



Design Of Aqua Silencer For Reducing Exhaust Emission

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Abstract: The main source of the pollution is Exhaust from automobiles and industries. Hence to reduce these pollutants from the Exhaust of Engines a new technology is introduced called Aqua silencer. The main components due to which air pollution is increasing are (Co), (NOx), and lead which are exposed from vehicles. The other sources such as big factories, electric power, generation plants, big industries, etc. Aqua silencer is one of the attempts taken to reduce air pollution. It is fitted to the exhaust pipe of the engine or system. These Silences are used to reduce the noise and control the emission of dangerous gases. In an aqua silencer the main component perforated tube which consists of several different diameter holes. Generally, these are 4 sets of holes on a perforated tube. The charcoal layer is pasted over that tube and it is used to convert high-mass bubbles to low-mass bubbles.

Keywords: Aqua Silencer, Noise reduction, Emission control, Environmental sustainability, Catalytic converter.

I. INTRODUCTION

An Aqua Silencer mainly deals with the control of emissions and noise in automobile exhaust. By using activated charcoal, a perforated tube, and an outer shell it is constructed. An aqua silencer is fitted to the exhaust pipe of the engine. The activated charcoal filters the harmful sulphur and nitrous content produced by the engine. The sound produced under water is less hearable than it produced in the atmosphere. This is 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 hence its name AQUA SILENCER. It is tested in a single-cylinder 4- 4-stroke diesel engine the noise and smoke levels are considerably less than the conventional silencer.

II. WHAT IS AN AQUA SILENCER

Perforated tube which is installed at the end of the exhaust pipe in Aqua Silencer. The perforated tube has different diameters. The purpose of providing different diameter holes is to break up gas mass to form smaller gas bubbles. Generally, 4 sets of holes are drilled into the perforated tube. The plug is used to close one end of the perforated tube. Around the circumference of the perforated tube, a layer of activated charcoal is provided, and further, a metallic mesh covers it. The whole unit is then half immersed in a lime water container.

III. CONCEPT

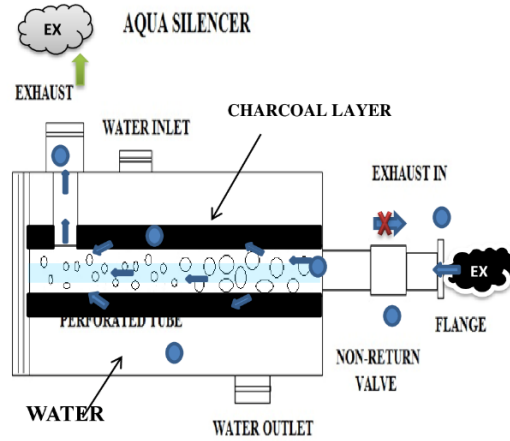


Fig. 1: Working layout

IV. COMPONENT AND EXPLANATION

- Perforated Tube.
- Charcoal Layer.
- Outer Shell.
- Non Return Valve.
- Flange.

IV.1 PREFORATED TUBE

The perforated tube consists of number of holes of different diameters. It is used to convert high mass bubbles to low mass bubbles. The charcoal layer is pasted over the perforated tube. Generally, 4 sets of holes are drilled on perforated tube. Other end of the tube is closed by plug.

IV.2 CHARCOAL TUBE

The charcoal layer has more absorbing capacity because it has more surface area. This charcoal is called as activated charcoal. It is produced by heating the charcoal above 1500 °c for several hours in a burner. Its surface area gets increased.

IV.3 OUTER SHELL

The whole setup was kept inside the outer shell. It is made up of iron or steel. The water inlet, outlet and exhaust tube was provided in the shell itself

IV.4 NON RETURN VALVE

The non-return valve is a mechanical device a valve, which normally allows fluid (liquid or gas) to flow through it in only one direction. The Aqua silencer was filled with water and it is directly connected to the exhaust pipe of the engine. There is a chance for the water to get enter into the engine cylinder. To avoid this, Non return valve is used. It allows the flow of fluid in one direction only.

IV.5 FLANGE

A flange joint is a connection of pipes, where the connecting pieces have flanges by which the parts are bolted together. Here flange is used to connect the silencer to the engine.

IV. H-NIPPLE

It is a device which is used to connect two pipes together. It consists of two threaded sides

V. WORKING PRINCIPLE

The exhaust gas from the engine cylinder enters into the twin filter silencer through perforated tube. Through the perforated tube gas first enters into the primary filter of the silencer. Perforated tube is a special tube having different diameter sections. So the perforated tube converts high mass bubbles into low mass bubbles. At the primary filter lime water reacts with toxic gases & reduces its concentration. After that they pass to the secondary filter consist of charcoal which again purify the gases. A charcoal is highly porous and possesses extra free valences. So it has high adsorption capacity. Finally, the exhaust gases escape through the opening into the atmosphere. The twin filter silencer is more effective in the reduction of emission gases from the engine exhaust gas using water and lime stone mixture. By using water and lime stone mixture the back pressure will remain constant and the sound level is reduced. By using water as a medium the sound can be lowered and also by using limestone in water we can control the exhaust emission to a greater level. The water contamination is found to be negligible in twin filter silencer, because the amount of acidity level in twin filter silencer is expected to be below the dangerous acidity. It is smokeless and pollution free emission and also very cheap. Hence twin filter silencer reduces both noise and pollution. The twin filter silencer's performance is almost equivalent to the conventional silencer.

VI. MERITS

- No vibration when the engine is running.
- Start the engine easy.
- Sound is reduced
- Low cost
- Control emission and noise in greater level.
- Carbon is precipitated.
- Cost is reduced 60 to 70% compared to ordinary silencer

VII. DEMERITS

- Frequent water filling is required.
- Silencer weight is more comparing to conventional silencer.
- More spaced is required
- Aqua silencer is big in size

VIII. RESULTS

Tests are taken on HERO HONDA

Form 59
[See rules 115 (2)]

Pollution Under Control Certificate
Authorised By :
Government of Maharashtra

Date : 21/04/2024
Time : 12:53:54 PM
Validity upto : 20/04/2025

Certificate SL No. : MH04600140037202
Registration No. : MH08AU6374
Date of Registration : 24/Jul/2019
Month & Year of Manufacturing : February-2019
Valid Mobile Number : *****5788
Emission Norms : BHARAT STAGE IV
Fuel : PETROL
PUC Code : MH0460014
GSTIN : Rs.50.00
Fees : No
MIL observation : No

Vehicle Photo with Registration plate
60 mm x 30 mm

Sr. No.	Pollutant (as applicable)	Units (as applicable)	Emission limits	Measured Value (upto 2 decimal places)
1	Carbon Monoxide (CO)	percentage (%)	3.0	0.02
Idling Emissions	Hydrocarbon, (THC/HC)	ppm	3000.0	393.0
	CO	percentage (%)	0.0	0.0
High idling emissions	RPM	RPM	2500 ± 200	0.0
	Lambda	-	1 ± 0.03	0.0
	Smoke Density	Light absorption coefficient	1/metre	

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IX. RESULT TABLE

	General Silencer	Aqua Silencer	% Reduction
CO	0.7	0.02	97.14
HC	718 PPM	393 PPM	45.2
TEMP	62 TEMP	34 TEMP	45.2

IV. CONCLUSION

“Aqua Silencer” can be said to be an advanced system that can be used along with or instead of a catalytic converter, using which exhaust emissions at the tail pipe of an exhaust system can be easily lowered than specified levels, along with reducing undesirable noise at the tail pipe. Also, the use of water decreases the overall temperature of exhaust gases coming out via the tailpipe, which may add to greenhouse gases.

V. ACKNOWLEDGMENT

We would like to express our gratitude to Prof. Shilpa Mondkar, our major project guide, for guiding us through the project and helping us apply the knowledge acquired during the semester and learn new concepts.

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