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AQUA Silencer

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Abstract **- Day by day the Air pollution is goes on increasing. The main source of the pollution is Exhaust from automobiles and industries. Hence to reduce these pollutants from Exhaust of Engine a new technology is introduced called Aqua silencer. An Aqua Silencer is used for control of emission and noise in automobile exhaust. By using activated charcoal, perforated tube and outer shell it is constructed. An aqua silencer is connected to the exhaust pipe of engine. The activated charcoal filters the harmful sulphur oxides and nitrogen oxides content produced from the engine. Sound produced under lime water is less hearable than it produced in conventional silencer. Because of this property lime water is used in this silencer and hence its name AQUA SILENCER. It is tested in single cylinder 4- stroke petrol engine the noise and smoke level is considerable less than the conventional silencer. The main pollutants contribute by automobiles are Carbon monoxide(CO), Unburnt Hydrocarbon(HC),Oxides of nitrogen(Nox) and Lead etc., other sources such as electric power generating stations, industrial and domestic fuel consumption, refuse burning, industrial processing.**

Keywords- **Aqua Silencer, activated charcoal, perforated tube, outer shell, sulphur, oxides of Nitrogen, noise.**

I. INTRODUCTION

Year by year global warming is increasing due to increase in usage of automobile, Which results in increase in air pollution. The main sources of air pollution are Automobiles, Industrial and domestic fuel consumption industrial processing etc. And this pollution is not hazardous only for Environment but also for Human beings. The main pollutants contribute by automobiles are Carbon-monoxide (Co),Carbon-dioxide (CO2),Unburned hydrocarbon (UBHC),Oxides of Nitrogen (Nox), Sulphur-dioxide (SO2), Lead(pb). An aqua silencer is an attempt in this direction, to deal with control of emission of pollution and noise.

What is an Aqua silencer?

An aqua silencer is a type of silencer which consist of a perforated tube cover with a layer of charcoal. The perforated tube has three sets of different diameter holes drilled on it. The activated charcoal is coated on the surface of the perforated tube and this unit is completely immersed in lime water. An aqua silencer is then attach to the exhaust end of an engine.

II. LITERATURE REVIEW

1. Literature Survey

Akhil Anil Kumar et.al (May 2016) had observed that the aqua silencer is successfully effective in reducing emission of gases from the engine exhaust. By using water as a medium, the sound levels have been reduced and by using activated charcoal in water, it produces almost pollution-free and smokeless emission and is also cheap considering long term use. The aqua silencer's performance is almost equivalent to the conventional silencer. It can be widely used in industrial engines and with a little improvisation, in heavy weight vehicles. This project analyzed the smoke content of the exhaust gas before and after treatment and it was found that there is a considerable reduction in the emission as pointed out by the test results.

G.Balasubramanian et.al (2014) had analyzed the contents of the exhaust gas before and after the treatment and it was found that there is a considerable difference in the percentage of harmful products in the emission.

Sarath Raj et.al (March 2016) had found that it is more effective in the reduction of emission gases from the engine exhaust using perforated tube and charcoal, by using perforated tube the backpressure will remain constant and the sound level is reduced. It is smokeless and pollution free emission and also it is very cheap. It can be also used both for two wheelers and four wheelers and also can be used in industries.

Alen.M.A et.al (Aug.2015) had observed that by using perforated tube the back pressure will remain constant and sound level get reduced. The water contamination is found to be negligible in aqua silencer.

Mankhiar Ajay B et.al (May 2014) had concentrates the full paper on the reduction of the air pollution and water pollution along with the elimination of noise. This is based on the effective way of managing the vehicle parameters to fulfil the emission norms.Rawale Sudarshan S et.al (Sep.2013) had found that the Aqua Ammonia with

proper concentration can be very useful for reducing the rate of pollution from I.C engine Points to be taken away

1. **Main pollutants contribute by Automobiles are** :
   - Carbon-monoxide (CO)
   - Carbon-dioxide (CO2)
   - Unburned Hydrocarbon (UBHC)
   - Oxides of Nitrogen (NOx) v. Sulphur-dioxide (SO2)
   - Lead (pb)

2. **Sources of Air pollution :**
   - Automobiles
   - Electrical power generating stations
   - Industrial and Domestic fuel consumption
   - Refuse burning
   - Industrial processing, etc.

3. **Consumption of fuel is an index for finding out the Economic strength of any country.**

4. **Causes of smoke :**
   - Injection system
   - Rating
   - Fuel
   - Load
   - Engine type and Speed
   - Air–Fuel ratio

5. Exposure to noise causes Harmful effects on Neuro-endocrine, Cardiovascular, respiratory and Digestive systems.
   - Perforated tube has 4 sets of holes of different diameters.
   - The Outer shell is of steel And made by Three roll bending mill.
   - For removal of pollutants there are two methods :

1. Lime water wash method

$Ca(OH2)+So2$…….$CaSo3+H2O$
Neutralizes Acid present in water
$2HCl+Ca(OH2)$……...$CaCl2+2H2$
$H2SO4+Ca(OH2)$……...$CaSO4+2H2O$
Precipitates bicarbonates as Calcium Carbonate
$Co2+Ca(OH2)$……$CaCO3+2H2O$
Precipitates bicarbonates as Calcium Carbonate
$Ca(HCO3)2+2Ca(OH2)$…..$2CaCO3+2H2O$
Converts bicarbonate ions (Like $NaHCO3$, $KHCO3$) into Carbonate
$NaHCO3+Ca(OH2)$……..$CACO3+H2O+Na2CO3$
Absorption process

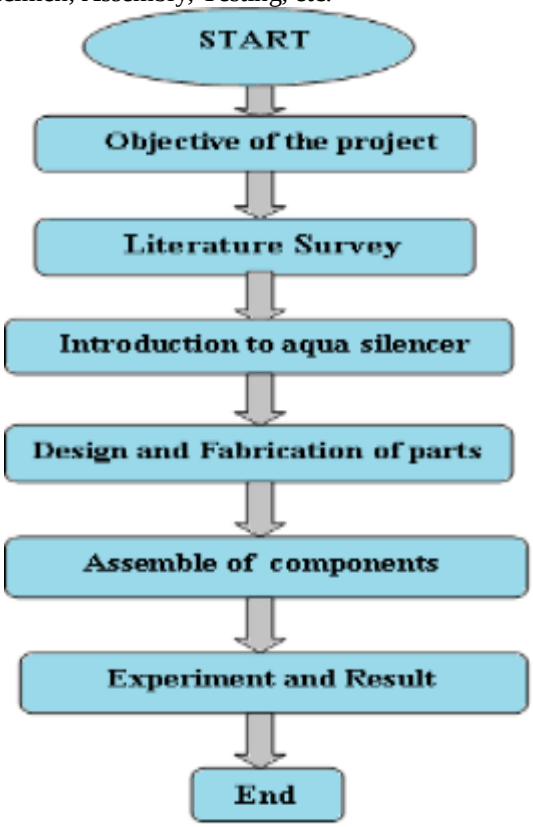
III. OBJECTIVE AND METHODOLOGY

1. Objective

Now a days, Transportation and Industrial areas are going on increasing, and along with them various pollutions are also increasing. It affects the environment very badly. In this case the main contributor is Automobiles i.e Exhaust gases from engine. The main pollutants are CO, CO2, etc. Hence, for removal of this pollutants or to convert them into Harmless gases, various measures are developed by some countries but they are very expensive. In India, we need Cheap and Effective technique. An Aqua Silencer is one of them. Hence it is used to reduce the pollutants and noise of emission from engine.

2. Methodology

It is basically a structure of particular system or the ideas from which we can make judgment/decision. It includes the various steps such as Literature review, Design of specimen, Assembly, Testing, etc.



IV. CONSTRUCTIONAL DETAILS

1. Perforated Tube :

Fig.1. Perforated tube.

It is a very essential component of Aqua silencer. It has a Cylindrical shape with different diameter holes to convert high mass bubbles into low mass bubbles. Generally 4 sets of holes are cut on the tube. The Charcoal layer is pasted on it.

2. Charcoal Layer :

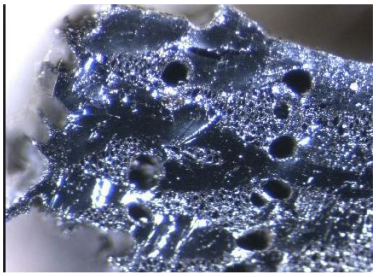


Fig.2. Charcoal layer .

It is basically an Activated charcoal . It is made by burning a coal on burner at 1500 oc for several hrs. It has high absorbing capacity as its surface area gets increasing and it is very porous and having extra free valance electrons hence gases get purify.

3. Outer shell :

Fig.3. Outer shell.

It is an outer casing of the unit. The whole unit is kept inside it. It is made of Iron or Steel and having cylindrical shape

4. U-bend/Non return valve :

U-bend is provided instead of Non return valve. The non return valve allows the flow of fluid only in one direction. As in Aqua silencer water and gases are present hence to avoid the back flow of the fluid, it is used.

5. Flange :

It is a component used for joining purpose. It is used to join the silencer to the engine

IV.WORKING PRINCIPLE

As the exhaust gases enter into the aqua silencer the perforated tube convert high mass gas bubbles into low mass gas bubbles after that they passes through charcoal layer which again purify the gases. Charcoal has extra free valences so it has high absorption capacity. After passing through charcoal layer some of the gases is absorbed in the water and some of the gas is escaped through the exhaust nozzle. Hence it reduces noise and pollution.

V. MERITS AND DEMERITS

1. Merits

- No vibration when the engine is running.
- Easy to start the engine .
- Emissions and noises are control at greater level.

2. Demerits

- Lime water filling is required once a year.
- Silencer weight is more when compared to other commercial silencer.
- Additional space is required.

VI. CONCLUSION

1. The aqua silencer is more effective in the reduction of emission of gases from the engine
2. Exhaust using perforated tube and charcoal.
3. By using perforated tube the fuel consumption remains same as conventional system.
4. by using water as medium the sound can be lowered and also by using activated charcoal in

water we can control the exhaust emission to a greater level.

5. the water contamination is found to be negligible in aqua silencer.
6. it is smokeless and pollution free emission and also it is very cheat.
7. aqua silencer's performance is almost equivalent to the conventional silencer.
8. .it can be used both for two wheelers and four wheelers and also be used in industries.

VII. ENHANCEMENT

At present, the aqua silencer is use to reduce the noise and emission level, It is suitable for automobiles and heavy vehicles but it effect the aerodynamics of vehicle and the efficiency of the engine hence R&D department had taken this problem in consideration and are going to redesign the silencer.

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