

Water Pump Controller using Arduino UNO

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Abstract— People face a problem of water shortage cause of very low temperature in the high altitude areas resulting in freezing of water pipes. So, they either have to change the water pipes or remove the blockage. As the diameter of water pipe is small so water easily gets frozen, as in other case it takes a lot of time for large amount of water to get frozen like water tank, etc. By using this Arduino water pump controller it will make it very easy for the people to get access to water for their daily use.

Key words: Arduino UNO, Water Pump Controller

I. INTRODUCTION

As people cannot get easy access to water in the high altitude areas where the temperature is very low because of which the water gets frozen in the pipelines because the water gets frozen easily if it is completely filled in the pipe. This is a very big problem in areas with low temperature. Giving a solution to this problem the water pump controller will be in which there is a temperature sensor which will sense the temperature in the environment and if the temperature is below freezing point the water will be sent in small gaps through the pipeline because of which the pipe won't be full of water and the water won't turn into ice. And when the temperature is above freezing point the water will flow through the pipes continuously without any gaps.

A. Different Types of Arduino Board

Arduino is a software and hardware company that manufacturers and designs many microcontrollers and single board microcontrollers that are used for different applications and projects. Types of Arduino boards are:

- Lily pad Arduino.
- Arduino mega.
- Arduino Leonardo.
- Red board.
- Arduino UNO.

The arduino board used in this project is Arduino UNO

B. Arduino Uno

Arduino is a open source platform used for building electronic projects. Arduino consists of both software or IDE (Integrated Development Environment) and microcontroller that runs on the computer, which is used to write the code and upload the code to the physical board. It has become very popular among the people who are just starting out with electronics. The Arduino board does not need a separate piece of hardware to load the code. The code can be loaded simply using a USB cable.



Fig. 1: Arduino UNO board

C. LCD:-

LCD is a type of display which is used in digital watches, TVs and many portable computers. The LCD display uses sheets of polarizing material with a liquid crystal solution between them. An electric current passes through the liquid which causes the crystals to align so that the light cannot pass through them. The technology of the LCD has advanced very fast since its first inception which was launched over a decade ago. The up gradations have resulted in brighter displace, higher resolutions, reduce response time and lower cost for manufacturing process.



Fig. 2: LCD Display (2 x 16)

II. TYPES OF TEMPERATURE SENSOR

There are many different temperature sensors with different range of sensing capacity. These temperature sensors can be used for different applications. Some of the temperature sensors are:

- Thermistors.
- Resistor temperature detectors.
- Infrared sensors.
- Thermometers.
- Semiconductors.
- Thermocouples.

The sensor used in this project is LM35 sensor.

A. LM35 Temperature Sensor:-

The LM35 temperature sensor is very precise in sensing the temperature. It gives output which is proportional to the

centigrade temperature. The LM35 is much better than the linear temperature sensor (that calibrates in Kelvin) as there is no need to change the large constant voltage from the output to get a convenient centigrade scaling. It does not require any external calibration or the need for trimming to get it at accurate room temperature. The range of this sensor is -55°C to 150°C . The LM35 device makes interfacing to readout and control circuitry easy because of the linear output, low output impedance and precise inherent calibration. This device is used with single power or plus and minus supplies. The LM35 device has a very low self heating that is less than 0.1°C because it draws only $60\ \mu\text{A}$ from the supply.

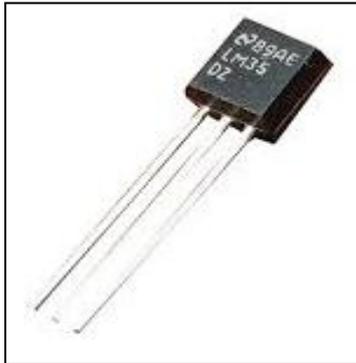


Fig. 3: LM35 SENSOR

1) Features of Lm35 Sensor:-

- 1) 0.5°C ensured accuracy (at 25°C)
- 2) Rated for full -55°C to 150°C range.
- 3) Low cost due to water level trimming.
- 4) Operates from 4V to 30V.
- 5) Low self-heating 0.08°C in still air.
- 6) Suitable from remote applications.
- 7) Linear $+10\text{-mV}/^{\circ}\text{C}$ scale factor.
- 8) Calibrated directly in in Celsius (centigrade)

B. LM35 Sensor Functional Diagram:

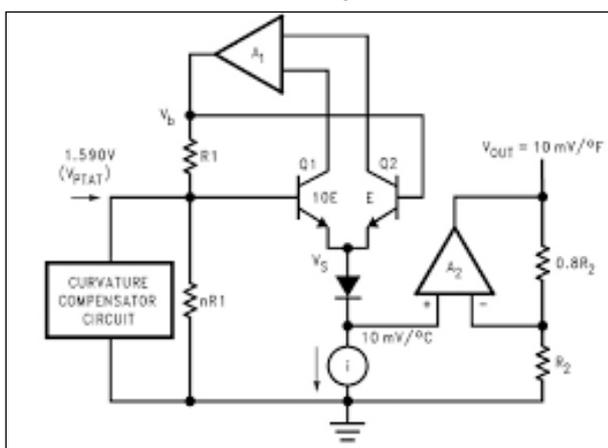


Fig. 4: Functional Diagram of LM35 Sensor.

III. OPTOCOUPLER

An optocoupler is also called as an photo coupler or an optical isolator which is an electronic component that is used to transfer electrical signal between two isolated circus by using light. It prevents the system that receives the signal from high voltages. Optocoupler that are commercially available

withstand input to output voltages up to 10kV and voltage transients with speeds up to $25\text{kV}/\mu\text{s}$.

The common optocoupler has a opaque package that consists of a LED and a phototransistor. Other types of combinations include LED-LASCR, LED-photodiode and lamp-photo resistor pairs. Usually it transfers digital signals but some other techniques allow it to be used with analog signals.

A. Operation of Optocoupler:-

An optocoupler contains a emitter which is a source of light almost always a near infrared LED(light emitting diode), that converts the electrical input signal into light, and a photosensor which is used to detect the incoming light and it either generates electric energy directly or electric current flowing from the external power supply. The sensor can be a silicon-controlled rectifier (SCR), a photo resistor, a photodiode. Construction of symmetrical bidirectional optocoupler is possible because LEDs can sense light in addition to emitting it. An optocoupler relay contains a photodiode optocoupler which drives a complementary pair of MOSFETs. A slotted optical switch contains a sensor and a source of light, its optical channel is open which allows the modulation of light by the external objects which obstruct the path of light or the reflecting light into the sensor.

IV. 5 PIN MINI SPDT 12V RELAY:-

A relay is a switch which is electrically operated there are many relays which use an electromagnet to operate the switch mechanically, other operating principles are also used such as a solid state relay. Whenever there is a need to control the circuit by a separate low power signal or several circuits are to be controlled by one signal a relay is used. The fist relays were used in circuits as amplifiers. The incoming signal from one circuit is re-transmitted to another circuit by repeating the signal. To perform logical operations in the early computers and telephone exchanges relays were used.

To handle the high power which is required to directly control an electric motor or other loads is a type of relay called a contactor. Instead of using a semiconductor to perform switching the solid state relay control power circuits with no moving parts. To protect electrical circuits from overload and faults relays with multiple operating coils are used in modern electric systems the functions are performed by a digital instrument called as 'protective relays'.

Magnetic latching relay consist of either one or two coils. It requires one pulse of coil power to move their contacts in one direction and another redirected pulse to move them back. If the pulse is repeated it will have no effect. Applications where interrupted power should not be able to transition the contacts, magnetic latching relays are useful.

In magnetic latching relays on a single coil device, the relay will operate in one direction when power is applied with one polarity and the polarity will be reversed when it is reset. On a dual coil device the coil is reset when polarized voltage is applied. To differentiate between operate reset commands an AC controlled magnetic latch relay is used which has a single coil that employs steering in diodes.



Fig. 5: PIN MINI SPDT 12V RELAY

V. BENEFITS OF WATER PUMP CONTROLLER:-

People can get easy access to water for their daily needs like cooking, washing, etc. it saves a lot of effort because when the water gets frozen in the pipes to again start the normal flow of water through the pipes, the pipes have to be removed and clean. It saves a lot of energy because the motor switches on and off according to the temperature in the environment automatically.

VI. CONVENIENT

It is very convenient as the motor switches on and off according to the temperature in the environment. There is no need to manually switch it on/off whenever it is to be needed.

VII. PROFITABLE

It is profitable to the user as it is cheap. It saves a lot of time as there is need to change the pipeline when the water gets frozen in the pipes in the high altitude areas, as it avoids the water to get freezed in the pipelines.

It requires less voltage to operate the Arduino UNO board as it takes 12V DC supply. This water pump controller can work for 5 years or more. There is no need to manually switch it on/off whenever it is to be needed, as the motor switches on whenever the temperature is below freezing point and it switches it off when the temperature is above freezing point this helps in saving energy.

VIII. CONCLUSION

This paper summarizes representation and brief information about the water pump controller used for the flow of the water in the pipelines without freezing.

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