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A REVIEW PAPER ON AQUA SILENCER

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Abstract – An Aqua silencer is type of noise observation silencer. Aqua silencer is used for controlling the noise & emission in automobile exhaust. Air pollution is important for environment in health of view. If talking about inhaling about 16 to 21 kg of air daily. Polluted air causes illness. Aqua silencer is used to replace traditional silencer. This article discusses the various effects of aqua silencer. This effect is more effective than conventional silencer. It can reduce noise and control air and noise pollution. This type of silencer controls the emissions and noise in engine exhaust achieved using activated carbon, perforated tubes and housings. The engine's exhaust is fitted with an Aqua silencer. The main pollutants produced by cars & other combustion engine include gases CO, UBHC (Unburnt Hydrocarbon), NO_x, CO_2 , SO_x these types of toxic gases are harmful for environment. The activated carbon layer filters out harmful nitrous acid and sulfur produced by the engine. Underwater sounds are inaudible than ambient sounds. This is mainly because the small sprocket in the water molecule reduces the amplitude, so the sound level is reduced. This silencer requires lime water, hence its name Aqua Silencer. Serious efforts must be made to reduce these pollutants and protect our environment. Because of this it gets named as AQUA SILENCER.

Keyword:- Aqua silencer, Charcoal, Non Return Valve, Flange, Perforated Tube, Outer shell, U Bend, Water, Pollutants, Emission control, Noise, Toxic gases

1. INRODUCTION

Today, pollution has a very negative impact on people and the environment. As we all know, the automotive industry plays a major role in air pollution, so we are using water silencer to reduce air and noise pollution. Automotive gases such as carbon dioxide and toxic gases like unburned hydrocarbons make up most of the air pollution. Other pollutant gas such as nitrogen oxides is also present in the car exhaust. Aqua muffler is one of the important methods to effectively reduce toxic gas and sound. The engine exhaust gas is carbon monoxide (CO), carbon dioxide (CO_2), nitrous oxide (NOx), sulfur dioxide (SO_2), unburnt hydrocarbon (UBHC). These poisonous gases are very harmful to the environment and human health. Aqua silencer is used to reduce emissions and noise, and with activated carbon, selective water reduces its harmful effects.

One of the major causes of air pollution is carbon dioxide emitted by automobiles, burning hydrocarbons, etc. To reduce the emissions of these gases, we can use aqua silencers.

2. RESEARCH REVIEW

Keval Patel et Al [1] Dimensions of a water muffler designed for a two-stroke gasoline engine. The exhaust pipe is connected to the housing and arranges the inside of its perforated pipe. The charcoal layer is stuck on the porous tube. Bead activated carbon is used as the charcoal layer. In the presence of a suitable oxidizing gas (such as steam and carbon dioxide (CO_2), a carbonization product is formed after a heat treatment of molecular size and extended surface area in the temperature range of 800-1000 ^{0}C. Bead activated carbon is made of petroleum pitch and is provided in a diameter of about 0.35 to 0.80 mm. It is also known for its low pressure drop, high mechanical strength and low dust content, but small particle size. Its spherical shape makes it a favorite for fluid applications. It operates a scrubber. The parameters they came up with showed a 60-70% reduction in CO compared to ordinary silencers. But it is larger and requires more space. It can be used for two-wheelers and four-wheelers.

Akhil Anil Kumar [2] It basically consists of a porous tube installed outside the engine exhaust, which may have a variable diameter hole. In theory, four holes or more can be formed by drilling holes in a porous tube. The other end of the porous tube is sealed with a stopper. An inner box is used to provide a small layer of activated carbon coating around the perforated tube. The box holds the charcoal in place and separates the charcoal and lime water from the water in the water silencer. The unit is then placed in a container and the container is filled with a certain level of water. The inner box has a small opening that can be lifted from the outside using a small diameter pipe.

Alen M.A [3] Aqua Silencer is mainly used to control emissions and noise in automobile exhaust. It is constructed by using activated carbon, a porous tube and a shell. The engine exhaust pipe is fitted with a water muffler. Activated carbon filters out harmful sulfur and nitrite produced by the engine. The sound produced underwater is less heard than the sound produced in the atmosphere. This is mainly due to the smaller sprocket in the water molecule, which reduces the amplitude and thus the sound level. Because of this feature, water is used in the muffler, hence the name AQUA SILENCER.

M.M Kulkarni [4] the water in the scrubber itself can play an important role in absorbing flammable products, such as nitrogen oxides. It is also used to dissolve unburned hydrocarbons present in diesel emissions, and is used to suppress sparks before they are emitted into the surrounding environment. Weak lime solutions can be used instead of water, and this change will allow chemical reactions to occur at a faster rate. With the exception of carbon monoxide, all gases present in diesel exhaust are easily used with working media, namely lime water and calcium carbonate. The intern's water indirectly supports chemical reactions by not allowing unburned hydrocarbons to deposit on calcium carbonate otherwise it will prevent further chemical reactions between the working medium and diesel emissions.

P.K. Sharma [5] The Aqua Silencer is fixed to the exhaust pipe of the engine. The sound produced underwater is less heard than the sound produced in the atmosphere. This is mainly due to the smaller sprocket in the water molecule, which reduces its amplitude and thus the sound level. Because of this feature, water is used in this muffler, hence its name AQUA SILENCER. Noise and smoke levels are significantly lower than traditional mufflers, are inexpensive, require no catalytic converters, and are easy to install. Air pollution can be defined as the addition of any substance to our environment that will have a deft effect on life on our planet. The main pollutants caused by cars are carbon monoxide (CO), unburned hydrocarbons, nitrogen oxides (NOx) and lead.

3. CONSTRUCTION

The main component of a water silencer is a perforated pipe. It is installed at the end of the exhaust pipe of engine. The porous tube is composed of pores of different diameters to convert the increase in the number of porous bubbles into the decrease in the mass bubbles in the porous container. An activated carbon layer covering is provided around the perforated tube. The lime water inside the perforated tube reacts chemically with the exhaust gas from the engine. These entire systems are then placed in a container filled with water to remove exhaust or harmful gases. Provide small openings on the top of the water container and the bottom of the container, and then place these entire systems in the container filled with water to remove the exhaust harmful gas. According to **Rahul.S.Padval el al** "The smoke and emission gases and noise level in aqua silencer is very less than the other commonly silencer". Fig 1 reference taken from (**Mr. Sagar. B.S et al)**

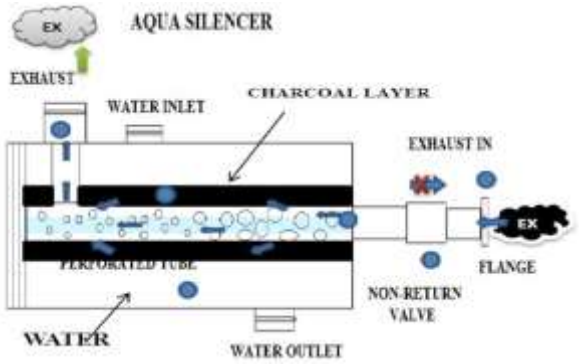

Fig 1:- Aqua Silencer

The Part Which Used In The Aqua Silencer:-

a) Perforated Tube
b) Outer Shell
c) Non-Return Valve
d) Charcoal
e) H-Pipe
f) Flange

a) Perforated Tube: - Composed of holes of various diameters, there are mainly four groups of holes. It is used to convert a large number of bubbles into a small number of bubbles, and attaches a very important layer of activated carbon. Fig 2 reference from (**Nitin. V. Patel el al**)

Fig 2: - Perforated Tube

b) Outer Shell: - Inside the enclosure, the entire system remains. It is mainly made of steel or iron. The water outlet, water inlet and exhaust pipe are all provided in the housing itself. Fig 3 reference from (**Rahul.S.Padval el al**)

Fig 3: - Outer Shell

c) Non-Return Valve: - It is type of valve where the flow of fluid not returns to backward direction. Fig 4 reference from (**Nitin. V. Patel el al**)

Fig 4: - Non-Return Valve

d) Charcoal: - The charcoal layer has a large surface area and therefore has a high absorption capacity. These types of charcoal are called activated carbon. These activated carbons are produced by heating them in a burner to a specified time of 1500 degrees Celsius. Therefore, the surface is increased. Fig 5 reference from (**Rahul.S.Padval el al**)

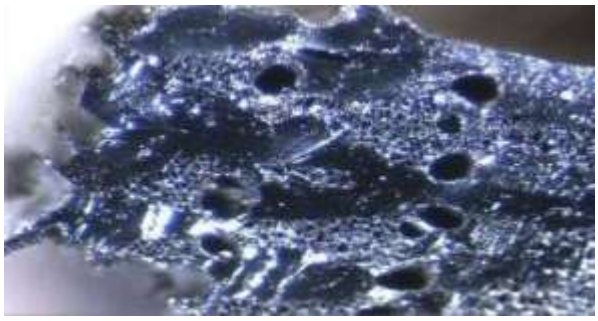

Fig 5: - Charcoal

e) H-Pipe: - It is a device which is used to connect two pipes together. Fig 6 reference from (**Mr. Sagar B.S et al**)

Fig 6: - H-Pipe

f) Flange: - A flange is a pipe connection, where the connector has flanges through which the parts are bolted together. The flange is an essential part that connects the muffler to the engine. Fig 7 taken from (**Rahul.S.Padval el al**)

Fig 7: - Flange

4. WORKING PRINCIPLE

The exhaust gas from the engine cylinder enters the dual filter muffler through a perforated pipe. The gas first enters the muffler's main filter through a perforated tube. Perforated pipe is a special kind of pipe, consisting of cross sections of different diameters. Therefore, the porous tube converts high-quality bubbles into poor-quality bubbles. In the primary filter, lime water reacts with toxic gases and reduces its concentration. After that, they pass through a secondary filter made of charcoal again to purify the gas. Charcoal is highly porous and has additional free valence. Therefore, it has high adsorption capacity. Eventually, the exhaust gas is discharged into the atmosphere through the opening. The dual filter muffler uses a mixture of water and limestone and is more effective in reducing exhaust emissions from engine exhaust. By using a mixture of water and limestone, the back pressure will be kept constant and the sound level will be reduced. By using water as a medium, sound can be reduced, and by using limestone in water, we can control exhaust emissions to a greater level. Water contamination in the dual filter muffler was found to be negligible because the acidity in the dual filter muffler is expected to be lower than the dangerous acidity. It's smoke-free and pollution-free, and it's cheap. Therefore, the double-filtered silencer reduces noise and pollution. The performance of a dual filter silencer is almost the same as a conventional silencer.

5. ADVANTAGE OF AQUA SILENCER

i. Easy construction and working.
ii. No need of catalytic converter.
iii. CO reduced 60% to 70%.
iv. At running of engine, there is no vibration.
v. Control emission and noise in greater level.
vi. Reduce noise and pollution at greater level.
vii. Cost is low.
viii. Carbon is separated.

6. DISADVANTAGE OF AQUA SILENCER

i. Space is required.
ii. Lime water filling is required frequently.
iii. Weight is more compared to conventional silencer.
iv. It is expensive than conventional silencer.
v. Lime water should be filled once in a year.

7. APPLICATION OF AQUA SILENCER

i. It is used in industrial sector.
ii. It is also used in automobile sector.
iii. It is used in marine & boats.
iv. It is applicable for DG sets & DG machine.

8. CONCLUSION

Compared with the traditional silencer, it uses activated coal and perforated pipes, which can effectively remove pollutants in the exhaust gas, reduce noise and continuous pressure, and reduce fuel consumption. Smokeless and pollution free it has been observed through experiments that aquarium mufflers are successful in reducing gas emissions in engine exhaust. By using water as a medium, the noise level is reduced, and by using activated carbon in water, it produces almost no pollution and smokeless emissions, and is also cheaper in long-term use methods. Aqua Silencer has almost the same performance as traditional silencers. It can be widely used in heavy vehicles with industrial engines and light weight improvements. The project analyzed the amount of exhaust gas before and after exhaust, and found that the emissions reported by the test results were significantly reduced.

9. FUTURE WORK

There has been an increasing concern in recent year over the increasing of transportation and discharge of industrial waste water into environment. The automobile emission contains air pollutants and other species. All pollutant gases are toxic in nature. Hence all pollutant gases are removed. Several expensive techniques are available in developed countries. But in developing countries like India is not applicable since absorption technique is less expensive and economically feasible. It has been selected for the present study using some cheap cost chemicals as an effective absorbent. Therefore the objective of the present work was to test the ability of some chemicals in removing air pollutants from automobile emission.

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