Review Paper on Design of a Solar Energy Based Air quality Monitoring System

Shivam Gupta , Riya Bansal , Yash Dwivedi
shivam.19b311162@abes.ac.in, riya.19b311146@abes.ac.in ,yash.19b311097@abes.ac.in

Department of Electronics and Communication Engineering
ABES Engineering College, Ghaziabad, Uttar Pradesh

***Abstract*- This analysis paper is concerning planning Associate in nursing fabricating a star battery-powered system for monitoring and filtering the air quality to reduce pollution. The main emphasis is on removing threatening particulate matter from the air, as they are the main causes of air pollution. The system employs an unconventional method of operation in an effort to provide the finest air purification results while utilizing cost-effective and environmentally friendly methods. In the intended system, we typically use a variety of sensors For illustrate, the MQ135 measures the quality of indoor environment, the MQ6 measures the contamination of different gases in the air, and the MQ2 measures compressed gasses. These sensors are conventional, thus we must use the ADC to transform their raw data into electronic data. Often, we measure victimization squared.**

Keywords— *Sensor, relay, LCD, Arduino Uno, parameter, and particle.*

1. INTRODUCTION

The quantity of toxic companies, open combustion of garbage and leaves, enormous volumes of building debris, significant forest loss, or the amount of automobiles (especially diesel- powered automobiles) on the road have all increased significantly as a result of civilization and urbanization. Therefore, it's crucial to constantly assess and document the harmful impacts of pollution. The primary source of contamination is airborne contaminants (PM2.5), which is responsible for various physiological and bronchial conditions that affect human health. According to a study, people who breathe in eupnoea particles are just as susceptible to second-hand smoke as non- smokers are to developing cancer. Temperature, humidity the variables to be watched in the climate are CO2 content and CO3 proportion.CO2 concentration and tracking of any releasing gases, such as smoke, alcohol, and LPG. The market is filled with a wide variety of air machinery, but none of them is powerful sufficient for use in public sector like stations, metro stops, degree colleges and universities, traffic signals, etc. Most groups of companies and organizations could manage the high installation and maintenance charges. I am therefore attempting to create such air apparatus thatmight bemore affordable and incredibly efficient.

2. OBJECTIVE

The main objective of this project is to watch parameters of air and transfer the information to server. 3. designing of labour Solar system isconnected to the charging negative feedback circuit, the circuit is then connected to 12V, 1.3Ah battery unit, The Micro-controller (AT Mega 328), which has fourteen digitals I/O pins (of which half give PWM outputs & Analog Input Pins), is then powered by the battery. It operates at a 5V supply. Three distinct sensor types (MQ135, MQ2, and MQ6) are linked to theMicro - controller.

3. STANDARDIZATION

CASE 1: If PPM value is -510 and MQ135 equipment activates the relays, it begins pumping clean air out of the sludge chamber and into the surrounding air, and at the same time, the amountof gas identified is shown on the liquid demitasse display screen.

CASE 2: If the PPM value is larger and the MQ2 equipment activates the relaying, fresh air flowing out of the muck container while the addicted starts inputting air into the muck chamber, and the amount of gas sensed is shown on the liquid glass carafe display panel.

CASE 3: If PPM value is equal to or more than HIGH, MQ6 equipment also activates the relays, addict begins pumping clean air into the sediment chamber, while at the same time, the amount of gas being detected is reported on the liquid demitasse display screen.

PM 2.5	Standard FOR Air Pollutants	PM2.5 AFFECTS ON HEALTH
0 -13.0	Good [0-50]	Almost no danger
13.1-36.4	Moderate [51-100]	Persons who are typically sensitive may have stage of evolution indications.
36.5-56.4	Awareness type harmful [101–150]	Increased likelihood of biochemical abnormalities in mild cases, aggravated cardiac or respiratory ailments
56.5-151.4	Unhealthy [151-200]	Accelerated mortality among elderly people and those with illnesses of the respiratory system.
151.5-251.4	Very unhealthy [201-300]	Significant worsening of cardiac or respiratory conditions, early death in seniors and those with respiratory conditions, and important rise in metabolic impacts on the general populace.
251.5-600.4	Hazardous[301-500]	Accelerated demise in those with lung diseases And seniors; extremely bad deterioration of heart or respiratory illnesses; incredibly severe danger of metabolic effects across the community

4. MODELLING & ANALYSIS

- Solar System
- Electric Fan
- Filter
- Arduino Microcontroller
- liquid show [LCD 16X2]
- Relays
- Battery [1.3Ah, 12V]
- MQ135 device
- MQ2 Sensor
- MQ6 Sensor

A proactive air pollution surveillance and recirculation pump is provided by this present scheme, which continuously monitors the region's air quality and shows the readings on an LCD screen. The technique aids in raising awareness of the everyday air quality that humans perceive. Real-time surveillance of air quality measures is possible with this proposed technology.

4.1 Solar System

There will be a 100w sun-based exhibition with partner level institutions. This board is used to generate electricity using solar radiation. The board have a chain of electrically conducting cells connected to actuators.

4.2 Fan

At the device's exhaust, a 750 rpm fan is installed. This fan has two functions: first, it draws dirty air from of the delta atmosphere into the chamber, and second, it pushes clean air into the facility providing climate.

4.3 MQ135 Detector

Ammonia (NH3), sulphur (S), benzyl (C6H6), CO2, and other dangerous gases and smoke are among the gases that the MQ-135 Gas Detector can detect. Similar to other gas detectors in the MQ series, this one has a pin for both a digital and analogue output. The digital pin becomes high once the concentration of such gases exceeds a specified threshold in the air

4.4 MQ2 Sensor

A Winsen smoky and gasoline vapours detector might be the MQ-2. It will detect combustible gas in very wide range wide range of 300 to 10,000 ppm. Domestic energy outflow alarms and detectors with a good precision to fuel and smoke are where it is most frequently used. SNO2 is the sensing material, and it conducts better when there is smoke or an ignitable gas present than it does in clean settings. Although it requires some effort, a simple circuit may easily sense this conduction fluctuation and convert it to information.

4.5 MQ6 Sensor

The MQ-6 module is used in both residential and commercial settings to detect gas outflows. It is very sensitive to LPG, isobutene, fuel, and LNG. It's possible to get used to smelling things like alcohol, cooking odors, and cigar smoke. The module outputs the gas concentration as an analogue voltage that may be seen to be high. The module also provides a board comparator that may be used to compare a planned value against a variable value and output a digital high or low. It may frequently be easily interfaced with your Arduino or Raspberry Pi. This MQ-6 Liquefied Fossil Fuel, Iso-butane; Fuel Gas Detector Module is easy to use and suitable for detecting airborne LPG concentrations (which are mostly fuel and butane). The MQ-6 can detect gas concentrations between 200 and 10,000 ppm. This detector has a fast time interval and great sensitivity. Analog resistance to a certain degree is the sensor's output. All you need to do to complete the driving circuit is provide the heating coil with 5V, add a load resistance, and associate degree link the output to an ADC. The MQ-6 gas detector's sensitive substance, SnO2, has decreased conduction in clean air.

When the target flammable gas is present, the sensor's conduction increases significantly along with the increase in gas concentration. Utilize a simple electro-circuit to convert the change of conduction to the corresponding signal of gas concentration. The MQ-6 gas detector is very responsive to fossil fuels, alkenes, and LPG.

5. Applications

A) Solar energy offer functionality

The solar array, which recharges the device battery and delivers relatively consistent voltage (11.5–14.5 V) under normal operating conditions, is the only source of power for the VGP system. The system was plagued by extended periods of inclement weather, such as overcast or wet days, which prevented the system from receiving electricity below the minimal operational voltage (11.5 V). The Hong Kong observatory's observations of radiation and sunlight hours in King's Park (N 114°10′22.05″, E 22°18′41.53″) were compared to the monthly average voltage. The monthly averaged voltage's fluctuation (solid line) exhibits a steady tendency during radiation and daylight hours. Thanks to system installation and precise calibration, data from the first month was eliminated before analysis. The parametric statistic of median voltage and radiation is zero.79, which is more than that of sunlight time (0.54) and shows that radiation is the primary factor affecting the system's working status. It can be noted that the lowest voltage periods occurred when radiation was at its lowest in January 2016 rather than when there was the least amount of direct sunlight in the Gregorian calendar month 2016. An overview of the operating voltage of the VGP system throughout the whole amount with a 1-min resolution; blanks indicated no readings or null values. The 16-month average of the diurnal voltage trend is shown on a relatively inexpensive panel, and the times of dawn (in black) and evening (in red) at the observation site are indicated by the two dotted lines. When sunrise occurred at around 07:00 h, the diurnal pattern of battery voltage charging significantly increased (left panel Distinct color border at constant distance inside the color map. The border variation, meanwhile, exhibits a brief delay for the charging process but maintains a steady trend with dawn time. The VGP system cannot run through the night with a fully charged battery during the middle and later times due to falling web battery capacity with frequent athletics. Additionally, at around twelve p.m., the battery discharge also displays a color border.

Thanks to low radiation for recharging, associate degreed shows an earlier trend before sunset timeline (about 07:00 h). In specifics, some losses for the entire day were mostly caused by the subsequent overcast with low radiation input for powering the solar array. Given the unattended operating strategy and style that minimizes the system's footprint; we often set a target of basic information fullness of fifty at the outset of a project. Although the ideal degree of data fullness is 100 percent, the lowered common core state level was deemed acceptable when taking into account the fast-paced, protracted installation that the solar-powered monitor occasionally through under the optimal exposure, daylight circumstances. In with us field trials, the valid information accumulation rate over the first twelve months was 69, but the last three months of operation saw a significant amount of information loss, which reduced the general justified information gathering rate to 62 over the course of sixteen months of operation with little to no maintenance.

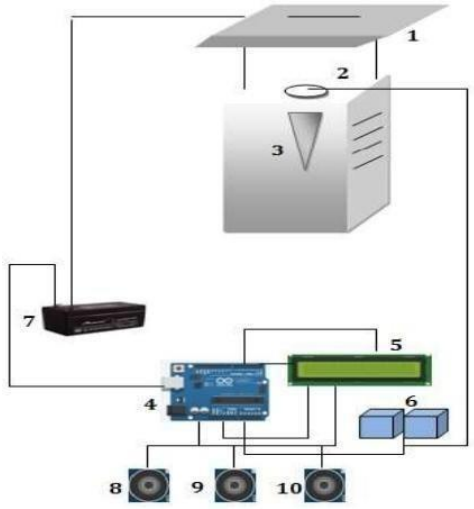

Fig.1 Schematic View

6. CONCLUSION

Corresponding filter air index value is 18 and maximum air index value is 205 ppm. Ppm (assumes a 6 ppm inaccuracy due to influence from dirty air), and Air Purification Percentage is (205- 17/205)*100 = 91.7% (92%).

This manufactured solar-powered air purifier takes into account the fact that consumers are more concerned about unnecessarily excessive electricity consumption than only clean air. By operating for roughly 14 hours after charging on a typical day with 5 to 6 hours of sunshine, this purifier mayproduce air that is up to 92 percent clean.

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