



AIR PURIFIER USING INTERNET OF THINGS (IoT)

M.VELMURUGAN¹, K.SHARMILA DEVI², C.NANDHINI³, V.SIVASANKARI⁴, V.THILAGA⁵

1 Assistant professor^{2,3,4,5} UG Students

Dept. Electronics and Communication Engineering

Vivekanandha college of technology for women, Namakkal, Tamil nadu

Abstract— An Aqua Silencer is used for control of emission and noise in automobile exhaust. By using activated charcoal, perforated tube and outer shell it is constructed. Or in other words Aqua Silencer is a modified version of a conventional silencer aimed at the reduction of toxic emission from the exhaust of an IC engine into the atmosphere and also to reduce the noise that is produced by damping methods which involves water and hence the name. Day by day the Air pollution is going on increasing. The main source of the pollution is Exhaust from automobiles and industries. Hence to reduce these pollutants from Exhaust of Engine a new technology is introduced called Aqua silencer. Decreasing the pollution level is now the main aim for many. Pollution is in many forms, almost every natural thing is now affected by the term pollution. Not only land, water, air, but each and every thing belongs to the planet is now in danger levels of pollution. Already human civilizations woke up to reduce this danger but are not into many things one of such is air. Air pollution is one of the hardest challenges to the humans as it is beyond our hand limits. So there must be a technology for that to decrease the alarming levels of air pollution. The discussed method also aims to bring the increased levels of pollution back to the bottom. In this method the air is being purified by the use of distilled water only, without the use of any synthetic material or chemical substance. Here, the air is made passed through the water so by reaction with water, pollutants stay in it results in clean air. In this method air is being purified by polluting water, but the fact is cleaning water is easy and there are many methods for this but cleaning air needs some boost up in the technology level. An Aqua silencer is a device used to filter the pollutants produced from automobiles such as CO₂, CO₃ etc., Due to water, the noise is also getting reduced than open environment. Because of this it gets named as AQUA SILENCER.

Keywords—..Emission control, Air pollution, Internet of things, CO₂ sensor, O₂ sensor and Pic controller.

I. INTRODUCTION

Air pollution can be defined as addition to atmosphere of any material, which will have dexterous effect on life upon our planet. It plays an important role in control the emission of gases from the industry and vehicles. We cannot ignore the harmful effects of the large mass of the burnt gases, which contaminates our clean environment everyday. During several billion years of chemical and biological evolution, the composition of its atmosphere has varied. Today, about 99% of the volume of air we inhale consist of two gases: nitrogen and oxygen. This project is an attempt to reduce the pollutant contents of industry exhaust, before it is exhausted to the environment. In today's life the air pollution causes health problem to the human and also the environment. Now a days air pollution is one of the major problem in the world.

II. LITERATURE REVIEW

Our air pollution monitoring System is an automated version of monitoring the quality of air and sending the information to a distant database wirelessly. Our system has got almost all things automated so that we get an advantage of this concept i.e. the real time direct measurement of the parameters (here air quality) through GSM/PC. Maintaining backup of sent data is easy and can be done within a few seconds. This model uses gas sensors, GSM module (SIM900), LCD and a Microcontroller. The GSM module is connected to PC through RS232 .The system model which says about the connectivity of all mentioned devices. The LCD is attached to microcontroller simultaneously display the measured temperature, through which we can experimentally check whether the data that is being sent is correct . Our air pollution monitoring System is an automated version of monitoring the quality of air and sending the information to a distant database wirelessly. These sensors will record the pollutant levels of gases like CO₂, SO₂ and NO₂ and relay the information through Internet/GSM network to the base station. The data received at the base stations will be arranged in a data base. The data so collected will then be processed and it involves validation, verification, standardization, normalization, aggregations and transformations. After the data is suitably processed the data prediction and analysis will be carried out. Finally conclusion, regulations and recommendations will be proposed. The communication protocol will serve as a mediator between the end user and the data base server. Our system has got almost all things automated so that we get an advantage of this concept i.e. the real time direct measurement of the parameters (here air quality) through GSM/PC. Maintaining backup of sent data is easy and can be done within a few seconds. This model uses gas sensors, GSM module (SIM900), LCD JHD 162A and a Microcontroller. The LCD is attached to microcontroller simultaneously display the measured temperature, through which we can experimentally check whether the data that is being sent is correct .

III. PROPOSED SYSTEM

The main contributor to the air pollution is gases releasing from the industries like carbon dioxide, unburned hydrocarbons etc .Our proposed system focused on minimizes generation of such polluting agent .In this air purifier the unwanted gases is sedemented onto the water while pure air is come out the water. Environment harmful gases or observed efficiently within the air purifier and keep environment friendly. Here we use O₂ and CO₂ sensor to sense the gas level of this gases. This system is controlled by the PIC controller and IoT is interface to get all the data about gases from the industry.

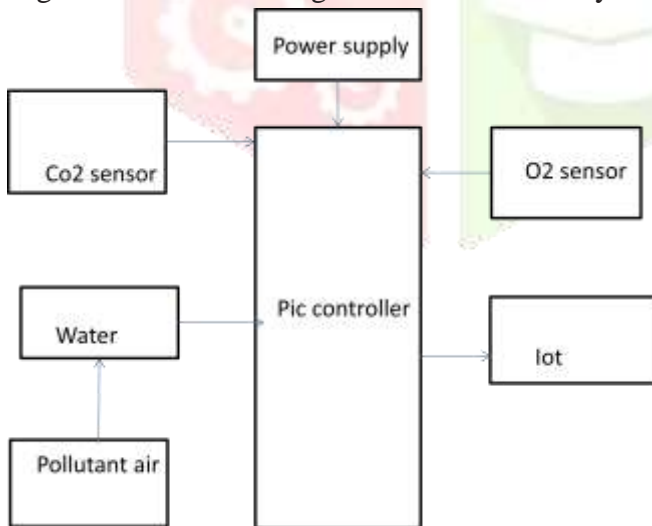


Fig. 1.Proposed block diagram for air purifier

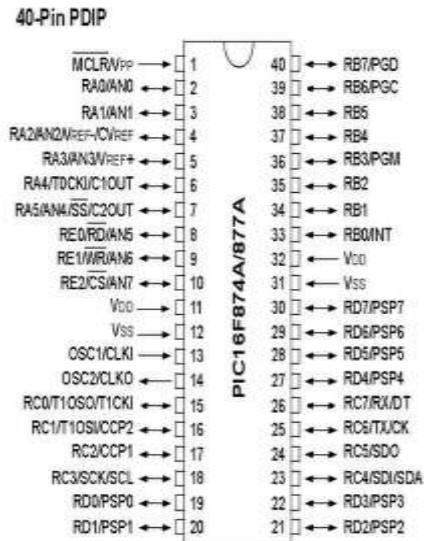
IV. HARDWARE REQUIREMENTS

A. POWER SUPPLY

A power supply is a device or system that supplies electrical or other types of energy to an output load or group of loads. The term is most commonly applied to electrical energy supplies, less often to mechanical ones, and rarely to others.

B. PIC CONTROLLER

PIC is a family of modified Harvard architecture microcontroller made by Microchip Technology, derived from the PIC1650 originally developed by General_Instrument's Microelectronics Division. The name PIC initially referred to "Peripheral Interface Controller". PICs are popular with both industrial developers and hobbyists alike due to their low cost, wide availability, large user base, extensive collection of application notes, availability of low cost or free development tools, and serial programming (and re-programming with flash memory) capability.



ADVANTAGES OF PIC MICROCONTROLLER

- PIC microcontrollers are consistent and faulty of PIC percentage is very less. The performance of the PIC microcontroller is very fast because of using RISC architecture.
- When comparing to other microcontrollers, power consumption is very less and programming is also very easy.
- Interfacing of an analog device is easy without any extra circuitry

C. O₂ SENSOR

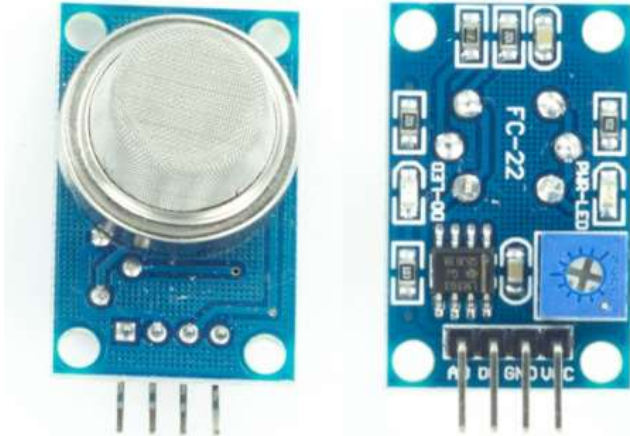
An oxygen sensor is an electronic device which is used to measure the proportion of oxygen in air and water. The sensing element is made up of thimble-shaped zirconia ceramic coated on the both sides of exhaust and reference with a thin layer of platinum. The planar-style sensor entered the market in 1990 and significantly reduced the mass of the ceramic sensing element, as well as incorporating the heater within the ceramic structure. This resulted in a sensor that started sooner and responded faster. The most common application is to measure the exhaust-gas concentration of oxygen for internal combustion engines in automobiles and industries in order to calculate and, if required, dynamically adjust the air-fuel ratio so that catalytic converters can work optimally, and also determine whether the converter is performing properly or not. Scientists use oxygen sensors to measure respiration or production of oxygen and use a different approach. Oxygen sensors are used in oxygen analyzers, which find extensive use in medical applications such as anesthesia monitors, respirators and oxygen concentrator so.



There are many different ways of measuring oxygen. These include technologies such as zirconia, electrochemical, infrared, ultrasonic, paramagnetic, and very recently, laser methods.

D. MQ-2 SENSOR

The MQ-2 sensor is a metal oxide semiconductor sensor that detects the flammable gas, smoke and concentrations of flammable gas. It is highly sensitive to LPG, propane, methane, hydrogen and smoke. It has the concentration of 300-10000 ppm for combustible gas. The voltage supply for this sensor is 5V. It is also known as chemiresistor. The sensing element will change its resistance when it comes in contact with the gas. By changing resistance, the concentration of gas can be detected.



The sensor is composed by aluminium-oxide ceramic coated tin dioxide sensitive layer, measuring electrode and heater are fixed into a crust made by plastic and stainless steel mesh. It has a 6 pin, two pins are responsible for heating current and other pin are used for the output signals. The voltage values will determine the concentration of gas. When the voltage values are higher, the concentration of gas is also high.

APPLICATIONS

- Gas leakage detection
- Air quality monitoring
- Combustible gas detector

E. INTERNET OF THINGS (IoT)

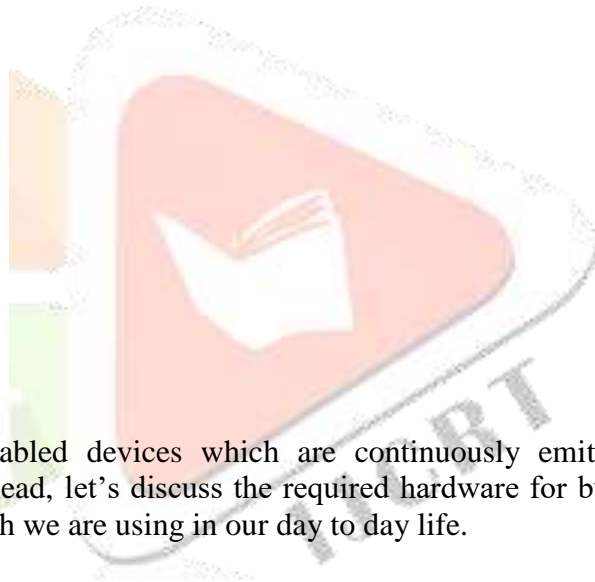
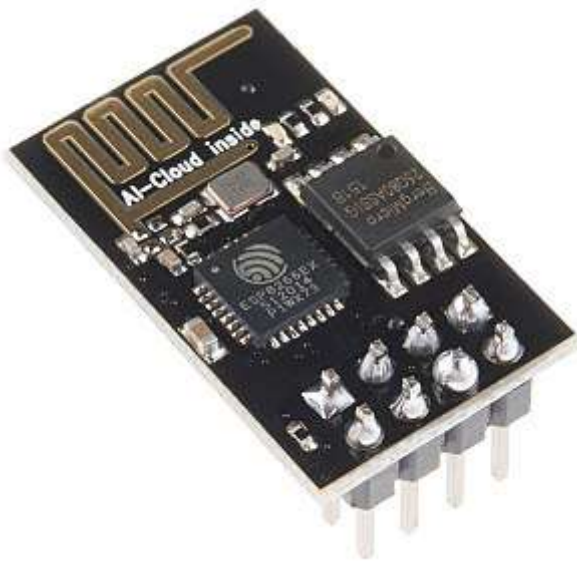
The 'Thing' in IoT can be any device with any kind of built-in-sensors with the ability to collect and transfer data over a network without manual intervention. The embedded technology in the object helps them to interact with internal states and the external environment, which in turn helps in decisions making process. In a nutshell, IoT is a concept that connects all the devices to the internet and let them communicate with each other over the internet. IoT is a giant network of connected devices – all of which gather and share data about how they are used and the environments in which they are operated. A developer submits the application with a document containing the standards, logic, errors & exceptions handled by him to the tester. Again, if there are any issues Tester communicates it back to the Developer. It takes multiple iterations & in this manner a smart application is created. Similarly, a room temperature sensor gathers the data and send it across the network, which is then used by multiple device sensors to adjust their temperatures accordingly. For example, refrigerator's sensor can gather the data regarding the outside temperature and accordingly adjust the refrigerator's temperature. Similarly, your air conditioners can also adjust its temperature accordingly. This is how devices can interact, contribute & collaborate.

1) Benefits of IoT

Since IoT allows devices to be controlled remotely across the internet, thus it created opportunities to directly connect & integrate the physical world to the computer-based systems using sensors and internet. The interconnection of these multiple embedded devices will be resulting in automation in nearly all fields and also enabling advanced applications. This is resulting in improved accuracy, efficiency and economic benefit with

reduced human intervention. It encompasses technologies such as smart grids, smart homes, intelligent transportation and smart cities. The major benefits of IoT are:

- Improved Customer Engagement – IoT improves customer experience by automating the action. For e.g. any issue in the car will be automatically detected by the sensors. The driver, as well as the manufacturer, will be notified about it. Till the time driver reaches the service station, the manufacturer will make sure that the faulty part is available at the service station.
- Technical Optimization – IoT has helped a lot in improving technologies and making them better. The manufacturer can collect data from different car sensors and analyze them to improve their design and make them much more efficient.
- Reduced Waste – Our current insights are superficial, but IoT provides real-time information leading to effective decision making & management of resources. For example, if a manufacturer finds fault in multiple engines, he can track the manufacturing plant of those engines and can rectify the issue with manufacturing belt.



Nowadays, we are surrounded by lots of IoT enabled devices which are continuously emitting data and communicating through multiple devices. Moving ahead, let's discuss the required hardware for building an IoT application. We will also look at the IoT devices which we are using in our day to day life.

- Wearables
- Smart Home Applications
- Health Care
- Smart Cities
- Agriculture
- Industrial Automation
- Smart grids

V. SOFTWARE REQUIREMENTS

The program is written in embedded c software. The PIC KIT2 loader is used to load the program in the microcontroller.

VI. CONCLUSION

This system works more effectively more pollution reduction. It has some other advantages like such as it requires cheap pollution reduction agent like water (renewable source).It's construction is simple it does not require any costly equipment and difficult process. This system can be used in industries and automobiles. The paper presented an IoT based Air pollution monitoring system for smart cities.

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