water used for household activities itself constitutes around 8% of Global water usage.

### 1.1 Problem definition

In case of residences, water is stored in both overhead tank and underground tank .The underground tank acts as a reservoir for the house. The water is getting wasted in these tanks due to the overflow of water or negligence of manual on/off of the motor. When the water level is very low in the reservoir the motor will absorb the air due to which the motor gets damaged. In case of the absence of house members for a long time, the water gets contaminated this is not preferable to use. The overhead tank is empty even though the reservoir is filled when there is no supply. Thus we have taken up this project to

conserve water and to enable complete automation of the water system.

### 1.2 Objective of the project

The aim of the project is to minimize the wastage of water, incorporate an interactive medium between the user and the machine and to prevent the over labor of the pumping machine and to prevent it from getting damaged. This is achieved by placing electrodes at different levels such as very low, low, medium and high to know the water level of both the tanks which helps in filling both the tank simultaneously. By checking water condition in both tanks automatic on and off of inlet valve as well as motor is to be done using embedded system. Sensing the different water levels of both tanks microcontroller sends signal to motor and inlet valve for automatic operation .and in the absence of user for long time monitoring the water tanks with status is to be done using GSM module. Thus we have entitled this project as "Smart controlling and monitoring of water system" which gives complete status of water system even in absence of user and operates automatically.

Water level is detected using electrodes which are placed in both the tanks. when 5v or 12v supply is given if the electrode touches water it conducts and gives signal to the control unit there in the LED of the level blink and the same is displayed in the LCD board. For example if the water in the sump is high it full the top most electrode senses it and sends signal there In all the LEDs of sump glows. Simultaneously if the overhead tank has medium level water the electrode placed in the middle level of tank conducts there in d0,d1,d2 LEDs glow. At the same time the position of both motor and inlet valve whether it is on or off is displayed in the LCD display.

## 2. Overview of the Project

The aim of the project is to minimize water wastage, to release user from operating water system and to have efficient water in both tanks which depends on water levels. Thus there is need for control system which takes input from electrodes and produces controlling action on motor and inlet valve and monitors the entire system. Thus the general block diagram of our project will be as shown in figure 2.1

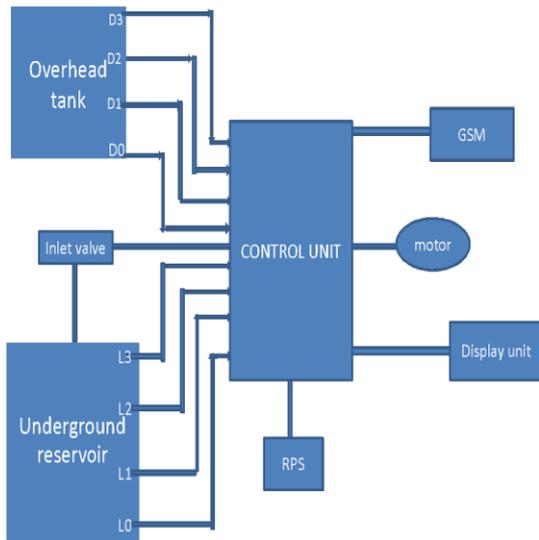


Figure 2.1: Block diagram of the project

### 2.1 Operating principle

The project deals with the control on/off of motor and inlet valve of a residence. The control of water flow to underground is carried out by controlling the solenoid valve which is similar to an electric on-off switch and control of water to overhead tank is carried out by controlling motor which pump water to overhead tank from underground tank. The state of solenoid valve is controlled by microcontroller which is programmed to receive data input from sensors and produce output to the relay drive which in turn controls the solenoid valve.

The connections and arrangements are made as shown in the figure above. The +9V is supplied to water using metal contact. In this circuit all the transistors are working as a switch. When the water touches the metal contact in which base of each transistor is connected, a small current flows and turns on the transistor. When a transistor turns on, LED connected to it glows. Thus LEDs will be turned on depending upon the level of water. By using a relay we can also control the level of water.

### 2.2 Hardware and software requirements

The hardware components used in the project decides the proper operation of the project. Thus selection and design of each components of the project shown in the circuit diagram in the figure 2.2 plays an important role in proper working of the project. From the selection of sensor to major parts such as solenoid valve, microcontroller is very important in the design procedure. The table 2 shows the software used along with its purpose. The coordination of both hardware and software is very much necessary in actual operation of project and in order to meet the objectives of the project. The table 3 shows the hardware components required for the project along with exact

model selected. Since the project is based on programming the microcontroller, several software tools are being used throughout the project starting from programming and display.

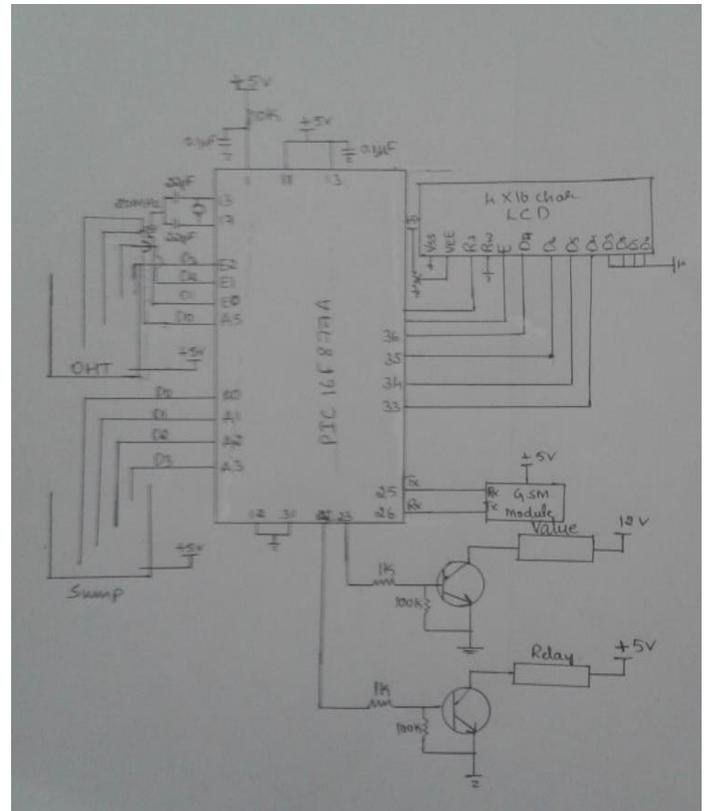


Fig. 2.2 Complete circuit diagram of the project.

Table -1: water level status of the tank

Overhead tank water levels indication				Water levels	Underground tank water level				Water levels
D0	D1	D2	D3		L0	L1	L2	L3	
0	0	0	0	Empty tank	0	0	0	0	Empty
1	0	0	0	Very Low	1	0	0	0	Very low
1	1	0	0	Low	1	1	0	0	Low
1	1	1	0	Medium	1	1	1	0	Medium
1	1	1	1	High	1	1	1	1	High

Table- 2: software tools used

Sl. No.	Software tool	Description
1	Micro c coplier	Programming the microcontroller and simulating the program.
2	MPLAB programming software	Burning the program to micro controller

**Table -3: The hardware components required for this project**

Sl. No.	Requirement	Component chosen	Manufacturing company
1	Power source	12Vdc	Exp-Pro and Texas Instruments
		5Vdc	
2	Microcontroller	PIC16F877A	Atmel Corporations
3	Water Solenoid valve	G1/180 ½" 12Vdc	Southern Ent.
4	Resistors	1k, 100k, 680 ohm	
5	Transistor	BC547	
6	Relay	12V	
7	Block terminal		
8	LCD display	4 x 16 inch	
9	Personal Computer	Windows 7/8.1 based PC	Microsoft powered Intel or Dell

### 2.3 Flow chart of project design:

The most important part of programming a microcontroller is to design the flowchart with complete flow of the control action, inputs and outputs. The flow chart of project is as shown in figure 2.3.

### 2.4 Benefits of the proposed system

The benefits of the proposed system are as follows

- **Reduces man power and time:** as the tanks fills we need to turn of the motor manually there it needs consciousness and time to operate using controller we can save both user energy and time.
- **Conservation of water:** the main advantage of the product is we can save water from overflowing, by automatic control.
- **Status of tanks:** without actually opening the tanks using controller we come to know the level in both reservoir and overhead tank which helps user to use water effectively without wasting it.
- **Compatible system:** the proposed system is compatible with existing one as only change that needs to be made to implement this system is to connect a valve in series with the existing pipeline.
- **Ensures sufficient water in both tanks:** as both the tanks are filled simultaneously it ensures sufficient water for households if power fails also.
- **Control through mobile:** in the absence of user in the premises he/she can control the system using mobile to ensure sufficient water after returning.

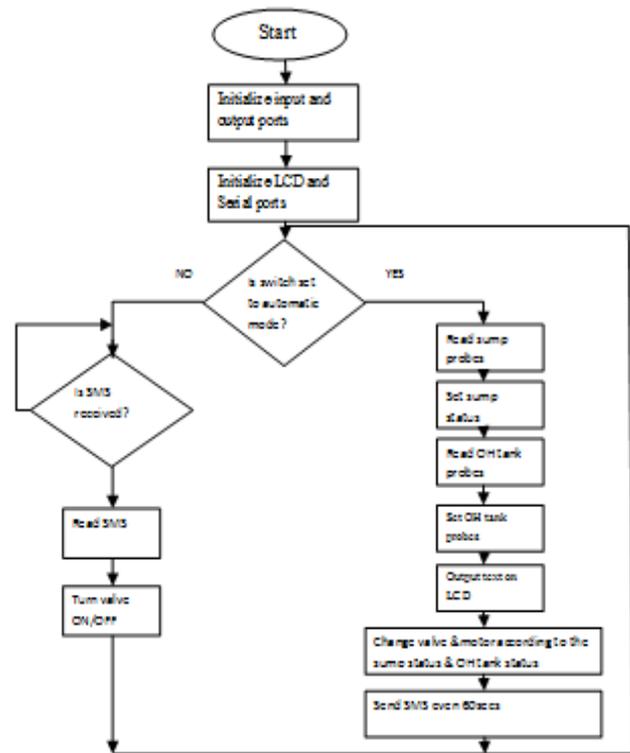


Fig 2.3 the flow chart of project

### 3. CONCLUSION

We can conclude from the testing process of that project can do the complete automation of the water flow system in a smart and in a cost reliable way. We can control the inlet pipe of the water coming from the main supply from the government water distribution supply. This is a new technology that we have found to control the water flow rate in underground tank along with the overhead tank.

A new idea for controlling the inlet pipe valve and motor is by using GSM module. This is used when is user is out of station say for 10 days ,he can make use of this GSM technology to stop the inlet valve i.e. to stop the water supply so that the water is not contaminated because of long duration storage. Using GSM the user can also shut down the complete system just in seconds by using his mobile which reduce electricity cost also. The main goal of this project which is the conservation of water is thus achieved.

With advancement in the field of technology the life style of people has changed such that it results in scarcity of resources available for the further use. But this work proves that the same advancement in technology can be used for better utilization of available resources. The control system developed not only helps in conservation of water but also in friendly operation of system.

### 3.1 Future Scope

- The proposed system is for control and monitor of water system, but this system can be further expanded for different sectors like school, hotels, apartments, hospitals etc.
- Another important application of this technology is used in watering agricultural fields. Say when there are four fields with different paths which have to be watered for a particular field can be controlled using the solenoid valve.
- The water supply can be limited to every house using this method we can restrict the over usage of water.
- Using the temperature sensors, this project can also be extended for the distribution of hot water in the apartments.

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