DEVELOPMENT OF PIC BASED CO2 MONITORING
SYSTEM DEVICE

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Abstract. Nowadays the air quality affects human health and energy. High levels of dioxide and alternative gasses within the air will cause serious ailments of a personality's body. Because of the enhanced attention to the current issue, it's necessary to develop air internal control devices. Consistent with GOST Indoor microclimate parameters’, the suitable level of greenhouse emission in a very space is 600-1000 ppm. However, the proper level of greenhouse emission concentration for health and prosperity is 380-400 ppm. The concentration level of 400-600 ppm is traditional and is usually recommended for children's rooms, bedrooms, colleges and kindergartens. A greenhouse emission concentration on top of one thousand ppm ends up in general discomfort, weakness, distracted attention and headache. The project is meant to construct a model of the device for observation the content of dioxide and alternative gasses in indoor air. The event relies on the PIC microcontroller board, completely different gas detector modules and therefore the LCD1602 module that may be a interfaced with PIC The detector management program is developed and compiled within the IDE software package shell. The operational principle of the device is that it displays the information (CO2 level and alternative gas level indoor) from the sensors on the digital display screen with a frequency of 5 minutes.

Keywords - Health, Arduino, CO2, Microcontroller

1. Introduction
Nowadays the air quality affects human health and energy. Carbon oxide (CO2) is the product of human life and activities. thanks to the very fact that top levels of greenhouse emission within the air will cause serious ailments of the human body, it is necessary to monitor this level in the area wherever folks are gift. According to GOST 30494-2011 named ‘Residential and public buildings. Indoor microclimate parameters’, the acceptable level of CO2 in a very area is 600-1000 ppm. However, the good level of CO2 concentration for health and well-being is 380-400 ppm. The concentration level of 400-600 ppm is traditional and is suggested for children's rooms, bedrooms, colleges and kindergartens. A CO2 concentration on top of a thousand ppm leads to general discomfort, weakness, distracted attention and headache [1]. In the Earth’s atmosphere there is concerning zero.04% of CO2(about four hundred ppm) and this index is still growing. It ought to be noted that carbon oxide is the major one among the "greenhouse gases", i.e. it absorbs and holds actinic radiation on Earth. Such a method ends up in the temperature increase on the planet, and this, in turn, entails climate modification. The increase in CO2 emissions to the atmosphere is the consequence of the trade growth around the world

2. Literature Review
Walsange proposed Internet of Things (IoT) might be a worldwide system of “smart devices” which can sense and connect with their surroundings and act with users and alternative systems [1]. World pollution is one in every of the most considerations of our era. Existing observation systems have inferior preciseness, low sensitivity, and want laboratory analysis. Therefore, improved observation systems area unit required. To overcome the problems of existing systems, we have a tendency to
propose a three-phase pollution observation system. Associate degree IOT kit was ready victimization
some sensors, Arduino IDE (Integrated Development Environment), and a Wi-Fi module. These kits
are often physically placed in various cities to observation pollution. The sensors gather knowledge
from air and forward the knowledge to the Arduino IDE. The Arduino IDE transmits the information
to the cloud via the Wi-Fi module. It is monitored from golem itinerant additionally. The projected
system is predict quality of air victimization completely different sensors and hold on knowledge in
information and cloud thus anyone will retrieve knowledge from anyplace anytime. [2] Manila
proposed .Air pollution may be a growing issue lately. it's necessary to monitor air quality and keep it
underneath management for a higher future and healthy living for all. Here we have a tendency to
propose associate air quality observation system that permits North American country to observe and
check live air quality in a explicit are through IOT. System uses air sensors to sense presence of
harmful gases/compounds in the air and perpetually transmit this knowledge to microcontroller. Con
jointly system keeps measure sound level and reports it to the on-line server over IOT. The sensors act
with microcontroller that processes this knowledge and transmits it over net. This permits authorities
to observe pollution in several areas and take action against it. Abirami proposed [3] Every vehicle has
its emission of gases, however the problem is the emission of the gas outside the uniform values. This
emission from the vehicles cannot be fully avoided, however in bound things, we are {able to} able to
management this, during this state of affairs, in most countries, air pollution is a major downside. In
our life there square measure 3 required requirements square measure used on earth i.e. air, liquid
substances (water), solid substances (food). Before it consumed the water, the water permits through a
reliable improvement method. From the statistics, while not important weather, the air contaminated or
not, living beings that breathe over 3000 tons of air per day, so this suggests raising awareness to the
public relating to air quality and air pollutants. as a result of of pollution not solely human health is
affected it conjointly damages the atmosphere and surroundings thus decrease the mature of live hood.

Sanjana Tiwari proposed The level of pollution has augmented with times by heap of factors like the
increase in population, augmented vehicle use, industry and urbanization which ends up in harmful
effects on human eudaemonia by directly touching health of population exposed there to. In order to
observe during this project we tend to square measure going to create associate IOT Based Air
Pollution watching System during which we tend to can monitor the Air Quality over net{an online'}
server using internet and can trigger a alarm once the air quality goes down on the far side a definite
level, means once there square measure sufficient quantity of harmful gases square measure gift within
the air like CO2, smoke, alcohol, benzol andNH3. it’ll show the air quality in PPM on the
alphabetic character numeric display and moreover as on webpage so we are able to monitor it terribly simply. In this
IOT project, you’ll monitor the pollution level from anyplace victimization your pc or mobile [4].
Monika Singh proposed today’s state of affairs we tend to face an enormous drawback that is
pollution. Not Indiaor solely Indian folks facing this drawback. Our whole world faces this drawback
of pollution. Pollution isof many sorts like pollution, water pollution, noise pollution, nuclear
pollution, etc. But here we tend to ar discussing the harmful effects of pollution and also the resolution
to pollution. the amount of pollution increasing day by day. the amount of pollution is increasing day
by day thanks to factors like industries, urbanization, increasing in population, increasing in use of a
vehicle which might have an effect on human health. within the web Of Things based mostly Air
Pollution observation, system monitors Air quality from the on top of internet server victimization the
web, once air quality goes down it triggers Associate in Nursing alarm. Air quality goes down once
enough quantity of harmful gases gift within the air like carbonic acid gas, smoke, alcohol, benzene,
NH3,and NOx. The air quality can be shown in elements per million on the alphanumeric display and
as well as on webpage thus that pollution will be monitored terribly simply. The system uses MQ135
andMQ6 sensing element for observation Air Quality. It measures their quantity precisely and findsout
harmful gases.
3. Proposed Methodology

Module Description

3.1 Power Offer

Power offer could be a relation to a supply of electric power, a tool or system that provides electrical or alternative varieties of energy to associate degree output load or cluster of hundreds is termed an influence offer unit or PSU. The term is most ordinarily applied to electricity provides, less typically to mechanical ones, and barely to others.

3.2 Transformer

Basic power offer the input power electrical device has its coil connected to the mains (line) offer. A coil, electro-magnetically coupled however electrically isolated from the first is employed to get associate degree AC voltage of appropriate amplitude, and once additional process by the PSU, to drive the physical science circuit it's to produce. The electrical device stage should be ready to offer the present required. If too little a electrical device is employed, it's probably that the facility supply's
ability to take care of full output voltage at full output current are going to be impaired. With too little a electrical device, the losses can increase dramatically as full load is placed on the electrical device. As the electrical device is probably going to be the foremost expensive item within the power offer unit, careful thought should run to reconciliation price with probably current demand. There may additionally be a necessity for safety devices like thermal fuses to disconnect the electrical device if heating happens, and electrical isolation between primary and secondary windings, for electrical safety.

Figure 3. Transformer

3.3 Rectifier Stage

Bridge rectifier Rectifier circuit is employed, to convert the AC input is regenerate to DC. the complete wave bridge rectifier uses four diodes organized in an exceedingly electric circuit to administer full wave rectification while not the requirement for a centre-tapped electrical device. an extra advantage is that, as 2 diodes square measure conducting at anyone time, the diodes would like solely [fr1] the reverse breakdown voltage capability of diodes used for [fr1] and traditional full wave rectification. The bridge rectifier are often designed from separate diodes or a combined bridge rectifier are often used. The current methods on positive and negative [fr1] cycles of the input. It are often seen that on every [fr1] cycle, opposite pairs of diodes conduct, however the present through the load remains within the same polarity for each [fr1] cycles.

Figure 4. Rectifier Stage

3.4 Filter
A typical power offer filter circuit are often best understood by dividing the circuit into 2 elements, the reservoir capacitance and also the low pass filter. every of those elements contributes to removing the remaining AC pulses, however in several ways that. Electrolytic capacitance used as a reservoir capacitor, therefore referred to as as a result of it acts as a short lived storage for the facility offer output current. The rectifier diode provides current to charge a reservoir capacitance on every cycle of the input wave. The reservoir capacitance is giant electrolytic, typically of many hundred or maybe 1000 or additional microfarads, particularly in mains frequency PSUs. This terribly giant worth of capacitance is needed as a result of the reservoir capacitance, once charged, should offer enough DC to take care of a gentle PSU output within the absence of associate degree input current; i.e. throughout the gaps between the positive cycles once the rectifier isn't conducting. The action of the reservoir capacitance on a wave corrected undulation. throughout every cycle, the rectifier anode AC voltage will increase towards Vpk. At some purpose on the brink of Vpk the anode voltage exceeds the cathode voltage, the rectifier conducts and a pulse of current flows, charging the reservoir capacitance to the worth of Vpk. Once the input wave passes Vpk the rectifier anode falls below the capacitance voltage, the rectifier becomes reverse biased and conductivity stops. The load circuit is currently equipped by the reservoir capacitance alone. Of course, even if the reservoir capacitance has giant worth, it discharges because it provides the load, and its voltage falls, however not by abundantly. At some purpose throughout succeeding cycle of the mains input, the rectifier input voltage rises on top of the voltage on the partially discharged capacitance and also the reservoir is re-charged to the height worth Vpk once more.

3.5 CO2 Sensor

CO2 sensing element might even be a chemical optical sensing element utilizing the acidic nature of acid gas for detection. It consists of a gas-permeable membrane throughout that a pH-sensitive luminescence dye is immobilized beside a buffer and associate inert reference light-weight dye. acid gas pervasive into the membrane changes the inner proton concentration of the buffer. With this changes the luminescence of the pH-sensitive dye. beside the inert reference dye internal referencing is made for detection of the luminescence quantity of the sensing element. The live signal detected by the pCO2 mini correlates to the partial pressure of acid gas shut.

![Image](image.png)

Figure 5. CO2 Sensor

3.6 LCD

liquid cell shows (LCDs) accustomed show of display of numeric and alphanemic characters in matrix and segmental displays. They are all around U.S.A. in laptop computer computers, digital clocks and watches, microwave, CD players and lots of alternative electronic devices. LCDs ar common as a result of they provide some real blessings over alternative show technologies. LCDs consume a lot of less power than junction rectifier and gas-display displays as a result of they work on the principle of interference light-weight instead of emitting it. An digital
display (alphanumeric display) is created with either a passive matrix or an energetic matrix display grid. An energetic matrix contains a semiconductor unit set at every picture element intersection, requiring less current to manage the luminosity of a picture element. For this reason, the present in an energetic matrix show may be switched on and off additional oftentimes, up the screen refresh time. Passive matrix LCD's have twin scanning, which means that they scan the grid double with current within the same.

3.7 Buzzer

A buzzer may be a mechanical, mechanical device, magnetic, magnetic force, electro-acoustic or electricity audio device. A Piezo electrical buzzer will be driven by associate periodic electronic circuit or alternative audio signal supply. A click, beep or ring will indicate that a button has been ironed. A buzzer takes some type of input and emits a sound in response thereto. They will use varied means that to provide the sound; everything from metal clappers to mechanical device devices. A buzzer has to have how of taking in energy and changing it to acoustic energy. Several buzzers square measure a part of a bigger circuit and take their power directly from the device’s power supply. In alternative cases, however, the buzzer is also battery supercharged in order that it'll detonate within the event of a mains outage. A buzzer or pager may be a device, The word "buzzer" comes from the rasping noise that buzzers created after they were mechanical device devices, operated from stepped-down AC line voltage at fifty or sixty cycles. Alternative sounds unremarkably wont to indicate that a button has been ironed square measure a hoop or a beep.
4. Result and Discussion
An experiment was conducted to realize sensible results. The developed device was put in accommodation of sixteen M2 with an operating ventilation system. The testing was conducted for 10 hours. At the 1st time, a window was opened and the greenhouse gas concentration corresponded to the street one, i.e. regarding 380 ppm. The following information was taken with the closed window and the presence of 2 folks in the space. The analysis verified that once the window is closed, the concentration of carbon oxide rises in this case to the worth of 850-970 ppm. The worth failed to rise higher because of the great work of the ventilation. This level of greenhouse gas is not dangerous, however for traditional air quality (with a CO2 concentration of 380-600 ppm) it's necessary to air the space frequently. Below could be a chart of the results of the experiment.

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