

FABRICATION AND TESTING OF AQUA SILENCER

Prof. Rakesh B. Thakare ¹ (Guide),
Chandrakant S. Deshmukh ² (Student),
Ashwin B. Inamdar ³ (Student),
Aniket P. Karmase ⁴ (Student),
Gaurav P. Potdar ⁵ (Student)

^{1,2,3,4,5} (Sandip Polytechnic, Mahiravani, Nashik)

ABSTRACT

In this Paper To conserve the earth's environment from degradation and also the public health from Air pollution it is very imperative then serious steps are to be taken for preserve them and Aqua silencer is an attempt to do so. Aqua silencer found its application for dealing with the emission and noise. An aqua silencer is generally attached to the exhaust side of engine. In this Aqua silencer both the Lime stone water method and Carbon absorption method are used. The gases like HC, CO from the engine exhaust are consume. The final emission is analyser and the reduction of gases HC, CO is measured.

Keywords: Testing, Fabrication, Aqua Silencer

I. INTRODUCTION

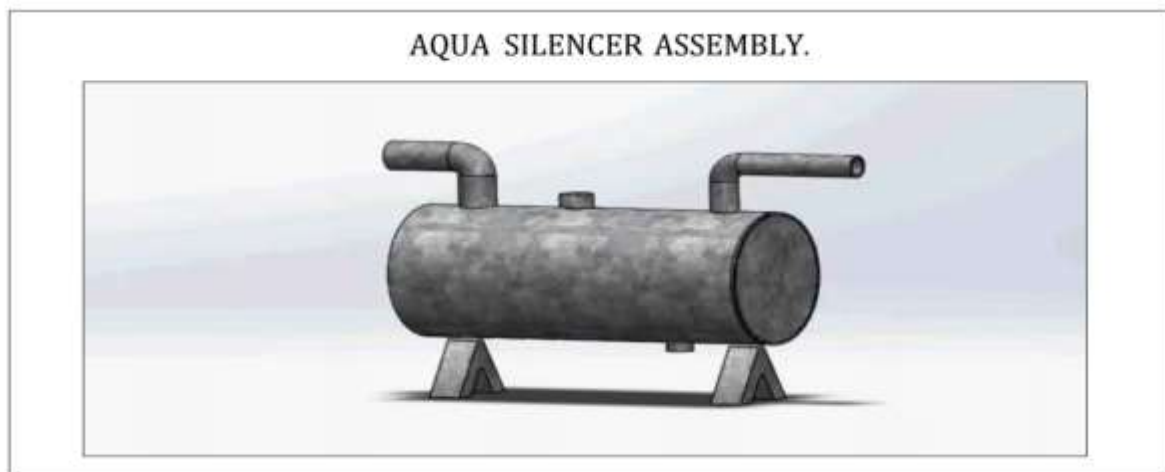
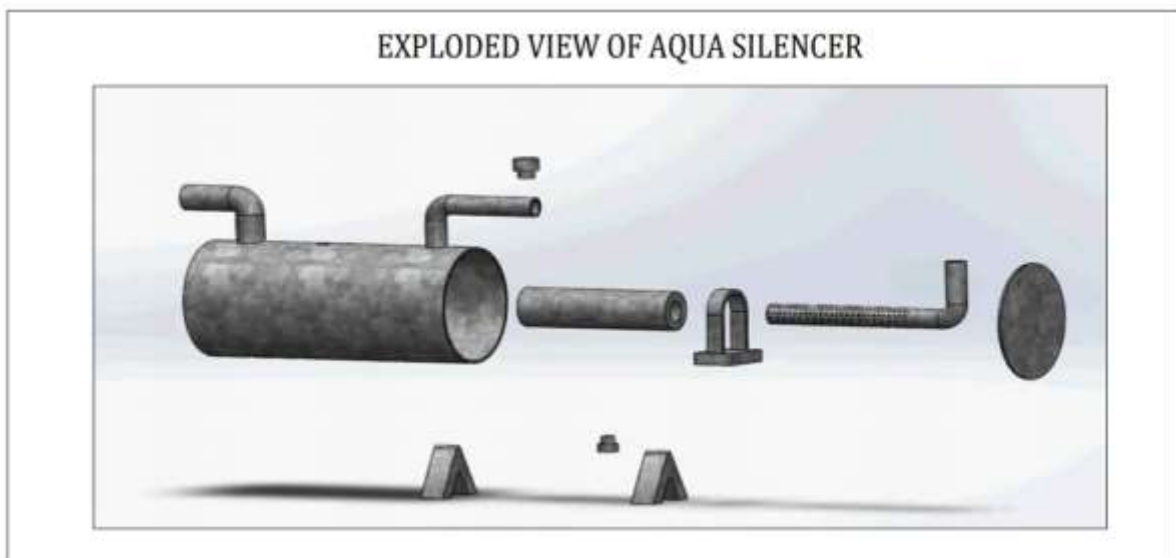
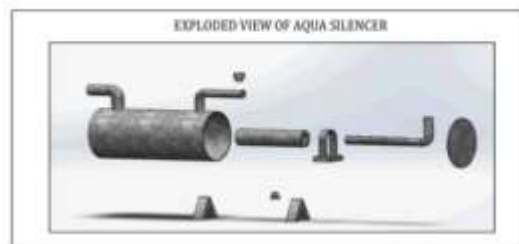
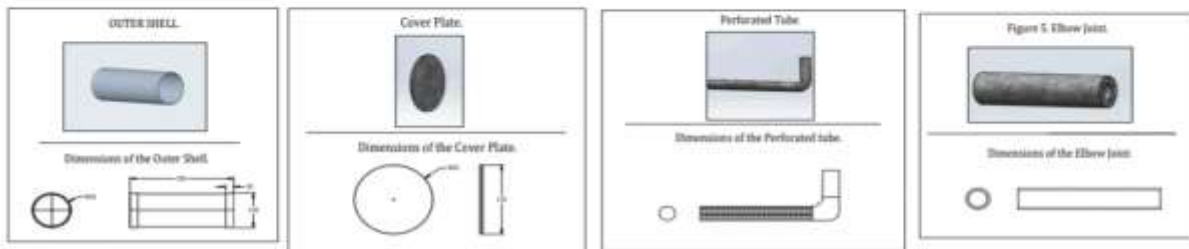
Air pollution is a major problem. The main pollutants aid by automobiles is (CO), Un-burnt Hydro Carbon (UBHC), NOX and Lead etc. Other causes of pollution are electric power generating stations and Industries. So it is assertive that serious attempts should be made to conserve earth's environment from degradation. An aqua silencer is an pursuit in this direction. It mainly finds its applications in controlling of emission and noise. An aqua silencer is installed to the exhaust pipe of an engine. Air pollution is because of chemicals, sum of all solid and liquid particles suspended in air and biological materials that cause harm or discomfort to humans or other living organisms or damages the natural environment. These items called pollutants can occur naturally or they can be produced by human activities. Hazardous waste include antigen, salt particles, smoke from forest fires, and gases from organic waste, Most pollution is due to by human activities is directly or indirectly the result of burning of fuels in furnaces or *engines*.

II. OBJECTIVES

1. To test the ability of aqua silencer to remove air pollutants from the exhaust of IC engine.
2. To test the ability of aqua silencer in reducing the noise lever of the engine exhaust.
3. To check the performance of aqua silencer over the conventional silencer.
4. To check the absorption capacity of charcoal layer this is placed in the silencer.
5. To understand the advantages and boundaries of aqua silencer over conventional Silencer.
6. To reduce emissions of toxic gases by 10 to 20 percentage then existing system.

III. ANALYTICAL DRAWING OF AQUA SILENCER

DIMENSIONS OF AQUA SILENCER.





Cross Section of Silencer



Charcoal layer

IV. SCOPE

An Aqua silencer is a device used to filter the pollutants produced from automobiles exhaust such as CO, unburnt hydrocarbon, NO_x and Lead. An aqua silencer is fitted at the exhaust of the vehicle. It is the modification of conventional silencer. It is basically consist of perforated tube, charcoal, non-return valve, outer shell and lime water. The Silencer is basically design to control the emission from engine exhaust and noise level. In aqua silencer the main component is perforated tube which consists of number of different diameter holes. Generally these are 4 set of holes on perforated tube is provided. The charcoal layer is placed on the circumference of the perforated tube. Whole unit is placed in the cylindrical shape container. The exhaust coming from the engine is passed through the perforated tube through non return valve. Then the emission and noise level is measure at the outlet. First the test will carried out using conventional silencer and then we will compare the result with aqua silencer. The silencer is design by considering the standard dimension of vehicle .As per design methodology we benchmarked same kind of engine models to set the target of transmission loss of muffler. But the major disadvantage of this silencer is that it occupies more space. Hence this silencer is not used on the vehicle which is compact in size. The further modification is possible in this silencer to reduce its size make it compact.

V. CONSTRUCTION

A. Outer shell

The whole setup will kept inside the outer shell. The water inlet, outlet and exhaust tube was given in the shell itself. The initial step deals with manufacturing the outer shell of the silencer. The shape of the outer shell has a cylindrical shape.

B. Perforated Tube

The perforated tube is fitted at the inlet side of the silencer from which exhaust gases will pass. It is the tube of small diameter and long length. The number of holes of different diameter is drilled on the perforated tube so that the large bubbles of exhaust will be break into small gas bubbles.

C. Activated Charcoal Layer

The charcoal layer has more soaking capacity because it has more surface area. This charcoal is called as activated charcoal. It is produced by heating the charcoal for several hours in a burner. Its surface area gets increased. Charcoal coating is given on the surface of the perforated tube. Charcoal is highly absorptive and possesses extra free valances. So the charcoal is a good absorbing medium. Hence the gases may purify. Different types of charcoal are available. But activated carbon charcoal is commonly used in twin filter silencer.

D. Cover plate

To complete the outer shell the two cover plate are employed on the both the sides of the shell. These cover plate is directly welded to the outer shell using Oxy-Acetylene welding. The flow rate of gas is properly controlled for the perfect weld.



Final Assembly of Aqua Silencer

VI. WORKING



Dismantling the silencer from the Bike



Aqua Silencer Assembled To The Bike

An Aqua silencer is an developed version of a normal silencer. As the exhaust gases come into the aqua silencer, the perforated tube transform high mass bubbles into low mass bubbles, after that they come into contact with lime water they chemically react with it and Enter through the charcoal coating which again purify the gases. The gases like HC, CO are soaked from the emission. The charcoal is highly absorptive and has extra free valences so it has high absorption capacity. The filtered gases are then released into atmosphere. The polluted lime water which has precipitates of calcium carbonate and bicarbonates in the aqua silencer is supplanted once in a year. The charcoal layer is enclosed with an outer shell which is filled with water. Sound generate under water is less audible than sound produced in atmosphere. This is mainly because of small sprockets in water partials, which decreases its amplitude thus, decrease the sound level hence aqua silencer minimizes noise and pollution.

VII. CHEMICAL PROCESSES

1. Treatment with water

In aqua silencer the water gets polluted by the abate gases. The exhaust gases merge with water to developed carbonates, acids like carbonic acid, sulphuric acid, and Nitrous acid. The petroleum products contain phenols, which gives suffocating smell. The sulphur gas combines with water to form hydrogen sulphide, which give

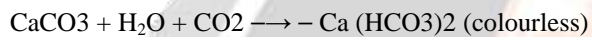
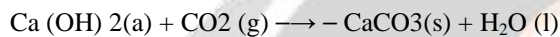
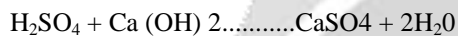
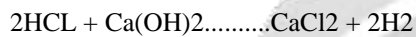
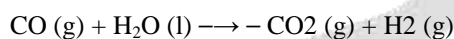
rotten egg smell. These should be controlled to prevent the water pollution. To control the water pollution following techniques are used in this project.

- a) Lime water wash method.
- b) Absorption method.

a) Lime water wash method

Lime wash is a mixture of slaked lime. The water is treated with slaked lime. Quantitative analysis of water has to be taken for this process. After mixing the heavy precipitates, they settle down as sludge at the bottom of the tank and they are thus removed from time to time.

Lime can wipe out any acid present in the water. SO₂ is removed from the flue gases forming calcium sulphate. The precipitates of carbon decompose as calcium carbonate and bicarbonate converts into carbonates. The equations are given below. The reactions with water are.



Thus the harmful gases are transforming into precipitates and are removed from aqua silencer.

b) Absorption process

Powdered form of Activated charcoal, which is available frequently is used in the aqua silencer. It has high valences and is porous in nature, which enables high Absorption capacity. It has excellent properties of attracting gases, its finely divided solid particles enable absorption of gases. The water is combined with charcoal before the coagulation with the sediment, which is in reality in powdered form.

VIII.CONCLUSION

This project examine the smoke content of the exhaust gas firstly and after treatment and it was found that there is a considerable reduction in the emission as pointed out by the test result. The aqua silencer is more effective in the reduction of emission from exhaust gases from the engine using perforated tube and charcoal. The black carbon smoke produced by using conventional silencer is more. By using aqua silencer the black smoke is considerably reduced. As the HC is more hazardous for the human life, its emission should be effectively controlled. The percentage of HC is reduced by the 15% than by conventional silencer. It was observed that "Aqua Silencer" is enough to control the carbon footprints up to 40%. It is found to be more appropriate. The CO₂ reduced by the aqua silencer is more than by conventional silencer. This is because of presence of charcoal layer which have high absorption capacity.

In aqua silencer by using water as a medium the sound can be lowered effectively. As the sound is less hear able in water, the noise level is decrease by 20% than b conventional silencer. The water contamination is found negligible in aqua silencer. It is pollution free emission with zero content of smoke, It is also very cheap. It finds its applications for both for two wheelers and four wheelers and also can be used in industries.

VII.REFERENCES

- [1] Tao, Z.; and Seybert, A.F. (2003). A review of current techniques for measuring muffler transmission loss. SAE International, Paper number: 2003-01-1653.
- [2] Ciskowski, R.D.; and Brebbia, C.A. (1991). Boundary element methods in acoustics. Computational Mechanics Publications.

- [3] Austen, A.E.W.; and Priede, T. (1965). Noise of automotive diesel engine, its causes and reduction. S.A.E. transaction, Paper Number: 650165.
- [4] Alfredson, R.J.; and Davies, P.O.A.L. (1971). Performance of exhaust silencer components. Journal of sound and vibration, 15(2), 175-196.
- [5] Belgaunkar, B.M.; Somayajulu, K.D.S.R.; and Mukherjee, S. (1969), A study of engine exhaust noise and silencer performance. N.V.R.L Report, I.I.T. Kharagpur
- [6] Keval I. Patel, Mr. Swastik R, Gajjar “Design And Development Of Aqua Silencer For Two Stroke Petrol Engine” IJRST–International Journal for Innovative Research in Science & Technology| Vol. 1, Issue 1, June 2014| ISSN(online): 2349-6010.
- [7] Sharad R. Mahajan “Air Pollution from I.C. Engines & its Control” International Journal of Inventive Engineering and Sciences (IJIES), Volume-1, Issue-11, October 2013.
- [8] Yogesh V Morankar , Prof. M. R. Khodke ,“Noise Reduction Of A Diesel Engine: A Review,” International Journal of Engineering Research & Technology (IJERT)ISSN: 2278-0181, Vol. 3 Issue 5, May – 2014.
- [9] S.*, PatilSnehal S., NandrekarAmruta A., Abhijeet S. Kabule, “Use Of Aqueous Ammonia In Silencer For Removal Of Co₂, So₂ And NO_x From Exhaust Gases Of I.C. Engines” RawaleSudarshan International Journal of Engineering Science and Innovative Technology (IJESIT)Volume 2, Issue 5, September 20.
- [10] P.Balashanmugam¹, G.Balasubramanian²,” Developments of Emission and Noise Control Device (Aqua Silencer)” Scientific Journal Impact Factor (SJIF): 1.711International Journal of Modern Trends in Engineering and Research.
- [11] JuhiSharaf; ” Exhaust Emissions And Its Control Technology For An Internal Combustion Engine” International Journal of Engineering Research and Applications , Vol. 3, Issue 4, Jul-Aug 2013.
- [12] Mankhiar Ajay B, Sindhu LS , G. Sasikala ,“An Advancement To Reduce Pollution Effectively By Using Ti Nanotubes In Aqua silencer” International Journal Of Engineering Sciences & Research Technology.
- [13] Abdul Rehman, Surya Yadav, Amansaxena, “Reviewed Of Noise Control In Ic Engine” International Journal of Scientific Research Engineering & Technology (IJSRET), Volume 3, Issue 8, November 2014.
- [14] Alen.M.A, Akshay. M, PremSankar. R, Mohammed Shafeeque. M, “Fabrication and Testing Of Aqua Silencer” International Research Journal of Engineering and Technology (IRJET) Volume: 02 Issue: 05 | Aug-2015
- [15] Patel Praful M, GajjarSwastik R., “A Literature Review On Design And Development Of Industrial Generator Silencer” IJSRD - International Journal for Scientific Research & Development| Vol. 3, Issue
- [16] Abhijeet Pratap¹, Ujjal Kalita², Sushil Kumar³ “Effect Of Perforated Tube On Transmission Loss Of Muffler- A Review” International Journal of Engineering Research and General Science Volume 3, Issue 3, May-June, 2015 ISSN 2091-2730
- [17] Md. Nasir Uddin, M M Rashid, “Development of An Absorption Silencer for Generator's Noise Reducing”
- [18] [1] Akhil Anil Kumar, Anoop N, “Design and Development of Aqua Silencer”, IJEIT, May 2016.
- [19] Alen M.A., Akshay M., “ Fabrication and Testing of Aqua Silencer”, IRJET, Aug-2015.
- [20] Rahul. S. Padval, Nitin V. Patil, “Aqua Silencer”, ICETEMR, March 2016.
- [21] Prof. H.A. Khande, Karansingh Naglot, “Reduction in Emission and noise using Aqua Silencer”, IJS DR, May 2016.
- [22] Prof. M.M.Kulkarni, “Experimental Investigation and testing of Diesel engine and Analysis of exhaust gases by using Aqua Silencer “
- [23] Rohit Thakre,Ajit Khushwah “Design and Fabrication of Aqua Silencer For Automobile”
BOOK
Internal Combustion Engine – V Ganesan, MCgraw Hill Publications.