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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 a device used to filter the pollutants produced from automobiles such as CO, UBHC, NOx and Lead. It uses the charcoal layer, perforated tube and water for its working. Due to water, the noise is also gets reduced than open environment. Because of this it get named as AQUA SILENCER.*

Key Words: Aqua silencer, Charcoal, Perforated tube, Water, Pollutants.

1.INTRODUCTION

Air pollution has been increasing day by day. The main sources of air pollution are Automobiles, Electric power generating stations, Industrial and domestic fuel consumption, refuse burning, Industrial processing, etc. And this pollution is not hazardous only for Environment but also for Human beings. Hence many steps are to be taken to reduce the pollution. The Diesel engines are playing vital role in Road and Sea transport, Agriculture, Mining and many other Industries. "The consumption of fuel is an index for finding the economic strength of any Country." 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).

To reduce this contamination of pollutants in Environment an attempt is made in this direction i.e An Aqua Silencer. It is mainly dealing with control of emission and noise, by using Activated charcoal, perforated tube and outer shell it is constructed. An aqua silencer is fitted to the exhaust pipe of engine. The activated charcoal filters the harmful sulphur and nitrous content produced from the engine. Sound produced under water is less hearable than it produced in atmosphere. This mainly because of small sprockets in water molecules, which lowers its amplitude thus, lowers the sound level. Because of this property water is used in this silencer and hence its name AQUA SILENCER. It is tested in single cylinder 4- stroke diesel engine the noise and smoke level is considerable less than the conventional silencer, no need of catalytic converter and easy to install. To get difference between before and after conditions of Exhaust gas the samples are analysed by orsat apparatus.

1.1 LITERATURE REVIEW

A] 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 engin

B] Points to be taken away

- Main pollutants contribute by Automobiles are :
    i. Carbon-monoxide (CO)
    ii. Carbon-dioxide (CO2)
    iii. Unburned Hydrocarbon (UBHC)
    iv. Oxides of Nitrogen (NOx)
    v. Sulphur-dioxide (SO2)
    vi. Lead (pb)
- Sources of Air pollution :
    i. Automobiles
    ii. Electrical power generating stations
    iii. Industrial and Domestic fuel consumption
    iv. Refuse burning
    v. Industrial processing, etc.
- Consumption of fuel is an index for finding out the Economic strength of any country.
- Causes of smoke :
    i. Injection system
    ii. Rating
    iii. Fuel
    iv. Load
    v. Engine type and Speed
    vi. Air–Fuel ratio
- 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 :

    i. Lime water wash method

Ca(OH2)+So2……..CaSo3+H2O
Neutralises 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

    ii. Absorption process

2.OBJECTIVE AND METHODOLOGY

2.1 Objective

Now a days, Transportation and Industrial areas are goes on increasing, and along with them various pollutions are also increasing. It affects the environment of world very badly. The main contributor in this pollution is Automobiles i.e Exhaust gases from engine. The main pollutants are CO, CO2, etc. Hence, for removal of this contents or to covert them in Harmless gases, various techniques Are developed by some countries but they are expensive and in Developing country like 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.

2.2 Methodology

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

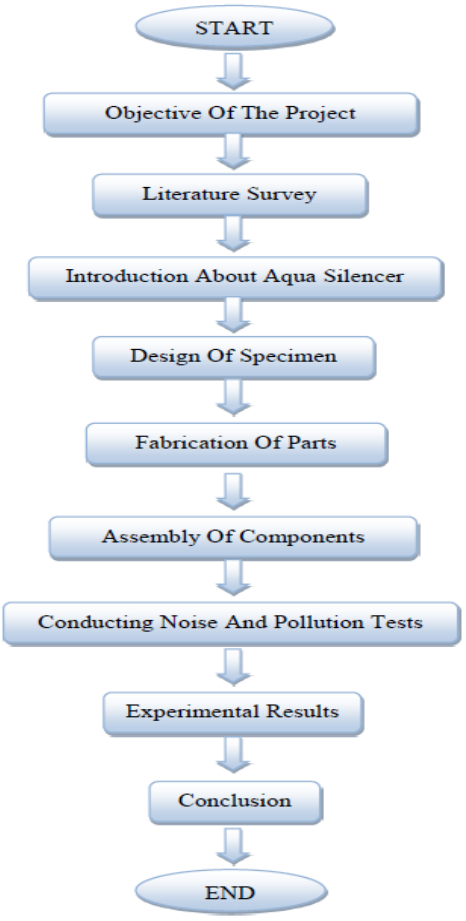

Fig-Project Methodology

3.CONSTRUCTIONAL DETAILS

3.1 Perforated Tube :

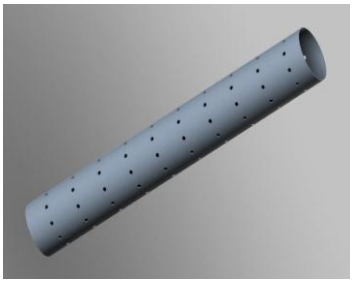

Fig.-3.1 Perforated tube

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.

3.2 Charcoal Layer :

Fig.-3.2 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.

3.3 Outer shell :

Fig.-3.3 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.

3.4 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.

3.5 Flange :

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

5.WORKING PRINCIPLE

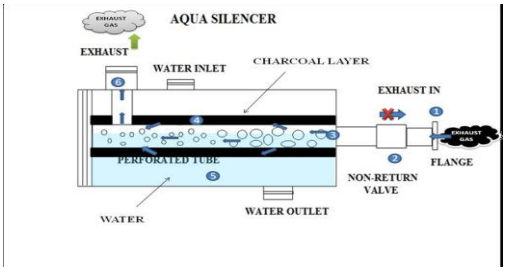

Fig.-5 Working principle

As the exhaust gases are entering into the perforated tube of the Aqua silencer, the high mass bubbles are converted into low mass bubbles. The lime water is present in the silencer the bubbles get react with the lime water, then it neutralizes the acid present in water, this is a primary filtering process. After that, the bubbles are passing through the activated charcoal layer which again purifies the gas bubbles by absorbing the pollutants; this is a secondary filter process. This charcoal layer is covered with outer shell that shell is surrounded by water. Due to that the sound level gets reduced because of small sprockets present in the water molecules which lower the Amplitude of sound wave. Hence Aqua silencer reduces the pollution as well as noise.

6. MERITS AND DE-MERITS

6.1 MERITS :

i. At running of engine, there is no vibration.
ii. Easy starting.
iii. Reduce noise and pollution at greater level.
iv. Carbon is separated.
v. Cost is low.
vi. Easy construction and working.
vii. No need of catalytic converter.

6.2 DE-MERITS :

i. Lime water should be filled once in a year.
ii. Weight is more compared to conventional silencer.
iii. Space is required.

7.CONCLUSION

By using Activated charcoal and Perforated tube it effectively eliminates the pollutants in the exhaust gases and reduces the Noise , Also back pressure remains constant, fuel consumption is same that of convensional silencer. It is a smokeless and pollution free emission.

8.ENHANCEMENT

At present stage the Aqua silencer is used to reduce the noise and emission level, and is suitable for Automobiles and heavy vehicles but it affects the aerodynamic properties of vehicle as well as the efficiency of the engine. Hence R and D departments are taken this problem in consideration and going to redesigning the Aqua silencer.

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