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Reduction of Air and Noise Pollution by Aqua Silencer- A Review

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Abstract — All across the world, people are facing a wealth of new and challenging environmental problems everyday. Nowadays, more importance is being given to environmental issues like air pollution and noise pollution. The major pollutants contribute by factories is sulphur-dioxide and from automobiles are carbon monoxide (CO), unburned hydrocarbon (UBHC), oxides of nitrogen (Nox) and lead. Automobiles are not only source of air pollution, other sources such as electric power generating stations, industrial and domestic fuel consumption, mining operations, industrial processing etc. also provide contamination of our environment heavily. Noise pollution is the disturbing or excessive noise that may harm the activity or balance of human life. The main source of outdoor noise worldwide is mainly caused by machines and transportation systems, motor vehicles, aircraft, and trains. An aqua silencer is an attempt in this direction to reduce air and noise pollution. The aqua silencer reduces noise pollution because, the sound produced in under water having less amplitude than in open atmosphere. It happens because of in water molecules are converted into low mass bubble which lowers amplitude of emission gases and lower the sound level. The charcoal layer which is pasted over perforated tube. The emission of polluted gases can be controlled by using the activated charcoal and highly porous extra free valences due to have high absorption capacity of this layer.

Keywords- Charcoal layer, Aqua silencer, Air pollution, Noise pollution.

I. *INTRODUCTION*

Global warming, a direct result of the increased imbalance of gases in the atmosphere has come to be known as the biggest threat and challenge that the contemporary world has to overcome in a bid for survival. Purity of air is prime necessity for the people as far as their health is concern. The average adult, when resting, inhales and exhales about 7 or 8 liters of air per minute. That totals about 11,000 liters of air per day. Noise pollution affects both health and behavior. Unwanted noise can damage psychological health. Noise pollution can cause hypertension, high stress levels, tinnitus, hearing loss, sleep disturbances and other harmful effects. Today, excessive noise pollution which, in the long run, may cause permanently reduced hearing. As a consequence, authorities now demand that noise levels are kept below certain limits. An aqua silencer System is designed to replace conventional single unit engine silencers on board structures. It is used to control the emission and noise in I.C. engines.

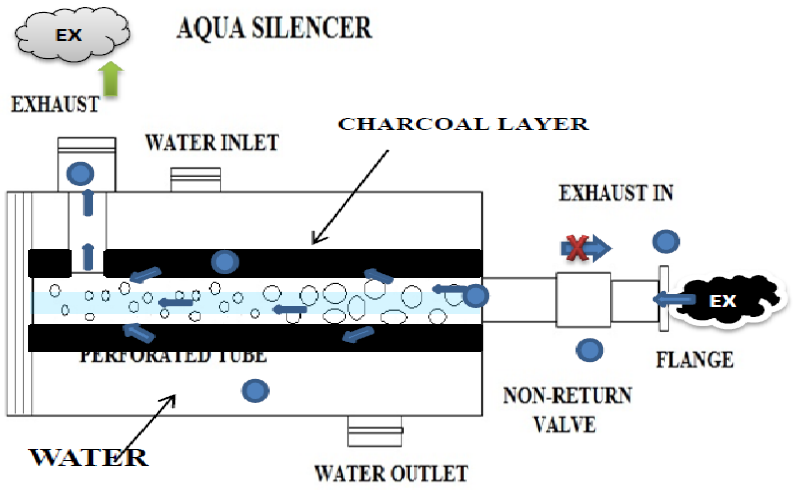

Fig. 1 Working layout of Aqua Silencer [3]

Generally, noise level of more than 80-90 dB is harmful for human being. The main source of noise in an engine are divided in two parts, first is the exhaust noise and second is the noise produced due to friction of various parts of the engine. The engine exhaust noise is the most dominant. To reduce this noise, the most effective way to use a muffler in the engines. The level of noise reduction depends upon the design, construction and the working procedure of muffler. If a car running without a muffler then the noise level is intolerable. The most of the advances in the acoustic filters and exhaust mufflers came out in last four decades. Hence good design of the muffler should give the best noise reduction and offer optimum back pressure for the engine. Back pressure is the extra static pressure exerted by muffler on the engine direct the restriction in the flow of exhaust gases. The insertion loss is defined as the difference in the acoustic power radiated without and with the muffler fitted.

This project is an attempt to reduce the toxic content of exhaust, before it is emitted to the atmosphere. This system can be safely used for power packs which could be used in inflammable atmospheres, such as refineries, chemical processing industries, open cast mines and other confined areas, which demands the need for diesel power packs. For achieving this toxic gases are to be reduced to acceptable limits before they are emitted out of this atmosphere, which otherwise will be hazardous.

Many researches going on to improve on acoustics of automobile and perjure to improve the turning of the silencer. The muffler is engineered as an acoustic sound proofing device design to reduce the loudness of the sound. Sarath Raj et. al. [1] discussed about silencer types in that the combined resonance and absorber type is the more effective type. In that project they made model and carried out the analysis. The outcome of this experimental analysis was that twin filter silencer is more effective and the water contamination was found to be negligible in aqua silencer.

Maruthi Prasad Yadav et. al. [2] carried out research for the four stroke multi cylinder diesel engine with an aqua silencer. In most of application the final selection of an aqua silencer is based on a arrangement between the predicted acoustical , aerodynamic , mechanical and structural performance in conjunction with the cost of the resulting system then have performance and work in the model and get result. They conclude that load increases the contaminations gradually by using conventional silencer but by fitting with aqua silencer, the contaminations decreases. They found comparison of different silencer for sound characteristic of engine. In conventional silencer is sound level is 83db but in an aqua silencer is 75 db without any load. Around 50% load in conventional silencer it give 84.5db and in an aqua silencer give 76.5 db load. In the fully loading condition the conventional silencer give 86 db and in an aqua silencer is 78 db.

Keval Patel et. al. [3] designs the dimensions of aqua silencer for two stroke petrol engine. The exhaust pipe connects with shell and inner side of it perforated tube is arranged. The charcoal layer is pasted over the perforated tube. Bead Activated carbon is used as a charcoal layer. It is a process by which the carbonized product develops porous structure of molecular dimensions and extended surface area on heat treatment in the temperature range of 800 – 1000 ^{o}C in presence of suitable oxidizing gases such as steam and carbon dioxide (CO_2). Bead activated carbon is made from petroleum pitch and supplied in diameters from approximately 0.35 to 0.80 mm. It is also noted for its low pressure drop, high mechanical strength and low dust content, but with a smaller grain size. Its spherical shape makes it preferred for fluidized applications. According to operational parameter they conclude that CO is reduced 60-70% compared to ordinary silencer. But it is big in size and more space is required. It is used in both two wheeler and four wheeler.

P.Balashunmugam et. al. [4] carried out the analysis in which the lime stones are originally intended to reduce the toxic ingredients of the exhaust, gas through chemical reaction. It is evidently affected the flow of resistance and hence the combustion characteristics of the engine will finally contribute the increased toxic ingredients of the exhaust gas. Because of the introduction of the scrubber, the net length of the exhaust gas flow path is also increased which is again, against the original intention according to his study they conclude that water in scrubber tank can itself play an important role in absorbing the obnoxious products of combustion like the oxides of nitrogen. NO is converted into NO_2 after emission which highly toxic is mainly absorbed in the water scrubber.

Rahul.s.padval et. al. [5] found in their experiment of an aqua silencer that water in a silencer reduces the sound. The system is very cheap and is use for four and two wheelers. The performance of twin silencer is almost equivalent to the conventional silencer.

Akhil anil kumar et. al. [6] designs an aqua silencer. They perform for three cases. Case- 1 for simple silencer , case- 2 for silencer with activated charcoal and Case- 3 for silencer with activated charcoal and lime water . The result shows smoke density for 1st case 1.7 to 2.2 K(m-1), for 2nd case 0.5 to 1.1 K(m-1), for 3rd case 0.4 to 0.5 K(m-1).

Alen.M.A et. al. [7] investigated that emission can be controlled by the activated charcoal and lime water. They compared the results between simple silencer and silencer with lime water and activated charcoal layer. They conclude that the silencer is more effective in the reduction of emission gases from the engine exhaust using perforated tube, lime water and charcoal layer. By using perforated tube the back pressure will remain constant and fuel consumption remain constant and sound level is reduced. Also by using activated charcoal in water we can control the exhaust emission to a greater level it is smokeless and pollution free emission equivalent to the conventional silencer.

II. CONCLUSION

On the basis of literature survey and studies, it is expected that the aqua silencer is more effective in reduction of emission of gases from engine. By using water as a medium, noise level is reduced. In aqua silencer system fuel consumption remain same as conventional silencer. It can be used for two wheelers and can be used in industries also.

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