# .AIR POLLUTION MEASURING SYSTEM WITH MOBILE SENSOR ARRAYS

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## ABSTRACT

*Now a day's air pollution is one of the environmental issues that cannot be ignored. The heavy transportati on, high influx of population to urban areas, rapid economic development & industrialization, increasing traffic results in the air pollutants concentrated in certain areas. Air pollution has harm full effects like global warming, acid rain & reduction of ozone layer which has a direct impact on human health & other living organisms. This paper represents air pollution measuring system using wireless sensor network which is cost efficient, low power consuming &time saving system.*

**Keyword :-** *ARM controller, GPS,GSM Modem, WSN.*

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## 1. INTRODUCTION

At present environment contains air, water, soil pollution worldwide. Air pollution problem becomes more common because of fast development of the industrialization & urbanization process in the word. The World Health Organization states that 2.4 million peoples are died each year because of air pollution. The human should focus on design air pollution monitoring system as based on the fact above mentioned.

### 1.1 Wireless Sensor Networks-

An effective solution for pollution measuring using wireless sensor networks (WSN).Sensor networks are nothing but a group of specialized transducers with a communications infrastructure intendedat diverse locations to monitor and record conditions. Sensor network has many advantages application in military and industries. A sensor network consists of sensor nodes which are nothing but a multiple detection stations; each of them is lightweight, small and portable. Every sensor node comprises of a transceiver, microcomputer, battery, transducer and power source. The transceiver, which may be hard-wired or wire-less, receives commands from a central server and transmits data to that computer. Based on sensed physical effects and phenomenathe transducer generates electrical signals. The microcontroller does the processes and stores the output of sensors. When such thousands of nodes are brought together that communicate through wireless channels used for information Cooperative processing and sharing makes wireless sensor network

### 1.2 Pollutant Sources-

Air pollution is responsible for difficulty in breathing, coughing and many respiratory problems. Human beings breathe in and out approximately 15 times in every one minute, which equates to over eight million times in one year. Our lungs process around four million liters of air from the atmosphere every year. The primary airborne pollutants are CO, NH3& NO2.The temperature & humidity are also little responsible for air pollution. The gas sensors are integrated with the ARM controller and GPS which is a location tracer in User terminal. To enable data analysis the parameters like temperature and humidity are also sensed along with gas pollutant. The system collects

pollution data using mobile hardware modules. This hardware transmits the data regularly using GSM MODEM to a back-end server, and it also integrates the data to send this data to handheld devices of the user and generate a pollution frame with geographical location

### 1.3 Air and Air Measures-

The air is part of earth atmosphere and air pollution means we can say presence of number of impurities for temporal duration that can become harmful to human life, trees and animal. The atmospheric contaminants include smokes, gases, poisonous chemical products, dust and many polluted materials. These types of polluted materials react with each other and produce other harmful pollutants. These other harmful pollutants are called as secondary pollutants. Carbon monoxide gas and nitrogen dioxide gas produced by automobiles motors which lead to the reduction of ozone layer This system is able to measure the following gases are present in the atmosphere as pollutants:-

### 1.3.1 Ammonia (NH3) -

Ammonia is a colourless and poisonous gas. It has pungent smell and fairly low odour threshold. Therefore, the monitoring and detection of NH3 are of interest in many technological fields such as clinical diagnosis, industrial processes, and environmental monitoring. Ammonia is commonly used in many industries such as petrochemical industries, pulp and paper industries, fertilizer and the oil industry.

### 1.3.2 Carbon Monoxide (CO) -

It is a pale gas, flavourless, unscented non-irritating gas. It produced when fuels or wood are burned which are sources of carbon. Human exposure includes common sources like smoke inhalation from cigarette smoke, fires automobile exhaustion. It causes respiratory problems.

### 1.3.3 Nitrogen Dioxide (NO2) -

It is a reddish brown color with a distinct sharp and biting odour, very acidic, easily noticeable for its smell and highly oxidant produced because of fossil fuels burned. NO2 also contributes to acid rain.
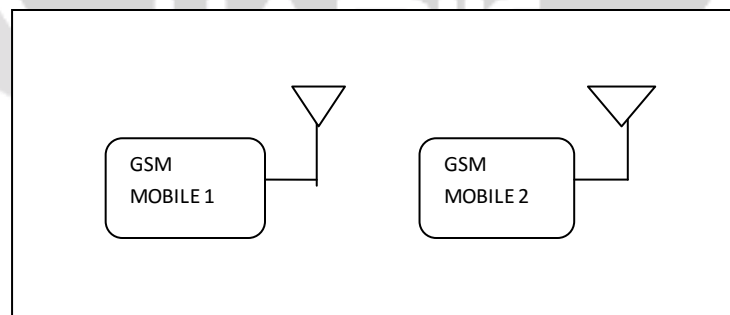
## 2. BLOCK DIAGRAM -
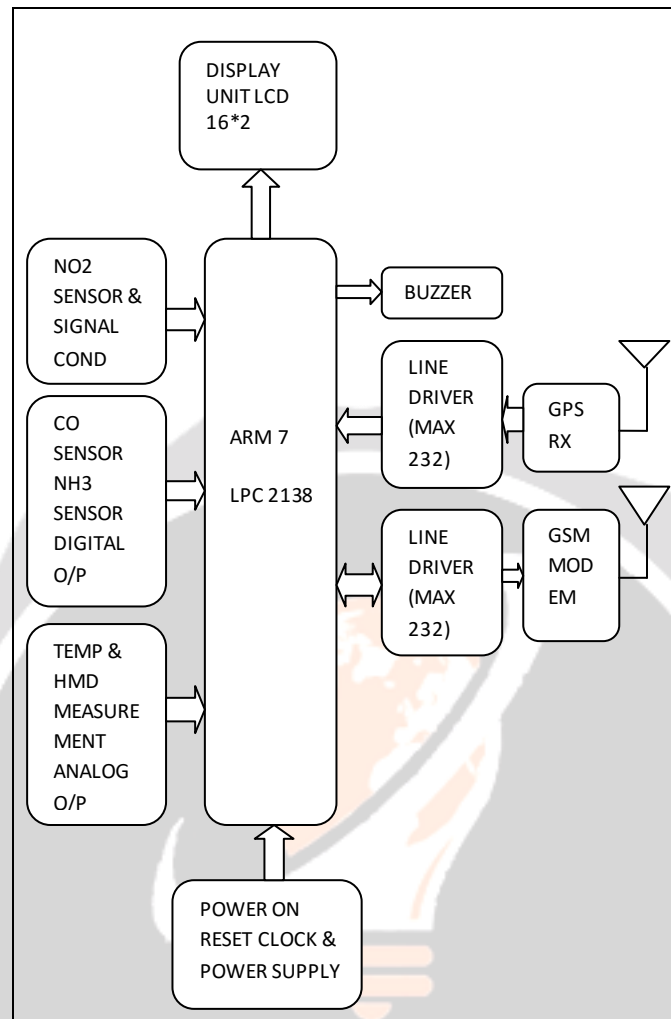


**Fig 2.** Remote monitoring system

**Fig 1**. Air pollution sensor networks

## 2.1 Block Diagram Description –

The system for the measuring of air pollutant gas concentration is presented in block diagram. The system consists of pollutant gas sensors, GPS and GSM modem interfaced with ARM7 controller. This system can be developed in three phases:

GPS Interfacing
GSM Interfacing
Pollutant Sensor Interfacing

**2.1.1 GPS System**:-

GPS receivers are used for tracing the positioning, location, navigation, survey, and determining the time.

**Fig 3.** GPS Modem

In the development process of the GPS system, especially focused on the following two aspects:

(a) In motion or at rest, GPS has to provide the capability of determining speed, position and time to users.

(b)GPS should have a universal, continuous, three dimensional positioning capabilities which have a high accuracy and disrespectful of the weather.

Global Positioning System is a standard used for tracking and location aware data logging. GPS standard is also used for positioning. The interfacing of GPS board with a microcontroller is done by using UART. Data such as latitude and longitude of the area where industries located are received.3.3V power supply is used for GPS.

**2.1.2 GSM Modem:-**

The GSM modem (SIM900A) supports dual frequency i.e. 900/1800mhz. GSM also provide standard AT command interface to external users. The features of GSM arecompactness, low power consumption, fast, reliable and safe transmission of data, voice message or short message and fax. It is optimal for this system because it has a function of high quality short message.

**2.1.3 Gas sensors:-**

Gas sensors are basically used in gas leakage sensing and detecting instruments in industries and houses. They are suitable for detecting of CO,NH3, NO2, alcohol and cooking fumes and smoke.

The gas sensor has features like high sensitivity to LPG, CO, CO2, NH3 and NO2 gases. They provide fast response with stable and long life.

**2.1.4 MQ135 Sensor:-**

MQ135 gas sensors has features like wide detecting scope, fast response, high sensitivity, simple drive circuit, stable & long life. The resistance value of MQ135 gas sensor is difference to various kinds and various concentration gases. So, when we use this sensor, sensitivity adjustment is very necessary. Fig3 Shows the MQ135 sensor.



**Fig 4**. MQ135 Sensor

### 2.1.5 Temperature sensor:-

LM35 is used as a temperature sensor. It is simple and accurate.



**Fig 5.** LM35 Temperature Sensor

### 2.1.6 Humidity sensor:-

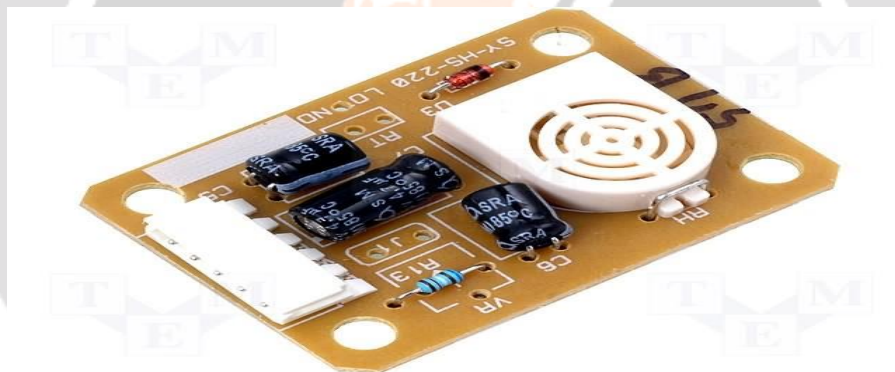SY-HS-220 is a industrial humidity sensor.



**Fig 6.** Humidity Sensor

## 3. RESULT:-

### 3.1 Temperature sensor output:-
Fig7 shows the LCD interfacing with ARM controller displaying air temperature in degree Celsius.



**Fig 7.** Temperature Sensor Output

### 3.2 Humidity sensor output:-
Fig8 shows the humidity sensor output displayed on LCD module. The humidity measure in percentage.

**Fig 8.** Humidity Sensor Output

**3.3 Ammonia sensor output:-**
Fig 9 shows the MQ135 sensor output which is more sensitive to NH3 gas.



**Fig 9.** MQ135 Sensor Output

## CONCLUSION:-

The main purpose of this paper is to provide an overview of air pollution monitoring application. Our work is enabled by WSN and pollution sensors i.e. for measuring pollutants in air accurately in short intervalsattached to pollution server for storing the pollutants levels for future usage by various clients. A mobile air pollution measuring system was designed, implemented and tested using GSM network. The system measures air pollutant gases like CO, NO2 and NH3. This system also measures the temperature and humidity. This paper will give clear ideain an industrial area or urban area to ultimately improve quality of life on earth to move towards real time measuring.

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