“An Aqua silencer as an emission controller”

न हि ज्ञानेन सदृशं पवित्रमिह विद्यते।

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Introduction

- Now a days Air pollution is major problem.
- The main pollutants contribute by automobiles are (CO), UBHC, (Nox) and Lead etc.,
- Other sources such as electric power generating stations, industrial and domestic fuel consumption , refuse burning, industrial processing.
- So it is imperative that serious attempts should be made to conserve earth’s environment from degradation.
- An aqua silencer is an attempt in this direction, it is mainly dealing with control of emission and noise.
- An aqua silencer is fitted to the exhaust pipe of engine.

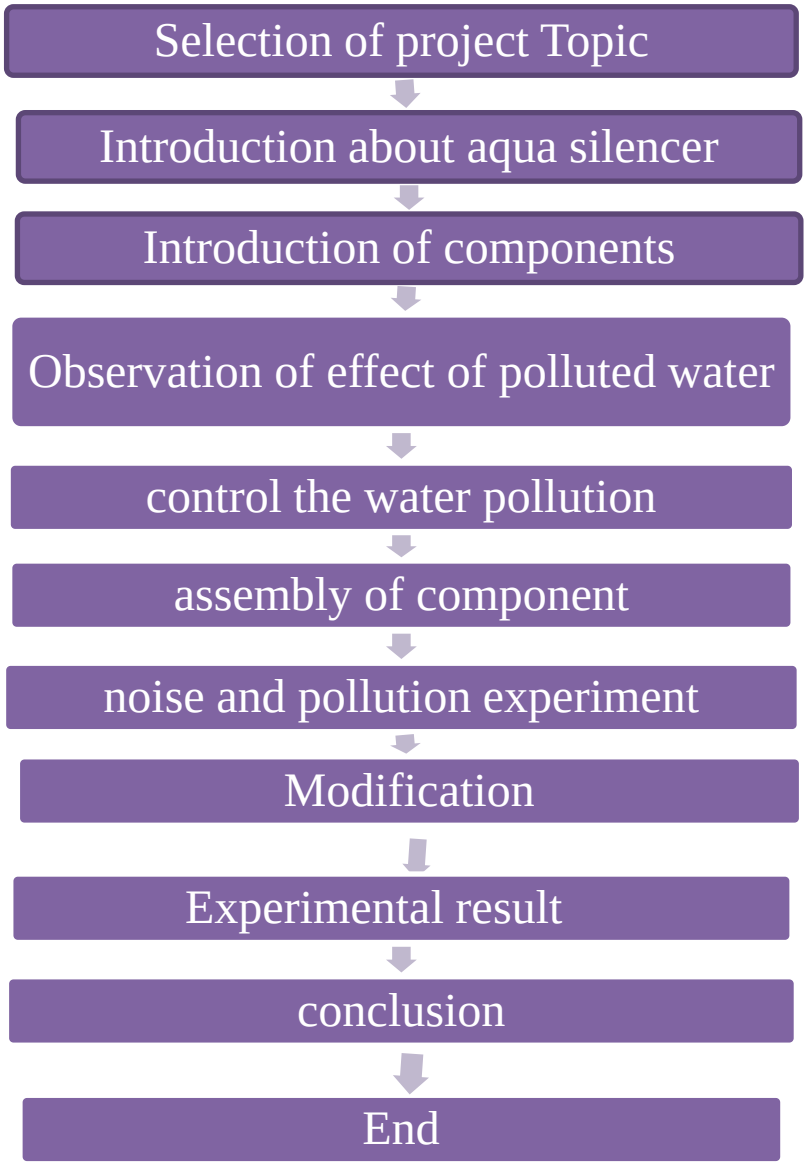
Literature review

SR. NO	JOURNAL NAME	TITLE NAME	YEAR	AUTHOR	METHODOLOGY	CONCLUSION
1.	Elsevier	Numerical simulation of the flow field of a diffused pneumatic silencer	2012	X.W. Zhang , Z.H. Yao, F. He	keywords:- N-S Equation With parameter, V=65.1m/s P=1.66028*10 ^{5} pa K=1.21*10 $^{-11}$ m^2 C_f =.91*10 5 m^{-1}	1.The outflow velocity distribution and inner pressure distribution could be improved by improving the structure of silencer. 2.Therefore modifying inner area Section or reducing the area of shell & end cover .

2.	Elsevier	A Study on Exhaust Muffler Using a Mixture of Counterphase Counteract and Split-gas Rushing	2011	Ying-li Shao	Keywords : Exhaust muffler; Backpressure; Insersion loss	1.The new exhaust mufflers obviously effective in controlling the low-frequency exhaust Noise. 2.this experiment reduce noise of the Engine.
3.	Elsevier	A case study on compatibility of automotive exhaust thermoelectric generation system, catalytic converter and muffler	2014	X. Liu, Y.D.Deng, S.Chen, W.S.Wang, Y.Xu,C.Q.Su 1	Keywords:- Automotive Exhaust, heat,Back pressure, Heat exchanger, Catalytic converter, Bench test	1.A research was carried out to test three cases about the installation position of the thermoelectric generator. 2.variuos cases was tested and In this paper case 2 is the Best positon for installation.

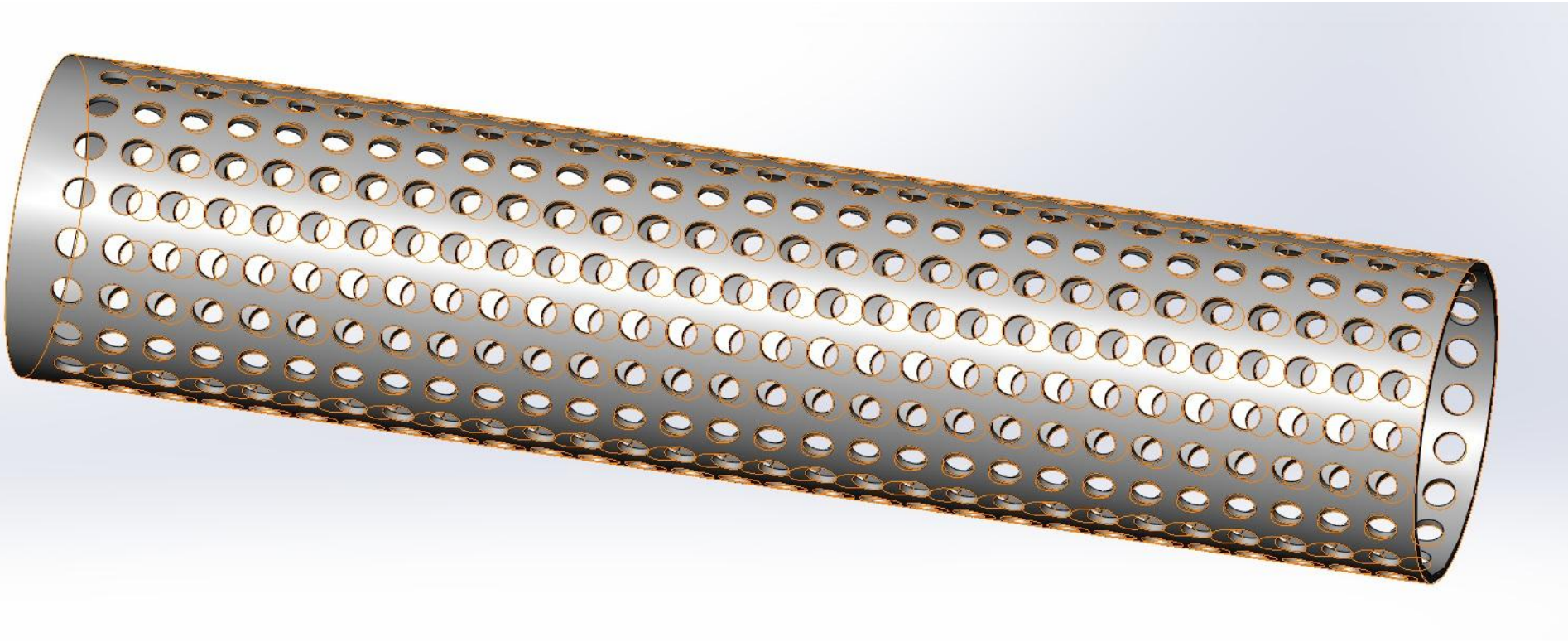
4.	Elsevier	Numerical study of finned type heat exchangers for ICE exhaust waste heat recovery	2014	M. Hatami n, D.D.Ganji, M.Gorji-Bandpy	Keywords **:** Waste heat recovery Heat exchanger Internal combustion Engine	1.In this paper, engines exhaust waste heat is recovered by using the finned type heat exchangers numerically. 2.Heattransfer through the walls and fins were modelled successfully and the transferred heat to cold fluid is calculated as the recovered heat.
5.	Elsevier	Experimental Investigation of exhaust temperature and delivery ratio effect on emissions and performance Of a gasoline ethanol Two-stroke engine.	2014	Mohsen Ghazikhani, Mohammad Hatami , BehrouzSafa, Davood Domir iGanji	Keywords : Two stroke Engine, Ethanol additives, Delivery ratio, Scavenging efficiency , Emission	1.Results of scavenging and trapping efficiencies are more in accordance with the perfect mixing model. This is due to rapid evaporation of ethanol In the enterance to cylinder and makes better mixing. 2.By increasing the delivery ratio, the scavenging efficiency increases due to increase in the inlet mass, but increasing the delivery ratio reduces the trapping efficiency

Methodology



Parts of aqua silencer

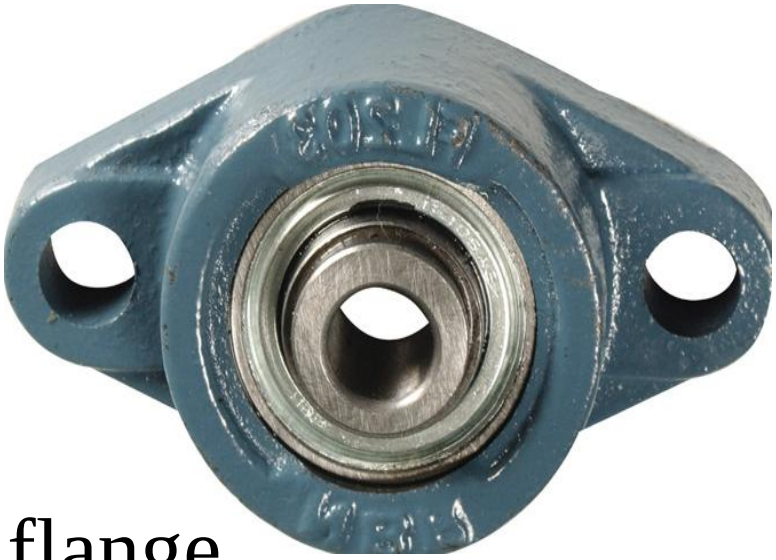
1. Perforated Tube
2. Non-return valve
3. Outer shell
4. Flange
5. Charcoal layer



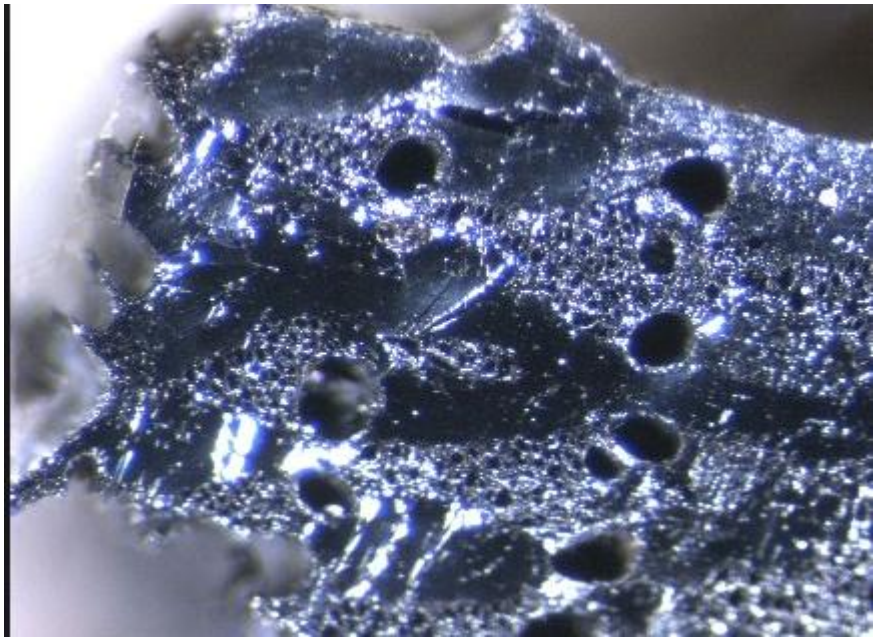
1. Perforated tube

2.Non return valve

3.Outer shell



4.flange



5.Charcoal layer

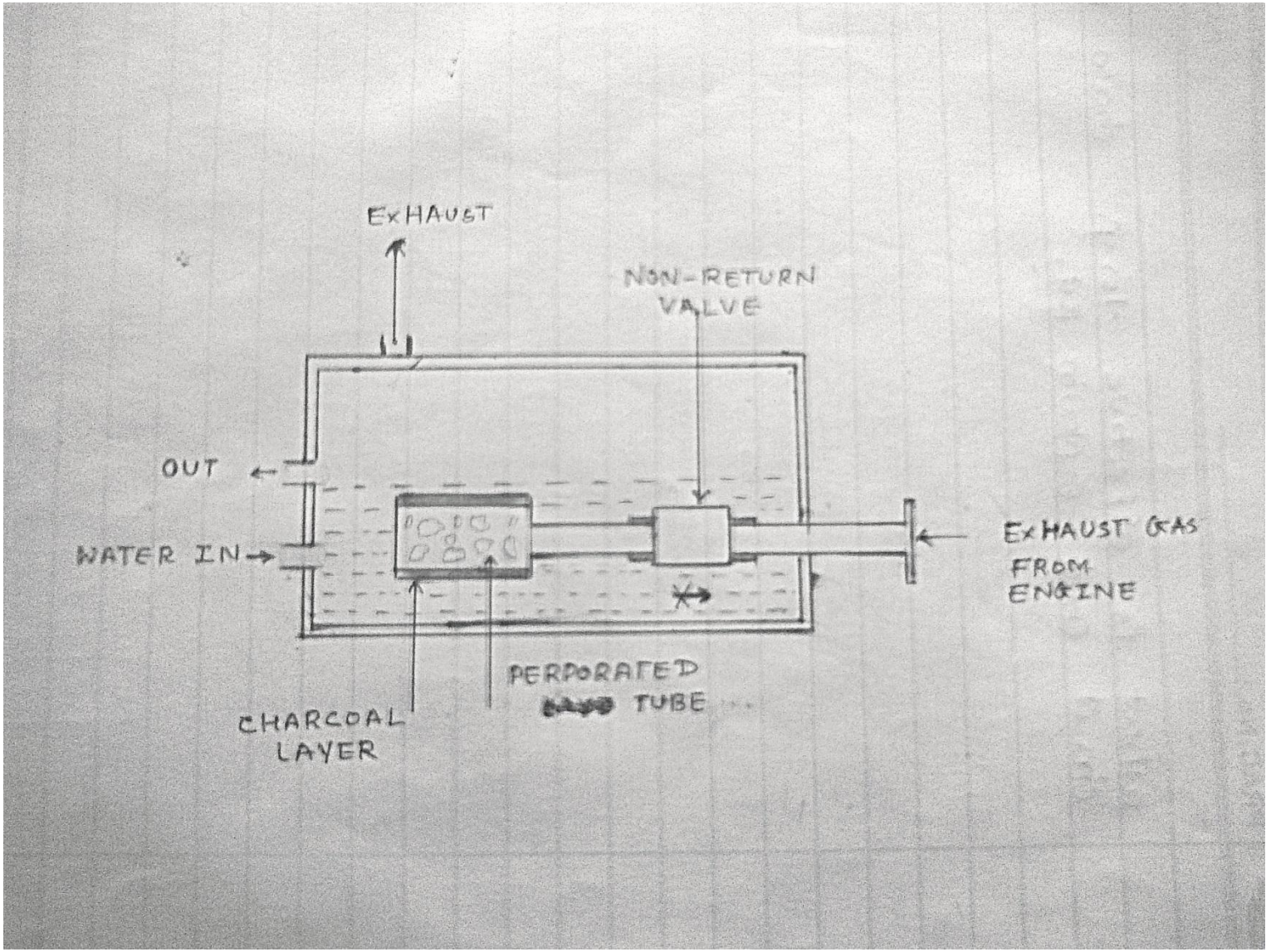
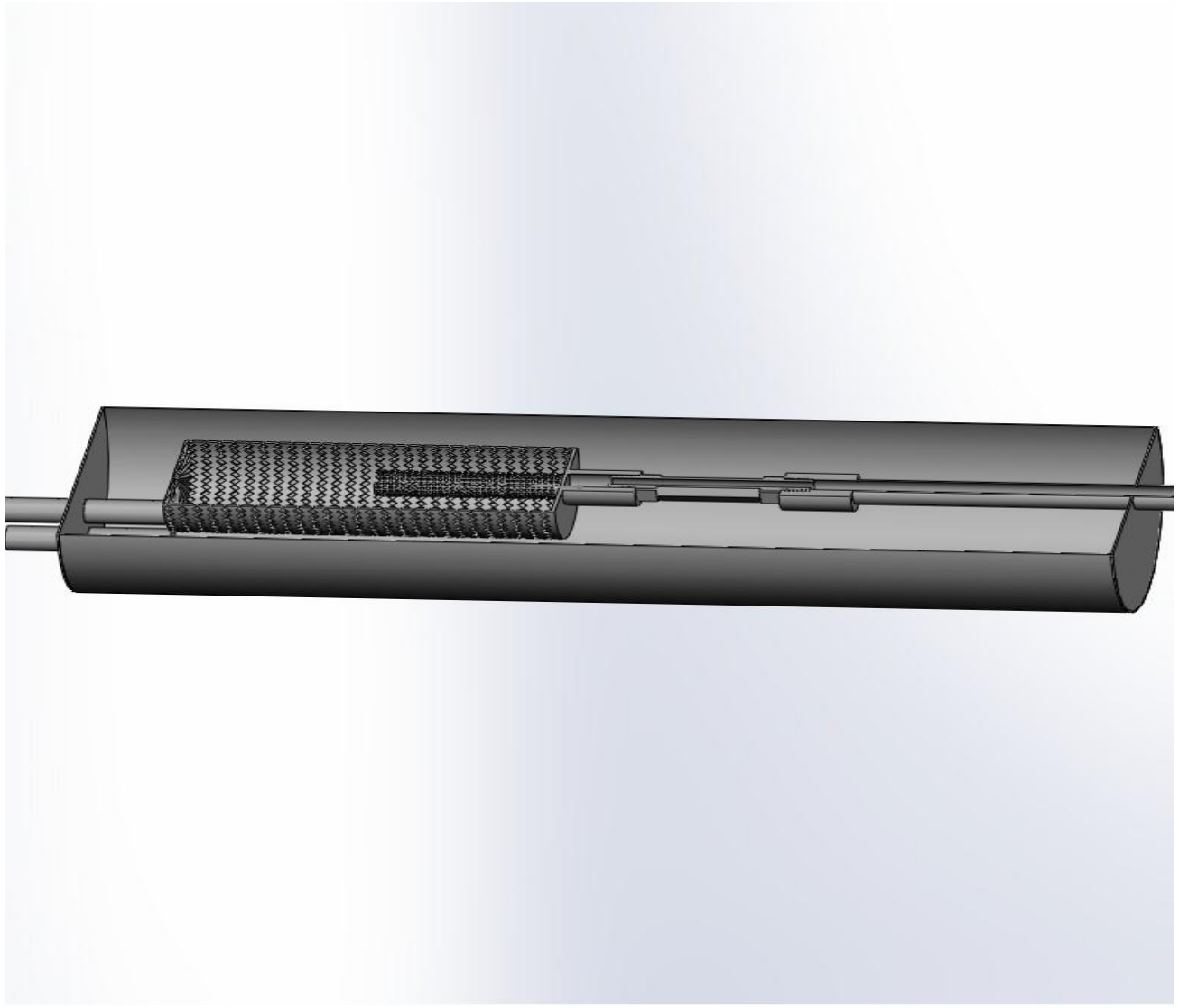


Fig. Line Diaram of Aqua Silencer



Cross-sectional view of aqua silencer in solid works

Working Principle

- As the exhaust gases enter into the Aqua silencer, the perforated tube converts high mass bubbles in to low mass bubbles after that they passes 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 dissolved in to the water and finally the exhaust gases escape through the opening in to the atmosphere.

- Hence aqua silencer reduces noise and pollution.

Effects on dissolved gases on water

The water is a good absorbing medium. In aqua 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 So_x
- Action of dissolved Co_2
- Effect of dissolved No_x

Action of dissolved So_x

When So_x is mixed in water, it form So_2, So_3, So_4, H_2So_4, i.e. sulfur Acid (H_2So_3,), it forms Hydrogen Sulphide which causes egg smell, acidify and corrosion of metals.

Action of dissolved Co_2

The dissolved carbon dioxide forms bicarbonate at lower PH and Carbonates at higher PH. This levels 40-400 mg/liter. Form a scale in pipes and boilers. The carbon dioxide mixes with water to form Carbonic acid. It is corrosive to metals and causes green house effect.

Action of dissolved No_x

The Nitrogen in water under goes Oxidation to form ammonia, Nitrate, Nitrite, Nitric acid. This synthesis of protein and amino acids is effect by Nitrogen. Nitrate usually occurs in trace quantities in surface water. A limit of 10 mg per liters Nitrate is affordable

Methods To Control The Water Pollution

There are two methods.

- 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.

Limitation Of Lime Water Wash Method

- Amount of nutrilization capacity is limited
- It is very difficult to handle
- It is expensive
- Regenerartion is possible
- Lime is in any form,it is difficult to handle

Absorption Process

- Activated charcoal is available in granular or powdered form. As it is highly porous and possess free valencies. 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.

Advantages Of Absorption 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, odour and taste is quite high.
- It can be easily regenerated.

Experimental Result

	Prescribed Standard CO	Measured level CO	Prescribed Standard HC	Measured level HC
Ordinary Silencer	3.50	0.85	4500	837
Aqua silencer	3.50	0.5	4500	429

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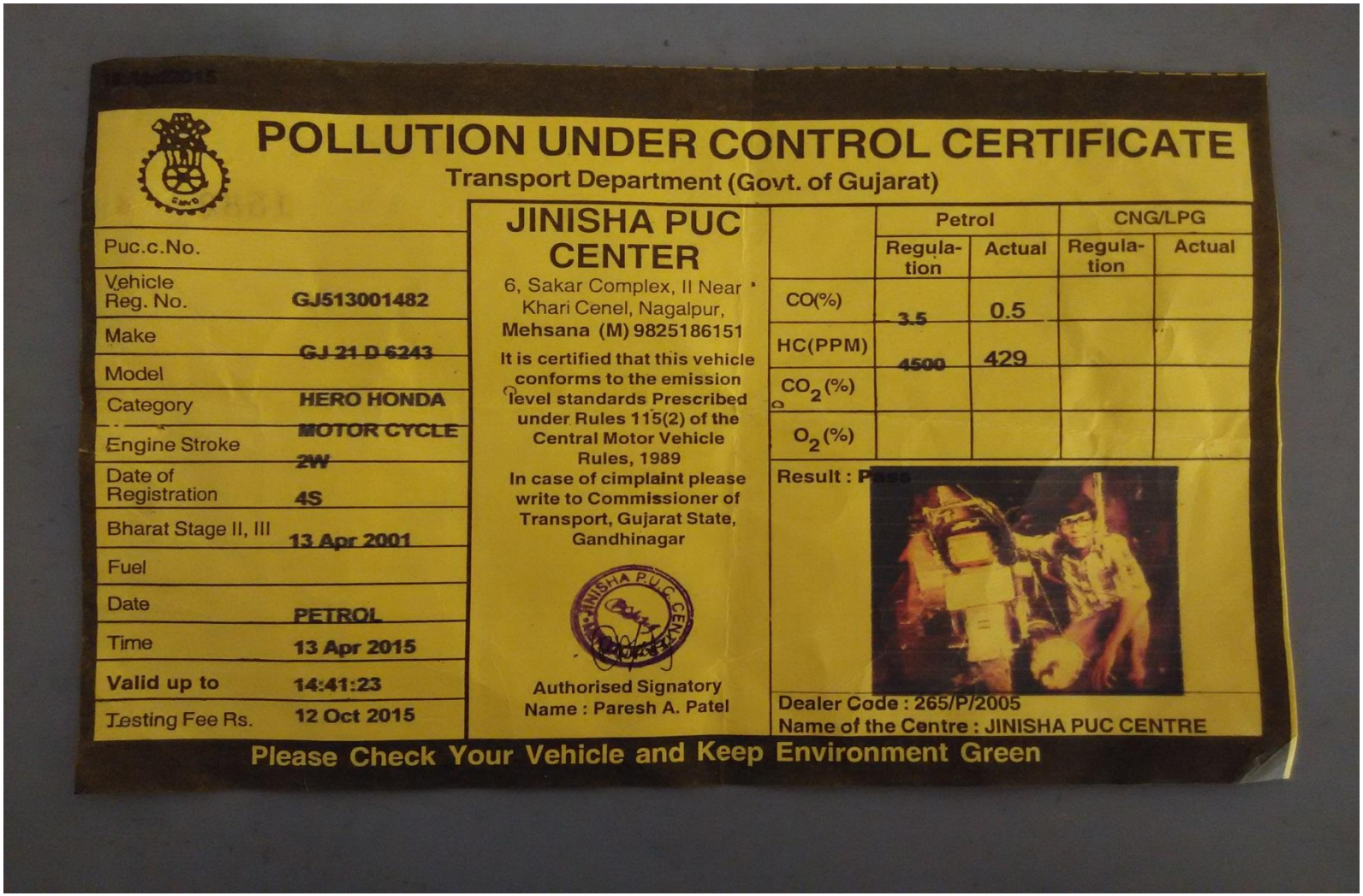

POLLUTION UNDER CONTROL CERTIFICATE

Transport Department (Govt. of Gujarat)

Puc.c.No.	
Vehicle Reg. No.	GJ513001482
Make	GJ 21 D 6243
Model	HERO HONDA
Category	MOTOR CYCLE
Engine Stroke	2W
Date of Registration	4S
Bharat Stage II, III	13 Apr 2001
Fuel	PETROL
Date	13 Apr 2015
Time	14:41:23
Valid up to	12 Oct 2015
Testing Fee Rs.	

JINISHA PUC CENTER

6, Sakar Complex, II Near Khari Cenel, Nagalpur, Mehsana (M) 9825186151

It is certified that this vehicle conforms to the emission level standards Prescribed under Rules 115(2) of the Central Motor Vehicle Rules, 1989

In case of cimplaint please write to Commissioner of Transport, Gujarat State, Gandhinagar

JINISHA P.U.C. CENTRE

Authorised Signatory
Name : Paresh A. Patel

	Petrol		CNG/LPG	
	Regulation	Actual	Regulation	Actual
CO(%)	3.5	0.5		
HC(PPM)	4500	429		
CO_2(%)				
O_2(%)				

Result : Pass

Dealer Code : 265/P/2005
Name of the Centre : JINISHA PUC CENTRE

Please Check Your Vehicle and Keep Environment Green

(Puc certificate)

Conclusion

- The aqua 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.

Progress Report

Sr. No	Description	Jul-14				Aug-14				Sep-14				Oct-14			
		W-1	*W-2*	*W-3*	*W-4*	*W-1*	*W-2*	*W-3*	*W-4*	*W-1*	*W-2*	*W-3*	*W-4*	*W-1*	*W-2*	*W-3*	*W-4*
(1).	Selection of project Topic																
(2).	Introduction																
(3).	Literature Review																
(4).	Introduction of components																
(5).	Observation of effect of polluted water																
(6).	Report Writing and presentation																

Sr no.	Description	jan-mar (2015)		
7	Model making			

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- www.efunda.com
- www.nmri.go.jp/eng
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Thank you..