



# METHANE GAS DETECTOR USING INTERNET OF THINGS

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**Abstract:** Biogas is a crucial component of both the rural new energy development and Sustainable development of the Country. Most of the people are willing to generate the methane gas by organic wastages from home. This project describes the Gas detector device using Internet of Things. It has a PIC Microcontroller with Gas and Temperature sensors. This detector device can also suitable for gas leakage problems and Underground mines. Ambient gas detection and measurement had become essential in diverse fields and applications, from preventing accidents, avoiding equipment malfunction, to air pollution warnings and granting the correct gas mixture to patients in hospitals. Gas leakage can reach large proportions, affecting entire neighbourhoods or even cities, causing enormous environmental impacts. This project elaborates about the gas detector and automatic alarming system using Internet of Things.

**Key Words:** PIC Microcontroller, Internet of Things, Gas sensor

## INTRODUCTION

Methane Gas is a natural gas, it is used to heat, generate electricity and fuel for vehicles. It can be Generate by the Organic wastages, people are in rural side mostly generating methane gas themselves. Methane Gas is Also a harmful gas. Because it is mixed into air volume by 16 percentage then have a chance to igniting and causing an explosion. This gas was affected people who were worked in underground mines and sewage cleaning. So the detecting of methane gas is an essential thing. So we develop a design of a methane gas detector. In this design PIC microcontroller is working as a controller. The design consist a methane gas sensor, temperature sensor, 16x2 LCD, Buzzer and wifi module. The advancement of design was IoT. We can check the live status of device, that was placed in a particular place by using of wifi module and internet. This device can workable for both domestic usages and industrial usages. By using this device we can sense methane gas from 200ppm to 10000 ppm around it.

BLOCK DIAGRAM

Transmitting Section

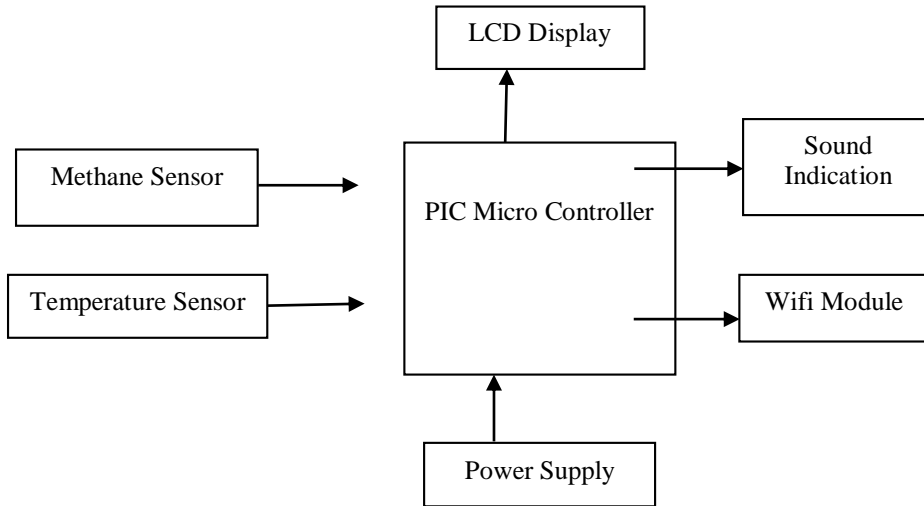


Figure 1 Block Diagram Transmitting Section

Receiving Section

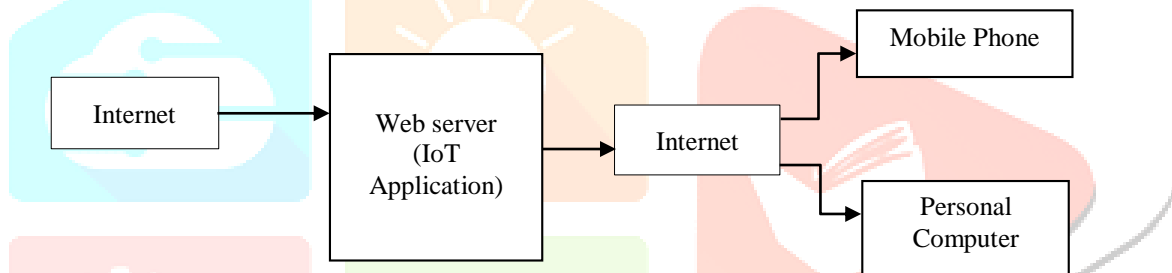


Figure 2 Block Diagram Receiving Section

CIRCUIT DIAGRAM

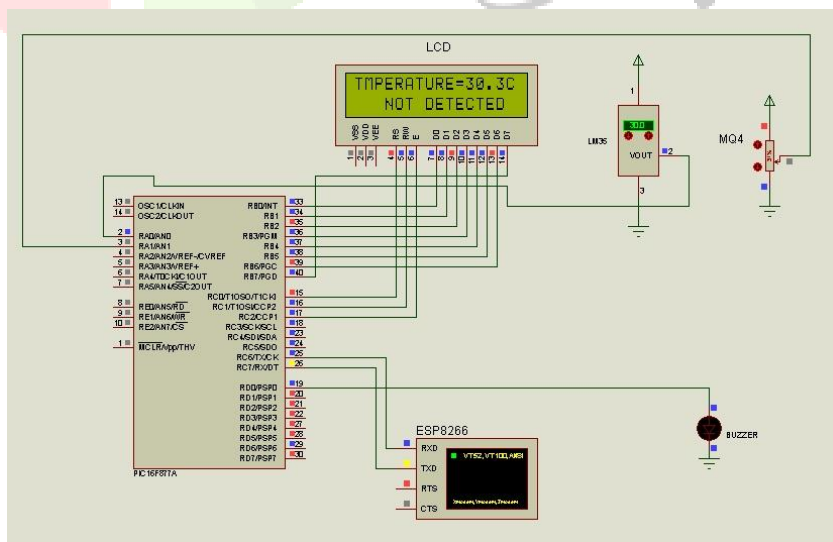


Figure 3 Circuit Diagram

## WORKING PRINCIPLE

PIC microcontroller working based on the Analog to digital conversion principle. Temperature value senses a by temperature and its analog value converted into digital value by ADC in microcontroller. Methane gas sensor detects the methane gas around it and it sends the output data to PIC Microcontroller. PIC Micro controller working in 12v dc power source. It is process the temperature and methane sensors data. The processed data will be displayed on an output unit LCD. LCD shows the live update of the temperature in Celsius and methane gas status. Buzzer is an output unit. When the sensor detects the methane gas then it will automatically truns on, otherwise remains off. Wifi Module uses to connect the microcontroller with wifi network and it is for getting internet and sends the sensor data into IoT platform. By using Mobile phone or PC we can check the live data of the device at anywhere through the IoT application.

## USING HARDWARE AND SOFTWARE

- PIC Microcontroller - 16F877A
- Methane Gas sensor - MQ4
- Temperature Sensor - DHT 11
- LCD - LM016L
- WiFi Module - ESP8266
- PIC Kit -3
- Buzzer
- Power Supply - DC12v
- MPLab IDE v 8.82
- Proteus 8 Professional

## HARDWARE DESCRIPTION

- PIC microcontroller 16F877A is a controller of a system, It has 40 pins. Its operating voltage is 5v and its digital output is also 5v. It has five different ports. PIC microcontroller has a build in ADC to converts analog data into digital data.
- Methane gas sensor MQ4 it is an input component, its operating voltage is 3.3v. And it has 4 pins, they are +Vcc, Gnd, A0, D0. It has connected to the PIC microcontroller analog pin.
- Temperature sensor DHT11 it is an input component, its operating voltage is 3v. And it has 3 pins, they are +Vcc, Gnd, A0. It has connected to the PIC microcontroller analog pin.
- 16x2 LCD screen LM016L it is an output component, its operating voltage is 4.7v. It has connected to PIC microcontroller digital pins.
- Buzzer is an output component, It operating voltage is 3v. And it has 2 pins, they are +Vcc and ground. It connected to the PIC microcontroller digital pin.

## RESULT AND DISCUSSION

This proposed system uses a Methane gas sensor MQ4, which is detects the Methane Gas and Digital Output was send to the PIC16F877A microcontroller. Then microcontroller was enables the buzzer alarm successfully. And LCD showed the current temperature value and Methane Gas status completed. Based on the serial communication we can transfer the data to cloud server. Things speak application is used for check the output data at anywhere through the smart phone and Personal Computer.

The humidity and temperature sensor DHT11 measures the heat around the place. And temperature value in Celsius directly displays in the LCD. Whenever need to know the temperature of a particular place we can simply switch on device and check LCD screen.

The methane gas sensor MQ4 is to detect and also measure gas concentrations in air. It consist a both analog and digital pins. Digital output is connected to microcontroller and programmed as alarming directly whenever gas sensing by the sensor.

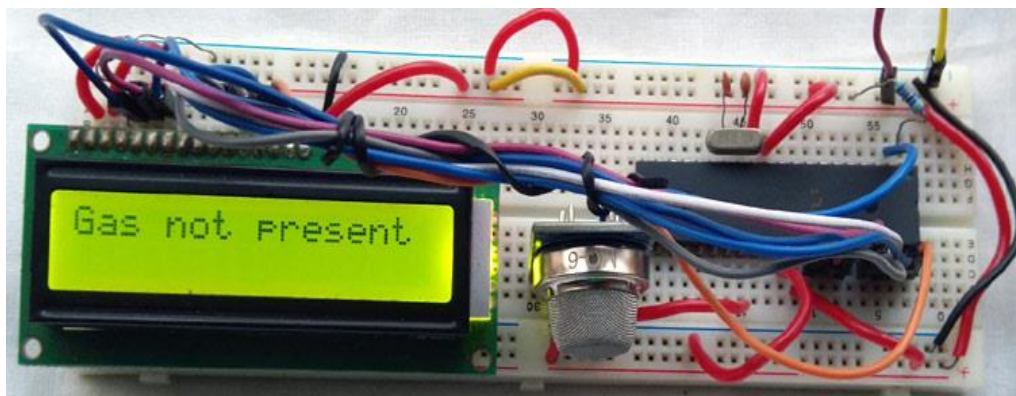


Figure 4 Experimental Setup

## CONCLUSION

The methane gas detection using Internet of Things has been experimentally proven to work in the methane tanks. It proposes better way to finding the generating methane gas from methane tank. The electronic sensor continuously updates the temperature and methane gas status to the microcontroller. We can easily know the temperature value of the surface by the LCD. It also stores the sensor values to the cloud via wifi. This concept can also work for various sectors like as Gas industries, Garbage management, Sewage Cleaners and Underground Mines. It will use for both safety and detecting purposes.

## LIMITATIONS

- When Device use in the underground Data can be miss when internet is not available or low speed.
- Device can also accessible for wireless usage, but it will not support for long duration works.
- Only one sensor working in this device, if this sensor get damage then device won't work properly.

## FUTURE WORK

- We can add more gas sensing sensors MQ137 and CM1106 in the device. Then it will become useful for multiple purposes in different areas like underground mines and sewage cleans.
- Additional methane gas sensor was add in this device, If one sensor is not working properly then another one is helpful to detect the Gas.
- In future we can use smart sensors to detect a methane gases in a different places at a time.
- Rechargeable batteries can supplies power to device and it can use for long duration.
- Using powerful LED's bulbs in the device is use for good gas indication.
- In future developed design consist of GSM and GPS modules, it is uses for alerting the authorized person and the fire service team directly to reduce the damages.

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