Waste GAS Remote Monitoring System Using GSM and GPS

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Abstract - To monitor the waste gas (particularly C02 and LPG gas) from any factory site & Industrial area a design & technique has been introduced which measures and monitors the amount of waste gas and also the temperature of that particular location. This paper will be advantageous if any Industry or factory releases unhygienic gas above certain level, which may harmful for human being. When level of such gases go beyond specific level, this system will send warning message to operator's mobile so that it can be controlled. To implement such system we have to use GSM for sending warning message & GPS for identification of proper location. In this system, we have also use microcontroller MSP 430, Co2 gas sensor MG811 and LPG gas sensor MQ6 and temperature sensor LM 335 are used. As the gas sensor detect the gas, it will send the signal to controller ,now controller enable the GSM to send the message to the station & also GPS for locating the desired position of plant. For monitoring purpose GUI is used to display the recorded data.

I. INTRODUCTION

The motivation behind this paper is that to minimize the serious tragedies occur due to the dissipation or waste leakage of the industry gases like LPG or CO2 gases ,which is widely used because of the its high calorific value. If there are any dissipation of these gases in the environment then due to their heavier weight then the air it do not split or disperse easily in the nature and may lead to serious problem to the human being. Here main goal behind this paper is to minimize the serious effect or injury happen through this.

The technology advances, expeditious, condensed and wireless systems are in demand. Many gas tragedies occurred in all over world. Bhopal gas tragedies and new London school explosion is the example of biggest gas tragedies.Gas tragedies occurs due to the leakage of waste gas above a predefined level. Any Industry or factory releases unhygienic gas which badely affected the health of human being.

General objectives of the paper are defined as;

a) To monitor and detect waste gases above certain level through short message service.

b) To successfully receive and transmit data via sms.

c) Minimize time and power wastage.

d) GPS used for location identification.

e) This project used as security system in applications like industries, hotels & homes.

f) The main objective is to work for safety of the slightly situated location, application.

g) To eliminate the need of being actually present in any position for task of monitoring of gases.

II. RELATED WORK

Co2 & LPG gas sensor are used for the remote measurement of waste gas like Co2 & LPG gas. For trace the position of Industry GPS module has been used. For temporary measurement LM 335 used. The exactness and accuracy of recorded measured gases and position from GPS have been increased.Graphical user interface is a type of user interface that allows users to interact with electronic devices through graphical icons and visual indicators. The actions in GUI are usually performed through direct manipulation of the graphical elements

Work will be divided into 3 sections:-

1) Sensor and GPS module.

2) Controller.

3) GSM module & Operator's cell.

First section-In 1st section 3 sensors are used temperature sensor LM335, LPG sensor MQ6, C02 sensor MQ811. Temperature sensor used for the measurement of temperature. LPG gas sensor used to sense LPG and C02 gas sensor used to sense C02 gas. GPS module is used in this section. Position of the remote terminal unit is identified using GPS module, which is interfaced with this monitoring system.

For the implementation of the GPS with MSP430 we would get to data. It is nothing more than plain text data. It is necessary the set static Buffer to keep data. String will be used to extract data from buffer.

Second section-Microcontroller MSP430 used. The MSP430 microcontroller is an extremely versatile platform which enables many applications.

Through it ultra low power and variety of peripherals it enables the designing engineer to meet the goals of many projects.

Third section-In third section GSM module used. GSM is a wireless communication technology; most popular today for transmitting data anywhere in the world through sms with the help of mobile phones. In third section interfacing is done between microcontroller MSP430 and GSM module.

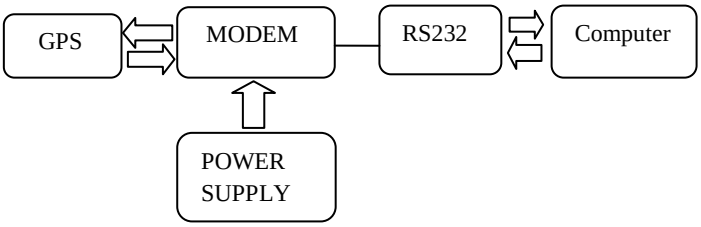

Fig. 1 GPS block diagram

III. SYSTEM HARDWARE

Figure shows the block diagram of the GAS monitoring System using GSM & GPS. Gas sensor will continuously measure the pressure of the Carbon Dioxide & LPG and temperature sensor measures the temperature. GSM technology is using to sending warning alarms to the operator's mobile. GPS module is using for identification of exact position of the system, which is interfaced with this monitoring system.

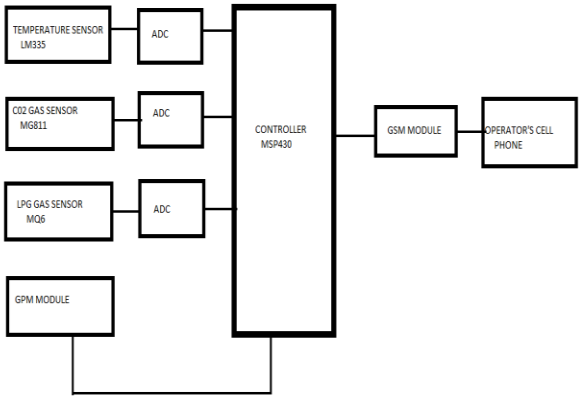

Fig. 2 Block diagram gas monitoring system using GPS and GPS module

1V. FLOW CHART OF GAS MONITORING SYSTEM

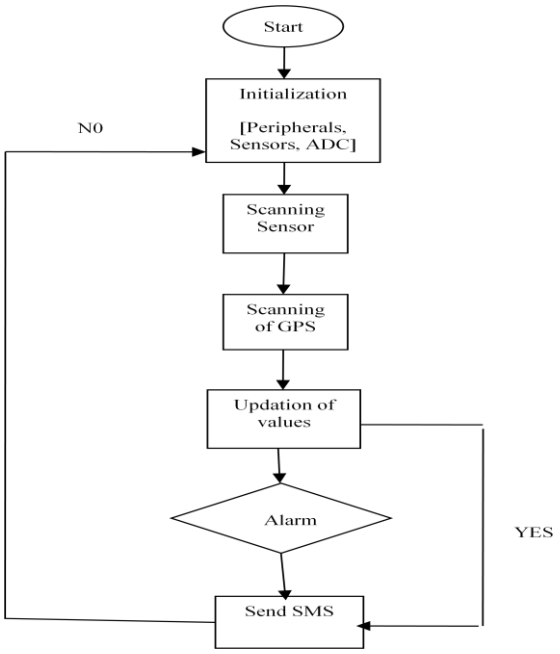

Fig. 3 Flow Chart of gas monitoring system

V. ORGANIZATION OF WORK ELEMENT

This project based on the principle of GSM and GPS. And the component descriptions are here:-

Hardware:

GPS module- GPS devices provide latitude and longitude information, and some may also calculate altitude although this is not considered sufficiently accurate or continuously available enough (due to the possibility of signal blockage and other factors) to rely on exclusively to pilot aircraft. GPS devices are used by the military, by aircraft pilots, by sailors, and for recreational purposes by the public. Other GPS devices need to be connected to a computer in order to work. This computer can be a home computer, laptop, PDA, digital camera, or smart phones. Depending on the type of computer and available connectors, connections can be made through a serial or USB cable, as well as Bluetooth, Compact Flash, SD, PCMCIA and the newer Express Card. GPS modules are significantly cheaper than complete stand-alone systems. The software may include maps only for a particular region, or the entire world, if software such as Google Maps, Networks in Motion's Atlas Book mobile navigation platform, etc., used.

Fig. 4 GPS module

GSM module- GSM module is same as the mobile phone which has GSM modem, With the aid of GSM module we can make call, receive call, Send and receive sms, Connect to internet(module has built in TCP/IP stack) through RS232 or TTL Serial interface. For using GSM module requires to send AT command to module. It should be necessary to have the knowledge of AT command prior to use the GSM module.

Fig. 5 GSM module

LM335 temperature sensor- The LM335 is precision temperature sensors which can be easily calibrated. They

operate as a 2-terminal zener and the breakdown voltage is directly proportional to the absolute temperature at 10mv/ok .It highly precise temperature sensor. Its calibration is very easy.

The perfect temperature sensor have following advantage:

- Has no effect on the medium it measures
- Is precisely accurate
- Responds instantly (in most cases)
- Has an easily conditioned output.

Temperature sensors using different technologies for different applications .These are:

- Thermistor
- Thermocouple
- Infra Red

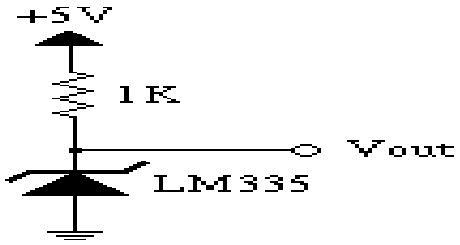

Fig. 6 Temperature sensor

CO2 Sensor- CO2 gas sensor is used for measuring carbon dioxide gas. it is important to measure Co2 in industry process. The principle of CO2 sensor is infrared gas sensor and chemical sensor. Application of CO2 gas sensor:-

- CO_2 sensors can be used to monitor the quality of air and the tailored need for fresh air, respectively. Measuring CO_2 levels indirectly determines how many people are in a room, and ventilation can be adjusted accordingly.
- In applications where temperature measurement is not applicable, where non dispersive infrared sensor can be used.

Fig. 7 Co2 sensor

LPG gas sensors- LPG gas sensor is an ideal sensor which is used to measure the LPG gas. It has excellent sensitivity with Quick response time. Sensor can also sense the iso-butane, propane, LNG and other smoke. It is also used as a wireless gas sensor in home security system.

Features of LPG gas:-

- High sensitivity to iso-butane, propane, LNG.
- Low sensitivity to smoke.
- Fast response time < 10s.
- Simple drive circuit.
- Heater voltage
- Dimensions: 18mm Diameter, 17mm High excluding pins, Pins - 6mm High.

Fig. 8 LPG sensor

Controller MSP430-The MSP430 microcontroller is a versatile platform which enables many applications. Through it ultra low power and variety of peripherals it enables the designing engineer to meet the goals of many projects. Microcontrollers are binary computers. They operate on the base of binary numbers. Assembly language is one step above binary. It is the most basic language for controlling computers since it represents binary directly. Knowledge of assembly is not completely necessary for programming the MSP430; however it is useful in optimizing routines for example. The C programming language is the primary language used and will be followed throughout the tutorial. A microcontroller has many peripherals, extra modules that perform specialized functions. The internal CPU performs processing, but the external modules include Timers, Communication, Input/output, Real Time Clocks, Direct Memory Access, etc. Some of these modules will be covered. The MSP430 is an ideal microcontroller solution for low-cost, low-power wireless applications because it consumes very little power.

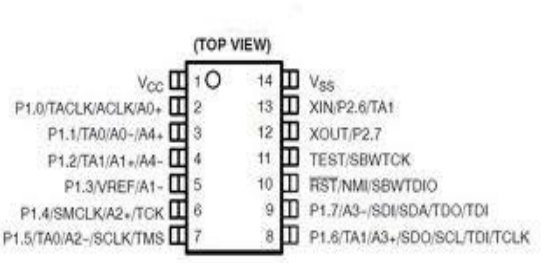

Fig 9 Pin diagram of MSP 430 Microcontroller

GUI - It is a graphical user interface. Designing the visual composition and temporal behavior of GUI is an important part of software application programming in the area of human-computer interaction. Its goal is to enhance the efficiency and ease of use for the underlying logical design of a stored program, a design discipline known as usability. Methods of user-centered design are used to ensure that the visual language introduced in the design is well tailored to the tasks. Examples of application-specific GUIs are:

- Automated teller machines (ATM)

- Point-Of-Sale touch screens at restaurants
- Self-service checkouts used in a retail store
- Airline self-ticketing and check-in
- Information kiosks in a public space, like a train station or a museum
- Monitors or control screens in an embedded industrial application which employ a real time operating system (RTOS).

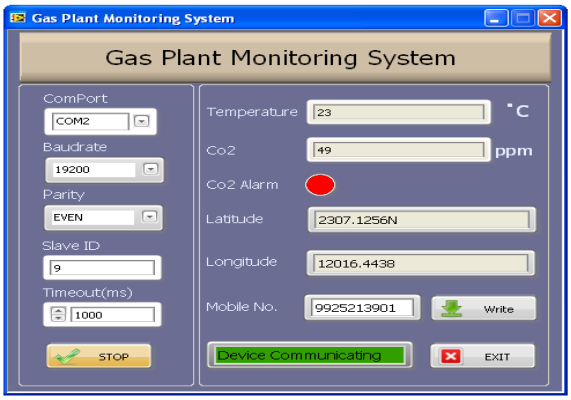

Fig 10 Gas plant monitoring system

VI. CONCLUSION

The remote GAS Plant monitoring system based on GSM and GPS has two features. Firstly, the system can automatically send alarms to the supervision staffs by the GSM network. Secondly, system can provide the location of the remote terminal unit using GPS system. At the same time, with the advantages of small size, real-time communication, inexpensive and easy to maintain, the system also has tremendous superiorities when compared with the expensive monitor system used by the environmental supervision and management departments imported from foreign country.

VII. RESULT

Microcontroller interfacing stage is shown in fig. This system has been tested by taking a small amount of LPG gas and Co2 gas near to the sensor MQ 6 & MG 811.Gas sensor dectect the gas & sends a signal to the microcontroller. After that microcontroller send an active signal to other externally connected devices. For temperature measurement LM 335 have been used. GUI is used for monitoring purpose.

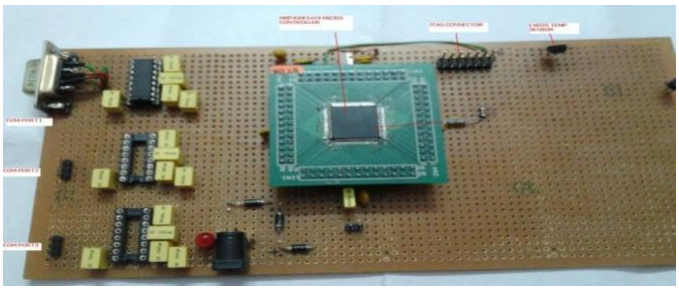

Fig 11 Microcontroller interfacing stage

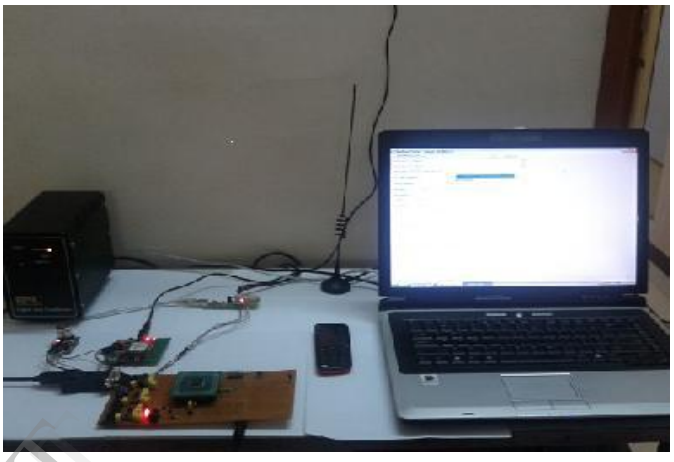

Fig 12 Setting up GPS

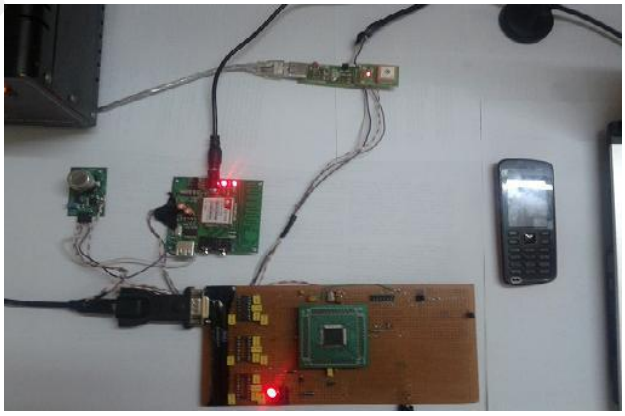

Fig 13 GSM and GPS connected with system hardware

VIII. FUTURE WORK

This project could be extended further; advance technology of telecom like CDMA in 3G, 4G could be used in this project. By using this technology we could increase flexibility as well as adaptability of modern technology of this project.

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