

AQUA SILENCER

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ABSTRACT

Global warming is increasing on our earth due to major increase in the pollution. Air pollution is very serious problem on our earth. The main component due to which the air pollution is increasing are (Co),(Nox) and lead which is get exposed from vehicles. The other sources such as big factories,electric power,generation plants, big industries etc.So it is required to solve these problems by taking various serious attempts.

Aqua silencer is one of the attempt taken in reduce the air pollution. It is fitted to the exhaust pipe of engine or system. These Silences is used to reduce the noise and control the emission of dangerous gases.

In aqua silencer the main component perforated tube which consists of number of different diameter holes.Generally these are 4 set of holes on perforated tube.Charcoal layer is pasted over that tube and it is used to convert high mass bubbles to low mass bubbles.

The aqua silencer reduces emission noise because, the sound produced in aqua silencer under water having less amplitude than the sound produced in open atmosphere .These is happen because of in water molecules there are small sprockets which lowers amplitude of emission gases and lower the sound level.The charcoal layer which is pasted over perforated tube can control the emission using the activated charcoal and highly porous extra free valences so these layer having high absorption capacity.

Keywords: Aqua silencer,Charcoal layer,Noise,Extra free valences,NOX,Perforated tube,Small sprockets.

1. INTRODUCTION

The aqua silencer system is design for replace commonly used single unit silencers in engine with it's slender structure and less weight.It play an important role in control the noise and emission of gases from engines.Air pollution causes dangerous physical effect on the human body,animal and environment.The main reason to use aqua silencer is because now a days air pollution is increasing rapidly.This system reduces the dangerous exhaust gases from the auto.

These emission controlled by the activated charcoal layer around perforated tube and lime water.The charcoal layer having high capacity to absorb emission gases from engine.These type charcoal layer with lime water reacts chemically with emission gases and change the chemical structure of emission gases.The smoke or emission gases and noise level in aqua silencer is very less than the commonly used silencers.

II. LITERATURE REVIEW

SR.NO	JOURNAL NAME	TITLE NAME	YEAR	AUTHOR	METHODOLOGY	CONCLUSION
1.	Elsevier	Numerical simulation of the flow field of a diffused pneumatic silencer	2012	X.W. Zhang, Z.H. Yao, F. He	keywords:- N-S Equation With parameter, V=65.1m/s P=1.66028*10 ⁵ pa K=1.21*10 ⁻¹¹ m ² Cf =.91*10 ⁵ m ⁻¹	1. The outflow velocity distribution and inner pressure distribution could be improved by improving the structure of silencer. 2. Therefore modifying inner area Section or reducing the area of shell & end cover.
2.	Elsevier	Numerical study of finned type heat exchangers for ICE exhaust waste heat recovery	2014	M. Hatami n, D.D.Ganji, M.Gorji- Bandy	Keywords : Waste heat recovery Heat exchanger Internal combustion Engine	1. In this paper, engines exhaust waste heat is recovered by using the finned type heat exchangers numerically. 2. Heat transfer through the walls and fins were modelled successfully and the transferred heat to cold fluid is calculated as the recovered heat.

III.CONSTRUCTION

The main component of aqua silencer is perforated tube. It fitted at end of exhaust pipe of engine. This perforated tube consists of different diameter holes to convert increase in mass bubbles to decreasing mass bubbles on perforated tube. Generally 4 sets of holes are drilled. The plug is provide to close the other end of perforated tube. The activated charcoal layer and metallic mesh covers is provided around circumference of perforated tube. The perforated tube contains the lime water inside it which chemically reacts with exhaust gas from the engine.

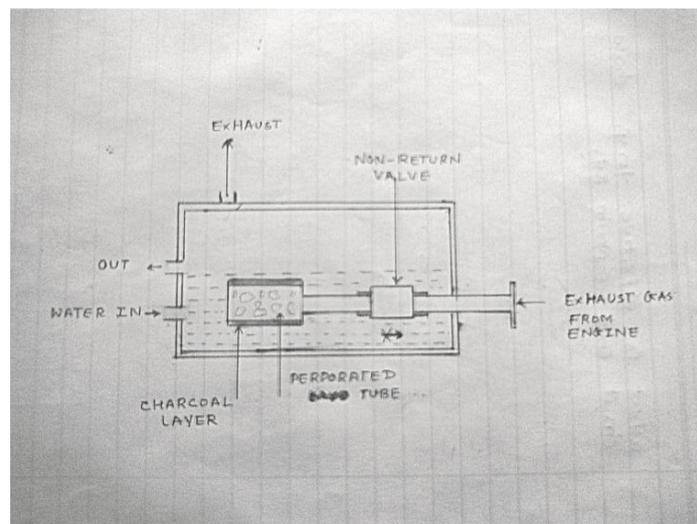


Fig. Line Diagram of Aqua Silencer

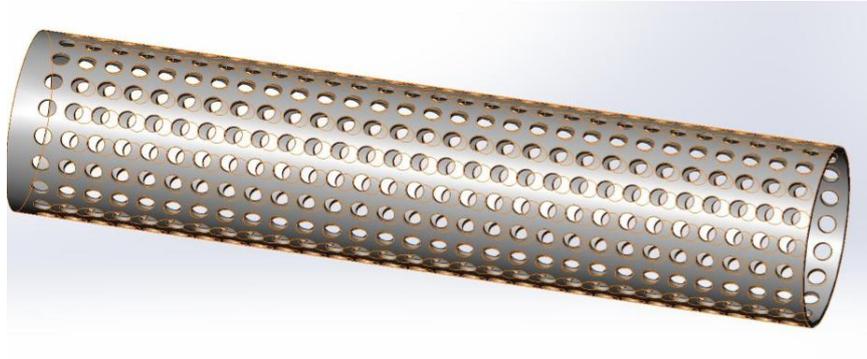
These whole unit or system is then placed in the container which is fitted with water to remove exhaust gas. The small opening is provided at the top of water container and at the bottom of the container opening is provide for cleaning purpose. At the top of container fulfiller plug is also provided. A non return valve is provided at the inlet of exhaust pipe to avoid back flow of gases and water as well. If exhaust gas enter to aqua silencer, perforated tube convert the high mass of bubbles to the low mass.

3.1.Parts Of Aqua Silencer

- 1).Perforated Tube
- 2).Non-Return Valve
- 3).Outer Shell
- 4).Flange
- 5).Charcoal Layer

1).Perforated Tube:-

It consist number of hole of various diameter mainly there are four sets of holes.It is used to convert the high mass of bubble to low mass and very important activated charcoal layer is pasted are it.



1. Perforated tube

2).Non-Return Valve:-

It is important part uses to avoid back flow of exhaust gases and water.



2.Non return valve

3).Outer Shell:-

In outer shell the whole set up is kept inside it.It is mainly made up of steel or iron.water outlet,inlet also the exhaust tube was provide in there shell itself.



3.Outer shell

4).Flange:-

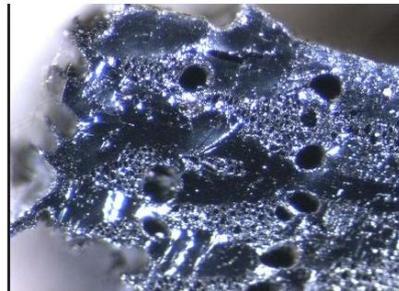
A flange is the connection of pipe where the connecting pieces have flanges by which the parts are bolted together flange is essential part it connect the silencer to engine.



4. flange

5).Charcoal Layer:-

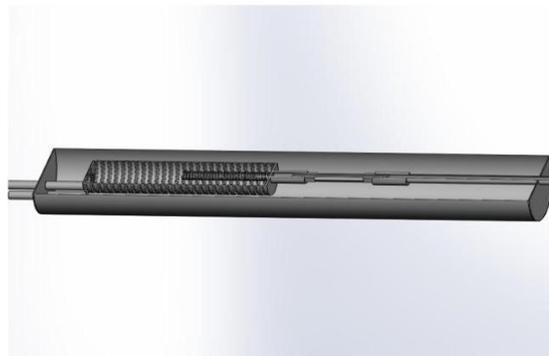
These layer having high absorption capacity because it having large surface area. These type of charcoal called activated charcoal. These activated charcoal produce by heating it upto 1500°C for specified hours in a burner. Thus its surface is getting increasing.



5. Charcoal layer

IV. WORKING OF AQUA SILENCERS

The exhaust gases from engine enters from inlet to aqua silencer then perforated tube convert high mass of bubble to the low mass of bubbles. Then this gases passes through charcoal layer which again purify the gas. This charcoal layer is highly porous and possess extra free valence so it having high absorption capacity. During that gases get contact with lime water they chemically react with it.



Cross-sectional view of aqua silencer in solid works

The charcoal layer is covered with outer shell which is filled with water due to that emission noise is reduces. The sound produced in the water having less amplitude than the sound produced at atmosphere. It happen because of water molecule which lower its amplitude. After passing over charcoal layer some of the gases may be get dissolved into the water. Finally exhaust gases escape through opening at the top of container into the atmosphere hence from above working principle aqua silencer reduces noise and pollution.

5. EFFECT OF DISSOLVED GASES ON WATER

In this system water is very good absorbing medium. In aqua silencer gases made to dissolved in water when this gases from engine get dissolved in water they form acid, carbonates and bicarbonates etc.

4.1). Action of dissolved Sox

4. 2). Action of dissolved CO₂

4.3). Effect of dissolved Nox

5.1). Action of dissolved Sox:-

When Sox is treated with water, it form So₂, So₃, So₄, H₂So₄, i.e. sulfur Acid (H₂So₃), it produces Hydrogen Sulphide which causes egg smell and causes corrosion of metals.

5.2). Action of dissolved CO₂:-

The dissolved carbon dioxide forms bicarbonate at less PH and Carbonates at greater level PH. This levels 40 to 400 mg/liter. Form a scale in pipes and boilers. The carbon dioxide mixes with water to form Carbonic acid. It causes green house effect.

5.3). Action of dissolved Nox:-

The Nitrogen in water under goes Oxidation to form ammonia, Nitrate, Nitric acid. This synthesis of protein and amino acids is get effect by Nitrogen. Nitrate usually occurs in trace quantities in surface water. A limit of 10 mg per liters Nitrate is affordable.

VI. METHODS TO CONTROL WATER POLLUTION

6.1). Lime water wash method

6.2). Absorption process

6.1). Lime water wash method

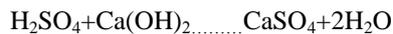
- The water is treated with the calculated quantities of slaked lime. After mixing the heavy precipitates settle down as sludge at the bottom of the tank are removed from time to time.
- Lime can neutralize any acid present in the water. SO₂.
- The precipitates dissolved carbon dioxide as calcium carbonate and converts bicarbonate ions into carbonates.

6.1.1). The equations are given below:-

1). $\text{Ca(OH)}_2 + \text{SO}_2 \dots \dots \text{CaSO}_3 + \text{H}_2\text{O}$

2). Neutralizes any acid in water

$2\text{HCL} + \text{Ca(OH)}_2 \dots \dots \text{CaCl}_2 + 2\text{H}_2\text{O}$



3).Precipitate Bicarbonate as calcium carbonate



4).Convert bicarbonate ions (like $\text{NaHCO}_3, \text{KHCO}_3$)etc into carbonates



6.1.2).Limitation Of Lime Water Wash Method:-

- Quantity of neutralization capacity is in specified limit
- It's handling is very difficult
- It is costly
- It having ability of Regenerations.

6.2).Absorption process:-

- Activated charcoal is available in powdered or granular form. As it is highly possess free valencies and it is highly porous.Hence it posses high absorption capacity.
- Activated carbon is mainly used for the removal of taste and impurities from the public water supplies.
- Because it has high properties of attracting gases, it divided solid particles and phenol type impurities, The activated carbon, usually in the powdered form is added to the water either before or after the coagulation with sedimentation.

6.2.1).ADVANTAGES OF ABSORPTION PROCESS:-

- It increases the coagulation power of the process.
- Chlorine demand is reduces by use of these method.
- The excessive dose of activated carbon is not harmful.
- The treatment process is very simple.
- The efficiency of removing color, impurities and taste is quite high.
- It can be easily regenerated.
- It has excellent properties of attracting gases.

VII. MERITS AND DEMERITS

• MERITS:-

1. Vibration less running of engine
2. Easily engine gets start
3. Emission and Noise is controlled at greater level

• DEMERITS:-

1. Once in year there is requirement of filling of lime water.
2. More requirement of space

3. The weight of silencer get increases

VIII. EXPERIMENTAL RESULT:-

TABLE NO.1

	Prescribed Standard CO	Measured level CO	Prescribed Standard HC	Measured level HC Ordinary
Ordinary Silencer	3.50	0.85.	4500	837
Aqua Silencer	3.50	0.5	4500	429

IX. CONCLUSION

An Aqua Silencer having more efficiency to reduce emission gases from engine using lime water, charcoal layer and perforated tube with the use of perforated tube back pressure always remains constant and sound level of exhaust reduces. Contamination of water remain very very less in aqua silencer. In this system fuel consumption remain same as conventional silencers because the use of perforated tube. Due to use of water as a medium sound reduces these system having pollution free emission and smokeless. These system is very cheap. These system is used for both four wheelers and two wheelers. It plays important role in industries

X. ACKNOWLEDGEMENT

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