SMART WATER SUPPLY SYSTEM

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ABSTRACT

The drinking water crisis in India is reaching alarming proportions. One day it will becomeglobal crisis. Hence, it is most essential to store water by some means. In every where there is unnecessary wastage of water fromstorage tank. . Since in urban masses where water scarcity is quite common problem in summer there is needed to monitor the consumption of water used for domestic purposes. So that it is possible for judicial usage of water especially in the dry areas. With the advancement of engineering and technology, process automation has come into reality with satisfying accuracy. Automatic Water Level Controller can provide a solution for this problem. Generally water level controller works upon the fact that it conducts electricity. So water can be used to open or close a circuit as desire. As the water level rises or falls, different circuits in the controller send different signals to controller. These signals are used to switch ON or switch OFF the motor pump&solenoid valves as per the requirements.

Keyword: **VCC, PLC, MV**

1. Introduction

This system is focused to make home as a smart home with different applications. Main aim to implement this project is to design and develop a low cost reliable and efficient technique to make proper water supply by continuous monitoring and also controlling it from a central microcontroller so that we can solve water related problems.

Generallywater scarcity is due to both natural and a human being. There is enough freshwater on the planet for six billion people but it is distributed unevenly and too much of it is wasted, polluted and unsustainably managed. Worldwide, more than 1.2 billion people lack access to clean potable water.Water scarcity affects every continent and around 2.8 billion people around the world at least one month out of every year.This signifies the need of preservation of fresh water resources by some means. The water level controller we propose to make in our project depends on two detection points in the OHT& Sump separately. The water level must be controlled at these two points & third sensor act as a ground. To facilitate this, we use water level indicating sensors. When water reaches a sensor, a proper circuit must be establish to detect and a signal is producedsimultaneously. This signal must pass through a logic circuits to give the correct output which is responsible to actuate either motor or solenoid valve or both.. Our circuit essentially uses the high and low states of a NAND gate to activate or deactivate the actuator. Simply put, we rely on the ON and OFF states of the actuator.

2. Automation

The ward automation refers to the technique, method, or system of operating sequence or controlling a process by highly automatic way, as by electronic devices, reducing human assistance to a minimum or zero. Introducing automation in water management system can remarkably reduce the human errors and thus help to reduce the water wastage. Also with limited supply of water, there is need to monitor the usage which may help people to habitat in all geographical conditions.Thus this facilitate the proper and fair use of water.

- Provide water reliably.
- Provide the ability to monitor and control remote facilities.
- Minimize routine visits to remote sites.
- Reduce power consumption.
- Optimize pumping operations.

2.1. Types of automation:

2.1.1. Fixed Automation:A manufacturing system in which the sequence of processing (or assembly) operations is fixed by the equipment configuration e.g. Distillation Process, Conveyors, Paint Shops, Transfer lines

2.1.2. Programmable Automation:A manufacturing system designed with the capability to change the sequence of operations to accommodate different product configurations e.g. in Steel Rolling Mills, Paper Mills etc.

2.1.3. Flexible Automation:An extension of programmable automation in which the system is capable of changing over from one job to the next with no lost time between jobs

In this experiment water is drawn from bore well by vertical submersible pumps& then sends to eitherOHT or sump as per the signal produced by different sensors (generally three in nos) arranged vertically with specific limit of water height in both tank. As per our setupboth OHT& sump should be filled up with water either by operating pump only or by operating pump & solenoid valve respectively. If water level reachesbelow the second sensor(middle) then respective equipments starts to run & when water level touches first sensor(top) all the equipment going to stop functioning .

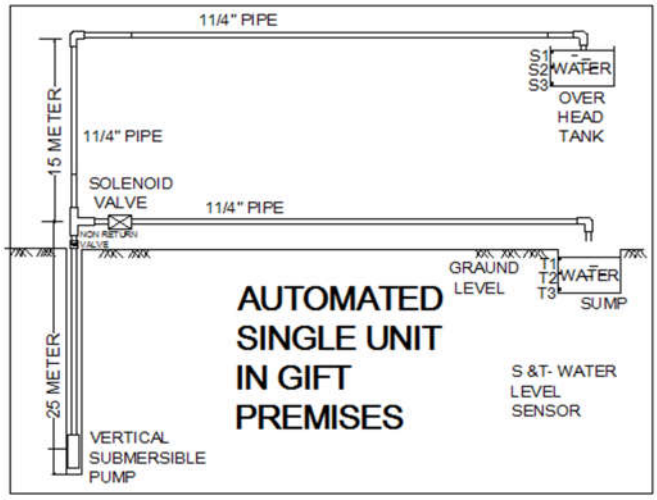

Figure 1. Automated single unit in GIFT premises

In this experiment we considered three cases:

- Both the tanks are full:If both the tanks are full, whole system will in off condition as water touches the top sensor of either tank.
- Any one of either tank is half full:If one of them is half full then respective equipments got energized by logic controller getting signal from water level indictor sensor attached to respective tank. If OHT is half filled then motor will start or if Sump is half filled then both motor and solenoid valve will energized.
- Both the tanks are empty:If both the tanks are empty, then signal coming from either tank will processed in Logic controller & preference will be given to the motor pump to fill OHT first then by operating both motor & solenoid valve simultaneously to fill the Sump. It is absolutely very

rare case to achieve the third case because at same fraction of time both the tank will not be empty. Sometimes it may so happen if power supply has gone & water from both tank will decrease simultaneously as consumed by consumer so water level reaches below the middle sensors of both simultaneously.

3. Flow Chart

A flowchart is a pictured representation of the different steps of a process arranged in sequential order. In this experiment first priority is given to system which is related to OHT & then sumpSo in this flow chart it is defined in particular fashion so that all the above three condition will be satisfied logically & systematically.

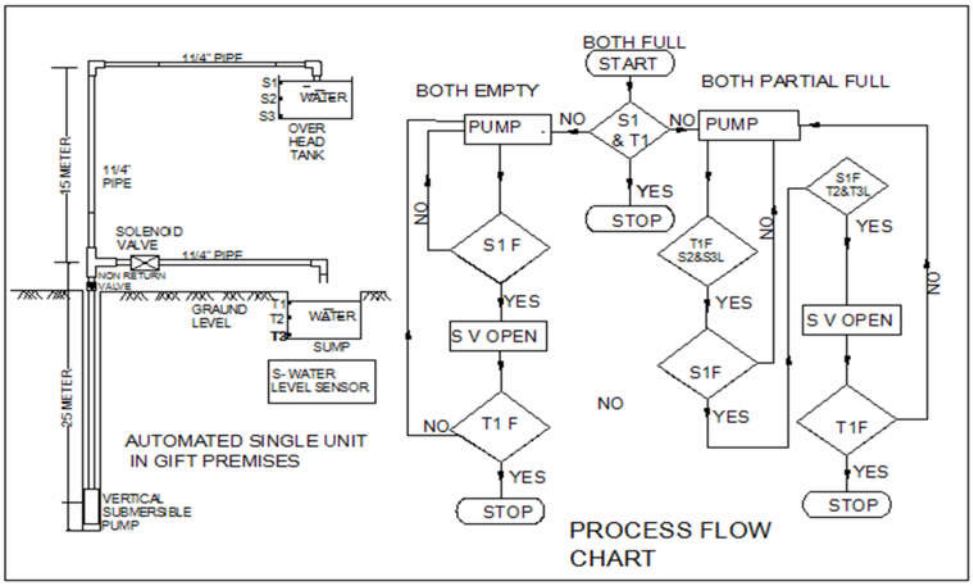

Figure 2. Process flow chart

3.1. Solenoid Valve (2x2)

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 vise-versa to initial condition of valve. But in our set up,We considered that the valve is normally closed & it will open when it get electricity from stator. We can automatically operate valves and supply water when it is needed it reduces manual work. Relays are used to drive solenoid valves. One 18watt Submersible motor are used which has 220v AC supply. Pump On off system made automatic by programming.

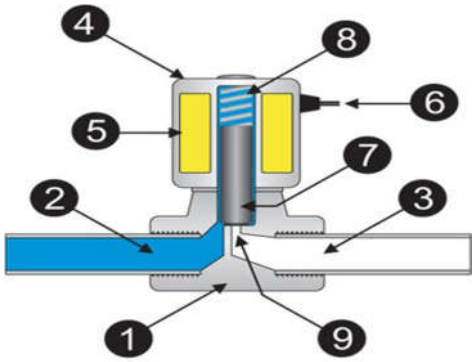

Figure 3. Solenoid Valve

1.Valve body 2.Inlet port 3.Outlet port 4.Coil/solenoid 5.Coil binding

6.Lead wire 7.Plunger 8.Spring 9.Orifice

3.2. ASCO Solenoid Valve

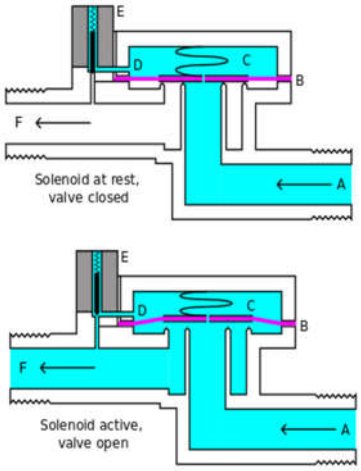

Figure 4.ASCO Solenoid Valve

A-Input side B- Diaphragm C- Pressure chamber D- Pressure relief passage
E- Electro Mechanical Solenoid F- Output side

In this type of valve relies on a differential of pressure between input and output as the pressure at the input must always be greater than the pressure at the output for it to work. Should the pressure at the output, for any reason, rise above that of the input then the valve would open regardless of the state of the solenoid and pilot valve?

Pressure developed on solenoid valve due to pump:

HP = hρgQh (1)

OR

h =*HP*hρgQh (2)

Where, ρ = 1000, g=9.81m/sec2, Q= m3 / hr, h=head(m), HP=746 watt

For 1 HP: PUMP:

H = 746 x 1 x 3600 x 0.9 x 1000 x 9.81 x 6.759

= 45.0 Pressure(P) = ρgh = 1000 x 9.81 x 45.0 = 441485.4 pascal

OR

441485.4/105 = 4.4 Bar

Water discharge through 1 HP rating pump considering

90% efficiency:

PUMP: 1 HP

Q = 746x1 x 3600 / 0.9x1000 x 9.81x45

=6.7595 m3/hr or 6759 lt/hr

Specification ofASCO solenoid valve:

• LIQUID FLOW (WATER)

• BRASS BODY

• NORMALLY CLOSED

• 2X2 VALVE

• NPT THREAD

• PIPE : 1 ¼" Ø

• PRESSURE : 9 BAR

• VOLT=230V

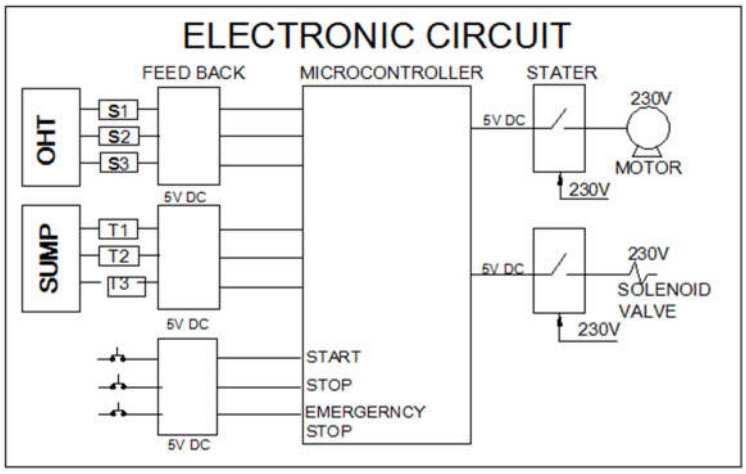

Figure 5.Basic electronics circuit

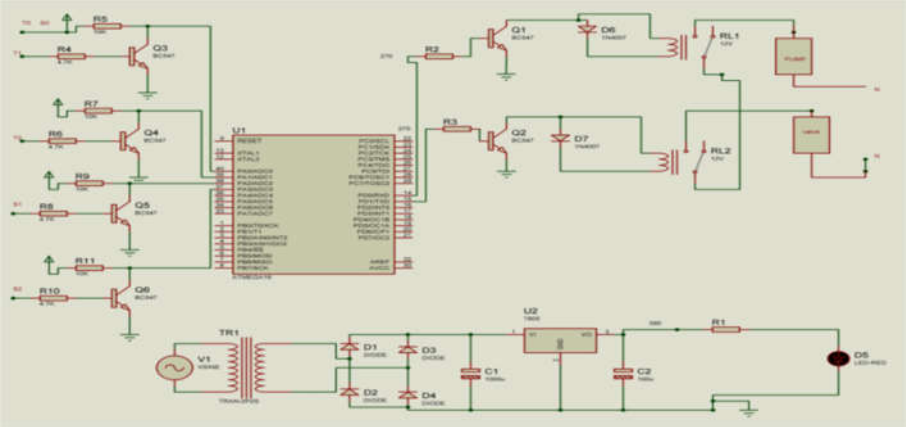

Figure 6.Electronic circuit

Application of Smart Water Supply System

- School and colleges
- Health care centres and hospitals
- Old age homes
- In Industries
- In Bus stops and Railway stations
- In Parks
- In Offices
- In Government Offices
- In Big Hotels and Restaurants
- In many Public Places

Advantages of Smart Water Supply System

- The Automatic water level controller responsible for no overflows or dry running of pumptherefore saveelectricity and water both.
- Automatic water level controller provides exact duration for operations of pump set & solenoid valve.
- Solenoid valves are an advantageous solution for controlling the flow of many liquids.
- Reduce in manual operation by providing solenoid valve.
- Solenoid valves are more lasting than the manual operated valves.
- Solenoid valves don't caught rust easily.
- Avoid seepage of roofs and walls due to overflowing tanks.
- Fully automatic, saves man power
- Consume very little energy, ideal for continuous operation.
- Shows clear indication of water levels in the overhead tank.

Conclusion:

- This system is very useful in rural as well as urban areas.
- It helps in the propare utilization of available water sources.
- If used on a large scale, it can provide a major contribution in the conservation of water for us and the future generations also.

In these days, when Earth's reserve of consumable water is decreasing every moment, every drop has its value. Water level controller is a simple yet effective way to prevent wastage of water. Its simplicity in design and low cost components make it an ideal piece of technology for the common man.

LIST OF ABBREVIATIONS

OHT: Over Head Tanks
HP: Horse Power
PLC: Programmable Logic Controller,
HMI: Human Machine Interface ,
CHI: Computer Human Interface ,
IC: Integrated Circuit ,
OHT: Over head tank
Vcc: Voltage In A Common NPN Circuit
GND: Ground
MV: Master Valve

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