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Study of vehicular pollution impact analysis on living and non-living things

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ABSTRACT

This paper has been written to review the study of vehicular pollution and it effect on living and non-living thing. There is a tremendous increase in the number of vehicles in the developing country . Vehicular pollution is one of the major source contributing air pollution . Improvement are required in the fuel quality ,traffic management This paper discusses toward the development of vehicular pollution control device which could control the pollution and report online to the controlling agency about pollution emission about any vehicle .This paper covered all the important aspect regarding pollution control and its measurement which is created by automobile sector.

Keyword:- vehicular pollution ,factor affecting vehicular pollution , impact on living things , non living things ,its control and managements .

I.INTRODUCTION

In today's world of quick industrialization, along with the emergence of automobile industries as the leading factor for contribution to world economy, it has also emerged as the main source of urban environmental pollution in developing countries. The developing countries have observed a tremendous increase in the dominating use of motorized vehicles in the passenger and transport market due to its flexible and versatile nature with low initial cost .There are other sources of pollution in the world but vehicular pollution is the major factor which contributes to clean air pollution (fig. 1). India contributes nearly 16% of total world pollution. Among these 16%, 14% pollution is contributes by vehicular pollution. Among these 14% pollution NCR contributes nearly 15% to 18% of pollution.

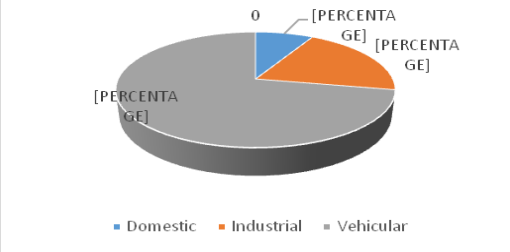

Fig.1. Contribution of vehicular pollution. **Factor affecting vehicular pollution**

The adverse effect of vehicular pollution on human health is marked by the symptoms like cough, headache, nausea, irritation in eyes, etc. There are some major factors which influence the vehicular pollution worldwide in urban areas.

Vehicle Population

The rapid growth in vehicle population is being observed since the beginning of 20th century. The vehicle population in 1950 was observed to be around 70 million which increased to about 700 million in 1996 (fig. 2). USA and Europe together have 2/3 of vehicle population of the world. After 1980 the annual growth rate of vehicle population is observed to be 3% and for the developing countries the rate is even higher. In 2020 the world vehicle population is estimated to be about 1.1 billion with developing countries constituting 44% of the total population. The large vehicular population results in increased vehicular emission leading to high air pollution. As urban areas have more vehicle population than rural areas, so, vehicle pollution in urban localities is much high as compared to rural localities. The personal automobile is the key source of pollution in cities and driving a private car is considered the daily polluting activity of any citizen.

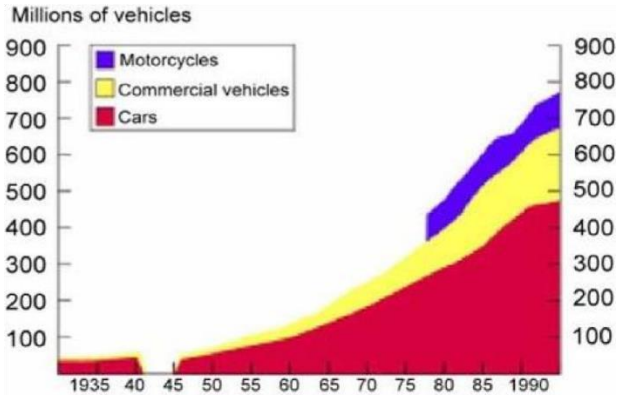

Figure 2 Global increase in trend of motor vehicles

Combustion Process and Vehicle Emissions

Traffic Congestion:

The congestion of traffic is also responsible for vehicular pollution. Generally, all big urban cities are crowded. So, any addition of the motor vehicle to the existing crowded area leads to increase in travel time for rest of the passengers. This increase in traffic congestion results in decrement of the average speed of all vehicles below the eco friendly speed leading to the rise in rate of emissions per km . The VOCs and carbon dioxide are observed to be 250% more in congested areas than the areas with free moving traffic.

Major pollutant

Carbon Monoxide (CO):

This is one of the major pollutants present in the vehicle emission. It is a toxic gas formed in the combustion chamber of vehicles due to insufficient supply of oxygen. About 90% of the carbon monoxide in atmosphere comes from gasoline engines and forest fires (fig. 3).

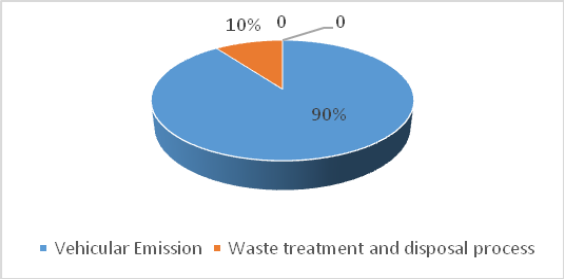

Figure 3 Contribution of Carbon Monoxide in atmosphere by different sources

Nitrogen oxides (NOx):

NOx represents both nitric oxide (NO) and nitrogen dioxide (NO_2). The vehicular emissions are responsible for 50% of NOx in the world (fig. 4). The urban regions experience major trouble due to NOx due to heavy road transport .

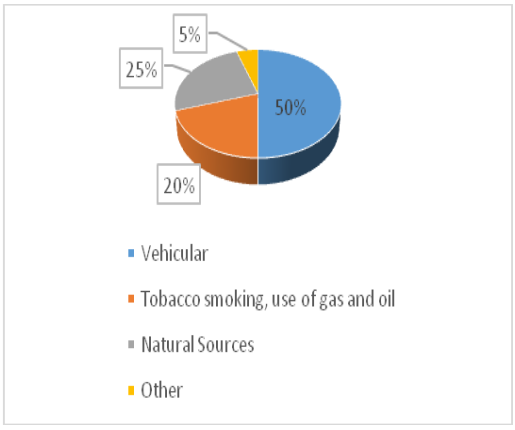

Figure 4 Contribution of Nitrogen Oxide in atmosphere by different sources

Carbon Dioxide (CO_2):

The increase in level of carbon dioxide in atmosphere is a result of various human activities. In present scenario, the vehicular emission is responsible for 25% of the total increase in carbon dioxide all over the world. Today, CO_2 is one of the major factor for global warming. According to various research, the rapid increase in carbon dioxide in world has resulted in rise in temperature of the earth by 1^oC for every thirty years.

Particulate Matter (PM):

The minute particles which are solid in nature (dust, dirt, soot, smoke) and droplets of liquids are referred to as Particulate Matter. These can be emitted in the atmosphere by natural (windblown dust, fires, etc.) or man-made (vehicles, construction processes, etc.) means. In case of motor vehicles the particulate matters

are formed by the condensation and transformation of gases constituting emission such as nitrogen dioxide, Sulphur dioxide, etc.

Technical Issues of gasoline engines:

Some technical factors are also responsible for vehicular pollution in case of gasoline engines.

Crankcase blow by:

This issue is observed in four stroke gasoline engines when combusted fuel and air-fuel mixture from carburettor escape past the piston rings and enter the crank case and then gets leaked into the atmosphere through vents [15].

Evaporative Emissions:

In this the fuel gets mixed with the atmosphere by getting evaporated from fuel tanks or carburetors. fig. 5 and 6 shows percentage contribution of technical issues and emissions to the pollution by 2-stroke and 4-stroke gasoline engines respectively.

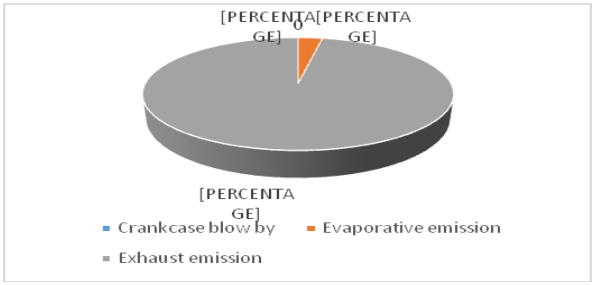

Figure 5 Percentage contribution of technical issues and emissions to the pollution by 2-stroke gasoline engines.

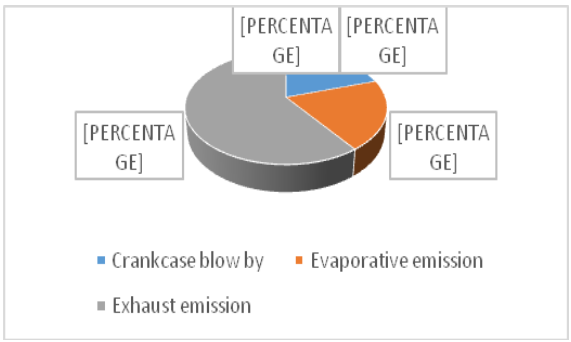

Figure 6 percentage contribution of technical issues and emissions to the pollution by 4-stroke gasoline engines.

Effect of vehicular pollution on living things and human health

The components of vehicular pollution (NOx, CO, SO, etc.) have harmful effect on both human health and environment. The effect of pollutants on human health varies from minor sickness to critical disease. Generally, respiratory and cardiovascular systems get affected by these pollutants.

Effect of vehicular pollution on nonliving things

Effects of air pollution on non living things are when gases from polluted air dissolve in rain causing acid rain,the rain water may settle on leaves leaving acids on it. These acids damage leaves of plants by burning them Contrary to popular belief, wind chill does not chill nonliving things below the actual air temperature, but it will influence how quickly they cool down. A high wind chill will speed up the temperature at whichopen water freezes and will increase the cost of home heating, but will never reduce the water or house to lower than the actual measured air temperature.

Fig.6. Mitigation measures for impact of vehicular emissions on the environment

As the serious impact of vehicular pollution on environment has become a worldwide challenge for the researcher and scientists, various measures are being used at different levels to control it. Many acts and laws have been implemented by different Governments in the world to force the manufacturers to use technical innovations for controlling pollution. Some major measures used all over the world to control motor vehicle pollution are:

Alternate fuels:

To reduce the harmful impact of vehicular pollution on the environment the use of alternate fuels is considered to be a useful to a great extent. The researchers are continuously trying to develop clean alternate fuels which may be easily available at cheap price.

Compressed Natural Gas (CNG) and Liquefied Petroleum Gas (LPG):

At present Compressed Natural Gas (CNG) is used widely as an alternative to gasoline and diesel. CNG is a clean fuel for vehicles with remarkable potential to reduce fine particles from the vehicular emission. According to Nylund and Lawson, combustion of diesel emits fine particles at the rate of 84 gms/kilometre

as compared to that of CNG at 11gms/kilometre. The use of CNG leads to reduction in emission of greenhouse gases by 12% than those from diesel engines. It has been also found that one CNG bus leads to reduction in emission equivalent to removal 85 to 94 cars from the road. Table 2 shows percentage reduction in different pollution parameters due to use of CNG as an alternative fuels.

TABLE 2: REDUCTION IN DIFFERENT
POLLUTION PARAMETERS BY USING CNG

Fuel	**Pollution Parameters**		
	CO	**NOx**	**PM**
Diesel	2.4 gm/km	21 gm/km	0.38 gm/km
CNG	0.4 gm/km	8.9 gm/km	0.012 gm/km
%Reduction	**84**	**58**	**97**

Apart from the use of CNG, Liquefied Petroleum Gas (LPG) is also considered as a good clean alternative fuel for vehicles. This fuel is a good choice for internal combustion engines as it is a fuel with high octane rating which burns with very less pollutant and the lubricants also do not get diluted. Various investigations denote that the use of LPG reduces the toxic emissions by 90 % and carbon dioxide by 22%24% as compared to those of gasoline.

Batteries and solar panels:

The problem of pollution by vehicular emission is also being eliminating by using batteries and solar panels as the source of power in motor vehicles. In such vehicles the emission is zero. The main point of research in these vehicles is the feasible method to fully charge batteries with alternators. Solar panels fitted with photo voltaic cells are also being used according to the aerodynamic design of the vehicle.

New and innovative Technologies:

With the use of alternatives fuels manufacturers must also focus on the development of new and innovative technology to optimize the pollution issues with existing facilities. Some basic modifications in designs may lead to great innovations contributing to reduction in vehicular pollution. Some of the technical measures that can be taken to improve the condition of environment are:

Positive Crank case ventilation:

To avoid crank case blow by phenomenon, a proper positive ventilation must be provided in crank case. The exhaust emission of vehicles can be controlled by some technical measures such as:

i.Control of oxides of Nitrogen by recirculating the exhaust gases. ii.Conversion of hydrocarbons (catalytic or non catalytic).

iii. Providing low pressure air in the exhaust port to oxidize carbon monoxide and unburnt hydrocarbons. iv. Modification in engine designs to reduce the emission of pollutants from the exhaust.

Control of evaporative emission:

The problem of pollution can be eliminated to a great extent by controlling the loss of fuel due to evaporation from fuel tanks and carburetors. This can be done by providing a proper connection line between the fuel pump and the fuel tank which will allow the vapour formed in the fuel pump to return back to the tank. It will also ensure the returning of extra fuel from pump to the tank.

Controlling the formation of NOx:

The control on the formation of NOx will also help in minimizing pollution from motor vehicles. This can be done by making some changes in parameters of operation or design to lower the high temperature of combustion accountable for NOx. Some high tech devicecan also be used for reduction of NOx formation in combustion chamber.

Use of catalytic convertors:

The use of catalytic convertors in the exhaust process may help in controlling the formation of NOx especially in the case of bio-diesel blend engines.

Acts and Policies:

The strict enforcement of different acts and policies by government may help to control the vehicular pollution in a country.

II.CONCLUSION

In this age of rapid advancement air pollution due to automobiles has become a critical concern for the environment. Today, in almost every country the majority of population is exposed to the poor quality of environment. The human beings have become vulnerable to different disease starting from a headache to serious diseases such as lungs cancer. This indirectly leads to the economic loss of a country as financial resources are need to be spent for providing required medical facilities to the affected public. The pollution from motor vehicles can be minimized by using new as well as innovative technology, alternate fuels and government policies. These methods need to be used in a proper way to improve the condition of the environment significantly. The present study helps the automobile manufacturers for a better sustainable environment.

REFERENCE

1) Sameer Kumar and DhruvKatoria, *Air Pollution and its Control Measures*, Department of Environment Engineering Delhi Technological University (D.C.E), Bawana Delhi, India, page 2,4,5.

2) ShivajiBhandarkar*Vehicular Pollution,Their Effect on Human Heatlh and Mitigatio*n *Measures,* Vehicle Engineering(VE) Volume 1 Issue 2, June 2013, page 34-37.

3) Faiz A., Weaver C. S., and Walsh M. P. (1996). *Air Pollution from Motor Vehicles: Standards and Technologies for Controlling Emissions*, The World Bank, Washington, D. C., U.S.A. page 246.

4) Gupta R, "*Automobile Engineering*" Satya Prakashan, New Delhi, 2009, page 979. 5)Pundir, B.P. (2001), "*Vehicular Air Pollution in India: Recent Control Measures and*

6) *Related Issues*", in India Infrastructure Report. Oxford University Press, Delhi, 2001

7) *Fig.1,http://sandeepadvocate.blogspot.com/2008/05/vehicular-pollution-case-and.html*

8) *Fig.3.https://www.researchgate.net/figure/Contri bution-of-Carbon-Monoxide-in-atmosphere-bydifferent-sources-2-Nitrogen-oxides*

9) Bridgment H.A. (1990). *Global Air Pollution: Problems for the 1990s*, Belhaven Press, London, page 190.