A STUDY ON CONSUMER PREFERENCE ON THE COMPRESSED NATURAL GAS (CNG) IN TRICHY

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Abstract: The use of compressed natural gas (CNG) as an alternative transportation fuel has gained attention due to its potential environmental benefits and cost savings compared to gasoline. Understanding consumer preferences regarding CNG vehicles is crucial for promoting their widespread adoption. This study aims to investigate the factors influencing consumer preferences for CNG vehicles through a comprehensive analysis of demographic characteristics, environmental concerns, cost considerations, and perceived risks associated with CNG technology. The research employs a mixed-methods approach, combining quantitative surveys and qualitative interviews to gather insights from potential and existing CNG vehicle owners. The findings reveal that while cost savings and environmental consciousness are significant motivators, concerns about limited refuelling infrastructure, range anxiety, and safety perceptions hinder the adoption of CNG vehicles. The study provides valuable insights for policymakers, automakers, and energy companies to develop strategies that address consumer concerns and promote the wider acceptance of CNG as a viable alternative fuel option.

Keywords: CNG vehicles, Alternative fuel vehicles, Environmental concerns, Refueling infrastructure, Emissions reduction.

1. INTRODUCTION

Compressed natural gas (CNG) is a clean and environmentally friendly alternative to traditional fossil fuels. This colourless and odourless gas is primarily composed of methane (CH_4) and is compressed to increase its energy density. The widespread adoption of CNG is driven by its smaller carbon footprint, economic viability, and potential to reduce air pollution. One of the main advantages of CNG is its composition, which is mainly methane extracted from natural gas deposits. Methane has a lower carbon content compared to gasoline or diesel, making CNG a cleaner fuel option. When burned, CNG emits fewer greenhouse gases like carbon dioxide (CO_2) and produces fewer pollutants such as nitrogen oxides (NOx) and particulate matter, mitigating climate change and improving air quality. The extraction and production of CNG involve several stages, including purification to remove impurities and compression to increase density for efficient storage and transportation. CNG has found significant applications in the transportation sector, where it is used as a cleaner fuel in vehicles ranging from compact cars to heavy trucks and buses. CNG vehicles emit fewer harmful emissions, contributing to improved air quality in urban areas. Additionally, CNG engines often require less maintenance compared to conventional internal combustion engines, resulting in cost savings for vehicle owners. CNG is also utilized in industrial processes, heating, and electricity generation, aligning with sustainable development goals by offering an alternative to more carbon-intensive fuels. Many industries are embracing CNG as part of their commitment to reducing environmental impact and meeting increasingly stringent emissions standards.

2. OBJECTIVES OF THE STUDY

- To analyze the demographic profile of the respondents using CNG
- To study the factors influencing consumers' preference for CNG gas as a fuel source
- To study the level of awareness among consumers regarding CNG as an alternative fuel.
- To Predict future consumer demand for CNG gas by analyzing current preference.

3. LITERATURE REVIEW

The research on preference for CNG has been proved by various researchers and academicians. The related articles are as follows:

(Paul, D., & Sharma, R. (2023, April)), The study showed the implementation of policies is a significant factor in accelerating natural gas usage. Affordability, infrastructure benefits, environmental benefits, and performance of natural gas were examined to determine policy focus areas to increase compressed natural gas (CNG) and piped natural gas (PNG) usage. (Patel, D. (2022)), Most of the revenue for CNG distribution companies comes from the industrial/commercial and CNG sectors. Therefore, these companies are constantly striving to increase sales in these markets. Currently, there is a particular focus on the CNG sector. To succeed in the CNG business, companies must retain customers and encourage the conversion from alternative fuels to CNG. This requires a strong sourcing and distribution network. The project discussed in this text addresses the challenges faced in ensuring a smooth and continuous supply of CNG to customers, with a specific focus on supply chain management. The main objective of the project was to identify solutions that would lead to higher sales of CNG by addressing these issues. (Tanim, S. H., Rahman, A., & Sadik, T. A. (2011)), The issue of transportation's continuous growth and its reliance on non-renewable energy resources is a pressing concern worldwide. Various countries, including China, are implementing policies to regulate energy consumption in the transportation sector. Additionally, the environmental consequences of the expanding vehicle fleet and their escalating fuel requirements are crucial considerations in environmental planning. The affordability of CNG compared to other fuels has led to a significant increase in the number of cars. Consequently, the authors highlight these significant issues and express a keen interest in conducting research on urban planning in Bangladesh. (Goyal, P. (2003)), The study examines Delhi's air quality about the transition from diesel to Compressed Natural Gas (CNG) in transportation. One measure involved shifting public transport to CNG since April 2001. Delhi now has many CNG-powered vehicles, but over half still need conversion. To evaluate CNG vehicles' impact, pollutant concentrations like CO, SO2, SPM, and NOX were analyzed comparing 1995-2000 (without CNG) to 2001 (with CNG). The results show a significant reduction in these pollutants, demonstrating CNG vehicles' positive effect on Delhi's air quality. (SALUJA R (2004)), The study confirms adjusting national income to account for environmental factors can achieve sustainable income measurement. Environmental economists argue natural resources should have depreciation allowances like capital assets. After implementing the CNG program, Delhi's air quality improved significantly. The study demonstrates environmental sustainability and economic gains can be achieved simultaneously.

FIGURE :1 RESEARCH FRAMEWORK
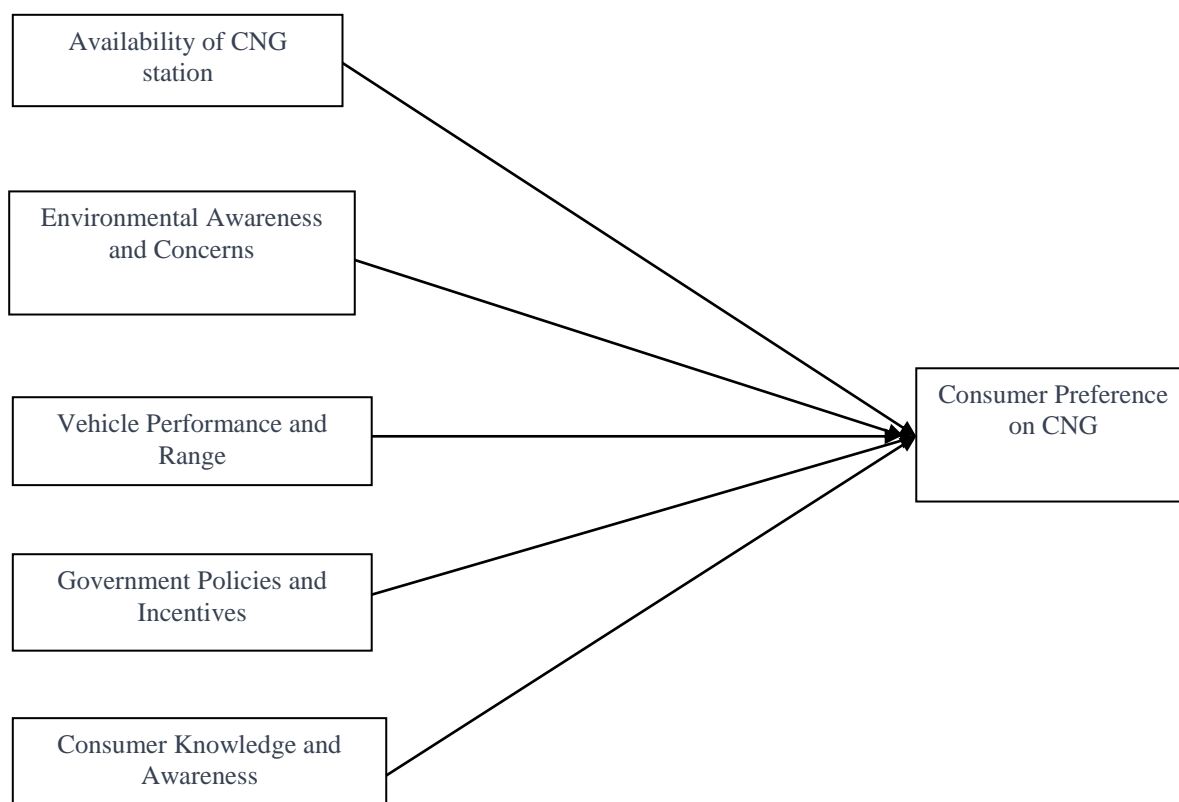
4. RESEARCH METHODOLOGY

In this research, the primary data are collected through structured questionnaires. The study used a purposive sampling method. The population of the study is from a selected area of Trichy district, Tamil Nadu. By considering time as a main constraint only 153 responses as CNG users are considered for the study.

5. DATA ANALYSIS AND FINDINGS

5.1 Percentage Analysis

The demographic details are analyzed by percentage analysis.

Table 5.1 Results of the Percentage Analysis			
Characteristics	Values	Frequency	Percentage (%)
Age	18-27	35	22.88
	28-37	41	26.8
	38-47	28	18.3
	48-57	32	20.91
	58 and above	17	11.11
Gender	Male	145	94.77
	Female	8	5.23
Marital Status	Married	108	70.6
	Unmarried	45	29.4
Education	Sslc	30	19.62
	Hsc	49	32.02
	Undergraduate	70	45.75
	Postgraduate	4	2.61
Employment Status	Self Employed	75	49.019

	Private	71	46.405
	Public	7	4.576
Monthly Income Level (Rs.)	Below Rs.20,000	33	21.56
	Rs.20,001-Rs.40,000	78	50.99
	Rs.40,001-Rs.60,000	37	24.18
	Above Rs.60,000	5	3.27

Source: Primary data processed by SPSS 16

From Table 5.1, out of 153 respondents, most respondents were male (94.77%) and between the ages of 28-37 (26.8%). Self-employed form the largest group (48.019%), followed by private employees (46.405%). Monthly income distribution revealed a significant proportion (50.99%) with income Rs. 20,001- Rs.40,000. Most of the respondents were undergraduates (45.75%.).

5.2 Correlation Analysis:

5.2.1 Monthly Income with Independent Variables

H0: There is no significant relationship between monthly income and independent variables.

Table 5.2.1					
Correlation for Monthly Income with Independent Variables					
		Availability of CNG infrastructure	**Vehicle Performance and Range**	**Environmental awareness and concern**	**Monthly income level**
Availability of CNG infrastructure	Pearson Correlation	1	.716**	.632**	.158**
Vehicle performance and Range	Pearson Correlation	.716**	1	.654**	0.039
Environmental awareness and concern	Pearson Correlation	.632**	.654**	1	0.091
Monthly income level	Pearson Correlation	.158**	0.039	0.091	1
**. Correlation is significant at the 0.01 level (2-tailed)					
Source: Primary data processed by SPSS 16					

Interpretation: From the above table 5.3.1 shows the correlations between monthly income and various independent variables for 153 respondents. There are positive correlations between monthly income and availability of CNG infrastructure (0.158) and vehicle performance and range (0.039). The weak positive correlation between the Availability of CNG infrastructure and Monthly income level indicates that higher-income individuals may have slightly better access to CNG infrastructure, but the relationship is not very strong.

5.2.2 Correlations for Education and Independent Variables

H0: There is no significant relationship between education and independent variables.

Table 5.2.2					
Correlations for Education and Independent Variables					
		Availability of CNG infrastructure	Vehicle performance and Range	Environmental awareness and concern	Education
Availability of CNG infrastructure	Pearson Correlation	1	.716**	.632**	.407**
Vehicle performance and Range	Pearson Correlation	.716**	1	.654**	.344**
Environmental awareness and concern	Pearson Correlation	.632**	.654**	1	.483**
Education	Pearson Correlation	.407**	.344**	.483**	1
**. Correlation is significant at the 0.01 level (2-tailed).					
Source: Primary data processed by SPSS 16					

Interpretation: From the above Table 5.2.2 Education is positively correlated at 0.483 with environmental awareness and concern and Education shows a positive correlation of 0.344 with vehicle performance and range. The correlations suggest that education is positively associated with the availability of CNG infrastructure, vehicle performance and range, and environmental awareness and concern. The strength of these associations varies, but they all indicate a tendency for higher education levels to coincide with these factors.

5.3 Chi-Square

Table 5.3.1 Demographic variable with Availability of CNG infrastructure			
Variable	**Value**	**Significance**	**Result**
Age	1.466	.000	Rejected
Gender	10.263	.247	Accepted
Education	1.369	.000	Rejected
Monthly Income	92.446	.000	Rejected

Source: Primary data processed by SPSS 16

Interpretation: From the above Table 5.3.1 Null hypothesis is rejected for Age, Education, and Monthly Income, there is a significant association between the variables and the availability of CNG infrastructure. This suggests that education, age, monthly income have a statistically significant impact on CNG infrastructure availability.

Table 5.3.2 Demographic variable with Environmental awareness and concern			
Variable	Value	Significance	Result
Age	2.141	.000	Rejected
Gender	12.417	.494	Accepted
Education	1.655	.000	Rejected
Monthly Income	68.909	.002	Rejected

Source: primary data processed by SPSS 16

Interpretation: From the above Table 5.3.2, the Null hypothesis is rejected for Age, Education, and Monthly Income, there is a significant association between the variables and Environmental awareness and concern. Age, education, and monthly income are found to have statistically significant impacts on environmental awareness and concern. gender is not considered to have a significant impact based on this analysis.

6. DISCUSSION

This study provides insights into the characteristics and inclinations of potential CNG vehicle buyers. The primary demographic consists of young individuals (aged 18-37) and is predominantly male. Most participants have completed at least high school and are employed, with almost half being self-employed. Their income typically ranges from Rs. 20,001 to Rs. 60,000. Notably, a significant portion already possesses a car. The most critical factor influencing their consideration of CNG vehicles is the range, followed by performance, with cost being of lesser concern. While they hold a neutral view of the current infrastructure's influence on their decision, a large majority agree on the necessity of expanding CNG stations and consider infrastructure essential for cleaner transportation. Over half of the respondents express concerns about the environmental impact of traditional fuels and believe that using CNG helps reduce air pollution

7. CONCLUSION

The research indicates that there is a potential market for CNG vehicles among young, working individuals who are mindful of the environment. While the range and performance are important considerations, government benefits and upgraded infrastructure could significantly impact purchasing choices. However, a considerable number of potential buyers appear to be unaware of the current incentives, underscoring the necessity for improved communication strategies. In general, the focus on expanding CNG infrastructure, advocating for environmental advantages, and raising awareness of government benefits could be crucial in driving the adoption of CNG vehicles in this target demographic.

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