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Research paper

An awareness of private car drivers in Masai Johor towards the usage of natural gas vehicle as an alternative fuel

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Abstract

This research has studied the level of awareness among the private car drivers in Masai Johor towards the usage of natural gas vehicle (NGV) as an alternative fuel to gasoline and diesel. The awareness of the private car drivers as the biggest community of the road users, would help in reducing air pollution, greenhouse effect and at the same time contributes to green environment. On the other hand, the lack of awareness on the usage of NGV as an alternative fuel would remain the dependency on gasoline or diesel which in long run would produce harmful pollutants to environment and diminish the fossil fuel supply in future. This research is intended to find out the level of awareness on the usage of NGV and also to find out the factors that contribute to the lack of NGV users in Masai Johor. Research is carried out using both qualitative and quantitative method where questionnaires, interviews and observation have been done in collecting the data. From the study, the researcher has found out that most of the private car drivers in Masai Johor are aware of the NGV as an alternative fuel but only small numbers of them have been using the NGV due to some constraints and having bad perceptions on the NGV. NGV is not just a cost saving, but also could reduce air pollution and proven to be among the best alternative fuel which indirectly reduces the dependency on gasoline and diesel thus create better and healthy environment.

Keywords: *Private car driver; Natural Gas Vehicle(NGV); alternative fuel; fossil fuel*

1. Introduction

Public transportation is a crucial part of the solution to the nation's economic, energy, and environmental challenges - helping to bring better quality of life. Public transport is very important to move people from the place where they are, to a place where they would be in the future. However inefficient and low accessibility of public transport result in more people will use their private vehicles to go to work, performing their duties, contact other community to establish social relationship and also to fulfilling their daily routine. The heavily used of fossil fuel (gasoline and diesel) will then result in the emission pollutant which threaten human lives and other living organism thus disrupt the daily life of the society. The emission discharged from the petrol and diesel engine release a variety of harmful pollutants such as carbon monoxide which in turn causes the numerous health problems to humans. In addition, the increasing use of gasoline or diesel by motor vehicles will also causes the diminishing of petroleum supply. As a result, the supply of petroleum which is one of the earth's non-renewable energy is expected to run out by the near future. Therefore, the move into an alternative fuel such as NGV is seen to be the best option to ensure the efficient used of fuel energy.

Recognizing the environmental benefits of using natural gas as a fuel source, the national petroleum company (PETRONAS) has develop and promotes a natural gas vehicle (NGV) as an alternative fuel, with initial focus to the public transportation sector. A natural gas vehicle (NGV) is an alternative fuel vehicle that uses compressed natural gas (CNG) or liquefied natural gas (LNG) as a cleaner alternative and produced lower emissions than fossil fuel. Both CNG and LNG demonstrated better performance and offers good acceleration and cruise speed which comparable to gasoline or diesel engine. The existence of natural gas vehicle (NGV) in the market is seen to be the best substitute or alternative to gasoline and diesel since it is more environmentally friendly and does not pollute the environment. The move to change from gasoline or diesel to NGV, is not just benefited the road users in term of cost saving, but also could reduce the air pollution as well as reduce the dependency on gasoline and diesel thus create clean and healthy environment.

Even though NGV is already in the market for quite sometimes, but not many people especially the private car drivers have taken the consideration of its advantage and benefits. This phenomena has been seen through little study conducted on the reason for the lack of usage of NGV in the area of Masai Johor in particular, where the usage of NGV by private vehicles is still low as compared to gasoline and diesel probably due to its availability in the market and smaller number of fuel stations selling this type of product thus discourage people to use NGV. In Masai Johor, with the population around 100,000 people, there are only three fuel stations operating with NGV facilities [8]. Whether the people in Masai Johor are aware of the existence of the NGV in the market, or they were blocked by bad perception due to lack of information and knowledge, are the main issues which the researcher is going to explore. This research is therefore intended to find out the level of awareness on the usage of NGV and also to find out the factors that become the obstacles or constraint to the users especially the private car drivers in Masai Johor to use NGV as an alternative fuel. The outcome of this research will help the general public especially the private vehicle drivers to have correct

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perception and better understanding on the important and benefits of using NGV. This outcome will also help government to come out with some solutions or counter measures to promote people to use NGV by providing more NGV stations and other facilities to accommodate the requirement.

2. Literature Review

Natural gas, commonly referred to as gas, is a gaseous fossil fuel consisting primarily of methane (CH4), the shortest and lightest hydrocarbon molecule. It is lighter than air, and so tend to dissipate [10] In Malaysia, the natural gas which is commonly used for vehicle is Compressed Natural Gas (CNG). Compressed natural gas, or CNG, is a natural gas under pressure which remains clear, odourless, non-poisonous, and non-corrosive. Natural gas can kill, however if it is present in large concentrations and thus reduces the amount of oxygen available in the air, such that amount of oxygen remaining in insufficient to sustain life [10].

The CNG used in natural gas vehicles (NGVs) is the same natural gas that is piped into millions of homes for cooking and heating. CNG is made by compressing natural gas (which is mainly composed of methane (CH4), to less than 1 % of the volume it occupies at standard atmospheric pressure. It is stored and distributed in hard containers at pressure of 20–25 MPa (3000–3600 psi), usually in cylindrical-shaped cylinder [6].

CNG is lighter than air so in the event of accidental leakage the very low density of CNG at atmospheric pressure, 0.68 kg/m3 compared to air, 1.202 kg/m3, means that CNG would rise and disperse into the air rapidly instead of forming pools on the ground as in the case of diesel and gasoline, which reduces the probability of a fire if the tank is breached.[7]

NGVs in Malaysia are still dominated by bi-fuel vehicles in which the petrol car is converted to an NGV, and the car is allowed to run either with petrol or natural gas based on the driver's choice. The conversion cost for a petrol engine vehicle to NGV ranged from RM3000 to RM7000 depending on the capacity of the selected gas cylinder [3]. The cost for conversion or installation of NGV system probably seen by many quit a high cost. But the trade-offs between high fix price and low operation cost may be very useful to calculate the consumer payback period. [9]. The cost of modification and installation of NGV tank become the obstacle and rejection factor to many people since the payback period will take more than a year.[5]

The use of NGV is very cost effective. NGV is safe, environmentally friendly, and cheaper than using other kinds of fuel. The costs per distance traveled by NGV are lower than other kinds of fuel. The vehicle powered by NGV currently 34% cheaper than vehicles powered by LPG, and up to 80-85% cheaper than vehicles powered by other fuels, such as gasohol or benzene [11]. This factor makes NGV an interesting alternative fuel for car users, especially compared to other alternative fuel options. However, the fact that not many fuel stations have the NGV filling facilities, make it become an obstacle to switch the users to use NGV. These factors have very much caused the lack of NGV consumption by private vehicles in Malaysia.

The safety aspect of the NGV tank is to be taken into account where installation and modification have to be done properly by an expertise. As the tank will be filled up with a compressed gas, it relatively high risk such as carrying a time bomb in the car and might cause danger to the users. Technically, a small spark is enough to burn it. Although we rarely heard the cases of tank exploding, at least the precautionary measures have to be taken to ensure the safety of users. Therefore CNG tank or cylinders are designed and built of special materials to withstand high pressures with a factor of safety than an ordinary petrol tanks [2].

Although NGVs are an ideal AFV in Malaysia with respect to environmental impact and reducing the dependency on petrol, the consumers' perception of NGVs is the most important factor [1]. The bad perception on NGV such as higher maintenance and operating cost, high risk in term of safety, and less performance is among the factors that blocked the mentality of the majority of the road users to accept NGV as an alternative fuel.

3. Research Methodology

Research is carried out using both qualitative and quantitative method where questionnaires, interviews and observation have been done in collecting the data. The survey questions or questionnaires measured each attribute of a factor on Likert-type scales with strongly agree reflecting the highest favourable response and strongly disagree indicating the least favourable response to each statement. The respondents whose been interviewed and issued with questionnaires were confined to private vehicle owner regardless of what type of fuel they are using.

The questionnaires were focused more on their perception and how much that they know the existence of NGV in the market in order to measure their awareness on the usage of NGV. The sampling method being used is convenience sampling method. Even though the researchers realized that this method is not representative enough but we proceed on the original idea. This is so as we realized this is just a preliminary research and being done at a very small scale. On top of everything in conducting this research we also face the problem of time and cost constraints.

4. Finding and Analysis

All findings are derived from the analysis process which is based on the original data from the distribution of the questionnaires. The researcher found that majority of the respondents aware on the existence of NGV in the market but mostly they have been blocked by few constraints and some respondents were having wrong perceptions due to lack of information and knowledge of the product. The result of the research questionnaires was translated into various charts to justify the findings.

4.1 Level of Awareness

4.1.1 The Price of Natural Gas Vehicle (NGV)

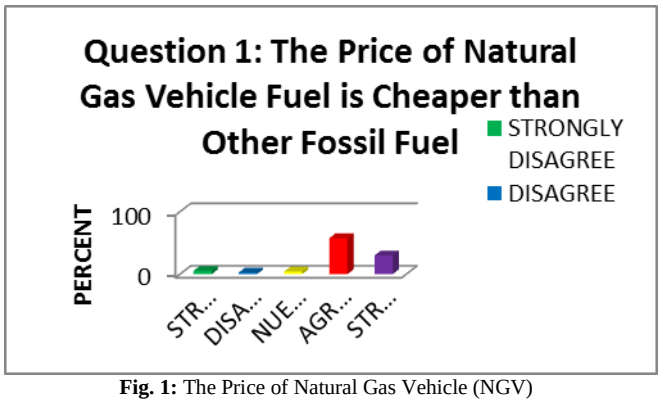


Fig. 1: The Price of Natural Gas Vehicle (NGV)

Based on the chart above, most of respondent agreed that NGV price is cheaper than other fuel. There are 57.5 % agreed and 30.1 % respondent were strongly agreed the price of NGV is cheaper than other fuel. This shows that most of the respondents were aware of the existence of NGV in the market and they know the price of NGV is cheaper than other fossil fuel. The retail price for NGV in September 2016 was RM 0.68 per litre as compared to Petrol RON 95 at RM 1.70 per litre and Diesel at RM 1.70 per litre [4].

4.1.2 The Efficiency of the NGV System

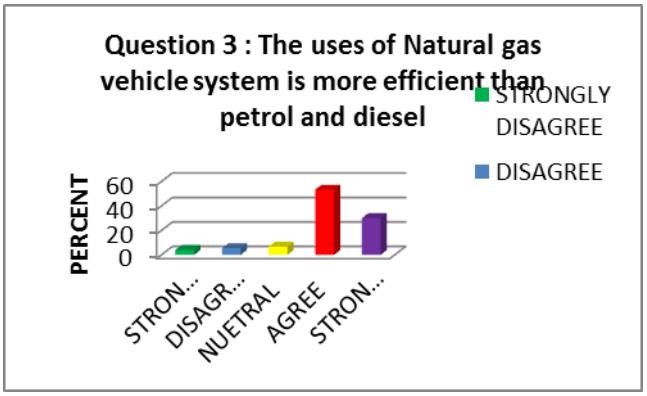


Fig. 2: The Efficiency of the NGV System

The Chart above shows that, some 83% of the respondents agreed and strongly agreed to the uses of NGV system which is more efficient than petrol and diesel. NGV is similar to gasoline/petrol and diesel with regard to power, acceleration, and cruising speed. NGV is safe, environmentally friendly, and cheaper than using other kinds of fuel. Compared with using diesel and petrol, NGV produces lower levels of emissions. This shows that majority of the respondents were aware of the existence of NGV in the market and they aware the efficiency of NGV is better than other fuel.

4.1.3. NGV Can Reduce the Cost of Movement

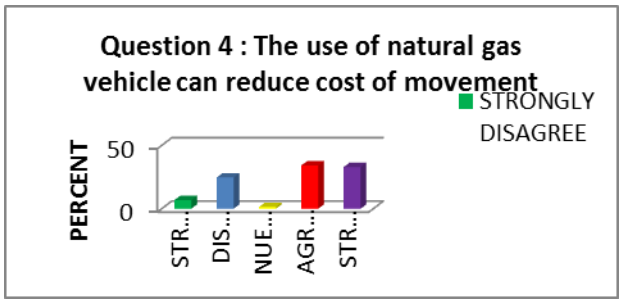


Fig. 3: NGV Can Reduce the Cost of Movement

From the chart above, 67% of the respondent agreed and strongly agreed that NGV can reduce cost for vehicle movement. However, there are some 30% of the respondent tend to disagreed. This shows that still majority of the respondent agreed that NGV can save the cost of movement. Therefore NGV is a better option for vehicle.

4.2. The Constraint Faced by Private Vehicle Driver to Use NGV

Constraint is the main factor that discourages the private vehicle drivers to use the NGV. These constraints were derived from the actual fact that the drivers knew, and some are from their own perception. The graft below shows some of the constraints faced by the drivers that blocked their will to use NGV.

4.2.1. Cost of Installation of NGV System

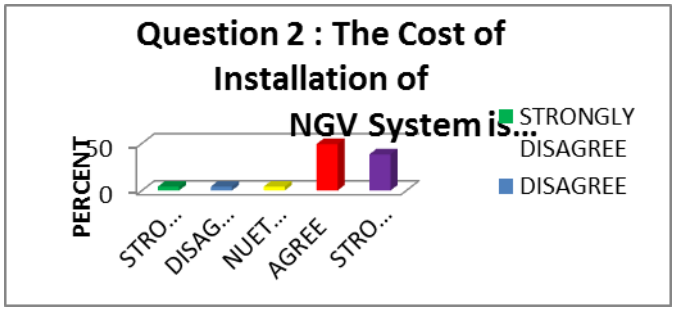


Fig. 4: Cost of Installation of NGV system

Based on the chart above, majority of the respondents agreed and strongly agreed with the cost of installation the NGV system is expensive. NGV has proven to be more economical, but the expensive installation costs and often causes the respondent think twice to install it. This shows that majority of the respondents were aware of the existence of NGV in the market and they aware the price of installation the NGV system is expensive but they failed to consider the long term benefit where they can off-set the installation cost with the cheaper NGV price.

4.2.2. The Maintenance of NGV System

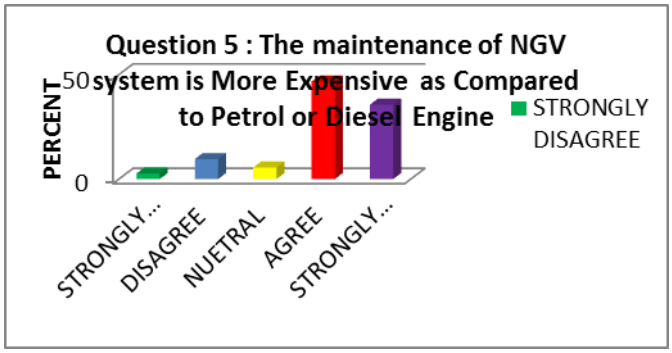


Fig. 5: The maintenance of NGV System

Based on the chart above, some 82% of the respondent believed that maintenance of NGV system is more expensive as compared to petrol and diesel engine. The most important requirement for NGV system maintenance is to have the fuel storage cylinders inspected at regular intervals, after accidents or when there is suspected damage so are replaced. The maintenance of the NGV vehicles, which are installed on the vehicle have to do maintenance every 15,000 km journey to adjust the rocker arm and the 30,000 km trip gas filter must be changed. The maintenance cost is more expensive because NGV equipment consists of several devices such as "NGV kit" including regulators, emulator, electronic controlling unit (ECU), meters, gas cylinders and others.

4.2.3 The Safety Level of NGV

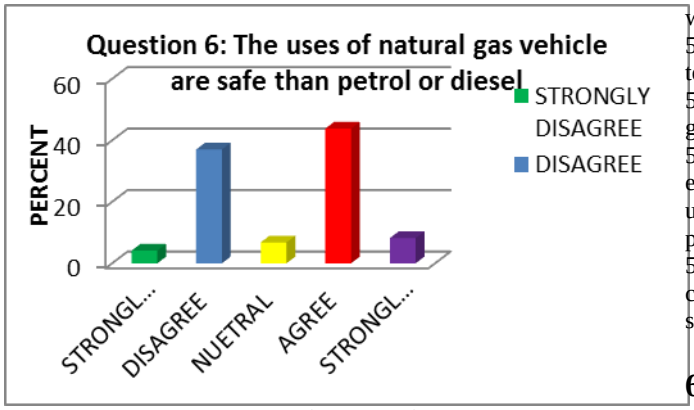


Fig. 6: The Safety Level of NGV

Percentages of the respondent that agree and disagree are not much different. It shows that they are not sure whether the use of NGV is safe or not. Many respondents, who agreed, felt that NGV is a safer fuel compared to gasoline or other alternative fuel today. This is due to NGV is housed in a separate physical system engine and the catalyst for the safety of its use when compared to petroleum-based fuel. Some suggest that the best way is to make a study on the installation of the selected spot, preferably select workshops that have ISO certification and certificate DOHC or ask friends who have installed the safe use of NGV.

For those respondents who were not agree or they felt NGV is not safe, they were argued that the safety aspect cannot be compromised and it is quite a high risk just like carrying a bomb inside the vehicle and can explode anytime. They really worried that since the gas is invisible, if there is only a little smell, a little spark is sufficient to turn it on. If the NGV system is to be installed, it need to further enhanced the safety aspects with free defect.

4.3 People Perceptions on NGV

Many people actually aware on the usage of the NGV, however due to lack of knowledge and insufficient information, many have wrong perceptions on the benefits of NGV. The lack of NGV refuelling facilities and lack of promotion have made the NGV become unpopular among the road users. The graft below shows the seven areas of people perceptions that influenced the road users in making the decision to use NGV.

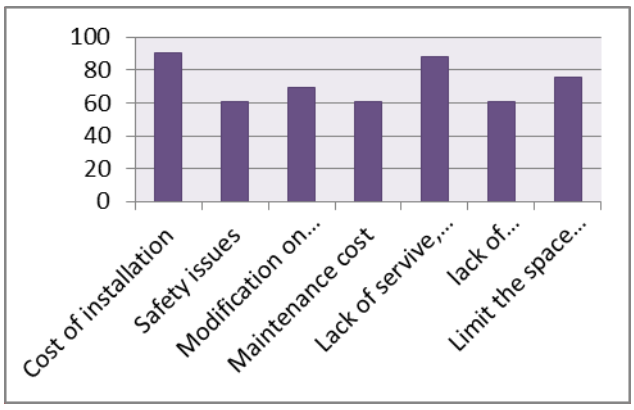


Fig. 7: Seven Areas of People Perceptions on NGV

5. Recommendation

It is learnt that NGV is one of the alternative fuel that could be fully utilised in our country since we are among the major player in petroleum and gas industry. Researcher would like to propose few suggestions in order to increase the number of NGV users and to make the NGV as the main source of energy in near future.

5.1 The government has to come out with a policy or regulation to encourage or to enforce certain category of vehicle to use NGV with some additional incentive such as subsidy and etc.

5.2 The manufacturers or oil producers have to play their part in term of promotion or giving incentives to people who used NGV.

5.3 More NGV stations and facilities have to be built in order to give more options to road user.

5.4 Organise more campaign to promote the important of green environmental and green transportation in order to give better understanding on the benefit of NGV and the peoples obligation to protect the environment.

5.5 Provide sufficient information and educate all citizens especially the younger generation the important of alternative fuel to safe guard the environment and oil reserve for future energy usage.

6. Conclusion

Natural gas is not just an alternative fuel for vehicle but also should be used as the main source of energy for other industries. As a country who produces oil and gas, we have the opportunity to utilise NGV as the main source of energy in the future. The use of NGV as an alternative fuel is a good move to reduce the dependency on petrol and diesel thus reduce the effect of pollutant and create a healthy environment. The researcher found that majority of the private car drivers in Masai Johor aware on the existence of NGV in the market but they have been blocked by some constraints and having wrong perceptions due to lack of information and knowledge of the product. Most of them knew that the NGV is cheaper and even save the cost for movement as compared to petrol and diesel, but the factors such as high maintenance cost and installation cost become the constraints. Some of them thought that NGV is not safe and therefore they preferred to use petrol or diesel. With the aggressive campaign and promotions, the road users especially the private car drivers will be more aware of the important to shift to an alternative fuel. There should be more NGV stations or NGV facilities established in Masai Johor to give more options and encourages the private car driver to use NGV in future.

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