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AIR POLLUTION MONITORING

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Abstract

Air pollution has bad influence on the concentration of constituents in the atmosphere, which leads to effects like global warming and acid rains. To avoid such adverse imbalances in the nature, an air pollution monitoring system is very essential. The fresh air is necessary for all human being, for that various types of technology has been used and some of this technology is really useful in order to provide a better quality of air for a better well being. Aim of this paper is to highlight some instruments which is used for air pollution monitoring and how effective of these technologies are and identify the important research in this important area.

The main reason for the increase in air pollution are increase in population, increased vehicle use, industrialization and urbanization which results in harmful effects on human wellbeing by directly affecting health of population excepted to it. The major four air pollutants are PM, SO₂, CO₂ and O₃. The WHO provides air quality guidelines (AQI) which are very strict for these four pollutants. However several measures have been taken to stop them, that measures had a good effect in many countries as in recent decades air pollution level has been decreased in many developed countries. But now also the air pollution level much higher than that of the Air Quality Guidelines set up by WHO. The effect of them can be sometime seen even when the air pollution level is below the AQI level. So in order to stop them some of the instruments must be made for the monitoring of air pollution.

Index Terms: -AQI, Effect, Instruments, Remedies & solutions etc.

1. INTRODUCTION

In today's generation air pollution is a major threat in our society. The major causes of air pollution are industrialization and harmful smokes from vehicle because of incomplete combustion of fuels inside the engine. So, there should be some system of monitoring to control air pollution. To stop them first we have to judge the quality of air.

Air Quality Index (AQI) helps in understanding the level at which air is polluted and the associated health effects. Environment protection authority calculates AQI for five major pollutants ground level ozone, particulate matter, carbon monoxide, sulphur dioxide, and nitrogen dioxide.

The monitoring of air helps us in better understanding of the resources and also helps us to know different types of air pollutants. The purpose of air monitoring is not just to collect the data but also to provide information to engineers, scientist and other people so they can help us to stop them.

Emission rate is a major factor in air pollution monitoring. It tells us the weight of pollutants emitted per unit time.

Emission rate = Input * Emission factor * applicable correction factor * Hours of operation * seasonal variation

1.1 Effects Of Pollution

Greenhouse effect

The greenhouse effect is the process by which radiation from a planet's atmosphere warms the planet's surface to a temperature above what it would be without its atmosphere.

If a planet's atmosphere contains radioactively active gases they will radiate energy in all directions. Part of this radiation is directed towards the surface, warming it. The intensity of the downward radiation that is, the strength of the greenhouse effect will depend on the atmosphere's temperature and on the amount of greenhouse gases that the atmosphere contains.

Earth's natural greenhouse effect is critical to supporting life. Human activities like the burning of fossil fuels and clearing of forests have increased the natural greenhouse effect leads to global warming.

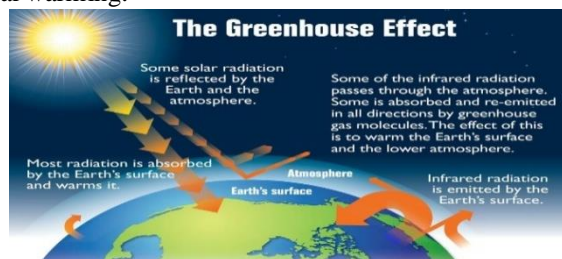


Fig-1.1: The greenhouse effect

Global warming

It is correlated with the greenhouse effect. Due to excessive increase in greenhouses gases, the temperature of surrounding increases, this is called global warming.

The increase in temperature is because as sun rays coming to the earth surface has to be reflected back by them. As they are reflected back but because of the increase in the greenhouse gases they are not able to escape from the earth atmosphere and reflected back to the earth surface this leads to increase in temperature and this causes global warming.



Fig-1.1.2: Global warming

Acid Rain

Due to industrialization the concentration of SO_x, NO_x and other harmful gases increase in the surrounding and when they gets reacted with the atmospheric oxygen to form respective oxide.

The oxides of sulphur and nitrogen in presence of water, which on reaction leads to formation of sulphuric acid, nitric acid. The pH of rain below 5.7 is called as acid rain.

Acid rain has been shown to have adverse impacts on forest, fresh water and soils, killing insects and aquatic life forms, corrosion of steel structures such as bridges.

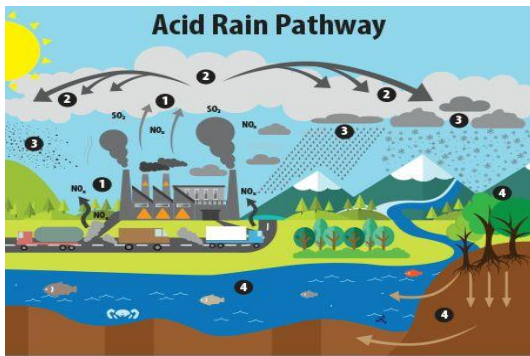
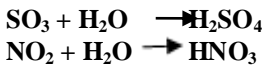
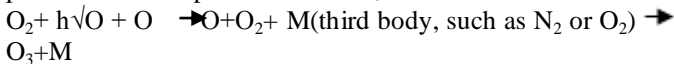


Fig-1.1.3: Acid rain

Depletion of Ozone Layer

It is natural process of formation and depletion of Ozone layer. The depletion is because of sun rays and the formation takes place with the help of this reaction,



Here third body absorbs the excess energy liberated by the above reaction & there by ozone molecule is stabilized. But because of the excess air pollution the depletion of ozone layer gets depleted from the bottom. Major cause of depletion of ozone layer from the bottom is CFC (chlorofluorocarbon) other harmful gases.

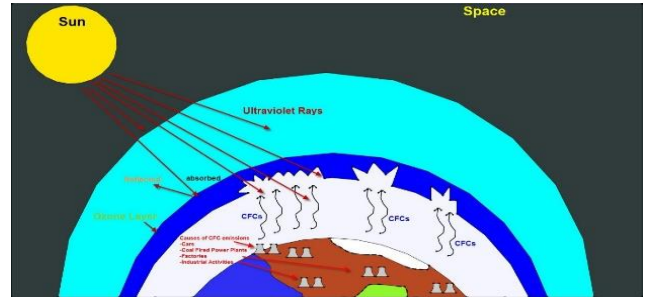


Fig-1.1.4: Depletion of Ozone layer

2. AIR POLLUTION MONITORING INSTRUMENT

2.1 Concentration measuring instrument

This group includes the instrument available for gaseous and particular sampling. The best example is the gas chromatography, in this the moving phase is a carrier gas usually are inert gas such as helium or an unreactive gas such as nitrogen and the stationary phase is a layer of liquid or a polymer. Firstly the mixture is been separated in liquid and stationary phase. Finally the concentration of gas is measured in vapour pressure.

It was invented in 1903 by a Russian scientist, Mikhail Semenovitchswett. Archer John Porter Martin was awarded a Nobel prize for liquid-liquid (1941) and paper chromatography in (1944).

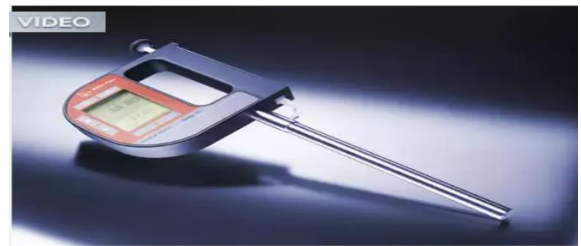


Fig-2.1: Concentration measuring instrument

2.2 Continuous emission monitoring system (CEMS)

Real time monitoring of stack gases is the basic trust behind such system. One of sensor used are Zirconia Sensor for emission monitoring there is always the requirement of oxygen, so it has an oxygen analyser for monitoring. This measures the real time oxygen measurement to make alongside the standard measurement of CO, CO₂, NO₂, etc. Its percentage varies from 2.5% to 5%.



Fig-2.2: Continuous emission monitoring system

2.3 Air measuring device

This category includes volume meter, rate meter and velocity meter. Optical flow meters are one of them. Small particles from nature and industries passes through two beams focus through a short distance from the flow pipe. The laser light is pass through them and light scatters through the particle which generates a pulse signal. by measuring the pulse interval we can measure the velocity by $V=D/T$, where D is the distance between the laser beams and T is the time interval.



Fig-2.3: Air measuring device

S.No.	Problem Area	Type of Industry
1	Singrauli	Power Plants, Mining, Aluminium Industry.
2	Korba	Power Plants, Aluminium Industry, Mining.
3	Vapi	Chemical Industries.
4	Ankaleshwar	Chemical Industries.
5	Greater Cochin	Oil Refineries, Chemical, Metallurgical Industries
6	Visakhapatnam	Oil Refinery, Chemical, Steel Plants.
7	Howrah	Foundry, Rolling Mills
8	Durgapur	Chemical Industries, Power Plants, Steel Plants.
9	Manali	Oil Refineries, Chemical Industry, Fertilizer Industry
10	Chembur	Refineries, Power Plant, Fertilizer Industry.
11	Mandi Gobindgarh	Secondary Steel Industry
12	Dhanbad	Mining, Coke Oven
13	Pali	Cotton Textile, Dyeing



Fig- 2.4.1: Meteorological instrument

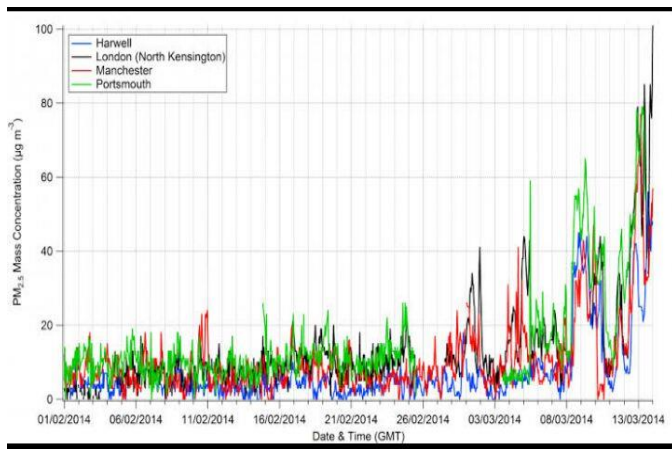


Fig 2.4.2- Problems caused by industry in particular area

2.4 Meteorological instrument

Meteorology is a science which does not use much lab equipments but relies more in site observation and remote sensing equipments. Basic device use for measuring atmospheric variable are included in this category. It was first invented in 15th century. In 20th century new equipments were invented such as weather radars, weather satellites and wind profilers, which provides better result.

3. REMEDIES AND SOLUTION

3.1. Regulatory solution:

This solution involves passage of law and the establishment of the government agencies which attempt to reduce air pollution through government monitoring.

3.2. Technological solution:

This includes the process in emission technology, extension of emission roles to trucks etc.

3.3 Market based solution:

This solution allow firms the flexibility to select cost effects solution to achieve established environmental goals.

4. CONCLUSION

After studying the demerits of air pollution we come to the conclusion that air pollution is harmful to the environment. But until now we are not able to make an instrument which can reduce 100% air pollution. After studying we came on the conclusion that by using the air monitoring instruments, the air pollution can be controlled to 60%-70% of the total air pollution. It is also necessary to install at least one air pollution monitoring device in all the industries to measure the industrial pollution made by them. To minimize the air pollution the measures has to be taken by everyone, it cannot be minimize by a single person. As "BETTER QUALITY OF AIR MEANS BETTER QUALITY OF LIFE".

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