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A REVIEW PAPER ON AIR QUALITY METER WITH WARNING SYSTEM

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ABSTRACT
Safety plays a major role in today's world and it is necessary that good safety systems are to be implemented in places of education and work. This work modifies the existing safety model installed in industries and this system also be used in homes and offices. The main objective of the work is designing microcontroller based toxic gas detecting and alerting system. The hazardous gases like LPG and Air quality index gases were sensed and displayed each and every second in the LCD display. If these gases exceed the normal level then an alarm is generated immediately and also an alert message (SMS) is sent to the authorized person through the GSM. The advantage of this automated detection and alerting system over the manual method is that it offers quick response time and accurate detection of an emergency and in turn leading faster diffusion of the critical situation

KEYWORDS:*Air pollution Monitoring, gas sensors, GSM module, wireless networks.*

I. INTRODUCTION

Global urbanization continues apace and with that, comes more intense energy consumption and increased emissions from transportation and industrial sources. As a result, people in both developed and developing countries are exposed to a more diverse variety of air pollutants and in many urban areas, unhealthy concentrations of many pollutants. Findings from epidemiological and toxicological research into the impact of ambient air pollution on public health have confirmed detrimental long- and short-term effects on mortality and morbidity from cardiopulmonary disease.1–6 Furthermore, an increasing number of studies are investigating the potential for air pollution to exert a wider threat, by, for example, negatively influencing reproductive outcomes7and neurological health.8Besides the health effects caused by day-today concentrations of urban pollution, are experienced during and following pollution 'episodes 'periods of prolonged and abnormally high concentrations of one or more outdoor air pollutants. They arise as a consequence of poor atmospheric dispersion conditions generated by still air and/or unusually high emissions following incidents such as wildfires, dust storms, local traffic congestion and construction, as well as long-range(1000 km or more) *trans*-boundary air pollution.

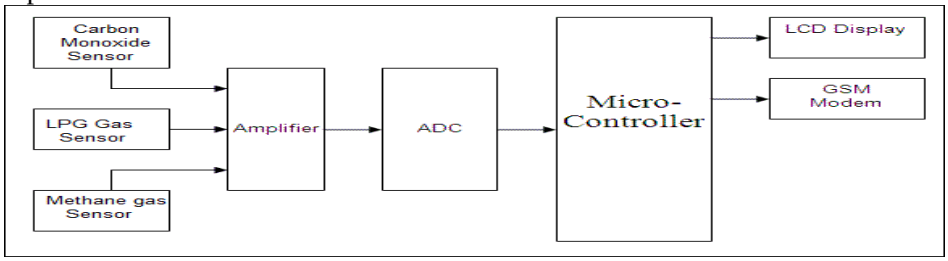

Fig1: Block Diagram of Air Monitoring Unit

In order to move towards a cleaner and healthier environment, where air pollution does not pose a significant risk to human health, there is a need for a much better understanding of air quality issues among all walks of society. For example, the public and particularly, vulnerable subgroups should aware of their quality of air, enabling them to take action in the event of increased pollution. Policy makers must also have a sound awareness of current air quality and future trends, if they are to identify the issues, guide policies and monitor progress. This increased awareness is dependent upon optimal air pollution monitoring, forecasting and reporting, serving all interested parties. This article outlines air quality monitoring required to protect public health and overviews how these data should be utilized. We focus on the use of air quality data to create an air quality index (AQI) and proactive alert services, before discussing public perceptions of such systems and developments we can look forward to in order to increase their effectiveness and accuracy.

II. LITERATURE SURVEY

Jerrett M, Burnett RT, Pope CA explained Air quality modelling techniques compliment the monitoring networks by being able to predict concentrations of air pollutants and this in turn, enables air quality to be assessed across a greater geographical area than that possible with monitoring data alone. For example, air quality forecasting of long-range transport provides knowledge of pollution sources many hundreds of kilometers from the forecast location. In addition, air quality assessment across rural areas very often relies upon models, while a combination of monitoring and modelling can assist air quality forecasting in heavily trafficked urban locations. Various forecasting approaches, of varying complexities are in use around the world. These can be broadly divided into statistical approaches and deterministic models. The former utilizes human expertise and statistical links between meteorology and pollution episodes.

Darrow LA, Klein M, Flanders WD mentioned in his paper that Air quality is defined as a measure of the condition of air relative to the requirements of one or more biotic species and/or to any human need or purpose. Air quality indices (AQI) are numbers used by government agencies to characterize the quality of the air at a given location. As the AQI increases, an increasingly large percentage of the population is likely to experience increasingly severe adverse health effects. To compute the AQI requires an air pollutant concentration from a monitor or model. The function used to convert from air pollutant concentration to AQI varies by pollutant, and is different in different countries. Air quality index values are divided into ranges, and each range is assigned a descriptor and a color code. Standardized public health advisories are associated with each AQI range. An agency might also encourage members of the public to take public transportation or work from home when AQI levels are high.

R. Al-Ali, *Member, IEEE*, Imran Zualkernan, and FadiAloul, *Senior Member, IEEE* explained the developed prototype of monitoring system consists of an original equipment measuring in motion the gaseous pollution of atmospheric air, further called results of concentration measurements in air of the substances outlined above to a server which plays the role of a database, along with information on vehicle location and speed as well as the temperature and humidity of air at the measurement spot. Data transmission between the equipment and the server is effected with the use of a radio modem operating in GSM/GPRS ARPOL (the acronym stems from ARMAAG - Agency of Regional Monitoring of Atmosphere of Gdańsk Agglomeration and Gdańsk Polytechnic), which is designed to test the pollution of atmospheric air with the following chemical compounds: LPG, NO2, NOx, CO and CO2. The equipment can be installed on any mobile vehicle like a bus or taxicab, relay the

M. Abu Jayyab, S. Al Ahdab, M. Taji, Z. Al Hamdani, F. Aloul, "Pollumap: Air Pollution mapper for cities", *in Proc. IEEE* gave the views about GSM module, produced by the WAVECOM Corporation, supports the Short Message Service (SMS). Based on a preset SMS format, all of the collected data is then sent to a control center database via the GSM module. Furthermore, using this GSM-SMS technique, the front-end automatic monitoring system can be remotely controlled by the control center through the GSM module.

III. AIR MONITORING UNIT

Block diagram of mobile monitoring unit is presented in Figure. This version of measurement device is made of sensor unit, A/D converters and microcontroller to convert sensor's electric response to gas concentrations. Microcontroller is also responsible for linking measurement results with geographic coordinates from GPS and sending these data to servers using GSM/GPRS link. The interior of one of monitoring units built in Gdansk University of Technology laboratory. The gas concentration sensors together with temperature and humidity sensors are put inside manifold Air flow inside manifold is forced by fan, which rotate speed is controlled by microprocessor because change in flow rate will change gas sensor's substrate temperatures as air is cooling the casings of sensors. Electrical response of gas sensors is converted into voltage signals using very high impedance operational amplifier (for EMF output) or by resistive voltage divider (for resistive output). Then the signals are passing low-pass filters with cutoff frequency about10Hz for all sensors which requires pulsed resistance measurement and therefore filter cutoff frequency has to be greater than 100Hz. Additional noise-filtering is made by microprocessor which averages digital values after A/D conversion during 10 seconds period. Averaged digital values are being transmitted to server without any additional conversion. Calculation of gas concentration is made by server using non linear equations derived during calibration procedure. Other data sent to server in every packet are:

- monitoring unit identification number;
- geographical coordinates of measurement point (from GPS receiver);
- speed and direction of movement (from GPS receiver);
- date/time of measurement (from GPS receiver);
- temperature and humidity of air in manifold;
- temperature of electronic circuits outside manifold;
- external or internal power supply voltage;
- state of vehicle engine in case of mounting the device on car/bus;
- error flags which indicate condition of monitoring unit.

Data transmission uses GPRS/EDGE radio link and TCP/IP protocol stack.

IV. SENSOR

The MQ series of Gas Sensors are simple and cost effective sensors useful for sensing gases in the air. There is a wide range of sensors available each of which are made to detect a specific gas like LPG, CNG, Carbon Monoxide and Alcohol. They provide great accuracy and performance for their price. As such, they are perfect for hobby purposes and prototyping. They come in a six pin package with odd pin spacing and pin size, which makes it tough to use them with standard breadboards and prototyping. The Gas Sensor Module makes it easy to work with these sensors by taking care of all the power supply and external circuitry needed to get both an analog and a digital output from these sensors. It provides a simple 4 pin interface through standard 0.1" male header pins. There are two figure of sensor DHT11 and MQ135 are shown similarly many other sensors are used for detection of gases in our circuitry

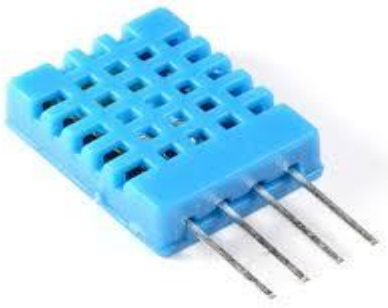

Fig2: DHT11 Sensor (real time clock sensor)

This makes it easy to use this sensor with standard breadboards and prototyping boards and enables easy integration with other circuits. The module can be used to make smoke detectors, LPG gas detectors, air quality sensors, alcohol breath analyzer, etc.

Fig3: MQ135 Gas Sensor

Application: Gas leak detection for houses, workshops, commercial building, Fire, Safety detection system. Coal gas, CO etc gas detection for houses/workshops/commercial building Gas leak alarm, Gas detector.
Features: High sensitivity - Fast response - Wide detection range - Stable performance and long life - Simple drive circuit.

V. CONCLUSION

Polluted air negatively influences health and in some cases may even lead to death. Therefore, the issue of air quality is now a major concern for many countries which have been working to improve air quality by controlling emissions of harmful substances into the atmosphere, improving fuel quality, and by integrating environmental protection requirements into the transport and energy sectors. Despite these improvements in air quality over recent years, the problem of air pollution still remains. Therefore, more needs to be done at local, national, European and international levels. Monitoring of air pollution is a prerequisite of air quality control and is carried out by a wide variety of analytical methods employing different measurement instruments which have different sensitivities and specificities. Monitoring plays a critical role in protecting the environment and is a key element of all actions related with the management and protection of ambient air.

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