

# Cooler Monitoring System

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**Abstract-** The main objective of the proposed system is to maintain the temperature of water and reduce the consumption of water in present ongoing environmental scenario. In our collage luckily we have cooler provision on every floor of the building. These cooler not only just filter the water but also provides cold water in summer days. The existing system cools and filters the water but there are many problems we need to suffer like wastage of water due to overflow of tank and over chilling of water even when there is no need of chilled/cold water and also monitoring the flow from the filter tubes which enables the exchange of those tubes time to time. So we need to find out the causes of water wastage and improve the water filtering system in colleges. It is an open-source project, software/hardware is extremely accessible and very flexible to be customized and extended. It is flexible, offers a variety of digital and analog inputs, SPI and serial interface and digital and PWM outputs. It is easy to use, connects to computer via USB and communicates using standard serial protocol, runs in standalone mode and as interface connected to PC/Macintosh computers. The objective of the proposed system is to continuously measure the level of water in the tank as soon as it reaches the maximum value it will turn off the supply or inlet of water. Again if the level is below the threshold value the turn off the supply inlet. Secondly, temperature of the water and the environment around the cooler will be continuously mentioned. The temperature of the cooler will be mentioned with reference to the external environment. Thirdly, the flow from the tubes reduces as the cooler gets old day by day. Hence to monitor the flow from the tubes the flow sensor is introduced and displays the health of the tube on the LCD display which makes it more user friendly as well.

**Index terms-** Arduino, water, filter, cooler, temperature

## I. INTRODUCTION

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the water but there are many problems we need to suffer like wastage of water due to overflow of tank and over chilling of water even when there's no need of chilled/cold water and also monitoring the flow from the filter tubes which enables the exchange of those tubes time to time. The objective of the proposed system is to continuously measure the level of water in the tank as soon as it reaches the maximum value it will turn off the supply or inlet of water. Again if the level is below the threshold value the turn off the supply inlet. Secondly, temperature of the water and the environment around the cooler will be continuously mentioned. The temperature of the cooler will be mentioned with reference to the external environment. Thirdly, the flow from the tubes reduces as the cooler gets old day by day. Hence to monitor the flow from the tubes the flow sensor is introduced and display the health of the tube on the LCD display which makes it more user friendly as well.

## II. EASE OF USE

The water, temperature, flow sensors which we are using have been in the market for a very long time and have been widely used. They have wide range of applications and can be found in industrial plants, refineries, pharmaceutical manufacturing, paper pulp mills, aircraft and shipbuilding facilities, wastewater treatment facilities, vehicles, indoor water quality testing and homes. They are categorized on the basis of what is the technology behind the making of the sensor and sometimes even the components which are used that affect their operation mechanism (semiconductors, oxidation, catalytic, photo ionization, infrared, etc.). These Detectors are also widely characterized as fixed or portable detectors.

## III. RELATED WORK

Before you begin to format your paper, first write and save the content as a separate text file. Complete all

content and organizational editing before formatting. Please note sections A-D below for more information on proofreading, spelling and grammar.

Keep your text and graphic files separate until after the text has been formatted and styled. Do not use hard tabs, and limit use of hard returns to only one return at the end of a paragraph. Do not add any kind of pagination anywhere in the paper. Do not number text heads-the template will do that for you.

#### A. Arduino UNO

Arduino Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.



Fig.1: Arduino UNO board

You can tinker with your UNO without worrying too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again. "Uno" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0. The Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases. The Uno board is the first in a series of USB Arduino boards, and the reference model for the Arduino platform; for an extensive list of current, past or outdated boards see the Arduino index of boards.

#### B. Water level sensor

There are various water level sensors are available in the market. We are using here ultrasonic sensor for the water level measurement. The HC-SR04 ultrasonic module is a module that can provide non-contact measurement within the range of 2cm to

400cm with ranging accuracy that can reach 3mm. It works on the principle of echolocation the ultrasonic sensor as a trigger and an echo pin. The Arduino provides a high signal of 10microseconds to this pin. After the HC-SR04 is triggered, it sends out eight 40 KHz sound waves to the surface of the water. On getting to the surface of the water, the wave is echoed back to the sensor and the Arduino reads the echo pin to determine time spent between triggering and receiving of the echo. Since we know that the speed of sound is around 340m/s then we can calculate the distance using;  $\text{Distance} = (\text{time}/2) * \text{speed of sound}$  To determine the level of the water in the tank we must know the total length of the tank. It is these values that will enable us calibrate our tank to our taste.

#### C. Water temperature sensor(DS18B20)

The DS18B20 Digital Thermometer provides 9 to 12-bit (configurable) temperature Readings which indicate the temperature of the device. Information is sent to/from the DS18B20 over a 1-Wire interface, so that only one wire (and ground) needs to be connected from a central microprocessor to a DS18B20. Power for reading, writing, and performing temperature conversions can be derived from the data line itself with no need for an external power source. Because each DS18B20 contains a unique silicon serial number, multiple DS18B20s can exist on the same 1-Wire bus. This allows for placing temperature sensors in many different places. Applications where this feature is useful include HVAC environmental controls, sensing temperatures inside buildings, equipment or machinery, and process monitoring and control.

#### D. Water flow sensor

An accurate flow measurement is essential, both from a qualitative and an economic point of view. Keeping this in mind, the type of Water Flow Sensor used here is YFS201. The sensor contains a pinwheel and sits in line with the water line such that water will pass through the sensor striking the pinwheel and rotating it to measure how much water has passed through it. There is an integrated magnetic Hall-Effect Sensor that will output an electric pulse for every revolution of the pinwheel. By using a suitable conversion formula, we can translate the number of pulses into liters of water that has flown through it. The Hall

Effect Sensor - The Hall effect is the production of a voltage difference (the Hall voltage) across an electrical conductor, transverse to an electric current in the conductor and a magnetic field perpendicular to the current.

#### IV. SYSTEM ARCHITECTURE

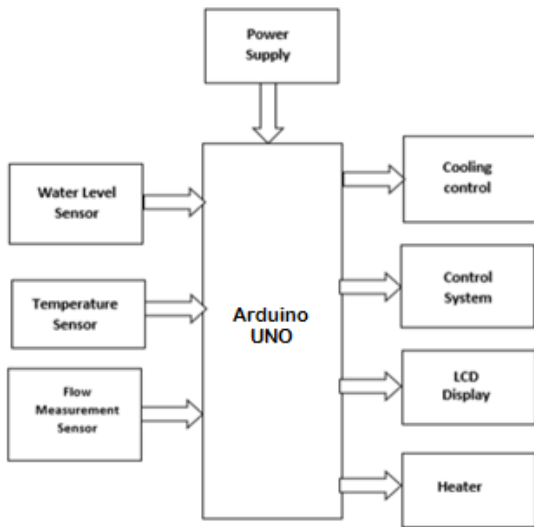


Fig.2: Block diagram

The basic block diagram of a cooler monitoring system using Microcontroller is shown in the above figure. Mainly this block diagram consist of the following essential blocks.

1. Power Supply
2. Water level sensor
3. Temperature sensor
4. Flow measurement sensor
5. Cooling control
6. LCD display Control system

##### 1. Power Supply

The main function of this block is to provide the required amount of voltage to essential circuits. Here we used +12V dc power supply. +5V is given to microcontroller, water level sensor, temperature sensor, flow measurement sensor. +12V is given to the Relay circuit. 7812 Voltage regulator IC 7812 Voltage regulator is a type of self-contained fixed linear voltage regulator integrated circuit. The IC belongs to ic 78xx voltage regulator family. The 7812 voltage regulator IC is ease-of-use and available in very low cost. The last two digits of 7812 indicates the output voltage that is 12 V The ic 7812 is a

positive voltage regulator which means that it generates the positive

Voltage with respect to the common ground. In case if both the positive and negative voltage supply is needed in the same circuit. The voltage regulator ic 7812 is combined with its corresponding 79XX family IC that is 7912 IC. The voltage regulator 7812 is available most commonly in TO-220 packages well as TO-3, TO-92 and surface mount Packages. The ic 7812 Voltage regulators do operate at their optimal capability, if the input voltage is at least 2.5 volt greater than the output voltage (i.e 14.5 V min.) and the current is 1 or 1.5 Amperes more. Though the voltage and current difference is different for other IC Packages. The 7812 ic have 3 pins.

1. The positive input is at pin 1.
2. The Pin 2 is common between both input as well as output voltage.
3. 3 .Pin 3 is a positive output.

##### Advantages of ic 7812

7812 voltage regulator ic does not require any component to balance or saturate their output voltage. The 7812 ic has a built-in protection from the high current. It has a heat-sink with the common ground connected with it. The heat sink prevents our regulator ic from overheating and short-circuits. What is Step down Transformer a Step down Transformer is a device which converts high primary voltage to a low secondary voltage. In a Step down Transformer, the primary winding of a coil has more turns than the secondary winding. Figure 1 below shows the winding representation of a typical Step-Down Transformer

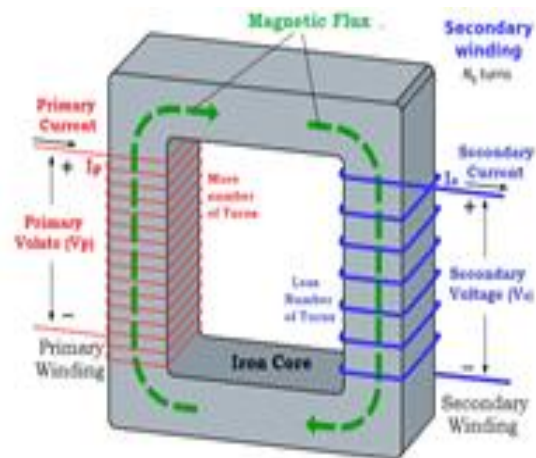


Fig.3: Step down transformer

**Working Principle of Step down Transformer**

Transformer work on the principle of Faradays law of electromagnetic induction. Mutual induction between the windings is responsible for transmission action in a transformer.

Faradays law states that when the magnetic flux linking a circuit changes, an electromotive force is induced in the circuit proportional to the rate of change of the flux linkage. The emf (Electro Motive Force) induced between the two windings is determined by the number of turns in primary and secondary winding respectively. This ratio is called as “Turns Ratio”. The voltage reduction capability of step down transformers depends on the turn ratio of the primary and secondary coil. As the number of windings in secondary coil is less as compared to the number of windings in primary coil, so the amount of flux linkage to the secondary coil of the transformer will also be less compared to the primary coil. Accordingly, the emf induced will be less in the secondary coil. Due to this, the voltage reduces at the secondary winding compared to primary winding

**Step Down Transformer Equation** The formula used to design a Step Down Transformer is

$$\frac{N_S}{N_P} = \frac{V_S}{V_P}$$

Where,

1. N<sub>s</sub> = number of turns in secondary
2. N<sub>p</sub> = number of turns in primary
3. V<sub>s</sub> = Voltage in secondary
4. V<sub>p</sub> = Voltage in primary

The number of turns in secondary winding should always be less than the number of turns in the primary winding of the transformer i.e N<sub>p</sub>/N<sub>s</sub> to work transformer as Step-Down Transformer As the number of turns will be less in secondary winding, so will be total induced emf and hence the output voltage in the secondary will also be less than the primary input voltage. Lets understand by considering the situation of Step-Down Transformer in which the secondary turns [N<sub>s</sub>] are 250, primary turns [N<sub>p</sub>] are 5000 and the input voltage [V<sub>p</sub>] is 240. Then the voltage at the secondary [V<sub>s</sub>] can be calculated by using the formula:

$$\frac{N_S}{N_P} = \frac{V_S}{V_P}$$

Buy rearranging the equation we get:

$$\begin{aligned} V_s &= \frac{N_S}{N_P} \times V_P \\ &= \frac{250 \cdot 240}{5000} \\ &= \mathbf{12v} \end{aligned}$$

Hence, the voltage at the secondary winding of the transformer is 12V, which is less than that at the primary winding. Therefore, the transformer in said to be a Step down Transformer.

**2. Water Level Sensor**

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Fig.4: Water level sensor

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Fig. 6(a): Water flow sensor

There is an integrated magnetic Hall-Effect Sensor that will output an electric pulse for every revolution of the pinwheel. By using a suitable conversion formula, we can translate the number of pulses into liters of water that has flown through it. The Hall Effect Sensor - The Hall effect is the production of a voltage difference (the Hall voltage) across an electrical conductor, transverse to an electric current

in the conductor and a magnetic field perpendicular to the current.

YF-S201 Water Flow Sensor can be used to measure the flow of liquids in both industrial and domestic applications. This sensor basically consists of a plastic valve body, a rotor and a Hall Effect sensor. The pinwheel rotor rotates when water / liquid flows through the valve and its speed will be directly proportional to the flow rate. The Hall Effect sensor will provide an electrical pulse with every revolution of the pinwheel rotor. This water flow sensor module can be easily interfaced with Microcontrollers, Arduino Boards and Raspberry Pi.



Fig. 6(b): Water flow sensor

#### What is Water Pump?

The water pump can be defined as a pump which uses the principles like mechanical as well as hydraulic throughout a piping system and to make sufficient force for its future use. They have been approximately in one structure otherwise another because of early civilization. At present these pumps are utilized within a wide range of housing, farming, municipal, and manufacturing applications.

#### Water Pump Working Principle

The working principle of a water pump mainly depends upon the positive displacement principle as well as kinetic energy to push the water



Fig. 6(c): Water pump

These pumps use AC power otherwise DC power for energizing the motor of the water pump whereas others can be energized other kinds of drivers like gasoline engines otherwise diesel. The water pump is a portable device and can be applied in several household applications. These pumps are used for

pumping the huge amount of water from one place to another. The main purpose of a water pump is versatile. A quality pump which can be selected carefully may be perfect for draining water from a low flooded region, refilling the swimming pool, and bathtub, circulating pesticides otherwise fertilizers.

#### 5. LCD Display

An LCD is an electronic display module which uses liquid crystal to produce a visible image. The 162 LCD display is a very basic module commonly used in DIYs and circuits. The 162 translates a display 16 characters per line in 2 such lines. In this LCD each character is displayed in a 57 pixel matrix.

Features of 16\*2 LCD module

Operating Voltage is 4.7V to 5.3V Current consumption is 1mA without backlight Alphanumeric LCD display module, meaning can display alphabets and numbers Consists of two rows and each row can print 16 characters. Each character is built by a 58 pixel box Can work on both 8-bit and 4-bit mode It can also display any custom generated characters Available in Green and Blue Backlight

#### V. ACKNOWLEDGEMENT

It gives us great pleasure in presenting the preliminary project phase-1 report on 'COOLER MONITORING SYSTEM'.

We would like to take this opportunity to thank our internal guide Ms. T. S. Deshmukh for giving us all the help and guidance we needed. We are really grateful to them for their kind support. Their valuable suggestions were very helpful.

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In the end our special thanks to Management and Principal for providing various resources such as laboratory with all needed software platforms, continuous support, for Our Project

#### VI. CONCLUSION

Our system is reasoned to help customers to upgrade their daily water consumption and their coolers system which the use on daily basis, the main objective of the proposed system is to maintain the

temperature of water and reduce the consumption of water in present ongoing environmental scenario and make human life easier.

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