AIR MONITORING SYSTEM

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***Abstract*- Nowadays, world is facing a major concern related to air pollution. Pollution related diseases increase every year and the leading factor for these major diseases is air pollution. In our analysis monitoring our Air quality is critical. For a bright future and a healthy life for all of us. Our Work is to focus on monitoring the air quality of different areas such as Indoor, Outdoor, Industrial, etc. We aim to design a system which can monitor various gases present in atmosphere Eg:- CO, NO2, Oxygen, etc through sensors. This paper narrates the detection of various gases and provide with accurate values.**

***KEYWORDS -Air, Pollution, Diseases, Monitor*.**

I. INTRODUCTION

Air is essential factor in our surrounding. Air contains gases like Nitrogen, Oxygen, Carbon dioxide, Carbon Monoxide, etc. Air is getting polluted because of release of toxic gases from Industries, Vehicle emissions and by increased in concentration of particulate matter. Humans need an atmosphere of air. i.e. free from contaminants that pollutes the air. Due to this polluted air the ratio of diseases are increased. Diseases like Respiratory diseases.

Our Air Monitoring System is help to monitor the air. With the help of this Air Monitoring System we show the amount of concentrations of contaminants present in the air. In this system we measure the 13 parameters like carbon dioxide, carbon monoxide, methane, acetone, alcohol, toluene, propane, hydrogen, LPG, ammonia with temperature and humidity. Our air monitoring system made with different types of sensors and processing unit with LCD display for showing output.

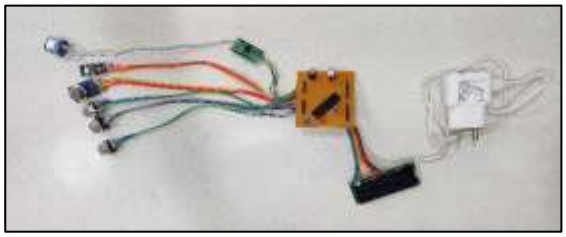

Fig.1 Air Monitoring System

II. METHODOLOGY

A. SENSORS:-

DHT11 Temperature and Humidity sensor

To measure temperature and humidity in the air , DHT11 sensor is used that comes with a NTC to measure temperature and an 8- bit microcontroller to output the values of temperature and humidity as serial data .[4][5] It uses a dedicated digital modules capture technology. As shown in Fig.2

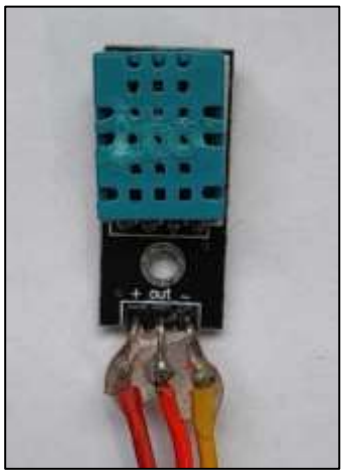

Fig.2 DHT11 Temperature and Humidity Sensor

Specifications :-

The Operating voltage of DHT11 is 3.5 volt to 5.5 volt. The Operating current is 0.3 mA (measuring) 60 uA (standby). The Output of DHT11 is serial data. Temperature range of DHT11 sensor is is 0 degree Celsius to 50 degree Celsius. Humidity Range of this sensor is 20% to 90% . Accuracy of DHT11 sensor is +- degree Celsius and +_1% .

Oxygen Sensor

In the exhaust system of an automobile an oxygen sensor is used. The appearance of this sensor look like a spark plug. To check the oxygen amount present in the exhaust is the working principle of the oxygen sensor.[4] It is the main sensor used in air monitoring system. As shown in Fig.3

Fig.3 Oxygen Sensor

Specifications:-

The standard range of the oxygen sensor is upto 0-25%. It shows ± 0.5% accuracy. The time of response is 20 seconds to 95% of scale. Material used is aluminium. This sensor has negligible pressure effect.

MQ135 Sensors

The MQ-135 gas sensor can detect gases like carbon monoxide (CO), Alcohol, Carbondioxide (CO2), Toluene, Ammonia (NH3), Acetone. This MQ135 sensor has a digital and analog output pin.[4] It operates from 2.5V to 5.0V and can provide both digital and analog output. As shown in Fig.4

Fig.4 MQ135 Sensors

Specifications:-

The operating voltage of MQ-135 is 2.5V to 5.0V. it consumes 150mA power. The digital output of this sensor is 0V to 5V (TTL Logic) @5Vcc and the analog output is 0-5V @5Vcc.

MQ9 Sensor

The MQ9 (Grove-gas sensor) module is useful for detecting gases like LPG, Methane (CH4), Carbon monoxide (CO). This sensor has a small heating element available which is needed to preheat the sensor to get in working. As shown in Fig.5

Fig.5 MQ9 Sensor

Specification:-
The input voltage of MQ9 is DC 5V. The power of the sensor is 150mA. Digital output of MQ9 is 0.1 and 5V analog output is 0.1-0.3V. An 4V is the highest voltage concentration.

MQ8 Sensor
MQ8 is a metal oxide semiconductor type sensor. It detects hydrogen gas (H2) present within the air. Detect gas leakage. The output of the sensor is analog. The MQ8 sensor response fast and is sensitivity and the output of this sensor is an analog resistance. [4] As shown in Fig.6

Fig.6 MQ8 Sensor

Specifications :-
The operating voltage of MQ8 is 5V DC. The digital output is 0.1 to 5V. The analog output is 0.1 to 0.3V. It consumes 150mA current.
MQ2 Sensor
The MQ2 module (Grove-gas sensor) helps to detect LPG, Propane, Hydrogen (H2). Measurement can be taken soon due to its sensitivity and fast response. Potentiometer help in adjusting the sensitivity of the sensor.[6] As shown in Fig.7

Fig.7 MQ2 Sensor

Specifications :-
The operating voltage of MQ2 is +5V. The analog output voltage is 0V to 5V. The Digital output voltage is 0V or 5V.

B. 24-BIT ANALOG TO DIGITAL CONVERTER:-
An ADC converts a continuous time and continuous amplitude analog signal to a discrete time and discrete amplitude digital signal. The ADS1240 and ADS1241 are precision, wide dynamic range, delta-sigma, Analog-to-digital (A/D) converts with 24-bit resolution operating from 2.7V to 5.25V power supplies. The delta sigma A/D converter provides up to 24 bits of no missing code performance and effective resolution of 21 bits.[3] As shown in Fig.8

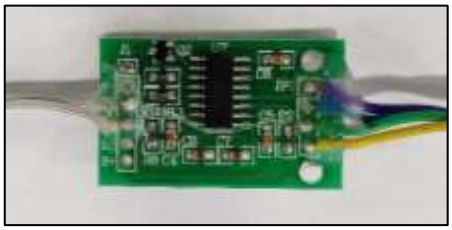

fig.8 24-bit analog to digital converter

C. LCD Display (16×2)

The LCD Display of (16×2) means 16 Columns And 2 Rows Alphanumeric Display is used Very Commonly On Large Scale To Show the Alphabets With number's . And We Will Able to Display 32 Characters on Screen. In Our Project the Role Of This LCD Display To Show the Amount Of Entities Present in The Air with The Help Of Sensors And We Connect it with VCC Ground, 5V supply and Data Lines. As Shown in Fig 9

Fig.9 LCD Display (16×2)

D. Arduino Uno

A Arduino Uno is the Most Important Thing In Our Project. Arduino Uno Consist Microcontroller, IC, Resistors, Capacitors, Crystal, Input and Output Pins. It Works On 5v Supply. In Our Project the Role of This Arduino Uno is To Take Input in terms of Supply And We Connect Sensors On One Side That gives the input to Arduino Uno. Arduino Uno read that Readings in IC with the Help of Microcontroller and sends Output to the LCD display.[2] As shown in Fig.10.1 & Fig.10.2

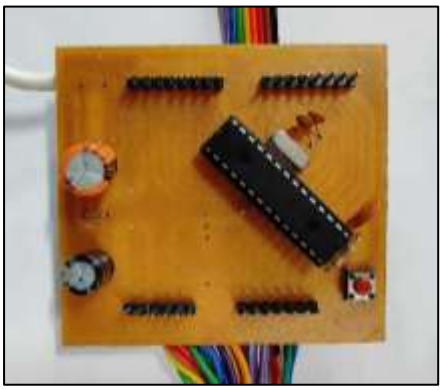

Fig.10.1 Arduino Uno (Front View)

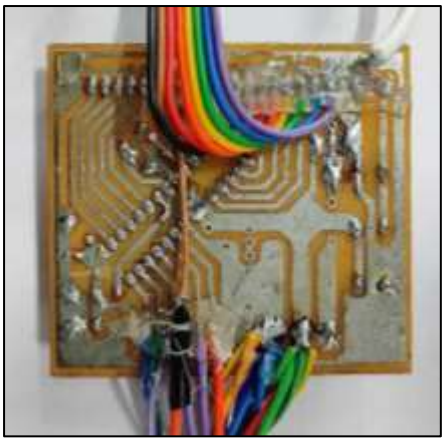

Fig.10.2 Arduino Uno (Back View)

Features:-

1. Single sided Arduino Uno
2. Arduino compatible form factor
3. Prototype area
4. Minimal cost
5. Easy to access reset switch

E. Construction & Working Of Air Sensor

Construction:-

1) First we add adapter to Arduino Uno to stepdown the voltage and current level.
2) Then we connected all the sensors to the Arduino Uno for Input and Output Purpose. Then we give input to the sensors in the form of supply and sensors give the output in the analog form to the Arduino Uno at a0 to a5 lines.
3) Sensors are:-
   MQ135 , MQ2, MQ9, MQ8,
   AO-2, DHT-11
4) Oxygen sensor gives the output in the form of analog in microvolts then, with the help of 24 bit ABC we convert analog form value into digital form.
5) Then we send all the readings to the microcontroller. Microcontroller read this all readings in IC (IC contain the coding of the project).
6) Then we attach LCD display to the Arduino Uno for Input VCC Ground & Enable RS with D4 to D7 (Datalines). Output of the LCD display is the final readings of the model .
7) This block contains the total construction of Air Monitoring System.

Working:-

1) First we give supply to the adapter to convert voltage level 230 volts to 5 volts.
2) We give 5 volts supply to the Arduino Uno.
3) This 5 volt supply is the input of the sensors. With the help of this input, sensors still works & give the output in the analog form.
4) Only one sensor DHT-11 gives the readings in the digital form.
5) And oxygen sensor gives the readings in microvolts with the help of 24 bit ABC, we convert this analog form reading into the digital form.
6) The Output readings of the sensors is the input of microcontroller.
7) Microcontroller read the readings in IC which consist the program of the project.
8) Output of the IC is the input of LCD display.
9) With the help of this input, LCD display show the final readings on the screen.

10) This contains the overall working of the Air Monitoring System.

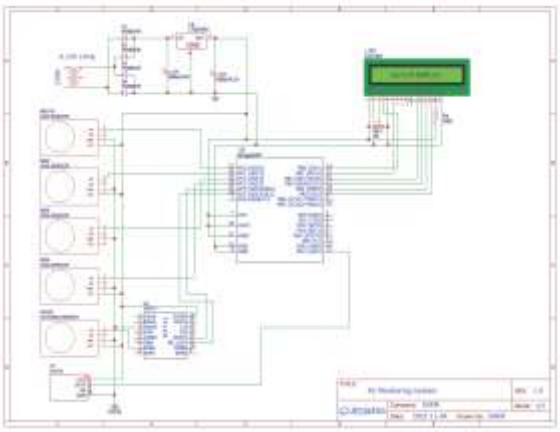

Fig.11 Circuit Diagram

F. Live Demonstration of Air Monitoring System

Sr.no	Name of the Gases	Before providing the gas	After providing the gas	Sensor use
1	Alcohol	6.7	41.8	MQ135
2	Toluene	0.4	10.5	MQ135
3	Ammonia	0.4	73	MQ135
4	Acetone	0.4	300	MQ135
5	Carbon dioxide	402	407	MQ135
6	LPG	0.9	330.0	MQ2
7	Oxygen	17.5	-	AO-3
8	Hydrogen	54.6	-	MQ2
9	Carbon monoxide	4.2	-	MQ135
10	Propane	1.3	-	MQ2
11	Methane	1.7	-	MQ135

Fig.12 Live Demonstration table

III. CONCLUSION

In this project we measure the gases present in atmosphere & the following gases are CO (Carbon Monoxide), CO2 (Carbon Dioxide), O2 (Oxygen), Alcohol, Acetone, Hydrogen, Tolune , Ammonia, Methane, Propane and LPG and the reading of each gas is accurate. We also measure the temperature and Humidity. This system use Sensors, Arduino Uno, LCD display and Power adapter.

IV. ACKNOWLEDGMENT

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