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Experimental investigation on composite catalytic converter for two wheeler

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ABSTRACT

Air pollution is most important from the public health point of view, because every individual person breathes approximately 22000 times a day, inhaling about 15 to 22 Kg of air daily. Polluted air causes physical ill effect decides undesirable aesthetic and physiological effects. The main pollutants contribute by automobiles are carbon monoxide (CO), unburned hydrocarbon (UBHC), oxides of nitrogen (Nox) and Lead. Automobiles are not the only source of air pollution, other sources such as electric power generating stations, industrial and domestic fuel consumption, refuse burning, industrial processing etc. also contribute heavily to contamination of our environment so it is imperative that serious attempts should be made to conserve earth's environment from degradation. This review paper discusses automotive exhaust emissions and its impact, automotive exhaust emission control by catalytic converter for using kevlar, e-glass fiber with epoxy. The noise and smoke level is considerable less than the conventional catalytic converter, it is cheaper and easy to install.

INTRODUCTION

Automobile engines are playing a vital role in Road and sea transport, Agriculture, mining and many other industries. Considering the available fuel resources and the present technological development, Petrol and Diesel fuel is evidently indispensable. In general, the consumption of fuel is an index for finding out the economic strength of any country. In spite, we cannot ignore the harmful effects of the large mass of the burnt gases, which erodes the purity of our environment every day.

It is especially so, in most developed countries like USA and EUOPE. While, constant research is going on to reduce the toxic content of petrol exhaust, the petrol power packs find the ever increasing applications and demand. This project is an attempt to reduce the toxic content of petrol exhaust, before it is emitted to the atmosphere. This system can be safely used for petrol power packs which could be used in inflammable atmospheres, such as refineries, chemicals processing industries, open cost mines and other confined areas, which demands the need for petrol power packs.

Reduction of green house effect gases (GHGs) has taken the attention of researchers and scientists around the globe. In recent years, these concerns have risen than ever before. The large amounts of carbon dioxide (CO2) being emitted into the atmosphere could cause severe global climate changes. Recent atmospheric observations confirm that the concentration of CO2 in the atmosphere has increased by nearly 30% for the last 150 years, with an accelerating trend in last year's. In 1997, world community including India accepted Kyoto Protocol. Its importance and possible implementation was emphasized in 2005. The

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objective was to address the problem of climate changes occurring due to human activities. Protocols were defined to follow the footwork of UN Framework Convention on Climate Change (UNFCCC) .This is the largest increase observed for any decade in at least the last 200 years. carbon monoxide emissions. However, this is no longer used in the U.S. and Canada due to their inability to control oxides of nitrogen.

LITERATURE REVIEW

Throughout the 1950s and 1960s, various federal, state and local governments in the United States conducted studies into the numerous sources of air pollution. These studies ultimately attributed a significant portion of air pollution to the automobile, and concluded air pollution is not bounded by local political boundaries. At that time, such minimal emission control regulations as existed in the U.S. were promulgated at the municipal or, occasionally, the state level. The ineffective local regulations were gradually supplanted by more comprehensive state and federal regulations. By 1967 the State of California created the California Air Resources Board, and in 1970, the federal United States Environmental Protection Agency (EPA) was established. Both agencies, as well as other state agencies, now create and enforce emission regulations for automobiles in the United States. Similar agencies and regulations were contemporaneously developed and implemented in Canada, Western Europe, Australia, and Japan.

PROBLEM IDENTIFICATION

1. It reduce high emission rate.
2. Excessive heat.
3. Dark exhaust smoke.
4. Reduced acceleration.
5. Sluggish engine performance.

POSSIBLE SOLSUTION

Use of composite material

SELECTION OF MATERIAL

1. Kevlar fibre
2. E- Glass fibre
3. Epoxy resin
4. Aluminium, Zirconium nano particles.

Kevlar Fibre

Kevlar is a heat-resistant and strong synthetic fibre, related to other aramids such as Nomex and Technora. Developed by Stephanie Kwelok at DuPont in 1965, this high-strength material was first commercially used in 1970s as a replacement for steel in racing tires.

Fig. 1 Kevlar

Table. 1 Kevlar Properties

PROPERTICE	VALUE
Density, gm/cc	2.58
Elongation%	4.8
Melting point	1200°c
Annealing point 'C (' F)	657(1215)

E-Glass Fibre

The use of E-Glass as the reinforcement material in polymer matrix composites is extremely common. Optimal strength properties are gained when straight, continuous fibres are aligned parallel in a single direction. To promote strength in other directions, laminate structures can be constructed, with continuous fibres aligned in other directions. Such structures are used in storage tanks and the like.

Fig. 2 E-Glass

Table. 2E - Glass properties

Properties	value
Specific gravity	1.44
Modulus GPa	186
Strength MPa	3440
Percentage tensile elongation	2.5
Co-efficient of thermal expansion µm/m/°C	-2.0

Epoxy Resin

Epoxy Resins Epoxy resins have been commercially available since the early 1950's and are now used in a wide range of industries and applications. Epoxies are classified in the plastics industry as thermosetting resins and they achieve

the thermoset state by means of an addition reaction with a suitable caring agent.

Fig. 3 Epoxy

Table.3 Properties of Epoxy

Properties of epoxy and polyester resins.	
Property	**Epoxy**
Viscosity at 25 °C μ (cP)	12000-13000
Density ρ (g.cm^{-3})	1.16
Heat Distortion Temperature HDT (°C)	50
Modulus of elasticity E (GPa)	5.0
Flexural strength (MPa)	60
Tensile strength (MPa)	73
Maximum elongation (%)	4

Aluminium Oxide

Aluminium is the most common metallic element in the earth's crust and occurs in rocks such as felspars and micas. Aluminium oxide is the amphoteric oxide of aluminium with the chemical formula Al2O3. It is also commonly referred to as alumina or aloxite in the mining, ceramic and materials science communities.

Fig. 4 Aluminium Oxide

Table. 4 properties of Aluminium Oxide

Formula	Al_2O_3
Melting point	2,072 °C
Molar mass	101.96 g/mol
Density	3.95 g/cm^3
Boiling point	2,977 °C

ZIRCONIUM OXIDE

Fig. 5 Zirconium Oxide

Table.5 properties of Zirconium Oxide

Formula	ZrO_2
Molar mass	123.218 g/mol
Boiling point	4,300 °C
Density	5.68 g/cm³
Melting point	2,715 °C

ADVANTAGES

1. Efficiency of the vehicle is increased
2. Fuel consumption is less when compared to ordinary vehicle
3. Less pollution

APPLICATIONS

1. All Diesel and petrol engine application
2. Automobile Applications

DISADVANTAGES

Additional cost is required

CAD DESIGN

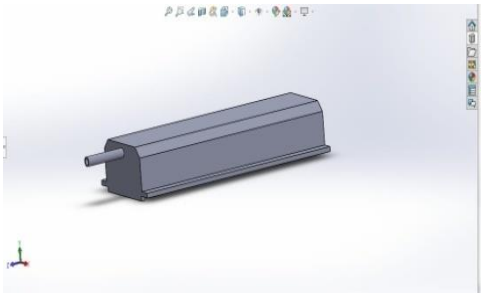


Fig. 6

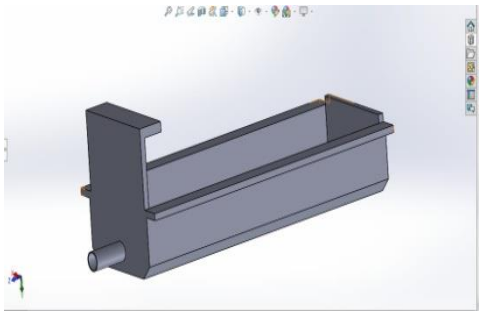


Fig. 7

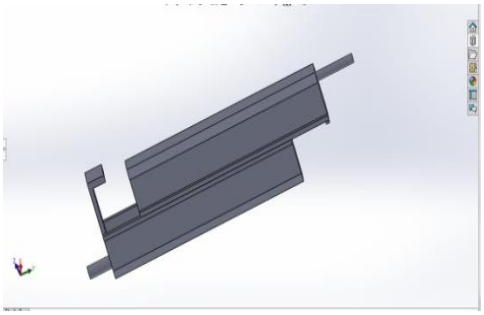


Fig. 8

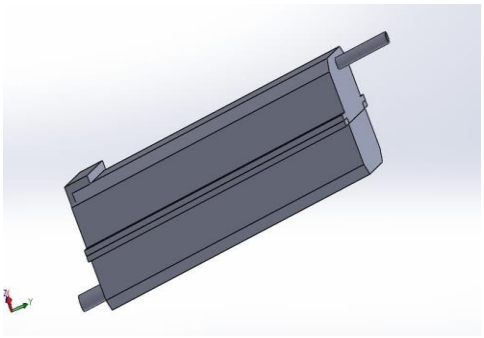


Fig. 9

RESULT

Before Project Result

Form(Computerised Pollution Under Control Certificate (Petrol / CNG / LPG)

SEE RULE 116(B) (10) (C) (AUTHORISED BY THE TRANSPORT DEPARTMENT)

Transport Department Seal

PRINCE EMISSION CHECKING CENTRE Serial No. : 2893

C.S. Nagar Bus Stop, Near R.T.O. Office, Sathy Main Road, Erode - 638 004, Cell : 98427 - 38373, 94422 - 38373

Centre Code : TN-33-012/2018 Authorisation Number & Validity : 012 / ERD / 28.07.14 to 27.07.2019

I.D. Number : 2201900015 Veh.Typ. : 2 W Fuel : PETROL / LPG

Vehicle Regn. No : TN33CH130... Eng.Typ. : 4 Stroke Date : 15-Feb-2019

Month&Year of Regn : 17-Nov-2014 Makers Name : HERO Time : 5:38:17 PM

Odo Reading(Kms) : 0 Makers Class : PASSION PRO

BS II Complaint :

Test : IDILING

	Regulation(%)	Actual Reading	
CO	3.5	00.153	% Vol
HC	4500	00228	PPM
CO_2		13.92	% Vol
O_2		00.72	% Vol

Driver/Owner Name : K.RAMASAMY

Validity : 6 Months Centre Code :

Valid UpTo 14-Aug-2019

Testing Charges : Rs. 50/-

Tunning Charges :

* Permissible limits at the back of form

PRINCE EMISSION CHECKING CENTRE

C.S. Nagar Bus Stop, Sathy Main Road,

Seal of Testing Station R.T.O. Office,

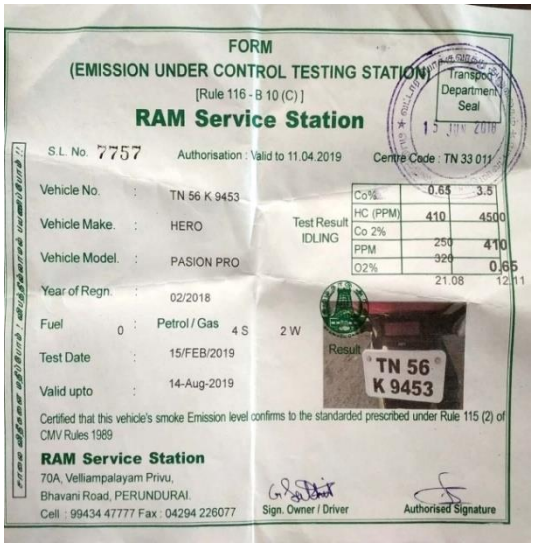
ERODE - 638 004.

Cell : 98427 38373, 94422 79479

Driver/Owner signature

Signature of Licencee / Testing Person

(Without catalytic converter)
(With catalytic converter)



FORM
(EMISSION UNDER CONTROL TESTING STATION)
[Rule 116 - B 10 (C)]
RAM Service Station

Transport Department Seal

S.L. No. 7757 Authorisation : Valid to 11.04.2019 Centre Code : TN 33 011

Vehicle No.	TN 56 K 9453
Vehicle Make.	HERO
Vehicle Model.	PASION PRO
Year of Regn.	02/2018
Fuel	Petrol / Gas
Test Date	15/FEB/2019
Valid upto	14-Aug-2019

Test Result IDLING

Co%	0.65	3.5
HC (PPM)	410	4500
Co 2%		
PPM	250	410
O2%	320	0.65
	21.08	12.11

4 S 2 W

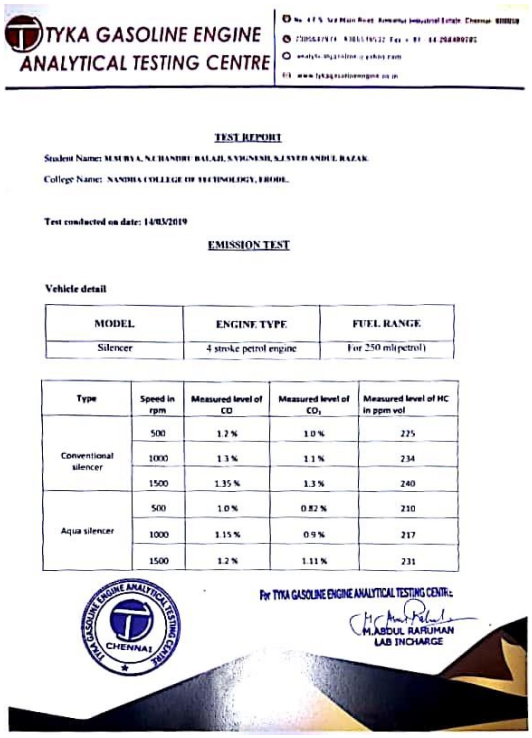
Result TN 56 K 9453

Certified that this vehicle's smoke Emission level confirms to the standarded prescribed under Rule 115 (2) of CMV Rules 1989

RAM Service Station
70A, Velliampalayam Privu,
Bhavani Road, PERUNDURAI.
Cell : 99434 47777 Fax : 04294 226077

Sign. Owner / Driver Authorised Signature

After Project Result



TYKA GASOLINE ENGINE ANALYTICAL TESTING CENTRE

TEST REPORT

Student Name: M.SURYA, S.C.THANDIU BALAJI, S.VIGNESH, K.JAVED ANDUL RAZAK

College Name: SANDHA COLLEGE OF TECHNOLOGY, ERODE.

Test conducted on date: 14/03/2019

EMISSION TEST

Vehicle detail

MODEL	ENGINE TYPE	FUEL RANGE
Silencer	4 stroke petrol engine	For 250 ml(petrol)

Type	Speed in rpm	Measured level of CO	Measured level of CO_2	Measured level of HC in ppm vol
Conventional silencer	500	1.2 %	1.0 %	225
	1000	1.3 %	1.1 %	234
	1500	1.35 %	1.3 %	240
Aqua silencer	500	1.0 %	0.82 %	210
	1000	1.15 %	0.9 %	217
	1500	1.2 %	1.11 %	231

TYKA GASOLINE ENGINE ANALYTICAL TESTING CENTRE CHENNAI

For TYKA GASOLINE ENGINE ANALYTICAL TESTING CENTRE

M.ABDUL RAHUMAN
LAB INCHARGE

CONCLUSION

The catalytic converter is more effective in the reduction of emission gases from the engine exhaust using honey comb structured fiber sand nano particles. The fiber contamination is found to be negligible in catalytic converter. It is smokeless and pollution free emission and also it is very cheap. It can be also used both for two wheelers and four wheelers and also can be used in industries.

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