



# Reduction of Air pollutants from Automobile Sources by using Wet Control Method

## ABSTRACT

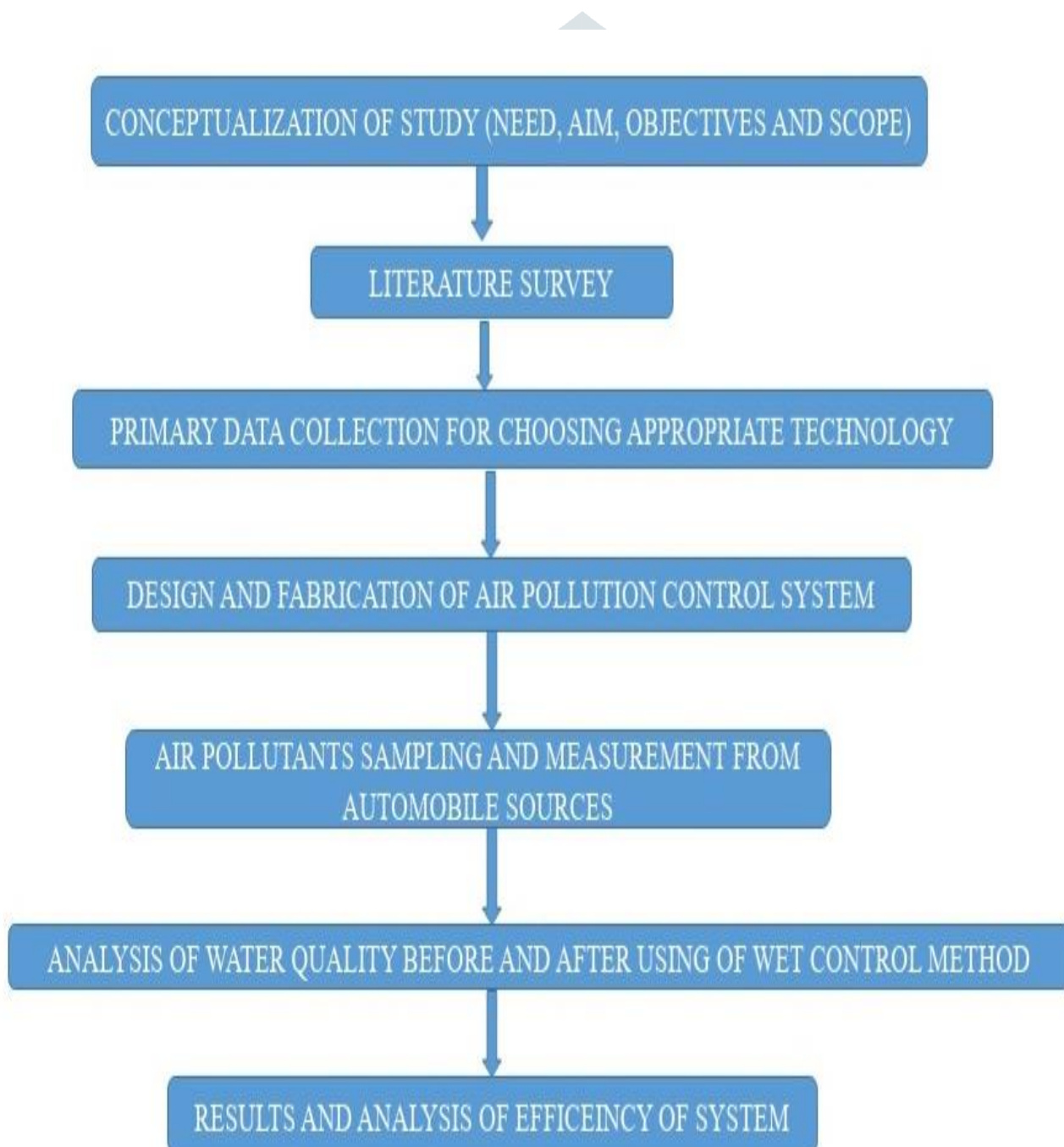
- Day to Day air pollution increasing due to increasing automobile emission. Automobile Emission generates unburnt hydrocarbons, Carbon monoxide, Oxides of Nitrogen and Particulate matter. In this study, wet control method and catalytic converter are introduced for reduction of automobile gases from automobile sources i.e.  $\text{NO}_x$ , HC & CO. By creating Atmosphere like Road Highways and signal Crossing by using Three Vehicles (i10 nios, Bajaj Platina, Honda activa) altogether. Measurement of these pollutants was done at the inlet and he outlet of the system by AVL Gas Analyzer. Reduction efficiency of this air pollution control system for HC, CO,  $\text{NO}_x$  is 70 to 80%, 70 to 80% and >90% respectively. After planting this system at S.G. Highway, water quality of used ground water was checked. And as per results pH decreases, TDS and TSS increases due to pollutants accumulation into water, Hardness decreases due to aeration through blower. Due to formation of  $\text{HNO}_3$  pH decreases.

## 1. INTRODUCTION

- Air pollution is the presence of substances in the atmosphere of such quantities and for such duration of time period that are harmful to the health of humans and other living beings, or cause damage to the climate or to materials.
- Air Pollution generated due to Automobile Emission is increased day by day due to increase in number of vehicles. Automobile Emission generates unburnt hydrocarbons, Carbon monoxide, Oxides of Nitrogen and Particulate matter.
- In this study, wet control method and catalytic converter are introduced for reduction of automobile gases from automobile sources.
- In this study polluted air introduced by high pressure blower into a water tank, where some amount of automobile gases will be reduced after that, pollutants which are heavier than water will be settle down and go to dust collector.

- Valves are provided for control of water into the tank one valve should be provided at the end of dust collector so nothing goes to the ground.
- Some amount of Automobile gases i.e. NO<sub>x</sub>, Particulate matters, SO<sub>x</sub> will be dilute into the water than it will go to next component catalytic converter.
- Catalytic converter can efficiently reduce automobile gases and fresh air will be out at the end of the system.

## 2. METHODOLOGY



### 3. NEED OF STUDY

- Day to Day air pollution increasing due to increasing automobile emission.
- Reduction of those pollutants is very important to achieve ambient norms.
- We don't have any technologies that can efficiently reduce pollutants from automobile emission, so it leads to deterioration of quality of atmosphere.
- The emissions of pollutants from vehicles are generally low but the numbers of vehicles increasing on the road therefore the environmental pollutions are also increases About 35% of CO, 30% of HC and 25% percent of NOx produced into the atmosphere is from the transportation sector.
- So, focus on to reduce the concentration of pollutants from automobile emission is important.
- Pollutants emits from automobile have harmful effects on environment

### 4. OBJECTIVES OF THE STUDY

- To collect primary data for appropriate site.
- To design air pollution control system for reduction of pollutants.
- To measure pollutants NOx, HC, CO at the inlet and outlet of air pollution control system.
- To calculate pollutants concentration.
- To check the water quality after the experiment. (i.e. pH, solids)

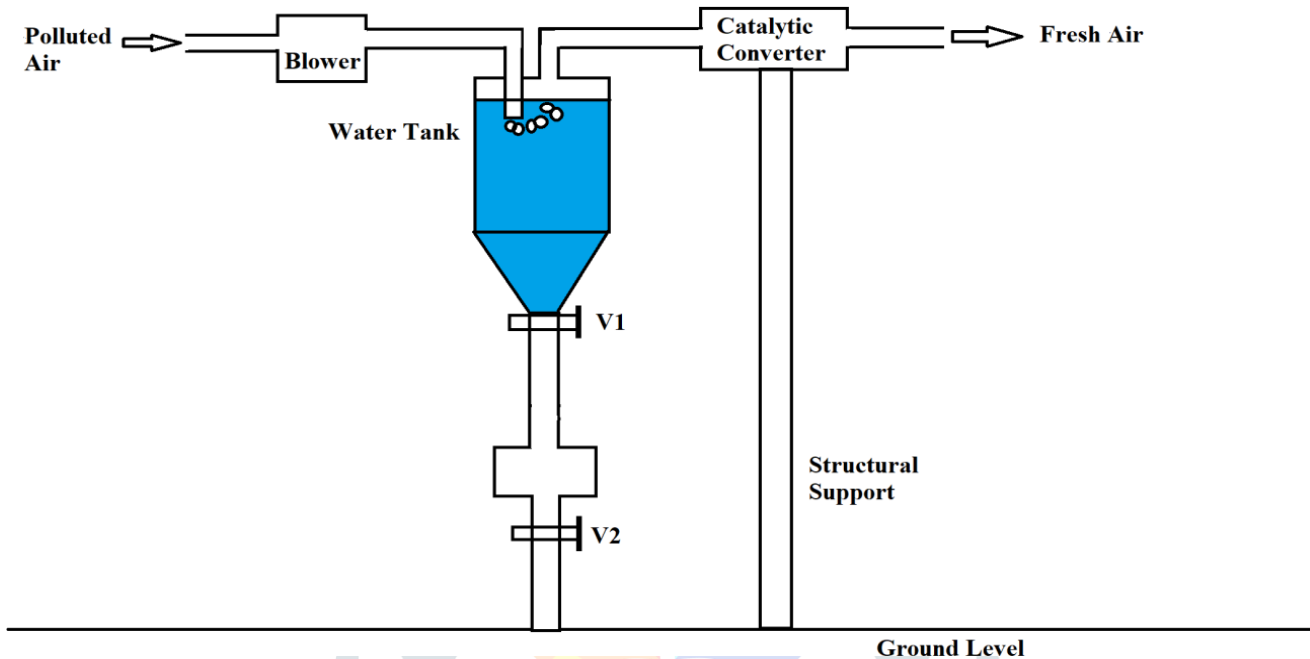
### 5. SCOPE OF THE STUDY

- This study will focus on 3 criteria pollutants,
  1. NOx
  2. HC
  3. CO
- Wet control methods consist of water tank and catalytic converter as control units.
- This experiment will be done on car ( 4 stokes engine), Bike (100 cc 4 stokes engine) and Scooter (Honda Activa 125cc).

## 6. DESIGN CONFIGURATION

- In this chapter, Preparation of flowchart was completed. Flowchart includes inlet pipe, blower, water tank, valves, catalytic converter and structural support for catalytic converter. As per flowchart polluted air should be introduced to the inlet pipe through blower and fresh air out at the end of the system. Water tank capacity is 22 L and 2 L is taken as free board Calculation of all design parameters i.e. inlet velocity, flow, area of inlet pipe, area of water tank is done.

### EXPERIMENTAL SETUP



## 7. EXPERIMENTAL SETUP

- In this chapter, fabrication of lab scale model was done. Lab scale model includes components like inlet pipe, blower, water tank, and catalytic converter. This setup was placed at Automobile Engineering Department, L.D. College of Engineering for performing practical by using AVL Gas analyzer



- Fabrication of air pollution control system includes components i.e. Blower, inlet pipe Water Tank, and catalytic converter.
- Flow of Blower is same as actual air pollution control system 2.6 m<sup>3</sup>/min.
- Shape of water tank is circular here and size of water tank is 20 liter.
- Catalytic converter is placed at the end of the air pollution control system.

## MEASUREMENT OF THE EFFICIENCY OF THE SYSTEM

- Measurement of the pollutants (CO & HC) at the inlet and outlet as per Pollution Under Control at Vijaynagar Petrol Pump on 8<sup>th</sup> Feb. 2021.
- Measurement of pollutants (NO<sub>x</sub>, CO, HC) at the inlet and outlet of the system by using AVL Gas Analyzer with measurement of Various parameters (Temperature, Oxygen, CO<sub>2</sub>)
- To check water quality by performing Practical for measurement of water parameters i.e. TS, TDS, TSS and pH.

### AVL Gas Analyzer

- By creating Atmosphere like Road Highways and signal Crossing by using Three Vehicles (i10 nios, Bajaj Platina, Honda activa) altogether.
- Initially, Polluted air was introduced to the inlet of the system followed by the blower and the probe was placed into the inlet pipe, So Pollutants i.e. (NO<sub>x</sub>, HC, CO)



### TO CHECK WATER QUALITY

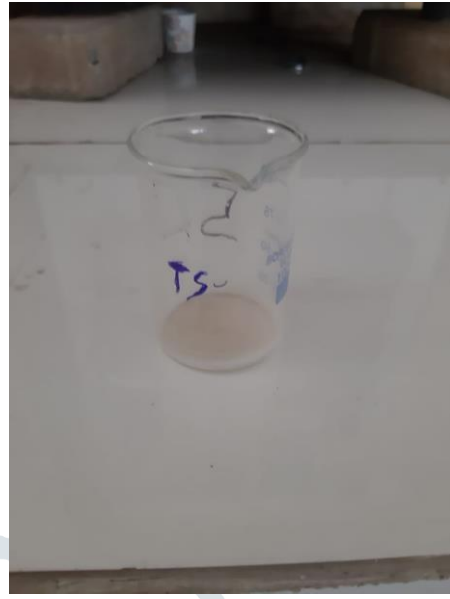
- After performing practical at Vijaynagar petrol pump and After planting this system at nearby S.G. highway for 2 hours, here is the result of initial water quality and water quality after the process. The results are shown in **Table**
- Lab scale Model of Air Pollution Control system was planted at S.G. Highway for 2 hours

#### Water Quality Before and after

PARAMETER	INITIAL	AFTER
Total solids	200 mg/L	600 mg/L
Total Dissolved Solids	175 mg/L	125 mg/L
Total Suspended Solids	25 mg/L	475 mg/L
pH	7.2	6.8



Initial weight of water sample



Final weight of water sample

## 6. CONCLUSION

- This Air Pollution Control System Can Efficiently reduce automobile gases i.e.  $\text{NO}_x$ , CO & HC
- It can reduce >90% of  $\text{NO}_x$  at the end of the system
- It can reduce 70% to 80% of CO by converting into  $\text{CO}_2$ , and HC by Oxidation reactions into water tank and catalytic converter.
- Ground water contains Metals i.e. Fe, Mn and K as hardness. This metals are in dissolved form but during blower passes pressurized air to the water tank which will also contain Oxygen so here aeration process takes place and Dissolved solids are converting into Suspended solids and settle down at the bottom of the tank.
- pH decreases to 6.8 from 7.2 due to formation of nitric acid from oxides of nitrites.

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