Vehicle Pollution Crisis in India

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***Abstract* - Air great crisis in towns is mainly because of vehicular emissions. Owing to the expanding financial base Indian cities is growing at a faster charge. Transportation systems are growing everywhere and the improved era is inadequate to counteract growth. Over the years, vehicular traffic has increased multifold causing an associated increase in the total emissions from transportation sources. A survey has been carried out in Delhi to assess the fame of air pollution throughout the city and to see the dangerous gases emissions from vehicles which effects on our health and environment.**

1.INTRODUCTION

Vehicular emissions are mainly the by-products of combustion of fuels within the vehicles engine combustion chamber and are released into the atmosphere through the tail pope or by the fugitive evaporative release of hydrocarbons escaping from the fuel storage delivery system. All over the world, mobile source stand out as the largest contributors of a number of air pollutants. The emission potential of gasoline-powered vehicle especially for the production of fine particles, CO, oxides of nitrogen and volatile

Organic compounds, including aromatic volatile organic compounds have been well documented in literature. In the recent past analysts has shifted their focus towards diesel-powered vehicles and their potential to emit fine particles like, NOx, sulfur compounds, semi-volatile, organic compounds and elemental carbon (EC) some of which are mutagenic and carcinogenic.

Carbon monoxide, which forms due to the incomplete combustion of carbon in fuel from vehicular traffic, is an important criteria pollutant that reduces the oxygen carrying capacity of the blood. Unlike many other air pollutants, CO levels are at the peak during colder months. Volatile organic compounds (VOC) are comprised of organic acids, hydrocarbons, aldehydes and Ketones.

Diesel emissions being very high in primary particulate matter emissions need to be controlled. Particulate matter (PM) is the term for solid or liquid particles found in the air. Mobile source particulate emissions consist mainly of fine particulates ($PM_{2.5}$) that are released directly and those that are products of secondary formation. These are very dangerous for our environment and especially for our health.

The pollutants cause problem when they react with the natural environment. When exposed to sunlight, hydrocarbons and nitrogen oxide create ground level ozone. Nitrogen lingers in the atmosphere and can cause acid rain and water pollution. Carbon dioxide is not only a deadly gas, but it also causes heat to be trapped in our atmosphere which causes the global warming. These negative effects become more and more serious as these pollutants increasingly build up in the air.

2. LITERATURE REVIEW

Urban populations spend almost 7% - 10% of their daily time commuting, most of which is to travel between their workplace and place of residence. Almost half of this time spent while stuck in traffic. An average Bangalore person spent 243 hours in traffic during a year i.e. 10 days 3 hours of their time wasted while struggling through traffic. This is not just happening in one city this is the whole world condition now a days.

In India the average rate of urban population growth is 3.16% per year, while motor vehicles are growing at a rate of 9% per year. This shows how fast we all are leading towards a major problem. Because of the increase in the no. of vehicles causes more pollution due to emission in atmosphere. Researchers with a wide range of expertise contribute to the development of the existing literature, with two main foci. The first focuses on engine technology and investigates vehicle emissions with regards to engine quality, and the second focuses on modeling vehicle emissions with

regards to the urban air quality. Gasoline-fuelled vehicles, common to passenger vehicles, emit significantly three key emissions,

Carbon Monoxide (CO), Hydrocarbons (HC), and nitrogen oxides mainly as nitric oxide between 90-98 percent of NO_x. Vehicle emissions are primarily produced by the engine, and simultaneously emitted by the exhaust (Houghton, 1995). Vehicle emissions are generally emitted by three sources: (i) by both tank and carburetor vents that produce hydrocarbons, (ii) by the crankcase vent that produces hydrocarbons, (iii) by the exhaust that emits CO, HC, NO_X emissions simultaneously.

3. METHODOLOGY

A survey had been conducted in Delhi which helps us to understand the emission and pollution problems. This survey shows the different types of emissions in different part of cities at different times.

An emission inventory of main criteria pollutants CO, NO_x and PM due to vehicles in the year 2008–09 over the central part of Delhi has been developed as follows:

1. A domain of the study area 26 km × 30 km (~780 km^2 area) in central Delhi has been selected.
2. The numbers of vehicles monitored by Central Road Research Institute (CRRI) at 27 locations on different types of roads in the year 2008–09 has been used. It is noticeable that during the monitoring hours, there were no unusual conditions such as major processions, VIP visits, or other activities, which could induce abnormal traffic characteristics in the selected grids during the survey.
3. The diurnal variations of vehicular movement are observed at major traffic intersections.
4. An emission inventory of each type of vehicle with respect to CO, NOx and PM has been made individually.
5. The diurnal variations of emissions during a study of start-up and running modes of different fueled vehicles have been estimated through IVE model.

The input data of the model is prepared according to the format of the model, which are fleeting characteristics, vehicular activity and emission factors based on local conditions. A fleet file contains the base emission factor adjustment by technology and pollutants. The basis of the emission prediction process of the IVE model begins with a base emission rate and a series of correction factors, which are applied to estimate the amount of pollutants from a variety of vehicle types. On-road fleet characteristics are one of the important factors to estimate emissions. A vehicle activity files mainly requires the information of location/time, temperature, road grade, gasoline information, diesel information and driving pattern distribution. While vehicle emission rate files contain the information of base emission factor and correction factors. There are three critical components that are used in the IVE model to create accurate emissions inventories: (1) Vehicle emission rates (Base Emission Factor and Correction Factors); (2) Vehicle activity (Location Input Data); and (3) Vehicle.

A data collection methodology has been designed to collect a large amount of data

With the help of the resources typically available in Delhi. The hourly number of vehicles monitored at 27 different locations in Delhi by CRRI, have been collected. The roads are chosen in the representative of residential streets, arterials and freeways.

4. RESULTS

The total emissions of CO, NO_x and PM from different types of vehicles over the study area of Delhi are found to be approximately 509, 194 and 15 tons/day respectively during the year 2008–09 which reveals that 2 wheelers (2W) and personal cars (PCs) are the mainly emitting the CO and NO_x respectively, while heavy commercial vehicles (HCV) are mainly emitting PM. It is noticeable that the emissions of different criteria pollutants are varying differently into the different operating conditions of vehicles, e.g., CO emissions are found to be higher during idling and decelerating than cruising, the NOx and PM emissions are lower during idling and decelerating than cruising. Therefore, shutting down the engine and restarting it will result in reduced emissions compared to allowing it to idle. Thus, one can say that the longer the shutdown period, the greater the emission benefits.

The diurnal variation of emissions of criteria pollutants CO, NOx and PM at ITO junction The two emission peaks during the day in each of these plots are evident, which indicate the peak traffic hours i.e., 8:00–10:00 in the morning and 17:00–19:00 in the evening, which are matched with starting and closing

hours of most of the offices in Delhi. The emissions of air pollutants at peak traffic hours are 56% to 62%. This figure also shows the hourly variation of

Vehicular emissions of different air pollutants in start-up and running modes. The CO, NO_x and PM are emitted 86%, 27% and 71% respectively in start-up mode. The peaks of start-up emissions always appear between 8:00 am and 10:00 am, which is consistent with morning vehicle starts, and more than half of the starts are cold starts. Also, the catalysts are not operating when the temperature is not conductive to NOx formation. Therefore, the proportion of NOx emission is not as large as the other pollutants of vehicular emissions and the PM emission is always less than CO and NOx emissions.

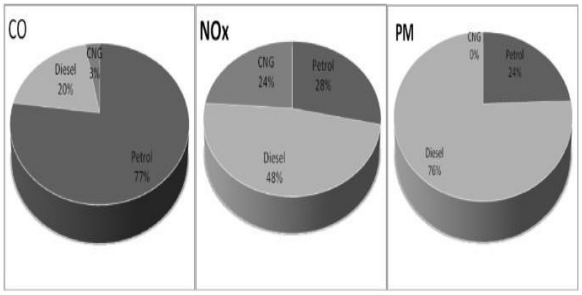

Figure 4.1 – Fuel wise emission of pollutants from vehicles

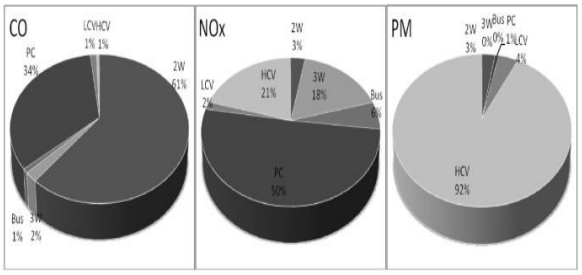

Figure 4.2 – Vehicle wise emission of criteria pollutants

5. CONCLUSION

The modelling proposition of this paper is that the formation of CO, HC, and NO_x emissions within gasoline-fuelled engines of passenger vehicles and commercial vehicles running on roads now a days. The findings that HC, CO, and NO_x emissions are statistically significantly interdependent, bridge an important gap in the current vehicle emissions state of art, and has important implications in developing predictive models of vehicle emissions.

We studied different aspects of vehicle pollution and saw the massive growth in vehicles in last decade. But the BS norms are helping in to reduce the pollution and emission of pollutants through vehicles in every possible way. In following figure we will see the impact of BS Stage norms on vehicle pollution.

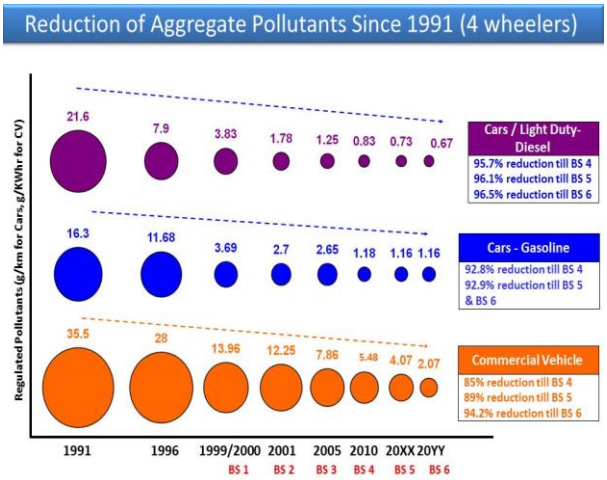

Figure 5.1

6. FUTURE SCOPE

The following recommendations are an outcome of the knowledge gained in the course of conducting the present research. The identified objectives may improve and add further to the knowledge base and fill in the information gaps currently in the field of impacts of vehicular pollution.

- Exhaust particulate analysis needs to be performed to compare the PM morphology and speciation for different fuels.
- Study of PM emission behavior during different operation modes may lead to insights into the identification of variables affecting PM emissions.
- Studies should also focus on the application of particulate traps and other diesel control technology at the tailpipe to study the reduction in pollution.
- The effect of using B50 and B100 fuels on emission behavior is another important avenue for research.

6.1 Electric Vehicles

An electric vehicle (EV) is a vehicle that uses one or more electric motors for propulsion. An electric vehicle may be powered through a collector system by electricity from off-vehicle sources, or may be self-contained with a battery, solar panels, fuel cells or an electric generator to convert fuel to electricity.

These types of vehicles can become a lifesaving option in future world due to no pollutants emission through these vehicles as they run on batteries and not on petrol or diesel. Now the governments are focusing on these vehicle productions which are a good thing.

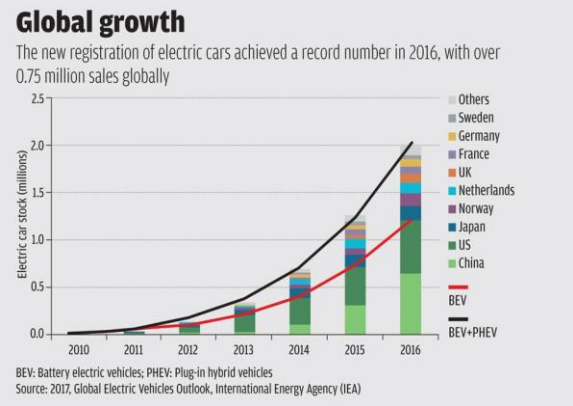

Figure 6.1 – Growth of EV's in last decade

6.2 Scrapping Policy

The Scrapping Policy will also help in reducing the pollution in atmosphere. Because when vehicles get old their engines stop working as good as they are working when they were new and they emit more and more pollutants in air. Now the government is already thinking on this policy and trying to apply it on vehicles which are older than 12 years.

In this the older vehicles got scrapped and the useful parts will be used again in vehicles and the new vehicles will also made with the help of this scrap which also lower the cost of vehicle manufacturing. So, this will help in both ways and can work for our better environment.

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