International Journal on Applications in Mechanical and Production Engineering
Volume 1: Issue 8: August 2015, pp 1-2. www.aetsjournal.com ISSN (online): 2395-3500

New Trends Of Emission Control System Used In Silencer

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Abstract— Air pollution is most important from the public health point of view, because every individual person breathes approximately 23000 times a day, inhaling about 17 to 24 Kg of air daily.Polluted air causes physical ill effect decides undesirable aesthetic and physiological effects. Air pollution can be defined as addition to our atmosphere of any material, which will have a detritus effect on life upon our planet. The main pollutants contribute by automobiles are carbon monoxide (CO), unburned hydrocarbon (UBHC), oxides of nitrogen (No_x) and Lead. A silencer is an attempt in this direction; it is mainly dealing with control of emission and noise.Asilencer is fitted to the exhaust pipe of engine. Sound produced under water is less hearable than it produced in atmosphere. This 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 and hence its name aqua silencer.The noise and smoke level is considerable less than the conventional silencer, it is cheaper, no need of catalytic converter and easy to install.

Key Words **-** Air Pollution, Emission, Noise, Silencer.

I. CONTRUCTION

Basically an aqua silencer consists of a perforated tube which is installed at the end of the exhaust pipe.The perforated tube -different diameters. Purpose of providing different diameter hole is to break up gas mass to form smaller gas bubbles.Generally 4 sets of holes are drilled on the perforated tube. The other end of the perforated tube is closed by plug.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 placed in a water container. A small opening is at the top of the container to remove the exhaust gases & a drain plug is provided at the bottom of the container for periodically cleaning of container.

Also a filler plug is mounted at the top of the container. At the inlet of the exhaust pipe a non-return valve is provided which prevents the back flow of gases and water as well.

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II. PARTS OF SILENCER

1. Mountings
2. Filler Plug
3. Charcoal Layer
4. Perforated Tube
5. Wire Mesh
6. Drain Plug

III. DIADGRM OF SILENCER

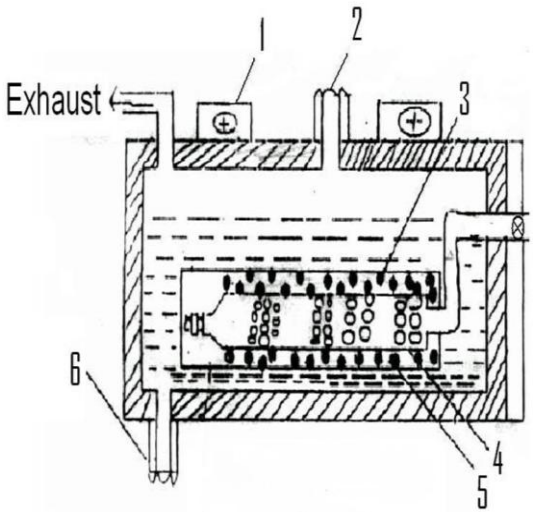

Figure1 shows the construction and schematic diagram of silencer.

IV. DIAGRAM OF PERFORATED TUBE

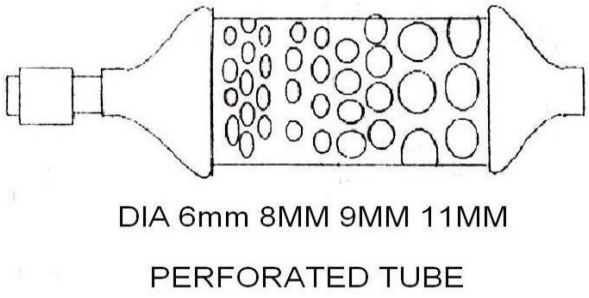

Figure 2 shows the schematic view of perforated tube.

V. WORKING

As the exhaust gases enter into the Aqua silencer, the perforated tube converts high mass bubbles in lo low mass bubbles after that they pass through charcoal layer which again purify the gases.It is highly porous and posses extra free

valences so it has high absorption capacity.After passing over the charcoal layer some of the gases may dissolvein to the water and finally theExhaust gases escape through the opening in to the atmosphere. Hence aqua silencer reduces noise and pollution.

VI. EFFECT OF DISSOLVED GASES ON WATER

The water is a good absorbing medium. In silencer the gases are made to be dissolved in water. When these gases dissolved in water they form acids, carbonates, bicarbonates etc,

Action of dissolved SO2
Action of dissolved CO2
Effect of dissolved NO_x

VII. METHODS TO CONTROLL THE WATER POLLUTION

Lime water wash method.
Absorption process.

LIME WATER WASH METHOD;

The water is treated with the calculated quantities of slaked lime. After mixing the heavy precipitates settle down as sludge at the bottom of the tank are removed from time to time. Lime can neutralize any acid present in the water, SO2; gases are removed from the flue gases forming calcium sulphate. The precipitates dissolved carbon dioxide as calcium carbonate and converts bicarbonate ions into carbonates.

VIII. EQUATIONS

$Ca(OH)_2 + SO_2$. .. .. $CaSO_3$ + H2o
Neutralizes any acid present in water
$2HCL + Ca(OH)_2$.....$Cacl_2 + 2H_2$
$H2SO_4 + Ca\ (OH)_2$..... $CaSo_4 + 2H_20$
Precipitates bicarbonate as calcium carbonate
$CO_2 + Ca(OH)_2$.....$CaCO_3$+$2H_2O$
Precipitates bicarbonate as calcium carbonate
$Ca(HCO3)_2 + 2Ca\ (OH)_2$..... $2CaCO_3 + 2H_20$
Converts bicarbonate ions (Like $NaHCO_3$, $KHCO_3$ etc.) into carbonates.
$NaHCO_3 + Ca(OH)_2$..... $CaCO_3 + H_20 + Na_2CO_3$

IX. LIMITATIONS OF LIME WATER WASH METHOD

Amount of neutralization capacity is limited, it is very difficult to handle,Bridging and form are formed, it is expansive,Regeneration is possible,Lime in any form it is difficult to handle.

X. ABSORTION PROCESS

Activated charcoal is available in granular or powdered form. As it is highly porous and possess free valances. So it posses high absorption capacity.Activated carbon is more widely used for the removal of taste and odorous from the public water supplies.Because it has excellent properties of attracting gases, finely divided solid particles and phenol type impurities, the activated carbon, usually in the powdered form is added to the water either before or after the coagulation with sedimentation.

XI. ADVANTAGES OF ABSORTION PROCESS

It increases the coagulation power of the process.Its use reduces the chlorine demand. The excessive dose of activated carbon is not harmful.The treatment process is very simple and it requires nearly no skill.The efficiency of removing color, odor and taste is quite high.It can be easily regenerated.It has excellent properties of attracting gases.

XII. CONCLUSION

The silencer is more effective in the reduction of emission gases from the engine. Exhaust using perforated tube and charcoal,by using perforated tube the backpressure will remain constant and the sound level is reduced.By using perforated tube the fuel consumption remains same as conventional system.By using water as a medium the sound can be lowered and also by using activated charcoal in water we can control the exhaust emission to a greater level.The water contamination is found to be negligible in aqua silencer.It is smokeless and pollution free emission and also it is very cheap. This aqua silencer's performance is almost equivalent to the conventional silencer. It can be also used both for two wheelers and four wheelers and also can be used in industries.

ACKNOWLEDGEMENT

The Author(s) gratefully acknowledged the technical support provided by the Research Centre, Jayalakshmi Institute of Technology, Thoppur, India.

REFERENCES

[1] Anoop Singh., Prasad, S., Joshi, "emission control and reduce of nitrox oxide in silencer", ***Resources, Conservation and Recycling Journal***, Vol. 50, (2007), 1-39.
[2] Al Baghdadi, M. A. S., "Performance Study of a Four- Stroke Spark Ignition Engine emission gas analysis and control", ***International Journal of automotive technology***, Vol. 25, (2013), 1005-1009.
[3] Brinkman, N. D., "A Single Cylinder Engine Study of Efficiency and Exhaust Emissions", ***SAE Paper***, No. 810345, (2012).
[4] ASTM D4809-00 Standard Test Method for Heat of Combustion of Liquid Hydrocarbon by chemical reaction, Vol 05.01.
[5] Sakaguchi, Environmental Friendly Diesel Engine "UEC Eco-Engine", Mitsubishi Heavy Industries Technical Review Vol.41 No.1 (2007).
[6] Mathur, H. B., Khajuria, P. R., "Performance and Emission Characteristics of chemical action control in Spark Ignition Engine", ***International Journal of chemical Energy***, Vol. 9, No. 8, (2002) , 729-735.
[7] Niven, R., "exhaust gas analysis: Environmental Impacts and Sustainability Review Article", ***Engine Emission Energy Reviews***, Vol. 9, (2005), pp-535-555.