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Investigation of Benzene and Diesel Economizers Performance

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Abstract: *Many trading companies claim that they produced devices that may reduce the fuel consumption in internal combustion engines, or what is called economizer. This Paper presents an experimental study of the efficiency of some fuel economizers suggested to be used in automobiles, and also make a check of such claims. The study includes both benzene and diesel engines. The experiments focus on fuel consumed by IC engines on both types in the unit of liter per hour and in CO% produced by such engines. The experimental tests show that such claims are not true, the fuel savings of such devices is of low rates, and also their contribution in CO emission reduction is low.*

Keywords *- Fuel Economy, Economizers, IC Engines, Diesel, Benzene.*

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I. Introduction

Automobiles drivers and consumers are looking for simple and inexpensive means to lower the cost of driving. The market has responded with a plethora of devices and fuel additive products which purport to improve fuel economy and/or reduce emissions. One way to raise the fuel economy (FE) of new cars is through FE standards, either mandatory or as a voluntary commitment of the automotive industry. An FE standard is usually expressed as the minimum sales-weighted average fuel economy for the new-car fleet entering the market in a given year. A second approach towards improving FE is to increase fuel taxation in order to induce purchases of more efficient cars and discourage private car travel. Mandatory fuel economy standards have been in force in the United States since 1978 (although, with a small exception for light duty trucks, they have not been tightened since 1990). Other countries followed later, and currently Australia, Canada, China, the EU, Japan, Switzerland, South Korea and Taiwan implement some type of FE or CO2 standard. There are many fuel economizers in the market. Fig.1 shows some of these fuel economizers. Little researches discussed this issue. Prateek J. et al. (2016), the main objective of the paper was to utilize heat from the exhaust gases of a diesel engine and convert heat to useful work. Energy supplied to an engine is the heat value of the fuel consumed. But only a part of this energy is transferred into useful work. From heat balance sheet of a typical CI engine they found out that the total heat loss is around 33-45%, of which 33% is due to exhaust gases and the rest is lost to the surroundings. If we can reduce this figure by 10% also then it will be a substantial contribution. Sofronis C. et al. 2006, the aim of this paper was to analyze the impact of standards and fuel prices in new car fuel economy with the aid of cross-section time series analysis of data from 18 countries. They employed a dynamic specification of new car fuel consumption as a function of fuel prices, standards and per capita income. Results were used to address policy questions that are currently in the center of discussions worldwide: to what extent the implementation of fuel economy standards has yielded fuel savings; how much fuel prices should rise in order to increase fuel economy without tightening standards; and whether autonomous fuel economy improvements should be expected in the absence of regulations or fiscal policy instruments.

Figure 1. Fuel economizers for both benzene and diesel engines

-Fuel Economy and Automotive Emissions devices

• Devices That Turn Water into Fuel

There are many advertisements about using the energy from the car's battery to split water molecules into hydrogen and oxygen gas which is then burned with the fuel. EPA has received no credible and complete data showing a positive fuel economy benefit from these devices.

• Fuel Line Devices

Such devices heat, magnetize, ionize, irradiate, or add metals to the vehicle's fuel lines and purport to increase your vehicle's fuel economy and reduce exhaust emissions. EPA testing and engineering analysis of such devices to date has shown no substantive effect on fuel economy or exhaust emissions. Installation of devices that retard timing or adjust the air-fuel ratio of the vehicle may be considered tampering.

• Mixture Enhancers

Several heavily marketed devices claim to increase vehicle's fuel efficiency by creating aerodynamic properties or turbulence that improves the air-fuel mix prior to combustion. EPA has received no credible and complete data showing positive fuel economy benefits from these devices.

Fuel economy standards

Figure 2 summarizes the fuel economy standards in the United States and other countries that have similar programs.4 In the European Union (EU), in response to regulations that set an ultimate target of 130 g CO2 per kilometer, average new vehicle fuel economy is set to reach 45 mpg in 2012 and to continue rising thereafter. Tighter standards are easier to meet in Europe because high fuel taxes and the predominance of small cars and more fuel-efficient diesel engines imply a higher baseline fuel economy. Unlike the United States, which has separate standards for cars and trucks, the EU has one set of regulations for the entire light-duty fleet, but a so-called ''limit value curve'' allows heavier cars to have higher emissions than lighter cars while preserving the overall fleet average. As part of the phase-in of the new regulations, the EU penalties for noncompliance are applied on a sliding scale through 2018, with low penalties of V5 for the first g/km in excess of the standard, which rise to V95 for the fourth g/km in excess and beyond.

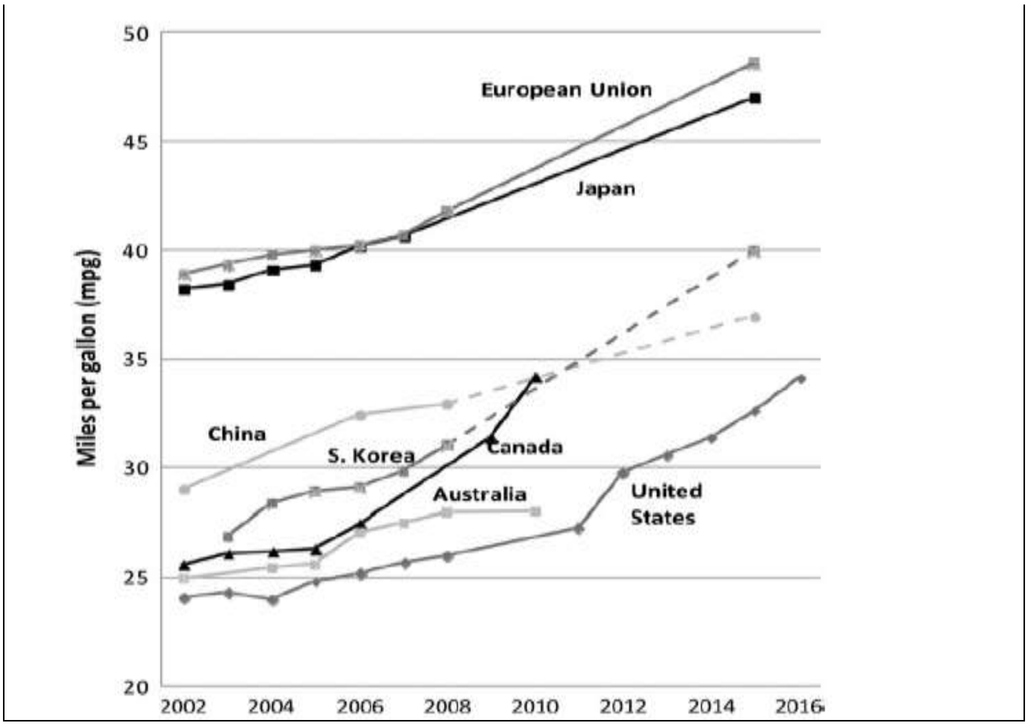

Figure 2. Fuel economy standards for new passenger vehicles by country Source: ICCT (2009). Notes: Dashed lines indicate proposed fuel economy targets not yet enacted. For Canada, the program includes in-use vehicles.

II. Results And Discussion

Table 1 and 2 show the fuel consumption rate and percent of CO emissions at different values of RPM and given average time with and without economizer

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Table 1. Data for benzene consumption without economizer

The Test is done without Device							
RPM	Volume (CC)	Time1 (S)	Time2 (S)	Time3 (S)	Average time (S)	consumable Rate (liter / hour)	Percent of CO
1000	50	180	179	175	178.00	1.0112	1.48
1500	50	103	109	108	106.67	1.6875	1.35
2000	50	70	69	69	69.33	2.5962	2.53
2500	50	49	51	49	49.67	3.6242	2.78
3000	100	83	83	83	83.00	4.3373	2.83
4000	100	50	50	48	49.33	7.2973	2.9

Table 2. Data for benzene consumption with economizer

The Test is done with Device							
RPM	Volume (CC)	Time1 (S)	Time2 (S)	Time3 (S)	Average time (S)	consumable Rate (liter / hour)	Percent of CO
1000	50	180	181	176	179.00	1.0056	0.4
1500	50	104	106	108	106.00	1.6981	1
2000	50	72	73	74	73.00	2.4658	2
2500	50	51	51	51	51.00	3.5294	2.27
3000	100	84	84	85	84.33	4.2688	2.6
4000	100	51	49	49	49.67	7.2483	2.75

Table 3 and 4 show the fuel consumption rate and percent of CO emissions at different values of RPM and given average time with and without economizer in the case of diesel fuel.

Table 3. Data for diesel consumption without economizer without load

The test is done without device and without load						
RPM	Volume (CC)	Time 1 (S)	Time 2 (S)	Time 3 (S)	Average Time (S)	Consumable Rate (liter / hour)
1000	25	370	375	375	373.33	0.241
1200	25	293	300	301	298.00	0.302
1400	25	239	247	252	246.00	0.366
1600	25	201	200	201	200.67	0.449

Table 4. Data for diesel consumption with economizer without load

The test is done with device and without load						
RPM	Volume (CC)	Time 1 (S)	Time 2 (S)	Time 3 (s)	Average Time (S)	Consumable Rate (liter / hour)
1000	25	381	382	388	383.67	0.235
1200	25	305	305	305	305.00	0.295
1400	25	243	252	253	249.33	0.361
1600	25	205	207	208	206.67	0.435

Table 5 and 6 show the fuel consumption rate and percent of CO emissions at different values of RPM and given average time with and with and without economizer in the case of diesel fuel with load and without load respectively.

Table. 5 The fuel consumptions without the economizer with load

The test is done without device and with load						
RPM	Volume (CC)	Time 1 (S)	Time 2 (S)	Time 3 (S)	Average Time (S)	Consumable Rate (liter / hour)
1000	25	207	218	219	214.67	0.419
1200	25	139	138	140	139.00	0.647
1400	25	88	89	89	88.67	1.015
1600	25	70	71	72	71.00	1.268

Table. 6 The fuel consumptions with the economizer with load

The test is done with device and with load						
RPM	Volume (CC)	Time 1 (S)	Time 2 (S)	Time 3 (S)	Average Time (S)	Consumable Rate (liter / hour)
1000	25	222	228	223	224.33	0.401
1200	25	146	154	154	151.33	0.595
1400	25	89	91	91	90.33	0.996
1600	25	77	80	76	77.67	1.159

Fig.3 shows the fuel consumptions in the case of the economizers and without using such devices it can be noticed that the fuel saving can be neglected it is less than 2%.

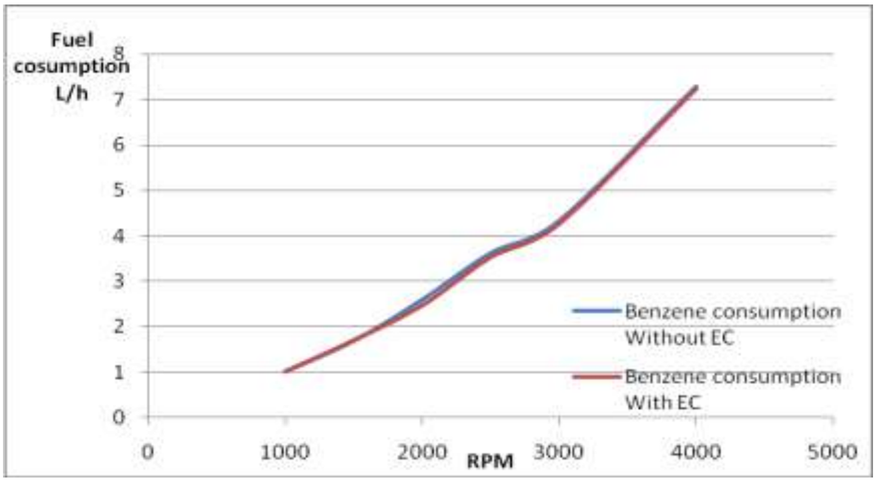

Figure 3. Fuel consumption after using economizers compared with the case of not using such devices.

Fig.4 shows the CO% with and without using such economizers; the reduction in CO emissions is weak.

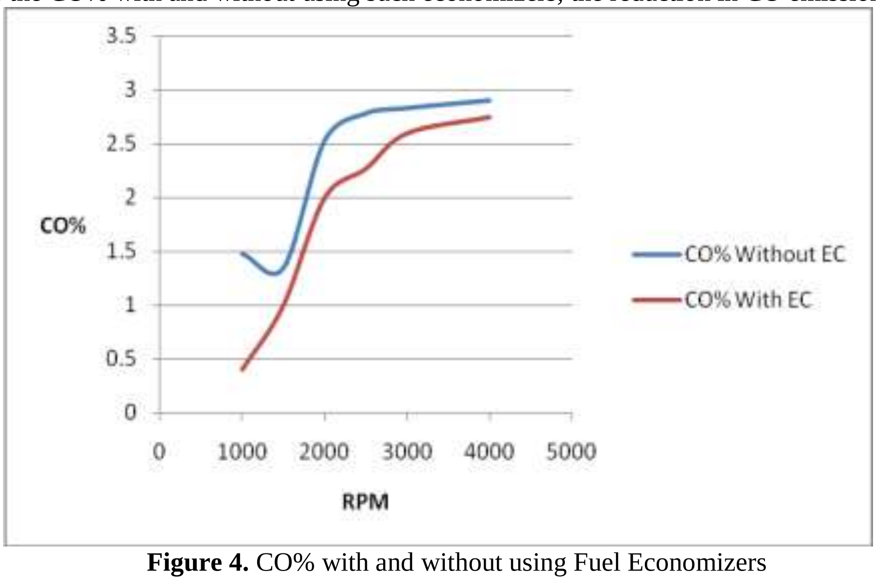

Figure 4. CO% with and without using Fuel Economizers

Fig. 5 and 6 shows diesel consumption with load without and with and without using the fuel economizers. It can be noticed that in both cases such devices has a weak effect on reducing fuel consumptions either with load or without load.

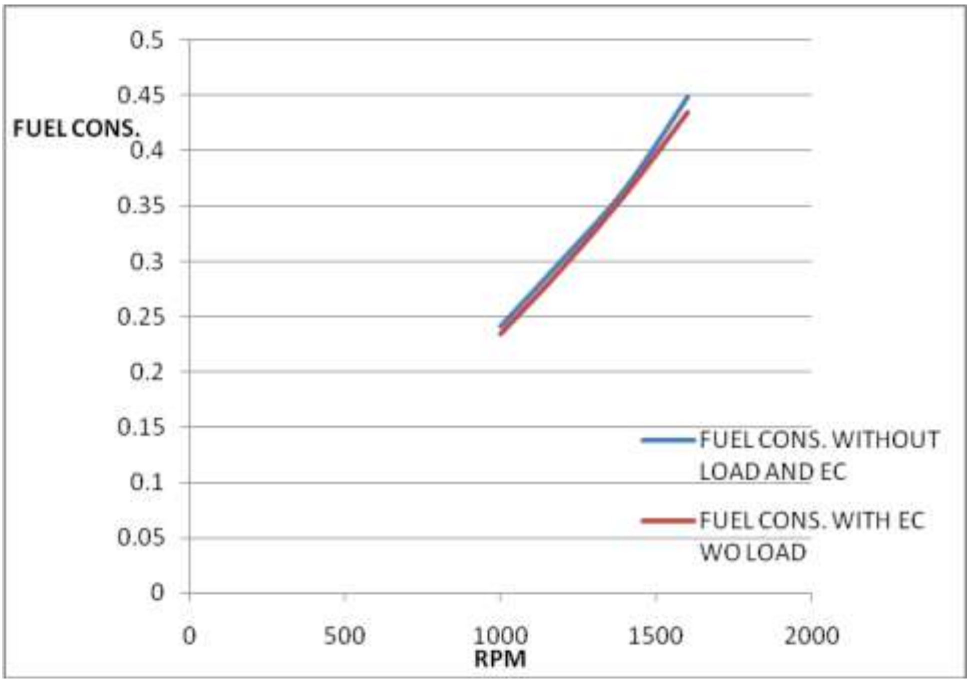

Figure 5. Fuel consumption with load or without load in the presence of FE and without FE.

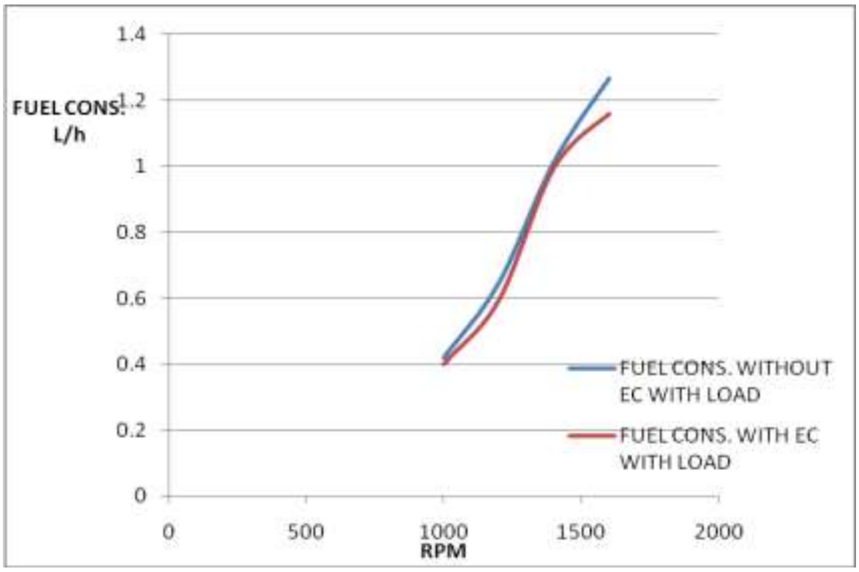

Figure 6. Fuel consumption with load or without load in the presence of FE and without FE.

III. Conclusions

This paper is an investigation paper that aims to test the marketing companies that presents the fuel economizers as a perfect solution to fuel consumptions in automobiles. The experimental tests show that such claims are not true, the fuel savings of such devices is of low rates, and also their contribution in CO emission reduction is low.

References

[1]. Prateek Jain, Sushil Yadav , Durgesh Singh, 2016, " REVIEW STUDY ON EXHAUST OF A DIESEL ENGINE THERMAL STORAGE", 3rd international conference on recent trends in engineering science and management, Vedant college of engineering and technology, Bundi, Rajasthan. 2016.

[2]. T. Zachariadis, On the baseline evolution of automobile fuel economy in Europe, Energy Policy 34 (2006) 1773–1785.

[3]. T. Zachariadis, S. Clerides, The effect of standards and fuel prices on automobile fuel economy: an international analysis. Proceedings of the 29th International Conference of the International Association for Energy Economics, Berlin, Germany, 2006.
[4]. S. Jiangzhou, R.Z. Wang, Y.Z. Lu, Y.X. Xu, J.Y. Wu, Experimental investigations on adsorption air-conditioner used in internal-combustion locomotive driver-cabin, Applied Thermal Engineering 22 (10) (2002) 1153–1162.
[5]. Sofronis Cleridesa and Theodoros Zachariadis, 2006, "Are Standards Effective in Improving Automobile Fuel Economy?", E-mail addresses: Clerides: s.clerides@ucy.ac.cy; Zachariadis: t.zachariadis@ucy.ac.cy.
[6]. Federal Trade Commission Consumer Alert www.ftc.gov/bcp/edu/pubs/consumer/alerts/alt095.shtm
[7]. Federal Trade Commission Fact Sheet: "Gas Saving" Products www.ftc.gov/bcp/edu/pubs/consumer/autos/aut10.pdf

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