MEASUREMENT OF CO_2 EMISSION IN CONJUSTED AREA

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ABSTRACT

Carbon Dioxide is one of the major environmental concerns in India. Over the past 20 years there has been a considerable increase in the number of motor vehicles. The present study was conducted to assess journey time and roadside exposure to particulate matter along major roads of salem, namakkal in tamilnadu during February 2017.Measurements of particulate mass were carried out continuously outside the vehicle at 15 different locations in all three cities. Additionally, monitoring was undertaken at a background site throughout the period. The carbon dioxide (ppm) has analyzed by using CO_2 meter . It also measures humidity and temperature. The highest levels were found at the sites with traffic congestion reflecting, not only, the large contribution of automobile exhaust but also the suspension of road dust. The majority of public transport vehicles in these cities are not air-conditioned and it is very likely that commuters are exposed to the similar high levels of pollution.

Keywords : Emission Analysis, CO_2

1. INTRODUCTION

To meet the ambitious carbon reduction targets that governments are now setting for 2020 and beyond, individual companies and industry sectors will have to implement,decarbonisation strategies over the next few years. The longer that it takes them to get onto an appropriate carbon reduction trajectory, the harder it will be to reach the targets. Many industry sectors and companies are still at an early stage in this process, analyzing their greenhouse gas (GHG) emissions and exploring options for reducing them. As the old business mantra states, ‘if you can’t measure it you can’t manage it’ and so the logical place to start is with detailed measurement of GHG emissions.In 2014 was introduce the work of CO2 emission control plans . Efforts have been made internationally to standardise the measurement and reporting of these emissions in order to ensure comparability. At present there is no single agreed standard, though the two main standards developed by the World Business Council on Sustainable Development / World Resources Institute (2004) (the Greenhouse Gas Protocol) and International Standards Organization (ISO 14064) are broadly similar. Both set out guidelines for the carbon auditing.

MEASUREMENT OF PHYSICAL METHODS

3.1 Infra-red Spectrography

3.2 Molecular Correlation Spectrography

3.3 Raman Spectrography

3.4 Mass Spectrography

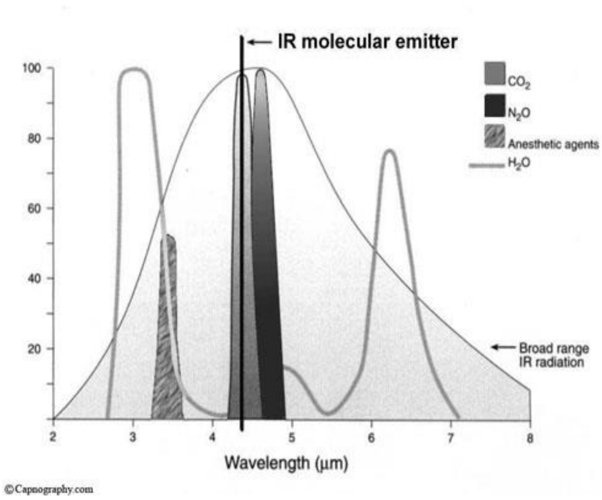
3.5 Photoacoustic Spectrography

3.1 Infra Red Spectrography

CO_2 absorbs Infra red light at 4.3 µm. Infra-red spectrographs are more compact and less expensive than the other methods of measurement. This has been the most popular technique for monitoring $C0_2$. The wavelength of IR rays exceeds 1.0 milli micron while the visible spectrum is between 0.4 and 0.8 milli microns. The IR rays are absorbed by polyatomic gases (non-elementary gases such as nitrous oxide (N20), CO_2, and water vapour. Carbon dioxide selectively absorbs specific wavelengths (4.3 milli microns) of IR light. Since the amount of light absorbed is proportional to the concentration of the absorbing molecules, the concentration of a gas can be determined by comparing the measured absorbance with the absorbance of a known standard.

3.2 Molecular Correlation Spectrography (MCS)

Microstream technology is built on unique approach to IR radiation emission. Laser-based technology, i.e., molecular correlation spectroscopy (MCS), is used to generate an IR emission that precisely matches the absorption spectrum of CO_2 molecule. The high emission efficiency and extreme CO_2 specificity and sensitivity of the emitter-deontrast to conventional CO_2 IR method, where the sampling flow rate is 150 ml/min Microstream technology uses a novel MCS source that operates at room temperature and emits only CO_2 specific.



The mechanism of MCS :

The source, unlike the black body IR radiator, is an all glass discharge lamp, without an electrode, coupled with an IR transmitting window which is either sapphire (for very high outputs and low noise) or high transmitting IR glass (for standard functions). The glass lamp undergoes a special cleaning process as well as chemical conditioning before being filled with a carefully balanced mixture of up to 7 gases at low pressure. Electrons generated by a radio frequency voltage excite Nitrogen molecules, one of the gases within the source. Carbon dioxide molecules are then excited through collision with the excited nitrogen molecules as energy is transferred from Nitrogen to the CO_2 molecules. As the excited CO_2 molecules drop back to their ground state they emit signature wavelength of CO_2, which is the radiation emitted from the source .

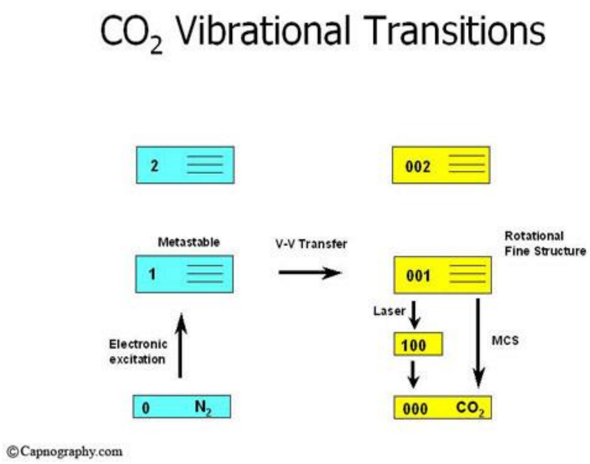


Figure:3.2 Co_2 Vibrational Transition

3.2.2 Molecular correlation spectroscopy signal processing:

The IR source is electronically modulated at a frequency of 20 Hz so that a measurement can be sampled every 25 msecs. This preserves a rapid response time while maintaining optimal signal characteristics without degradation. The amplitude of each signal received by the detector is dependent on the amount of radiation absorbed from the gas sample that is proportional to the CO_2

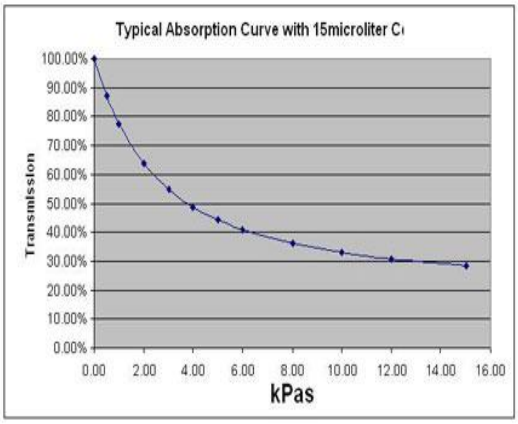


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Figure:3.3 Typical Absorption Curve

This phenomena is present even for small variances in CO_2 concentration and provides high signal to noise characteristics in the final displayed waveform. To further enhance the waveform signal to noise, without affecting the response time, dynamic averaging of the 25 msec signal is used. The degree of dynamic averaging is proportional to the rate of change of the signal. In this method, only with slow changing signals, indicative of the alveolar CO_2 plateau or the inhalation phase, is averaging applied. When fast changing signals are detected, indicative of the ascending CO_2 upstroke, all signal averaging is removed. Microstream employs a flow rate of 50 ml/min, one-half to one-third the rate typically required by conventional side-stream capnographs. It has been suggested that the low flow rate reduces the entry of moisture and humidity that can condense in the sampling line and obstruct the sample pathway - a common problem with conventional side-stream technology.

3.3 Raman Spectrography

Raman Spectrography uses the principle of "Raman Scattering" for CO_2 measurement. The gas sample is aspirated into an analyzing chamber, where the sample is illuminated by a high intensity monochromatic argon laser beam. The light is absorbed by molecules which are then excited to unstable vibrational or rotational energy states (Raman scattering). The Raman scattering signals (Raman light) are of low intensity and are measured at right angles to the laser beam..

3.4 Mass Spectrography

The mass spectrograph separates molecules on the basis of mass to charge ratios. A gas sample is aspirated into a high vacuum chamber (10-5 mmHg) where an electron beam ionizes and fragments the components of the sample. The ions are accelerated by an electric field into a final chamber, which has a magnetic field, perpendicular to the path of the ionized gas stream. In the magnetic field the particles follow a path wherein the radius of curvature is proportional to the charge:mass ratio.

3.5 Photo acoustic Spectrography

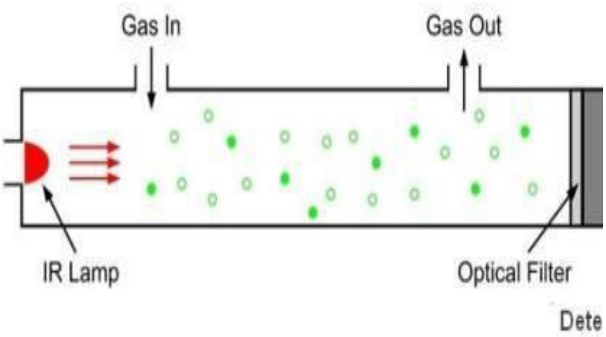
Photo acoustic gas measurement (e.g., Bruel-Kjaer gas monitor)is based on the same principles as conventional IR-based gas analyzers: the ability of CO_2 and N20 and anaesthetic agents to absorb IR light. However, they differ in measurement techniques. While Infra-red spectrography uses optical methods, PAS uses an acoustic technique. When an IR energy is applied to a gas, the gas will expand and lead to an increase in pressure. If the applied energy is delivered in pulses the gas expansion would be also pulsatile, resulting in pressure fluctuations. If the pulsation frequency lies.

2. CARBON DIOXIDE SENSORS

Carbon dioxide is a colourless and odourless gas and is toxic if present in high levels.
Basically there are two types of carbon dioxide sensors used:
1. Non-Dispersive Infra Red (NDIR) Sensors
2. Chemical based CO_2 Sensors

4.1 NDIR Sensors

NDIR is term for "non-dispersive infrared", and is the most common type of sensor used to measure CO_2.



(a) Working of NDIR detector
These types of sensors basically consist of a tube or a chamber in which a source of infrared light is placed at one end and at the other end there is a detector. The tube is filled with the gas and the source directs the infrared waves of light in the tube filled with gas. The molecules of the carbon dioxide gas absorb light of particular wavelength. A optical filter which is just placed in front of the detector absorbs light except the light of wavelength absorbed by carbon dioxide molecules. The difference between the amount of Infrared light among the source and the detector is calculated. This difference is directly proportional to the number of carbon dioxide molecules present in the gas.

4.2 Chemical based CO_2 Sensors:

The basic principle of chemical based carbon dioxide sensors is based on the measurement of the pH change of the electrolyte solution caused by the hydrolysis of the CO2. The sensor consist of a pair of electrodes, an oxide electrode and a reference electrode, bicarbonate based internal electrolyte solution, a gas permeable membrane at the bottom of the sensor. The CO2 molecules present in the solution diffuse through this gas permeable membrane and enter into the internal electrolyte solution. Here the the carbon dioxide molecules react with the water and form carbonic acid, which again breaks into bicarbonate and proton ions.
CO2(aq) + H2O H2CO3 HCO3- + H+
These proton ions decrease the pH of the electrolyte solution and which is detected by the internal electrodes.

3. MEASUREMENT OF CO_2 EMISSION STRATEGIES

Carbon dioxide measurement is required in many applications from building automation and greenhouses to life science and safety.
This document covers the following topics:
• Operation principle of infrared carbon dioxide (CO2) sensors
• The ideal gas law and how to use it to compensate the CO2 measurement for environmental factors
• Optimal locations for CO_2 transmitters
• Safety issues related to CO_2 Operation Principle of Infrared Sensors Carbon dioxide and other gases consisting of two or more dissimilar atoms absorb infrared (IR) radiation in a characteristic, unique manner. Such gases are detectable using IR techniques. Water vapor, methane, carbon dioxide, and carbon monoxide are examples of gases that can be measured with an IR sensor effectiveness than duct-mounted sensorsDuct-mounted sensors

CONCLUSION

CO_2 is the major greenhouse gas .The Intergovernmental Panel on Climate Change(IPCC) concludes that increasing level of CO_2 resulting from human activity such as fossil fuel burning and deforestation the atmospheric level of CO_2 has droughts,elnino,hurricanes,climate change are caused. In this project we have studied the level of CO_2 emission around congested areas in salem and namakkal. It is showed that the level of CO_2 has a adverse effect which can cause climate change in this area. Let we conclude that there should be reduction of CO_2 level in this area. And it is recommended that further studies should be carried out in order to reduce level of emissions.

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