

Gasoline Consumption In Relation To Mileage And Cost

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Introduction

An energy audit can be defined as a form of inspection of energy used in a system to reduce the amount of energy in a system while keeping the output of the system unaffected. (www.google scholar.com, 2018). Energy audits are important because they make sure that fuel consumption is controlled to safeguard the environment from pollution and also reduce costs of fuel consumption since most fuel sources, especially petroleum sources, are very harmful to the ecosystem and are expensive. The main focus of this project paper is an energy audit on fuel consumption, specifically gasoline, in relation to the mileage of the vehicle and the cost of the gasoline over a period of two months.

Fuel consumption is defined as the rate at which fuel is used by a vehicle per the distance covered, usually expressed in gallons per mile (GPM) (Berry, 2010). Gasoline is a motor fuel made up of petroleum hydrocarbon mixture (Dictionary, 2010). Most vehicles in the United States of America use gasoline as the main fuel for daily operations. There are several ways to reduce the energy consumption of a car; for instance, it can be a mechanical approach, avoiding unnecessary idling and paying attention to stop lights, driving, and planning approach (Sam, 2008).

Using the mechanical approach, one can keep the engines properly tuned. This saves 4 to 40 per cent of fuel. Secondly, check and replace air filters. This one saves up to 10 per cent of the energy. Thirdly one can make sure that the tires are filled well and are of quality grade, this saves 4 percent of fuel. On the driving approach, observe speed limits, stop aggressive driving, use cruise control when appropriate, remove excess weight and drive at a steady pace. This measure ensures that most vehicles consume minimal fuel and keeps them well-maintained.

Regarding the planning approach, the following are ways to reduce fuel usage: combine errands, buy gas during the coolest hours to avoid traffic, and go at less congested times. These approaches reduce the time spent on highways, traffic jams, and car mileage, hence cutting off fuel consumption. Also, one decides not to go to town or walk or cycle and take a bus instead of using his/her vehicle. Another context in this project paper is to look at the way of driving, the distance covered, the type of engine, the age of the vehicle and the type of driveway.

Driving style involves how the driver engages with the vehicle on the road, his discipline and the type of road (Berry, 2010). Understanding the effect of driving style on fuel consumption is important for exploring the role of vehicle performance in driving aggressiveness (Berry, 2010). The role of vehicle

performance in fuel consumption is also an important factor to discuss, especially when automobile technology has improved exponentially over the years.

Vehicles are more aggressive when they possess higher speeds and accelerations (Erickson, 2005). The engine size determines the power of the engine, (Andre Michel R. j., 1994). Another concept to acknowledge in this project is fuel economy testing; this is a procedure involving a driver driving a car placed on the chassis of a dynamometer whereby its wheels are on the rollers, and the driver drives it with styles for recording purposes. A drive cycle can be defined as a way of tracking the speed of a vehicle running at a certain velocity. This one accounts for the energy that the dynamometer will require to spin the rollers so that it can match the velocity of the vehicle. Other prescribed conditions are speed trace, ambient conditions like temperature and humidity, engine start conditions, and air conditioning use.

Furthermore, drive cycles are important in that they show the mode of driving at specific locations in the U.S. Another concept to discuss in this fuel consumption project is eco-driving (Barth, 2009). Eco-driving is a mode of driving that saves fuel which consists of various ways like upshifting to make sure the speed doesn't pass over 2500 rpm, controlling a steady velocity whereby there are smooth acceleration and deceleration, knowing when to avoid traffic and making sure to avoid long periods of idling. This technique is very common in city or urban driving, although most of it involves lower highway speed. In general, eco-driving has a five per cent decrease in fuel consumption after some period. However, this can be achieved if we observe the sensitivity of a vehicle to the changes in the way the vehicle is being driven and also if people are willing to drive in a different style.

Fuel consumption is dependent on vehicle speed, which increases with decreasing speed and increasing acceleration. Fuel consumption is mostly insensitive to changes in velocity wheel work. It only increases primarily with wheelwork but to a lesser amount with both higher and lower velocities (Berry, 2010). Also, aggressiveness factors in driving do not necessarily rely on fuel consumption or fuel flow information since those values are affected by variables other than driving style. However, to be important in studying the effects on fuel consumption, the aggressiveness factors must be correlated directly with fuel consumption (Erickson, 2005). To shed light on which driving behaviours have the greatest effect on fuel consumption, the aggressiveness factors must display driving behaviours based on how they affect fuel consumption. In considering the importance of mass in fuel consumption so that there can be a comparison across vehicles, aggressiveness should be mass-normalized.

The aggressiveness factor can also be grouped into city driving, whereby the average speed is almost 20-45 mph (32 and 72km/hr.). Here, the relationship between wheelwork and fuel consumption is almost linear, but there is a lot of variation. Therefore, if we get rid of steady-speed wheel work from the drive cycle, we get acceleration wheel work, which depicts a tighter fit linear line fuel consumption. In summary, the acceleration wheelwork is balanced by vehicle mass, giving units of acceleration.

The aggressiveness factor equals wheel work minus steady speed wheel work at average speed, all divided by mass. In other words, the aggressiveness factor is linearly related to fuel consumption. From this insight, we learn that driving acceleration is the main behaviour that impacts fuel consumption in a city. For highway driving that involves an average speed of 45 mph (72 km/hr.), wheel work alone is correlated with fuel consumption. The increase in wheelwork will cause a proportional increase in fuel consumption, regardless of whether that increase originated from high acceleration or just from the higher average velocity. Therefore, in highway driving, not only does the aggressiveness factor increase at higher speeds, but it is also sensitive to acceleration.

There are also fuel issues from this information about aggressiveness factors. For instance, reducing velocity during highway driving can save the same amount of fuel as accelerations during all driving. This is because the impact of velocity on fuel consumption during highway driving is similar to the one experienced during all driving. This is due to aggressiveness factors being distance-weighted. Also, higher speeds increase wheel work more than average velocity.

Methodology

This section involves a review of various methods that are used in the introduction to characterize the effect of driving style, mileage, and eco-driving on fuel consumption in vehicles. It also describes the methods used to compare the alternative forms of transport to vehicle transport in relation to gallons of gasoline consumed, environmental effects and the total cost of transport.

Methodologies from the literature: Many researchers have looked into both the discipline involved in the way drivers engage on the road and its impact on fuel consumption (Andre Michel J. H., 2006). Many research projects have heard the aim of analyzing and modelling road safety, fuel consumption and emissions from vehicles. Polls and surveys are traditionally the main sources of information concerning driving behaviour. To provide real-world information on pollutant emissions from vehicles, portable emissions measurement systems (PEMS) are used.

Methodologies for this project: With respect to the concepts defined in the introduction, there arise two research questions: one is on how driving styles affect fuel consumption, whereas the second is about the environmental impact on cost by aggressive driving. Therefore to compare data from two different scenarios to evaluate the effect of aggressive driving on fuel consumption is a suitable method. The first scenario in March involves aggressive driving, such as grocery shopping every week and driving everywhere, even to classes. The second scenario in February involves avoiding highways, walking to classes, driving with friends, reduced grocery shopping to once a month.

To record the data on mileage, I used the odometer in my car; the capacity of gasoline for each month was recorded at the beginning and end, respectively, to calculate the difference and derive the fuel consumed.

The data obtained was loaded and analyzed in Microsoft Excel to investigate the difference between

February and March fuel consumption and mileage concerning the cost of gasoline.

Results

Table 3.1 Data on Gasoline Consumption and Cost from February and March

	Fuel conservative driving		Aggressive driving			
	Gallons	Cost/Gal	Gallons	Cost/Gal	Total cost	Avg cost/day
FEB	23.435	\$2.68	24.466	\$2.67	\$128.08	\$4.57
MAR	23.036	\$2.50	12.581	\$2.40	\$143.33	\$4.62

Table 3.2 Gasoline consumption in relation to mileage (MPH) at the beginning of the month

	No. of days	Date	Trip (MI)	Fuel used(Gal)	Average Econ MPH	Mileage
FEB	28	01/02/2018	74035.9	4774	14.5	78581
MAR	31	01/03/2018	74642.1	4817.4	14.5	79187

Table 3.3 Gasoline consumption in relation to mileage (MPH) at the end of the month

	No. of days	Date	Trip (MI)	Fuel used(Gal)	Average Econ MPH	Mileage
FEB	28	28/02/2018	74642	4817.4	14.5	79187
MAR	31	31/03/2018	75347.8	4887.3	14.5	79839

Table 3.4 Summary

	Total fuel used	Total mileage	Est. Gal/day
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FEB	43.4	606	1.55
MAR	69.9	706	2.25

The data in the tables below were collected in February and March about the capacity in gallons of gasoline consumed by a Chevrolet Tahoe 2011- four-wheel drive vehicle and its mileage concerning the cost of gasoline at each period.

Discussion

This part reviews the summary of the research with respect to the findings to derive recommendations for drivers on main activities that are fundamental towards saving fuel and environmental conservation. This project has been worthwhile since it has involved a lot of hands-on skills in terms of driving, cycling, and walking to shopping centres and classes. The findings associated with this project are;

Fuel consumption can be elaborated by observing the efficiency of the car in consuming gasoline to energize the wheels. As speed increases the vehicle efficiency remains constant, fuel consumption can also be very when driving at a steady velocity. The aggressiveness of real-world driving is exhibited by low-performance vehicles. The results above show that aggressive driving causes an increase in mileage and fuel consumption, as evidenced by the more mileage covered in March than in February. The same goes for the total cost of fuel (gasoline).

In conclusion, an aggressive driver can save fuel by using lower acceleration while other drivers can save energy and fuel by engaging at a lower speed on highways. As for the moderate ones, they can employ both techniques while driving on the highway.

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