AUTOMATED SELF ISOLATING WATER LEVEL CONTROLLER

PROJECT REPORT

submitted by

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Of

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Department of Electronics Engineering

College Of Engineering, Chengannur

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DEPARTMENT OF ELECTRONICS ENGINEERING

COLLEGE OF ENGINEERING, CHENGANNUR

CERTIFICATE

This is to certify that the report entitled "**Automated Self Isolating Water Level Controller** " submitted by , MOHAMMED SHAHEER V K to the APJ Abdul Kalam Technological University in partial fulfillment of the requirements for the award of the Degree of Bachelor of Technology in Applied Electronics And Instrumentation is a bonafide record of the project work carried out by him/her under my/our guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

Internal Supervisor(s)

Mini project coordinator

HEAD OF THE DEPT

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ABSTRACT

This project is categorized under technical projects. Aimed at providing an overview of the level of automation. The drinking water crisis in India is reaching alarming proportions. It might very soon attain the nature of global crisis. Hence, it is of utmost importance to preserve water. In many houses there is unnecessary wastage of water due to overflow in Overhead Tanks. Automatic Water Level Controllers can provide a solution to this problem. The operation of the water level controller works upon the fact that water conducts electricity. So, water can be used to open or close a circuit. As the water level rises or falls, different circuits in the controller send different signals. These signals are used to switch ON or switch OFF the motor pump as per our requirements. So, the main objective of this paper is to design and develop an automatic water level controller to maintain the outlet process of the water level at its desired level. The paper also focuses on the need of the people to install automatic water level controllers to avoid wastage of water.

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ABBREVIATIONS

Abbreviation	Meaning
AC	Alternating Current
DC	Direct Current
IC	Integrated Circuit
LED	Light Emitting Diode
OHT	Over Head Tank
PCB	Printed Circuit Board
SPDT	Single Pole Double Throw
UGT	Underground Tank

NOTATIONS

C Capacitance,

R Resistance, Ω

Greek symbol

τ Time constant, s

CHAPTER 1
INTRODUCTION

Our idea is to help people in saving water for the future. The project mainly consists of 555 timer, 12 V SPDT relay, A.C motor and wires which act as sensors. The wires are placed at different levels of the tank. All these mentioned components take an active role in switching ON and OFF of the motor. Water level controllers are quite common nowadays. This circuit is based on the popularly used IC555 IC. Water level controller circuits have these advantages: Mostly the circuit only displays the amount of water present in the circuit, but this circuit will "on" and "off" the motor according to the level of water present in the tank. It will not automatically stop the motor when the tank is filled but it will "on" the motor when water in the tank reaches below a specific point. It can be easily installed in overhead tanks because of less components used in circuits. It prevents the wastage of water due to overflow of the tank. Can be operated with the help of 12V battery or adaptors (converts 230V AC to 12V DC) readily available in markets.

1.1 GENERAL BACKGROUND

The total amount of water available on Earth has been estimated at 1.4 billion cubic kilometers, enough to cover the planet with a layer of about 3 km. About 95% of the Earth's water is in the oceans, which is unfit for human consumption. About 4% is locked in the polar ice caps, and the rest lo/o constitutes all fresh water found in rivers, streams and lakes which is suitable for our consumption. A study estimated that a person in India consumes an average of 135 liters per day' This consumption would rise by 40%by the year 2025. This signifies the need to preserve fresh water resources.

1.2 OBJECTIVE

The following objectives are likely to be focused and achieved at the end of the project.

l)To create the most cost-effective and reliable water level controller using as few resources as possible.

2) To study the controller model and observe its characteristics.

3) To compare the controller with the conventional controllers available in the market and find the advantages of the former over the latter.

4) To suggest any ideas or improvements that can lead to future development of the controller.

1.3 SCOPE OF THE PROJECT

The project was designed to automatically control the pump which ensures constant reserve of water in the reservoir. The scope of the design was kept concise and simple in order not to introduce unnecessary complexities and render it generally uncomfortable. The system does not have attached complex peripheral device which though impossible for the detail printable information has been excluded for reasons of affordability material of low range and less accurate performances as opposed to a well-built automatic water pump was used to achieve this aim, the automatic water level controller detects and control the water in the tank.

CHAPTER 2
LITERATURE REVIEW

[1] This paper has an implemented Automatic water level control system consisting of Arduino to automate the process of water pumping in a tank and has the ability to detect the level of water in a tank and switches ON or OFF the pump accordingly and displays the status on the LCD screen. The system also monitors the level of water in the sump tank (source tank). If the level inside the sump tank is low, the pump will not be switched ON and this protects the motor from dry running. A beep sound is generated when the level in the sump tank is low or if there is any fault with the sensors.

[2] This paper has developed a system which initially tests the availability of water in the tank with the help of a level detector and then adjusts the state of the water pump according to the information collected through the level detector. This design makes use of a seven segment display and a motor pump. The proposed system consists of a water level sensor and a digital logic processor circuit. The proposed system eliminates manually controlling of water requirements in home and agricultural fields.

[3] This paper introduced a system which proposes a simple water level monitoring system with different levels indicated. It also signifies when the water level is below and above than the requirement. This method helped us to understand the use of Bluetooth modules and how it can be made as a portable device.

[4] This paper introduced a system which measures water level by using ultrasonic sensors. The system makes use of a water level indicator, water level sensor, water pump controlling system and microcontroller. The ultrasonic sensor gets a water level reading and it will send a signal to the microcontroller and start to echo the pulses.

[5] The system uses a microcontroller to automate the process of water pumping in an overhead tank storage system and has the ability to detect the level of water in a tank, switch on/off the pump accordingly and display the status on an LCD screen. This research has successfully provided an improvement on the existing water level controllers by its use of calibrated circuit to indicate the water level and use of DC instead of AC power thereby eliminating risk of electrocution.

[6] This paper proposes an Automatic water level controller with Short Messaging Service (SMS) Notification. SMS Notification was added to the automatic controller system so that water can be managed by the user during load shedding. Two systems work synergistically; automatic level controller system and SMS system. The program was developed in an Arduino program developing environment and uploaded to the Microcontroller. Water level in the system is controlled automatically. The controller operates on battery power. Whenever the system encounters an empty level and the status of load shedding, the SMS notification is sent to the user.

CHAPTER 3
THEORY & METHODOLOGY

3.1 THEORY

It could automatically switch ON and OFF of the domestic water pump set based on the water level of the tank output and increase once the voltage at the second pin (trigger pin) is no more than 1/3 VDC. We may also reset the IC by making use of a low voltage to the 4th pinout (reset pins). In this particular project you will find 3 wires immersed in the water tank. We will specify two levels-Low Water Level (Low) and High (Up) Level. One of the pins of the probe is of Vcc. The lower-level sensor is hooked up to the trigger (2) of the pin 555 CI. Therefore, the voltage at the 2nd pin is Vcc while it is inside water. When the water level reduces, the second probe is detached from the water voltage, and the trigger pin gets to be under Vcc. Then the output of 555 gets high. The output 555 is placed on a BC548 transistor, it triggers the relay coil and also the water pump collectively is switched on. When the water level goes up, the upper-level probe is included in water and the transistor turns OFF. Its collector voltage is VCE (sat) = 0.2. The low voltage on the 4th pinout resets the IC. Therefore, the output of 555 turns into 0V. Thus, the motor is switched OFF.

3.2 METHODOLOGY

Automatic isolating water level controller is an automatic system used to control the water level of the overhead tank without any requirement of human assistance. This system switches on the pump when the water level in the overhead tank goes low and switches it off as soon as the water level reaches a predetermined level. It also pre- vents ‘dry run’ of the pump in case water level in the underground tank goes below suction level. There are many methods for designing an automatic water level controller. We can simply implement the system by using 555 timer ic and relay. This system is a simple yet effective way to prevent wastage of water, energy saver and it increases the life of the water pump.

This system mainly consists of the following basic components.

3.2.1 Power supply

The full wave rectifier consists of four 1N4007 diodes and 1000mF, 1mF capacitors. It converts an AC voltage into a pulsating dc voltage using both half cycles of the applied ac voltage. It uses two diodes of which one conducts during one half cycle while the other conducts during the other half cycle of the applied ac voltage. Rectifier outputs are connected to voltage regulators IC 7805. The output of IC 7805 provides Vcc to use to supply the DC voltage to support current flow between the metallic contacts and also used to give Vcc to 555 Timer IC.

3.2.2 Conducting probes

Thin aluminum wires are used as conducting probes. It is working with the principle of conductivity of wires. Conductors have no band gap, so electrons can freely move through them to generate an electric current.

3.2.3 555 Timer IC

Here, we use a 555 timer in monostable mode.

When a negative (0V) pulse is applied to the trigger input (pin 2) of the Monostable configured 555 Timer oscillator, the internal comparator, (comparator No1) detects this input and “sets” the state of the flip-flop, changing the output from a “LOW” state to a “HIGH” state. This action in turn “OFF” the discharge transistor connected to pin 7, thereby removing the short circuit across the external timing capacitor, C1.

This action allows the timing capacitor to start to charge up through resistor R1 until the voltage across the capacitor reaches the threshold (pin 6) voltage of 2/3Vcc set up by the internal voltage divider network. At this point the comparator's output goes “HIGH” and “resets” the flip-flop back to its original state which in turn turns “ON” the transistor and discharges the capacitor to ground through pin 7. This causes the output to change its state back to the original stable “LOW” value awaiting another trigger pulse to start the timing process over again. Then as before, the Monostable Multivibrator has only “ONE” stable state.

The **Monostable 555 Timer** circuit triggers on a negative-going pulse applied to pin 2 and this trigger pulse must be much shorter than the output pulse width allowing time for the timing capacitor to charge

and then discharge fully. Once triggered, the 555 Monostable will remain in this “HIGH” unstable output state until the time period set up by the R_1 x C_1 network has elapsed. The amount of time that the output voltage remains “HIGH” or at a logic “1” level, is given by the following time constant equation.

$$\tau = 1.1\ R\ C$$

Where, t is in seconds, R is in Ω and C in Farads

3.2.4 Relay circuit

It works on the principle of Faraday's Electromagnetic Induction. A SPDT-single pole double throw relay is used here. It is beneficial in modern applications because of its internal configurations. It consists of five control terminals. Two electromagnetic re- lay coils, one common terminal (C), one normally closed terminal (NC), and one normally open terminal (NO). We can always refer to these terminals as contacts. When we have continuous power applied on the coil of wire wrapped around the solenoid, the normally open and standard terminals get charged. When there is no coil current, the magnetic circuit is relaxed, the common terminal and the normally closed terminal get assigned.

CHAPTER 4
HARDWARE REQUIREMENT

555 Timer IC is an integrated circuit (chip) used in a variety of timer, delay, pulse generation, and oscillator applications. Derivatives provide two (556) or four (558) timing circuits in one package. The design was first marketed in 1972 by Signetics.

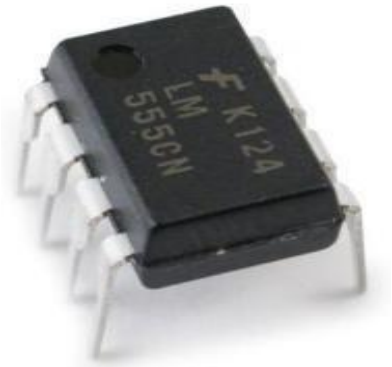


Fig (4.1) LM 555 Timer IC

LEDs (Light Emitting Diode) are heavily doped p-n junctions. Based on the semi-conductor material used and the amount of doping, an LED will emit a colored light at a particular spectral wavelength when forward biased. As shown in Fig 4.2, an LED is encapsulated with a transparent cover so that emitted light can come out. Here we are using it in the voting module in order to assure enabling of the vote casting facility to the verified user by the polling officers.

Fig (4.2) Light Emitting Diode (LED)

Jumper Wires shown in Fig 4.3 are simply wires that have connector pins at each end, allowing them to be used to connect two points to each other without soldering. Jumper wires

are typically used with breadboards and other prototyping tools in order to make it easy to change a circuit as needed.

Fig4.3 Jumper Wires

The BC547 is a NPN transistor meaning when power is applied to the base (control pin) it will flow from the collector to the emitter. Typically, NPN transistors are used to "switch ground" on a device, meaning, they are placed after the load in a circuit.

Fig 4.4 BC547 Transistor

A capacitor is a two-terminal electrical device that possesses the ability to store energy in the form of an electric charge. It consists of two electrical conductors that are separated by a distance. The space between the conductors may be filled by vacuum or with an insulating material known as a dielectric.

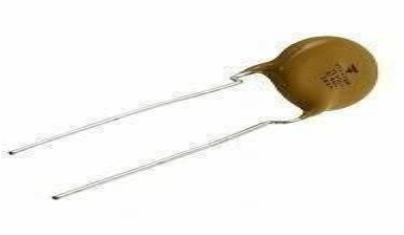


Fig 4.5 Capacitor

The SPDT Relay is a high-quality Single Pole Double Throw Relay (SPDT). The Re-lay consists of a coil, 1 common terminal, 1 normally closed terminal, and one normally open terminal. When the coil of the relay is at rest (not energized), the common terminal and the normally closed terminal have continuity.

Fig 4.6 SPDT Relay

A resistor is an electrical component that limits or regulates the flow of electrical current in an electronic circuit. Resistors can also be used to provide a specific voltage for an active device such as a transistor.

Fig 4.7 Resistor

1N4007 is a rectifier diode, designed specifically for circuits that need to convert alternating current to direct current. It can pass currents of up to 1 A, and have peak inverse voltage (PIV)rating of 1,000 V. Note: This product has a minimum quantity restriction (20 nos) for order.

Fig 4.8 1N4007

A water pump is a machine used to increase the pressure of water in order to move it from one point to another. The core concept of a water pump is to use a motor to convert rotational energy or kinetic energy and turn it into energy for moving fluid or for fluid flow.

Fig 4.9 AC Water Pump

A Single Pole Single Throw (SPST) switch is a switch that only has a single input and can connect only to one output. This means it only has one input terminal and only one output terminal. A Single Pole Single Throw switch serves in circuits as on-off switches .

Fig 4.10 SPST Switches

The **7812** is a commonly used linear regulator. Input voltage can range from 14 – 35VDC and it outputs a fixed 12V at over 1A of current and up to 2.2A of surge cur-rent.

Fig 4.11 LM 7812 Voltage Regulator

12-0-12 1A Center Tapped Step Down Transformer is a general-purpose chassis mounting mains transformer. The transformer has 230V primary winding and center tapped secondary winding The transformer acts as step down transformer reducing ac - 240v to ac - 12v.

Fig 4.12 12V Step Down Transformer

CHAPTER 5
PCB DESIGNING

Design of printed circuit bound (PCB) can be considered as the last step in electronic circuit design as well as the first step in production. It plays an important role in the performance and reliability of electronic circuits, the productivity of the PCB's assembling, and its service ability depends on design. All these factors get reflected in a piece of electronic equipment. It is clear that the task of PCB design is not very simple or always straightforward. The schematic is follower by layout generation Layout designs the stage where engineering capacity combined with creativity is the governing in-puts

5.1 PCB DESIGN PROCEDURES

The PCB designing procedure consists of following steps

5.1.1 DRAWING PCB LAYOUT ON EASYEDA SOFTWARE

Drawing of circuits is done through EasyEDA, Easy EDA is a web-based circuit simulation and electronic design and automation software Mod product testing is being done with the help of computer programs. The term Electronic Design Automation (EDA) is being used to describe the use of these tools with the help of advanced powerful computing systems and interactive software tools and development of electronic circuits has undergone automation. Thus, the software and hardware tools, which enables this automation includes PCB designing, IC design, circuit simulation etc. These tools help us in such a way that we can draw the circuit and test the functioning of the circuit in response to test inputs in simulation software that includes many libraries with thousands of component symbols. We can select the required symbol from the library and place it in the schematic page. After placing the component symbols, we can complete the Interconnection using wire or bus control. The next step is to assign a part reference. Each component has to be assigned a footprint or PCB pattern name. The footprint gives the actual size physical representation of components on the PCB artwork. The component symbol and foot symbol should correspond in all respects. DESIGN RULE CHECK AND NET LIST CREATION After the circuit schematic is completed with all required information such as part reference and footprints, the design rule check can be used

for checking errors in the design. It will check for duplicate symbols, overlapped lines and dangling lines. After the schematic design file passes the DRC check, it is processed by a program called an electric rule checker (ERC) that checks for writing errors. The final operation to be done before starting PCB artwork is the net list creation A netlist creation of the components and interconnection along with other information such as footprints, track width etc. A net list software or tool can take the circuit schematic as input and generate a net list. The net list can be used as an information source for the remaining CREATING THE PCB ARTWORK In automatic design, the net list obtained from the previous stage is used for getting the required footprint and interconnections. The software used for the PCB artwork de- sign in the EasyEDA PCB fabrication, need to generate a positive (copper black) UV translucent artwork film to get the best possible quality at this stage

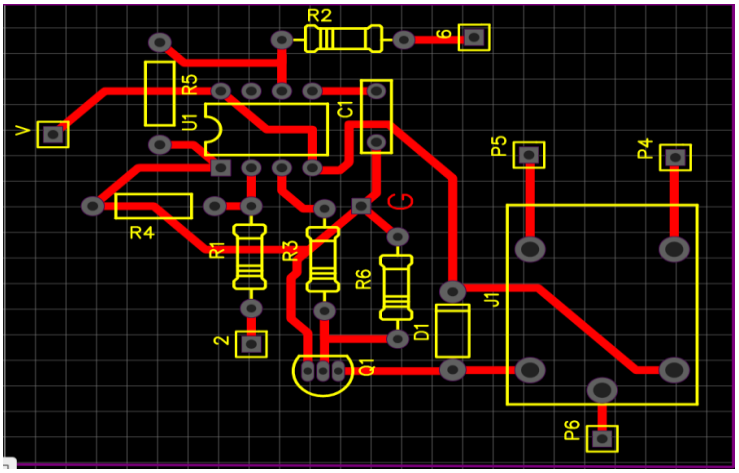


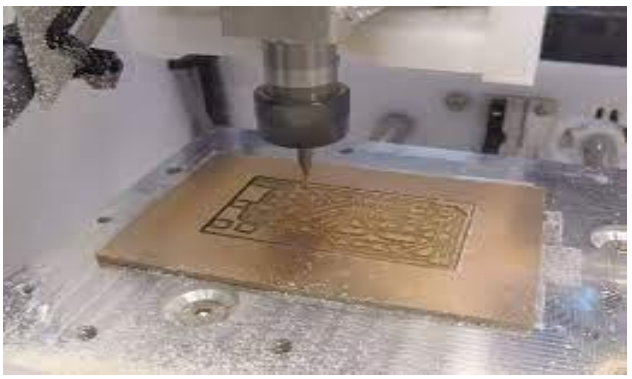
Fig 5.1.1 Drawing of PCB design on EasyEDA

5.1.2 IMPLEMENTING DESIGN ON PCB

The designed layout is implemented on a copper clad using CNC machine, for this copper clad of dimension 20cm*10cm is selected, the circuit diagram that we designed on EasyEDA software is converted into STEP format and uploaded into a CNC machine. Place the copper clad on the base of CNC and set the origin i.e., the drill bit aligned to the copper clad. Select print the circuit and CNC will begin etching on copper clad.The path where etching is required will

be etched out and holes on required places will be drilled by CNC, based on our specification in the drawing uploaded into CNC machine.

Fig 5.2.1 CNC machine PCB etching illustration



5.1.3 SOLDERING COMPONENTS ON PCB

After etching PCB our next task was to implement the circuit on PCB by soldering different components for the same.

Soldering is the joining together of two metals to give physical bonding and good electrical conductivity. It is used primarily in electrical and electronic circuitry. Solder is a combination of metals, which are solid at normal room temperatures and become liquid between 180 and 200 degrees Celsius. Solder bonds well to various metals, and extremely well to copper. Soldering is a necessary skill you need to learn to success- fully build electronics circuits. To solder you need a soldering iron. A modern basic electrical soldering iron consists of a heating element, a soldering bit (often called a tip), a handle and a power cord.

We have used Soldron 878D Hot Air Soldering Rework Station 60W, for soldering the components. After cleaning the surface each component was placed on PCB and soldered using Solder alloy 63/37. That is, 63% lead, 37% tin. It is also known as eutectic solder. Its most desirable characteristic is that it solids (‘pasty’) state, and its liquid state occurs at the same temperature -361-degree Fahrenheit. The combination of 63% lead and 37% tin melts at the lowest possible temperature.

CHAPTER 6
DIAGRAMS & WORKING

6.1 BLOCK DIAGRAM

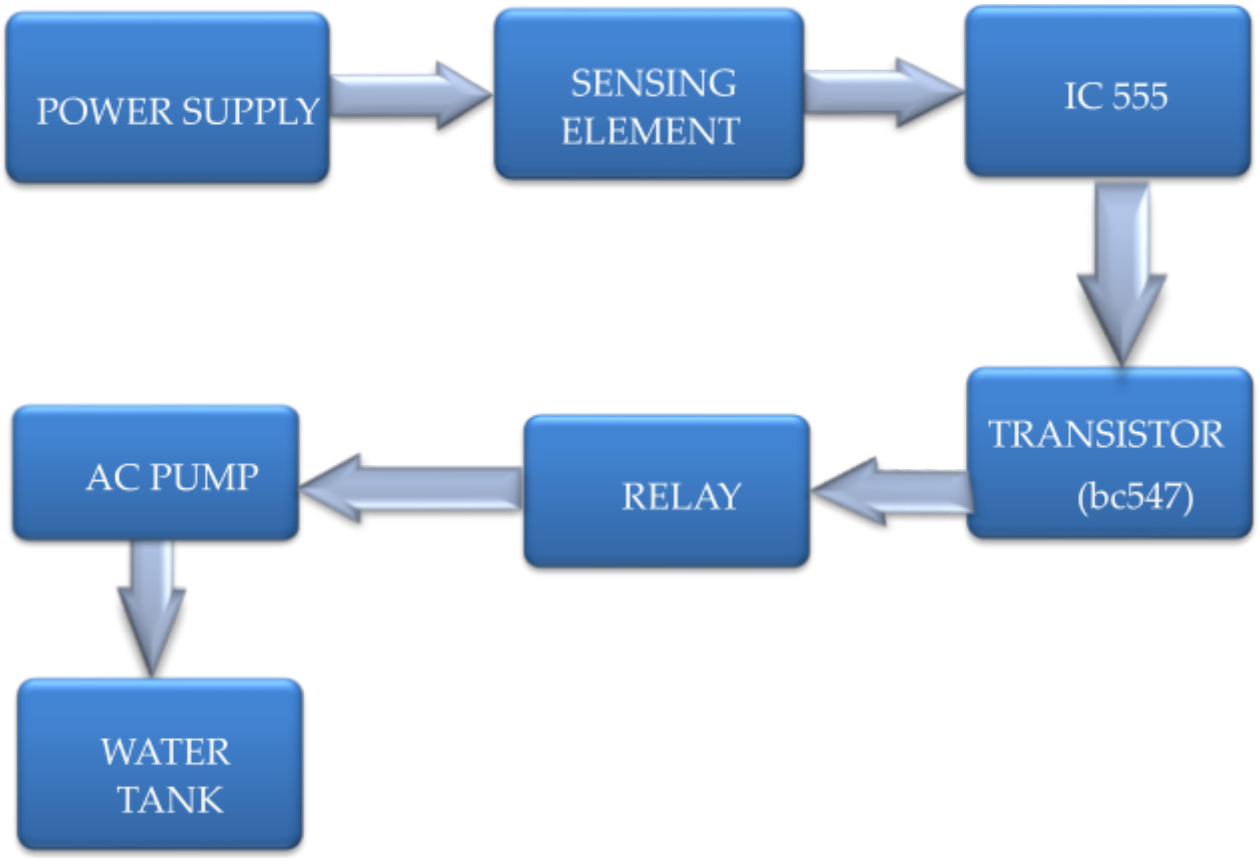


Fig 6.1 BLOCK DIAGRAM

The water level controller we propose to make in our project depends on two detection points in the OHT. The water level must be controlled at these two points. To facilitate this, we use sensors. In our case, these sensors are metallic contacts with space between them present at each detection point. When water reaches a sensor, a proper circuit must be present such that the presence of water is detected and a signal is produced. This signal must pass through IC555 circuits to give the correct output. A similar action must take place when water reaches another sensor. Our circuit essentially uses the high and low states of an IC555 to activate or deactivate.

6.2 CIRCUIT DIAGRAM

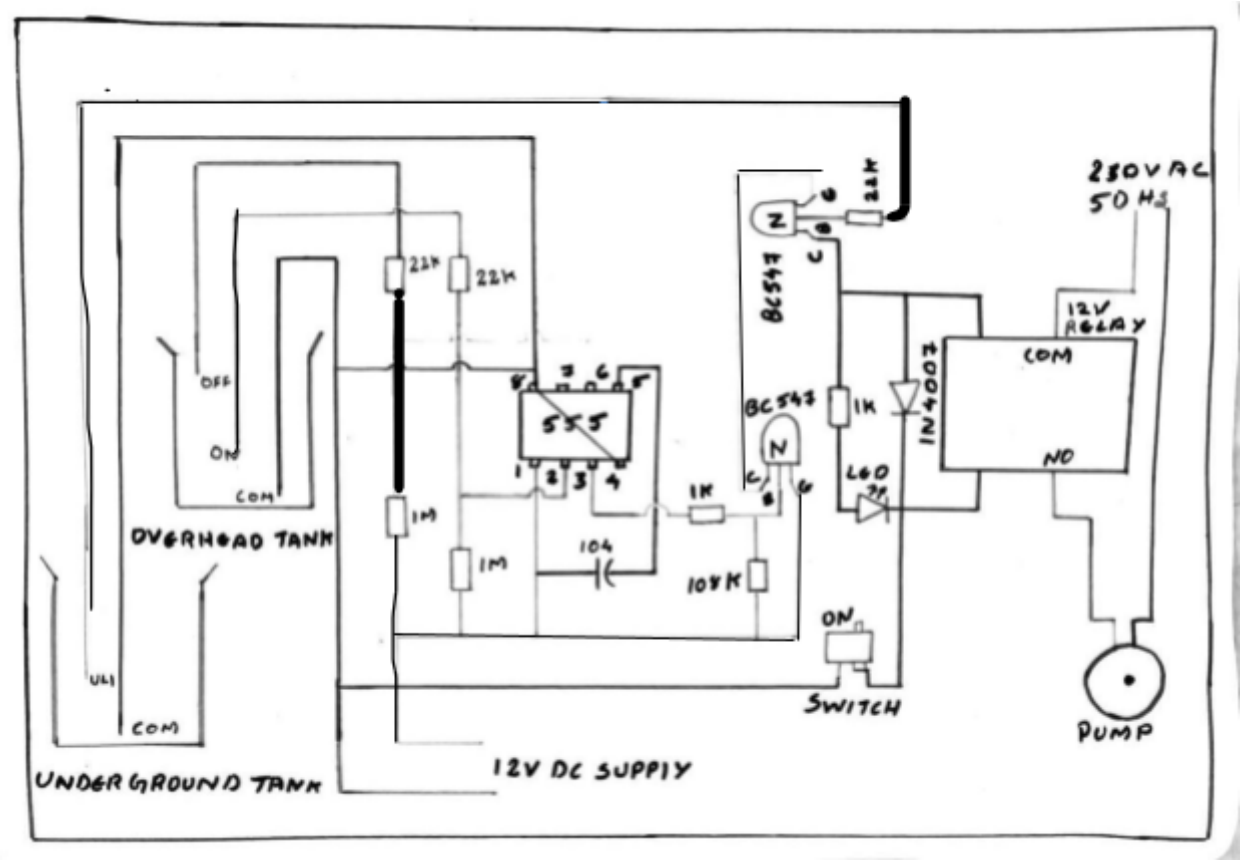


Fig 6.2 CIRCUIT DIAGRAM

6.3 WORKING

In most houses, water is first stored in an underground tank (UGT) and from there it is pumped up to the overhead tank (OHT) located on the roof. People generally switch on the pump when their taps go dry and switch off the pump when the overhead tank starts overflowing. This results in the unnecessary wastage and sometimes non-avail-ability of water in the case of emergency. This water-level controller circuit makes this system automatic. It switches on the pump when the water level in the overhead tank goes low and switches it off as soon as the water level reaches a predetermined level. It also prevents 'dry run' of the pump in case water level in underground tanks goes below suction level.

In this water-level controller circuit, aluminum wires are used as probes. The common probes in the circuit connecting the underground tank and the overhead tank to +12V supply are marked as common 'COM'. The other probe in the underground tank, which is slightly above the 'dry run' level, is marked 'UL1'. The low-level and high-level probes in the overhead tank are marked 'ON' and 'OFF', respectively. When there is enough water in the UGT, probes COM and UL1 are connected through water. As a result, the NPN transistor T1 gets forward biased and starts conducting.

Initially, when the OHT is empty, the 555 timer IC gets a voltage less than Vcc/3 in the trigger pin and allows the output to switch from low to high. And also, we can reset the IC by application of a low voltage at the fourth pin (reset pin). The NPN Transistors T2 get forward biased via the high base voltage. The 2 transistors T1, andT2 are forward biased, they conduct to energize the 12V relay. Thus, the indicator bulb is on and the supply to the pump motor gets completed via the normally open (NC) relay contacts and the pump starts filling the overhead tank. As soon as the water level touches the probe LOW in the OHT, 555 gets a triggering pulse which energizes the relay, and the pump continues to run. The level of water continues to rise.

When the water level touches probe OFF, a positive pulse is given to the threshold pin of the 555IC. It compares the voltage applied to this pin with the reference voltage and makes a low output. Transistor T2 gets only low voltage and it gets cut off. As a result, the relay de-energizes and the pump stops. The transistors T2 will be turned on via 555IC again only when the water level drops below the position of the LOW probe. When there is not enough water in the UGT, probes COM and UL1 are not connected through water. As a result, the NPN transistor T1 gets reverse biased and it is not conducting. As a result, the circuit becomes incomplete and the motor always in off condition.

CHAPTER 7
RESULTS AND DISCUSSION

The automatic water level controller has been successfully designed and developed. The submersible pump is turned off and on according to the level of water in the tank. Compared to other conventional methods, the automated self-isolating water level controller shows excellent performance with its reliable technology and is cheaper and durable. The automatic water level controller is a promising controller in terms of system response in water level control with respect to the nonlinearity introduced by pumps and sensors. The experimental model was made according to the circuit diagram and the results were as expected. The motor pump switched ON when the overhead tank was about to go dry and switched OFF when the Overhead tank was about to overflow.

During our project work we observed the following:

The time taken by the control circuit to stop and start the motor when water reaches its predetermined level is about 20 milliseconds

CHAPTER 8
CONCLUSIONS

8.1 CONCLUSIONS

These days, when Earth's reserve of consumable water is decreasing every moment, every drop has its value. A 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.

Thus, the automatic water level controller is a big boon as it is concerned with the household applications as well as other water saving purposes including agricultural sector and industries. The automatic water level controller has a rising demand and it is a good asset from the electronics perspective.

Hence, we conclude that-

1. This system is very beneficial in rural as well as urban areas.

2.It helps in the efficient utilization of available water sources.

3. If used on a large scale, it can provide a major contribution in the conservation of water for us and the future generations.

8.2 FUTURE SCOPES

Automatic water level monitoring systems have a good scope in the future especially for the agriculture sector. There are many areas where we need a water level controller. It could be agricultural fields, overhead tanks. We can make this project wireless by using NRF transmitter and receiver. We can also add Ethernet shields so that we can get all the information using mobile phones and control it accordingly. The project could be extended by installing pH sensors which will help to regulate the acidity or alkalinity of the water.

Hence providing the information for the need of cleaning the tank. The same implemented system could be monitored using an app operating on IoT.

CHAPTER 9
COST ESTIMATION

COMPONENT NAME	KEY SPECIFICATION	QUANTITY	TOTAL PRICE
TRANSFORMER	12 V, 1 A	1	200
DIODE	1 A, 1000 V	5	50
CAPACITOR	100 nF, 1000 mF, 1mF	3	30
LM7812	2.2 A, 45 V	1	15
555 TIMER	200 mA, 16 V	1	20
TRANSISTOR	100 mA, 45 V	2	30
LED	1.5 V,5 mm, Red	1	15
RESISTOR	1K-0.25 W,22K -0.25 W,180K -0.25 W, 1 M-0.25 W	8	40
RELAY	SPDT, 12 V	1	30
WATER PUMP	5 W, 230V	1	30
SWITCH	SPDT (SLIDE TYPE)	1	30

TABLE 9.1 COST ESTIMATION TABLE

REFERENCES

[1] Asaad Ahmed Mohammed Ahmed Eltaieb and Zhang Jian Min, Automatic Water Level Control System, International Journal of Science and Research (IJSR), Volume 4 Issue 12, December 2015.

[2] Beza Negash Getu and Hussain A. Attia, Automatic Water Level Sensor and Controller System, Â©2016 IEEE.

[3] Priya J, Sailusha Chekuri, water level monitoring system using IoT, International Research Journal of Engineering and Technology (IRJET) Volume: 04 Issue: 12, Dec-2017.

[4] Madhurima Santra, Sanjoy Biswas, Sibasis Bandhapadhyay and Kaushik Palit, Smart Wireless water level Monitoring & Pump controlling System, International Journal of Advances in Scientific Research and Engineering (IJASRE), Vol. 03, Issue 4, May -2017.

[5] K. Santhosh Kumar, G. Mukesh, K. Deepti, Microcontroller based Automatic Water level Control System, International Refereed Journal of Engineering and Science (IRJES) Volume 4, Issue 11, November 2015.

[6] Sanam Pudasaini, Anuj Pathak, Sukirti Dhakal and Milan Paudel, “Automatic Water Level Controller with Short Messaging Service (SMS) Notification”, International Journal of Scientific and Research Publications, Volume 4, Issue 9, September 2014.

APPENDICES

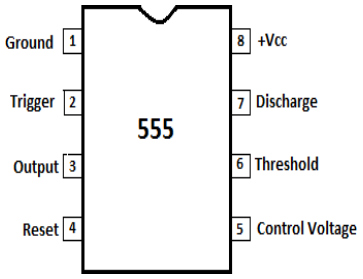
A.1 NE555

Description

These devices are precision timing circuits capable of producing accurate time delays or oscillation. In the time- delay or monostable mode of operation, the timed interval is controlled by a single external resistor and capacitor network. In the astable mode of operation, the frequency and duty cycle can be controlled independently with two external resistors and a single external capacitor.

The threshold and trigger levels normally are two-thirds and one-third, respectively, of VCC. These levels can be altered by use of the control-voltage terminal. When the trigger input falls below the trigger level, the flip-flop is set, and the output goes high. If the trigger input is above the trigger level and the threshold input is above the threshold level, the flip-flop is reset and the output is low. The reset (RESET) input can override all other inputs and can be used to initiate a new timing cycle. When RESET goes low, the flip-flop is reset, and the output goes low. When the output is low, a low- impedance path is provided between discharge (DISCH) and ground.

The output circuit is capable of sinking or sourcing current up to 200mA. Operation is specified for supplies of 5V to 15V. With a 5-V supply, output levels are compatible with TTL inputs.



Features

Timing from microseconds to hours

Astable or monostable operation

Adjustable duty cycle

TTL compatible output can source or sink up to 200mA

“Green” Molding Compound (No Br, Sb)

Lead Free Finish/ RoHS Compliant (Note 1)

Functional Table

Pin Name	Nominal Trigger Voltage	Threshold Voltage	Output	Discharge Switch
GND	Irrelevant	Irrelevant	Low	On
TRIG	<1/3VCC	Irrelevant	High	Off
OUT	<1/3VCC	<2/3VCC	Low	On
RESET	<1/3VCC	<2/3VCC	As previously established	

Electrical parameters

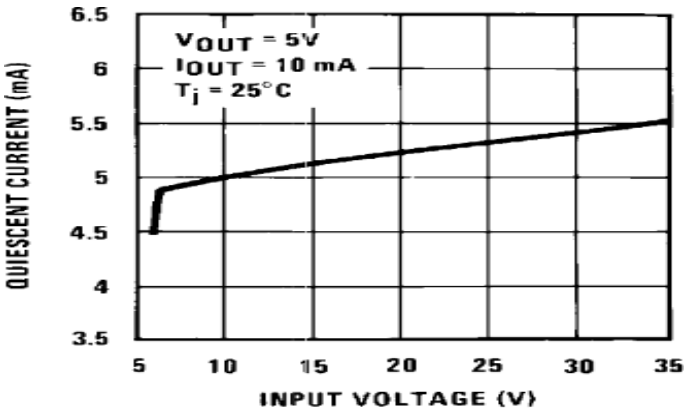
Integrated Circuit	555 TIMER
Total Pin	8 pins
Input Pin	2
Output Pin	3
Max supply Voltage	18 v
Supply current	15 mA
Threshold voltage	11.2 v
level Junction	150°c
temperature Output	225mA
Current	-60-150°c
Storage Temperature	1v
Reset Voltage	0.4mA
Reset Current	2 *M*A
Trigger Current	

A.2 VOLTAGE REGULATOR

The LM7812 series of three terminal positive regulators are available in the TO-220 package and with several fixed output voltages, making them useful in a wide range of applications. Each type employs internal current limiting, thermal shut down and safe operating area protection, making it essentially indestructible. If adequate heat sinking is provided, they can deliver over 1A output current. Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltages and currents.

Voltage Regulator IC	LM 7812
Max Input Voltage	35 V
Output Voltage	12 V
Peak Current	2.2 A
Short Circuit current	230 mA
Operating Temperature	0-125°C
Ripple Rejection	73 dB
Output Resistance	0.018
Quiescent Current	ohm
Dropout Voltage	8mA
Line Regulation	2 V
Load Regulation	240 mV
Storage Temperature Range	120-240 mV
	-65-120°c

V-I Characteristics



A.3 RECTIFIER DIODES

Features

The plastic package carries Underwriters Laboratory

Flammability Classification 94V-0

Construction utilizes void-free

Molded plastic technique

Low reverse leakage

High forward surge current capability

Parameter		1N4001
Peak Reverse Voltage		50
RMS Voltage		35
DC Blocking Voltage		50
Forward Voltage @ IF=1A		1.1
Average Rectified Current		1
Reverse Voltage Leakage Current Ta = 25℃		5
Ta = 75℃		50
Typical junction capacitance		15
Junction Temperature		150
Storage Temperature range		-55 to 150

A.4 TRANSISTOR BC547

Transistor Type	NPN
Maximum collector current	100 mA
Maximum collector – emitter voltage	45 V
Maximum collector-base voltage	50 V
Maximum emitter-base voltage	6 V
Maximum transition frequency	300 MHz

A.5 SPDT RELAY

Trigger Voltage (Voltage across coil)	12V DC.
Trigger Current	100mA.
Maximum AC load current	7A at 250/125V AC
Maximum DC load current	104 at 30/28V DC.
Maximum switching	300 operating/minute