

# Design and Fabrication of Aqua Silencer in Four Stroke Petrol Engine with Noise and Vibration Analysis

M. Venugopal<sup>1</sup> Mahamood VP<sup>2</sup> Muhammed Ali Jalib Davari<sup>3</sup> Roshith P<sup>4</sup> Samson Saji<sup>5</sup>

<sup>1</sup>Assistant Professor <sup>2,3,4,5</sup>UG Scholar

<sup>1,2,3,4,5</sup>Department of Mechanical Engineering

<sup>1,2,3,4,5</sup>Gnanamani college of Technology, Namakkal, TamilNadu, India

**Abstract**— An Aqua Silencer is mainly dealing with central if emission and noise. It is fitted to the exhaust pipe if engine. Sound produced under water is less hearable than it produced in atmosphere. This mainly because if small sprockets in water molecules, which lowers its amplitude thus, lowers the sound level. The noise and smoke level is considerable less than the conventional silencer. A sound level meter is simply a device with audio frequency sensing capabilities that is controlled, essentially, by a microcontroller, which measures, compares, and triggers the appropriate action to reduce noise level nice the critical sound level has been exceeded. Vibration meters are used in many installations and machines as well as in the development if products, to measure vibrations and oscillations. Its measurements provide the following parameters: vibration accelerating, and vibration displacement.

**Keywords:** Aqua Silencer, Noise Control, Emission Control

## I. INTRODUCTION

Air pollution is the introduction of chemicals, particulate matter, or biological materials that cause harm or discomfort to humans or other living organisms or damages the natural environment. These substances called pollutants can occur naturally or they can be produced by human activities.

Air pollution in the world has emerged as the focus of environmental remediation efforts because of their toxicity and threat to human beings. Hence the removal of toxic air pollutant contaminants from atmosphere is one of the most important environmental and economic issues today pollutants.

Many expensive methods of removal for air pollutants are available in developed countries but in developing countries like India these methods are hard to apply because of its cost.

## II. CONSTRUCTION

Basically an aqua silencer consists of a perforated tube which is installed at the end of the exhaust pipe. The perforated tube has holes drilled in it. The very purpose of providing holes is to break up gas mass to form smaller gas bubbles. Here we take an Alloy 347 stainless steel pipe of dimension 460x38 mm for the perforated tube. The other end of the perforated tube is let as outlet to the atmosphere. The perforated tube is filled with water and the powder of activated charcoal and further a metallic mesh covers it. The whole unit is then placed in the metallic mesh with water and charcoal power in it. A small opening is provided at the top of the metallic mesh to fill or pour the water into in and a drain valve is provided at the bottom of the metallic mesh for the removal of the water at periodic intervals.

## III. WORKING PRINCIPLE

As the exhaust gas passes from the exhaust port of the IC petrol engine, it enters into the aqua silencer. The perforated tube converts the high mass bubbles into low mass bubbles. This gas in the perforated tube via the drilled holes enters into the mixture of water and coal powder .Since charcoal has high adsorbing capacity, it adsorbs the harmful gases and purifies the exhaust gas. After passing over the water and charcoal mixture some of the gases dissolve in to the water and finally the exhaust gases escapes through the opening in to the atmosphere. The sound produced under waste medium is less hearable than to that produced in air medium Hence aqua silencer reduces noise and pollution. The vibration obtained during operation of silencer and also during displacement of vehicle is sensed by the installed vibration sensor and the values are indicated in the LCD display.

## IV. MAJOR COMPONENTS

- 1) FRAME
- 2) SHEET METAL
- 3) PIPE
- 4) CHARCOAL
- 5) VIBRATION METER
- 6) NOISE METER

### A. Metal Frame

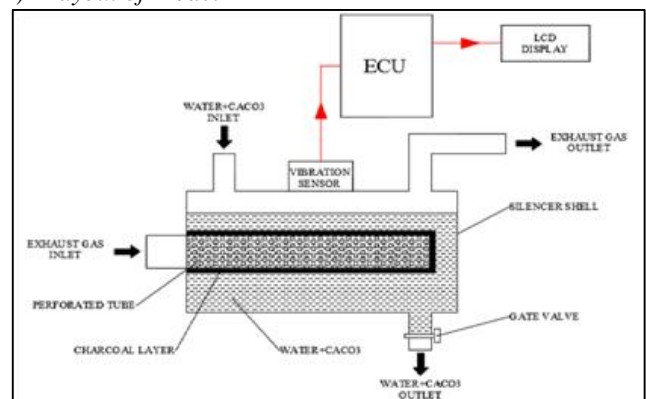
The metal frame is generally made of mild steel bars for machining, suitable for lightly stressed components including studs, bolts, gears and shafts.

It can be case-hardened to improve wear resistance. They are available in bright rounds, squares and flats, and hot rolled rounds.

### B. Charcoal

Charcoal is the lightweight black carbon and ash residue hydrocarbon produced by removing water and other volatile constituents from animal and vegetation substances.

### 1) Layout of Model



## V. MANUFACTURING PROCESS

Manufacturing processes are the steps through which raw materials are transformed into a final product. The manufacturing process begins with the creation of the materials from which the design is made. These materials are then modified through manufacturing processes to become the required part.

### A. Sawing

Cold saws are saws that make use of a circular saw blade to cut through various types of metal, including sheet metal. The name of the saw has to do with the action that takes place during the cutting process, which manages to keep both the metal and the blade from becoming too hot.

### B. Welding

Welding is a process for joining similar metals. Welding joins metals by melting and fusing.

## VI. VIBRATION MEASUREMENT

Vibration is a time-based (periodic/cyclic) displacement of an object around a center static position. The following contributing factors have a complex relationship with the magnitude and rate of the vibration:

- The object's own natural frequencies and stiffness
- The amplitude and frequencies of any external energy source(s) inducing the vibration
- The coupling mechanism between vibration energy source and the object of interest.

Vibration is measured as an acceleration, velocity, or displacement. Each has advantages and disadvantages and each vibration measurement unit can be converted to the others although with potentially adverse consequences from the conversion. Acceleration and displacement are the most common methods of vibration measurement.

## VII. NOISE MEASUREMENT

Noise is measured using decibel meter.

## VIII. ADVANTAGES

- More effective in the reduction of emission gases and noise.
- Water and charcoal are renewable sources of energy, so it is easy to use.
- Maintenance is easy.
- It is smokeless and pollution free emission occurs.
- Performance is higher than the conventional silencer.
- In mass production it has less cost.
- Non exhaustable energy source is used.
- It is easy to construct and has good appearance

## IX. APPLICATIONS

- 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 and prone to accidents.

## X. MAINTENANCE

- Maintenance of this unit is very easy.
- It can be easily maintained effectively for years together.
- If any part is damaged it can be easily replaced.

## XI. CONCLUSION

It has been experimentally observed that the aqua silencer is successfully effective in reducing emission of gases from the engine exhaust. By using water as a medium, the sound levels have been reduced and by using activated charcoal in water, it produces almost pollution-free and smokeless emission and is also cheap considering long term use. The aqua silencers performance is almost equivalent to the conventional silencer. It can be widely used in industrial engines and with a little improvisation, in heavy weight vehicles. This project analyzed the smoke content of the exhaust gas before and after treatment and it was found that there is a considerable reduction in the emission as pointed out by the test results.

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## REFERENCES

- [1] Akhil Anil Kumar, Anoop N, "Design and Development of Aqua Silencer", IJEIT, May 2016
- [2] Alen M.A., Akshay M., "Fabrication and Testing of Aqua Silencer", IRJET, Aug-2015
- [3] Rahul. S. Padval, Nitin V. Patil, "Aqua Silencer", ICETEMR, March 2016.
- [4] Prof. H.A. Khande, Karansingh Naglot, "Reduction in Emission and noise using Aqua Silencer", IJSRD, May 2016.
- [5] Prof. M.M.Kulkarni, "Experimental Investigation and testing of Diesel engine and Analysis of exhaust gases by using Aqua Silencer