A comparative analysis of consumer preference towards gasoline vehicle and zero emission vehicles in India
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Abstract: Rapid growth of Indian urban road vehicles, in particular, the increase in the number of gasoline vehicles, leads to an increase in the traffic congestion and problems pertaining to air pollution. With growing concerns about the contribution of transportation sector’s to climate change, many vehicle manufacturing companies are looking to deploy high compression and more efficient engines that have greater fuel economy and emit less carbon dioxide (CO2). Hence, this study focuses on comparing the features of gasoline vehicles with that of zero emission vehicles and also tries to find the reasons for transmission from gasoline vehicles to zero emission vehicles. It is found that, there is significant difference in preference of consumers towards two categories of vehicles. Since, zero emission vehicle is the futuristic vehicle, the preference of consumers towards it is found to be high.

Keywords: Gasoline Vehicles, Zero emission vehicle, consumer preference, etc.

1.1 Introduction:
With the development of urban economy in India, pollution due to vehicle’s emission has become a significant environmental problem. By the end of 2020, the gasoline vehicle population in India reached 185 million, for which the quantity of emission accounted for 61.3% of the total emission of vehicles. Therefore, a strengthened control on gasoline vehicle’s exhaust emission is a significant measure to improve the urban air quality. To determine more targeted energy saving and emission reduction strategies, the approach to determine a reasonable and accurate emission inventory of gasoline vehicles becomes one of the most important and challenging tasks.
Commonly, the studies of vehicle emission inventory do not consider the comprehensive consideration of the influence of environmental factors, vehicle situations, and road conditions in different regions.
With growing concerns about the contribution of transportation sector’s to climate change, many vehicle manufacturing companies are looking to deploy high compression and more efficient engines that have greater fuel economy and emit less carbon dioxide (CO2). To date, however, the use of high compression engines has been obstructed by the low gasoline octane rating. This increases the possibility of engine knock, wherein gasoline self-ignites and explodes, reducing vehicle efficiency and performance. In order to overcome this issue, vehicle manufacture companies have called on the US Environmental Protection Agency (EPA) to adopt regulations to increase levels of gasoline octane. While EPA officials have previously expressed support for regulation, it is not clear if an action will be taken by the Trump Administration. In the absence of federal action, states may wish to adopt their own regulations (Webb, 2017).

1.2 Rationale behind the study
Rapid growth of Indian urban road vehicles, in particular, the increase in the number of gasoline vehicles, leads to an increase in the traffic congestion and problems pertaining to air pollution. The establishment of the emission inventory of gasoline vehicles is influenced by several factors, like environmental characteristics, vehicle conditions, road conditions, and so on. In order to obtain gasoline vehicle emission inventory in accordance with the actual situation in different regions, this study focuses on comparing the features of gasoline vehicles with that of zero emission vehicles and also tries to find the reasons for transmission from gasoline vehicles to zero emission vehicles.

2.1 Literature Review:
According to Faris, Waleed & Kafafy, Raed & Idres, Moumen & Elmoselhy, Salah. (2011), modelling of vehicle fuel consumption and emissions has emerged as an effective tool to help develop and assess vehicle technologies and to help predict vehicle fuel consumption and emissions. A review to identify the current state-of-the-art on vehicle fuel consumption and emissions modelling is elucidated. This review categorises vehicle fuel consumption and emissions models into five classifications. The relevant main models to each of these classifications are presented. These models are then compared with regard to assumptions, limitations, merits, drawbacks, characteristic parameters, data collection techniques, accuracy, and relevance to road traffic. The study demonstrates that the trends of vehicle fuel consumption and emissions provided by current models generally do satisfactorily replicate
field data trends. In addition, the paper demonstrates that mesoscopic models, empirical models, mean value-based models, and quasi dimensional models strike a balance between accuracy and simplicity and thus are very suitable for transportation and control applications. The study shows as well that no one model as yet fully meets the needs of transportation applications.

According to Dong Guo et. al (2018), rapid growth of China’s urban road vehicles, in particular, the increase in the number of gasoline vehicles, leads to an increase in the traffic congestion and problems pertaining to air pollution. The establishment of the emission inventory of gasoline vehicles is influenced by several factors, like environmental characteristics, vehicle conditions, road conditions, and so on. In order to obtain gasoline vehicle emission inventory in accordance with the actual situation in different regions, this study proposed a method of establishing a list of gasoline vehicles with regional differences. Comprehensive consideration and evaluation of various factors that affect the vehicle emissions were carried out and the corresponding correction factors were obtained. According to the formula of comprehensive emission factor for Zibo city, the emission inventory of gasoline vehicle was established. This method can be effectively utilized to obtain the emission inventory of gasoline vehicles in different cities more accurately and provide theoretical support for control strategies of gasoline vehicle emissions.

Improving the gasoline fuel combustion, reducing gasoline fuel consumption and reducing vehicles exhaust emissions pollution associated with gasoline combustion become growing interest locally and global-wide. To satisfy the exhaust gas emissions rules and regulations and reducing fuel consumption, it is very significant and critical to determine and understand the gasoline fuel quality impact on fuel consumption, air-fuel ratio (AFR), lambda (\(\lambda\)) and exhaust emissions of gasoline fueled vehicles. Therefore, studying the impact of gasoline fuel quality on fuel consumption, the air-fuel ratio (AFR), lambda (\(\lambda\)) and exhaust emissions of gasoline fueled vehicles is very important and necessary. A sensitive and detailed analysis conducted to analyze and determine the impact of gasoline fuel quality on fuel consumption, air-fuel ratio (AFR), lambda (\(\lambda\)) and exhaust emissions of gasoline fueled vehicles. The study results indicated a direct impact of gasoline fuel quality on fuel consumption, the air-fuel ratio (AFR), lambda (\(\lambda\)) and some vehicle exhaust gases emission including carbon dioxide (CO2), oxygen (O2) and nitrogen oxides (NOx). Also, the results indicated the indirect
impact of gasoline fuel quality on hydrocarbons (CxHy) vehicle exhaust emission. The results of this study can help in reducing fuel consumption, improving the quality of fuel combustion and reducing vehicle exhaust emissions.

3.1 Research Objectives
1. To examine the features of gasoline and zero emission vehicles
2. To analyse the attitude of consumers towards gasoline and zero emission vehicles
3. To compare the preference of consumers towards gasoline and zero emission vehicles in India.

3.2 Research Hypothesis:
There is no significant difference in preference of consumers towards gasoline and zero emission vehicles in India

3.3 Research Design:
A descriptive research design has been used to describe the features of zero emission vehicle and gasoline vehicles in India.

3.4 Data Collection:
During the research, primary data has been collected using a semi-structured questionnaire from consumers who have visited the electric vehicle stores and also from respondents who are using gasoline vehicles in India between 2018-2020. The questionnaire was distributed using google forms. Secondary data for the research has been collected from journals, magazines, news papers, etc.

3.5 Sampling Techniques:
During the research, convenient sampling technique has been applied to collect the data from 200 customers (i.e. 100 customers who visited electric vehicle showroom and 100 customers who are using gasoline vehicles) in India between 2018-2020.

4.1 Comparison between Gasoline Vehicle and Zero emission vehicle:
A primary data has been collected from 200 customers with an objective to find their attitude towards gasoline and zero emission vehicles in India, where following responses have been received:

**Fig. 1 (Source Primary Data)**

Above figure 1 compares the fuel efficiency of both electric and gasoline vehicles, it is found that out of total customers 33% agree that electric vehicles have fuel economy which is supported by 23% of respondents who strongly agree to this. 12% of respondents neither agree nor disagree to this. 21% disagree that electric vehicles have fuel economy and 11% strongly disagree to this.

Out of total customers who use gasoline vehicles, 30% agree that vehicles have fuel economy which is supported by 19% of respondents who strongly agree to this. 14% of respondents neither agree nor disagree to this. 18% disagree that their vehicles have fuel economy and 19% strongly disagree to this.
Above figure 2 compares the life cycle cost of both electric and gasoline vehicles, it is found that out of total customers 34% agree that electric vehicles have less life cycle cost which is supported by 17% of respondents who strongly agree to this. 12% of respondents neither agree nor disagree to this 37% strongly disagree to this. Out of total customers who use gasoline vehicles, 20% agree that vehicles have less life cycle cost which is supported by 15% of respondents who strongly agree to this. 17% of respondents neither agree nor disagree to this. 25% disagree that their vehicles have fuel economy and 23% strongly disagree to this.

Fig. 3 (Source: Primary Data)
Above figure 3 compares the urban usage of both electric and gasoline vehicles, it is found that out of total customers 29% agree that electric vehicles are perfect for urban usage which is supported by 19% of respondents who strongly agree to this. 14% of respondents neither agree nor disagree to this. 23% disagree that electric vehicles have fuel economy and 15% strongly disagree to this.

Out of total customers who use gasoline vehicles, 27% agree that vehicles are perfect for urban use which is supported by 24% of respondents who strongly agree to this. 11% of respondents neither agree nor disagree to this. 19% disagree that their vehicles are perfect for urban use and 19% strongly disagree to this.

4.2 Hypothesis Testing:
To test the hypothesis “There is no significant difference in preference of consumers towards gasoline and zero emission vehicles in India”, one way ANOVA test is applied taking features of both category of vehicles as dependent factors, where following result has been obtained:

Table 1
The sixth column in the above ANOVA table gives the F-Value and seventh column gives the sig-value i.e. p-value which is compared with the alpha value of 0.05. In case of all the factors representing features of both category of vehicles, the sig. value is found to be less than alpha value of 0.05 (p-value < 0.05), which states that there is significant difference in preference of consumers towards two categories of vehicles. Hence, the hypothesis i.e. There is no significant difference in preference of consumers towards gasoline and zero emission vehicles in India is failed to be accepted.

5.1 Conclusion:
It is found from the above analysis that, the preference of consumers towards zero emission vehicle is high as compared to gasoline vehicles because zero emission vehicles have more fuel economy, less life cycle cost, perfect for urban use, have smooth acceleration and deceleration, have proved technology and futuristic. The hypothesis test show that there is significant difference in preference of consumers towards two categories of vehicles. Since,
zero emission vehicle is the futuristic vehicle, the preference of consumers towards it is found to be high.

References:


