International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 04 Issue: 08 | August -2020 ISSN: 2582-3930

# A Review Paper On Ice Melting Road

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**Abstract -**In this paper,a detailed explanation of the system designed to face road blocking problems due to snowfall is explained. In winter the airports which are situated in areas where snowfalls have problem-related to the accumulation of snow on runways, which will cause serious accidents. In there are few places wherein a calendar year most snowfall comes. Due to that snowfall transportation gets stuck many times. Roads get packed with snow. There are many problems faced while traveling in such places. In an emergency, it is very important to have a clear road. So to avoid such a problem a system is designed on a trial basis. This will help to clear the snowfall from roads and airports or railway tracks. We are designing a system especially for the airport which is on faster transportation in the world.

***Key Words***:Heater, Roads, Ice, Arduino, Car, Airport, Snowfall

## 1.INTRODUCTION

Accumulation of snow on airport runways is the main obstacle during the winter season in areas where snow falls very heavily during the winter season. Due to heavy snowfall runway get blocked all transport gets stopped. There are some cases where severe accidents were happened due to the slippery nature of the road because of layers on ice on the road. In this project work the problem is identified as accumulation ice on roads of airports and to overcome this problem the system is designed which will try to melt the ice on the rods by using heat or we can say that use of thermal energy. Before design and developing a sample working model on this issue, the team developed a comprehensive understanding through brainstorming and reading various research papers on it the issues related to snowfall and the energy needed to effectively prevent accumulation. The objectives of this work are to Melt snowfall on the airport and make a clear and snow-free airport runway.

## 2. METHODOLOGY

The methodology used to tackle the issue regarding accumulation ice on airport runways is this system is, all working objects will be inserted inside the road or below the road and roadside station. Copper plates will be inserted in airport runway road while constructing airport runway. These copper plates will be heated using DC heaters so that it will produce heat which will be sufficient to melt the ice layer present on the road.

## 3. BLOCK DIAGRAM OF SYSTEM

As shown in Fig-1 the various elements used while design prototype of the working model of the system are power supply(SMPS), temperature sensors, Arduino, relay, and heaters.

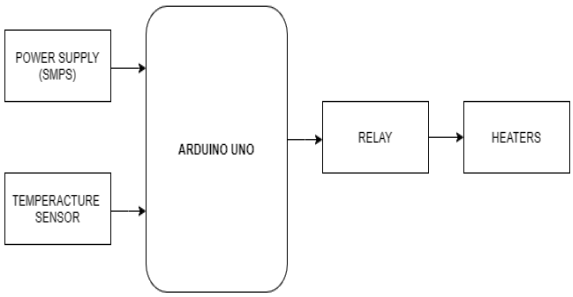


**Fig -1**: Block diagram of a system

## 4. WORKING OF SYSTEM

As shown in the Fig-1 shows that the block diagram of the system here in the system Arduino Uno has used as the microcontroller the power supply has given to the Arduino and heaters through the 12 volts 20 amp SMPS here in the system 6 heaters have used to heat the copper plate which is inside the road the power supply has given to through SMPS to the heater via Relay module again which relay module has connected to Arduino when the relay is on the current flows and heater get on. Here is the system lm35 temperature sensor has used to read road temperature of the road if temp will cross 35 degree Celsius relay automatically will off.

## 5. VARIOUS HARDWARE USED

### A. Arduino Uno

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, 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 an Arduino UNO computer with a USB cable or power it with an AC-to-DC adapter or battery to get started. The Arduino Uno can be powered via the USB connection or with an external power supply. The power source is selected automatically.

External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm center-positive plug into the board's

power jack. Leads from a batterycan be inserted in the Gnd and Vin pin headers of the POWER connector.

The board can operate on an external supply of 6 to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts.

Arduino is a tool for making computers that can sense and control more of the physical world than the desktop computer.Arduino can be used to develop interactive objects,taking input from a variety of switches or sensors,and controlling a variety of lights,motor,and physical output.

The advantages of using Arduino than other microcontrollers are,inexpensive,simple programming environment and open source and extensible software as well as hardware. It is used as a controller. It's an open-source physical computing platform based on simple microcontroller board

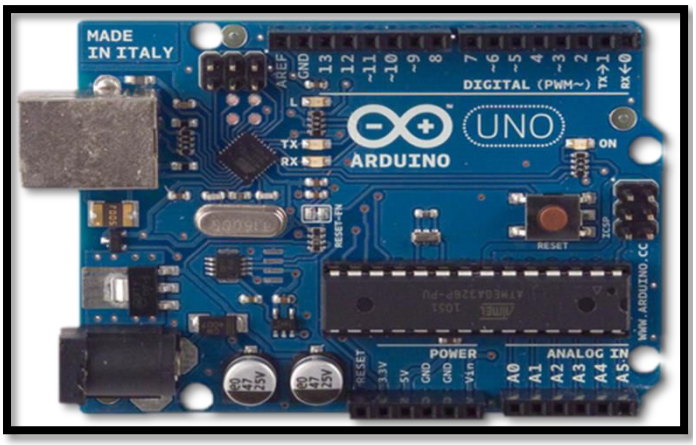


**Fig -2**: Ardunio board in the project work

| | |
|---|---|
| Microcontroller | ATmega328 |
| Operating Voltage | 5V |
| InputVoltage | 7-12V |
| Input Voltage (limits) | 6-20V |
| Digital I/O Pins | 14 (of which 6 provide |
| Analog Input Pins | 6 |
| DC Current per I/O Pin | 40 Ma |
| DC Current for 3.3V Pin | 50 Ma |
| Flash Memory | 32 KB (ATmega328) of |
| SRAM | 2 KB (ATmega328) |
| 2 KB (ATmega328) | 1 KB (ATmega328) |
| Clock Speed | 16 MHz |

**Table -1:** Detail specification of Ardnio board used

**B. ESP8266 Wi-fi module**

The ESP8266 Wi-Fi Module is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your Wi-Fi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Finetworking functions from another application processor. Each ESP8266 module comes pre-programmed with an AT command set firmware, meaning, you can simply hook this up to your Arduino device and get about as much WiFi-ability as a WiFi Shield offers (and that's just out of the box)! The ESP8266 module is an extremely cost-effective board with a huge, and ever-growing, community.

This module has a powerful enough on-board processing and storage capability that allows it to be integrated with the sensors and other application-specific devices through its GPIOs with minimal development up-front and minimal loading during runtime. Its high degree of on-chip integration allows for minimal external circuitry, including the front-end module, is designed to occupy minimal PCB area. The ESP8266 supportsAPSD for VoIP applications and Bluetooth co-existence interfaces; it contains a self-calibrated RF allowing it to work under all operating conditions and requires no external RF parts.

There is an almost limitless fountain of information available for the ESP8266, all of which has been provided by amazing community support. In the *Documents* section below you will find many resources to aid you in using the ESP8266, even instructions on how to transforming this module into an IoT (Internet of Things) solution

The Wi-Fi- Module used has the following specifications

- 802.11 b/g/n
- Wi-Fi Direct (P2P), soft-AP
- Integrated TCP/IP protocol stack
- Integrated TR switch, balun, LNA, power amplifier and matching network
- Integrated PLLs, regulators, DCXO and power management units
- +19.5dBm output power in 802.11b mode
- Power down leakage current of <10uA
- 1MB Flash Memory
- Integrated low power 32-bit CPU could be used as an application processor
- SDIO 1.1 / 2.0, SPI, UART
- STBC, 1×1 MIMO, 2×1 MIMO
- A-MPDU & A-MSDU aggregation & 0.4ms guard interval
- Wake up and transmit packets in < 2ms
- Standby power consumption of < 1.0mW (DTIM3)

**C. LM- 35 SENSOR**

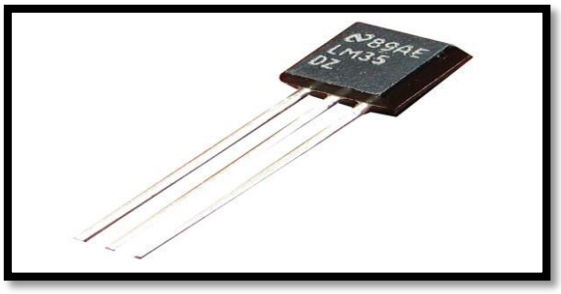


**Fig -2**: LM-35 Sensor

Temperature sensor operates from 4v to 30 v and suitable for remote appliances. It is calibrated directly in Celsius (centigrade).Temperature sensor is a device which is designed specifically to measure the hotness or coldness of an object.LM35 is a precision IC temperature sensor with it's output proportional to the temperature (in degree Celsius). With LM35, the temperature can be measured more accurately then with a thermistor. It also possess low self-heating and does not cause more than 0.1 degree Celsius temperature rise in still air. The operating temperature range is from -55 to 150 degree Celsius. The LM35 low output impedance, linear output, and precise inherent calibration makes interfacing to readout or control circuitry especially easy.

LM-35 Sensor Features:-

- Calibrated directly in Celsius temperature sensors, with an output voltage linearly.
- Rated for Full -55 to +150 degree Celsius Range sensors calibrated in Kelvin as the user is not.
- Low cost due to Water-Level Trimming LM35 does not require any external calibration
- Operates from 4 to 30 V
- Low self-Heating 0.008 degree Celsius in still air trimming and calibration at the wafer level.

LM-35 Sensor Applications:-

- It has find it's applications on power supplies, battery management, appliances.
- It is used to detect precise centigrade temperature.
- It is widely used in domestic and industrial applications such as: refrigerators; ovens; HVAC environmental control; in the automotive industry to monitor air intake, coolant or cylinder head temperatures.

## 6.ARDUINO PROGRAM USED FOR WORKING MODEL

```
int sensor= A0;
int relay = 7;
void setup() {
pinMode(relay,OUTPUT);
Serial.begin(9600);
digitalWrite(relay, LOW);
      }
void loop() {
intval = analogRead(sensor);
int temp = val * 0.4887585533;
Serial.println(temp);
if(temp>40)
     {
digitalWrite(relay, HIGH);
            Serial.println("heating system is off");
     }
else
     {
            digitalWrite(relay, LOW);
            Serial.println("heating system is on");
     }
}
```

## 7.WORKING MODEL PROTOTYPE DESIGN

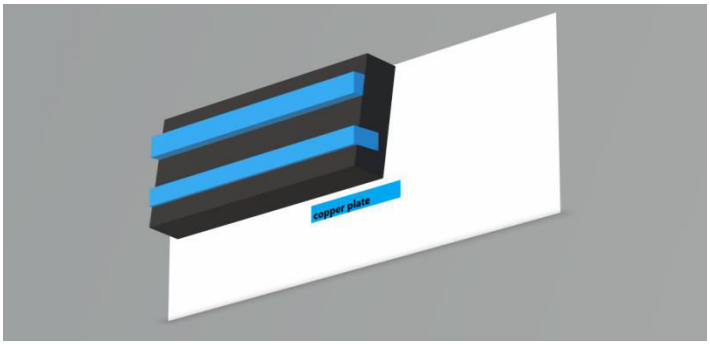


**Fig -3**: Working model prototype

## 8.COST ANALYSIS OF THE PROJECT

| Sr | Parts | Quantity | Amount |
|---|---|---|---|
| 1 | Arduino uno | 1 | 450 |
| 2 | Relay | 1 | 150 |
| 3 | Heaters | 6 | 1200 |
| 4 | SMPS | 1 | 950 |
| 5 | Copper plates | 6 | 1000 |
| 6 | Plywood | 2 Square feet | 500 |
| 7 | Cement | 1kg | 100 |
| 8 | Wiring | 10 | 30 |
| 9 | Total | 4400 Rs. Approx | |

**Table -2:** Expected cost of the project

## 9. CONCLUSION

Ice and snow have always been a challenge for road administrators in cold climates. Increasing demands on accessibility and safety in rural roads can lead to costly winter maintenance. The common wayof handling ice and snow on a road is to use snow-ploughs and de-icing salt.Salting creates technical and environmental issues such as decreased durability of different types of pavement material and soil saltification along roads. An alternative method

For facing this issue in this project work a systematical solution is put forwarded which uses thermal energy generated from DC power source . This heat is systematically transferred to road via copper plates which are connected to temperature sensors which will automatically work according to environmental conditions. By using Arduino system whole working prototype works automatically without any human intervention. This project has yield very good results at prototyping level and surely it can be implemented on large scale basis.

## 10. FUTURE SCOPE

Here in the system developer can implement it on airport or it can be implemented on roads where snow falls. In this system we have used SMPS or AC source as a input source but we can replace it solar panel, so we can use solar power to power up the system. So we can save the electricity.

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