INEFFICIENT FUEL CONSUMPTION IN THE TRANSPORT OPERATIONS: INTEGRATED COLD CHAIN LOGISTICS SDN. BHD. CASE STUDY

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Abstract:

Fuel is a high cost commodity which must be considered as a major budget feature of all goods vehicle fleet. The paper aims to examine the effect of inefficient use of fuel consumption on the transportation. This study was conducted at Integrated Cold Chain Logistics Sdn. Bhd. (ICCL) which is a logistic company that handles transportation. The proposed model was empirically evaluated by using survey data collected from 26 employees working at the transportation company. The Chi Square results shows that there were no significant relationship between vehicles running long distances when only partially loaded, vehicles poorly maintained, improper service or maintenance plan and the improper route planning or scheduling with efficiency of fuel consumption. Only the vehicles covering extensive distances to reach their destination shows there is signifcant relationship with efficiency of fuel consumption. Possible interpretations, limitations, and implications were discussed. The study is expected to propose better mechanism in fuel controls, appropriate training method for drivers, proper maintenance and better route planning.

Keywords: *Fuel consumption, fuel efficiency, fuel cost, logistics, route planning and training*

1. Introduction

Fuel is a high cost commodity which is highly considered as a major budget feature of all goods vehicle fleet. Inefficient use of vehicles constitutes great waste of fuel (Douglas C., 2009). There are many vital aspects that contribute to the excess use of fuel in goods vehicle fleets that need to be addressed. Increases of fuel prices are creating significant costs for truckload carriers through existing fuel surcharge formulas that cannot be fully recovered. The truckload carriers have an inherent number of miles that they must run empty when dropping off one load and picking up the next load fuel (Douglas C., 2009) . Some carriers manage this

very well by optimizing their customer shipping and delivering points as to efficiently utilize the fuel. Large carriers have enough customer diversification that they have plenty of loads to choose from. All carriers, though, pay for the fuel they use for every mile that they run empty fuel (Douglas C., 2009).

The Malaysian logistics market has always been a very competitive industry. The rising fuel prices and continued competition from new entrants in the market have forced operators to ensure that they are operating as efficiently as possible. A fuel conscious operator will definitely will choose a fuel economy model, but at the same time the trucking companies have to stick with the vehicles they have and are faced with the need to consider how to improve its fuel economy by proper scheduling.

Integrated Cold Chain Logistics Sdn. Bhd. (ICCL) has been experiencing high cost on the fuel consumption, which amounted to RM20,000.00 per month (ICCL Annual Report, 2013) because of inefficient fuel management which in turn, it has a significant impact to company bottom line. A poorly maintained truck will inevitably consume more fuel. Therefore, the company opted to minimize the consumption of the present fuel supply, especially diesel that has been consumed. For instance, by reducing the fuel consumption to keep the vehicle operating costs down should be reduced.

From the problem statement the profit margin of ICCL is deteriorating. This is because of the rising fuel consumption and the inability of the company to identify the actual problems of excess use of fuel. The aims of identify the factor that contributes towards the inefficiency of fuel usage in the mentioned logistic company. Few issues been identified as the contributing factor that makes the company unable to manage its cost wisely. First, vehicles running long distances when only partially loaded and covering extensive distances to reach their destination. This leads to utilizing fuel inefficient truck and high fuel price. Besides, the vehicles are poorly maintained, improper service/maintenance plan. Other than, the drivers were not guided with proper route planning/scheduling.

1. Literature Review

Trucking logistics takes into account all the factors involved in the transportation of goods by truck with the goal of maximizing productivity and efficiency. This may include planning the most efficient routes for truck drivers, selecting optimal fuel types according to market trends, choosing the best kind of trucks for the particular task, and hiring an excellent staff of truck drivers. Gubins (1998) claims that the amount of mileage covered in a day by a lorry is restricted by driver's hour's limitation and road speed restrictions. If the lorry cannot get back to its base within the hours limits, the company faces additional expenses from overnight parking fees and accommodation for the driver. For a lorry to operate outside of one drivers working hours, an additional driver can be carried out but this also increases the costs. The company can achieve 24 hours operation by using some form of staging where the trailers are passed from one driver to another along a route. This enables each driver to return to base within the hour's limits but the trailers and loads can be continuously on the move.

As stated by Gubins (1998) it is clearly define, fuel consumption is substantially related to the type of vehicle, its power unit and drive-line, its mechanical condition, the use to which it is put and how it is driven. In recent times manufactures of automobiles have offered fuel economy models within their ranges so the cost-conscious operator can choose between economy and outright performance.

Lambert, D.M. et. al. (1998) mentioned that the significant capital investment in equipment and facilities, along with operating expenses, transporters recognize the importance of good routing and scheduling in achieving acceptable levels of company profit and customer service.

These areas have become much more significant because of increased competition and deregulation, and a number of economic factors (e.g. fuel, labour and equipment).

2. Methodology

2.1 Participation & Instruments

This study has been conducted at Integrated Cold Chain Logistics Sdn. Bhd. (ICCL) which is a new diversified company based in Bukit Minyak, Penang, Malaysia. As to identify the variables that contributes to the inefficiency of fuel consumption, survey data been collected from 26 employees at ICCL. For this research, the purposive sampling has been implemented. Based on the literature review, the conceptual model was developed as shown in Figure 3.1. The conceptual model shows that the relationship between factors of inefficient fuels usage and effectiveness of fuel consumption. The inefficient factors are the independent variables and effective fuel consumption is the dependent variable.

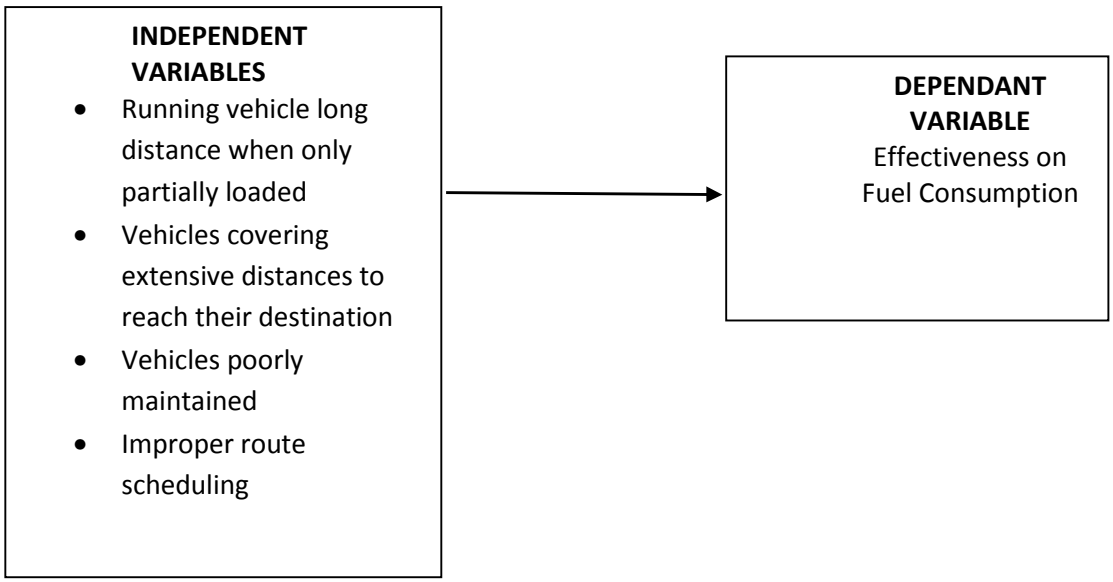

Figure 3.1: Research Theoretical Framework (Gubbins, 1998;

Lambert, D.M. 1998)

2.2 Data Analysis

Reliability analysis has been performed in order to test the internal consistency by using the values of Cronbach's Alpha. Reliability consistency refers to when tests measure the same thing more than once and the result in terms of the average inter-correlation among the items measuring the concept (Sekaaran, 2003). The closer Cronbach's alpha coefficient is to 1.0, the higher the internal consistency reliability (Sekaran 2003). The descriptive analysis and Chi Square by using Statistical Package for Social Science (SPSS) version 20.0 were performed in order to have meaningful interpretations and results.

4. Research Findings

Figure 1 and 2 shows the profile of respondent which indicates the distribution of the respondents by designation. Figure 1 shows that the highest respondents who were driver with 19 or 73.1%, followed by 3 admin clerk with 11.5%, 2 supervisors with 7.7% and the lowest was 1 respondent from operation manager with 3.85%. Figure 2 shows that the distribution of the respondents by years of experience. The years of experience of respondents were grouped into 4 categories which are less than 5 years, 6 to 10 years, 11 to 15 years and more than 15 years. The biggest category of years of experience was respondents with experience between 6 to 10 years, 9 respondents with 36%. It is followed by 6 respondents with 15 years and more (24%), 5 respondents with less than 5 years and 11 to 15 years with 20% respectively.

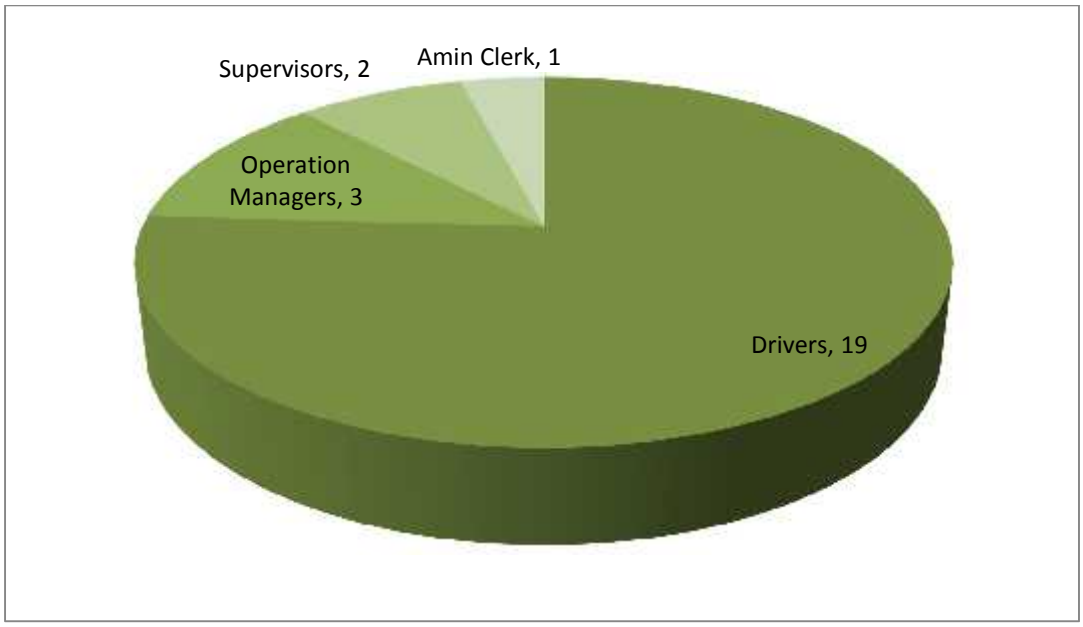

Figure 1: Distribution of Respondents by Designation

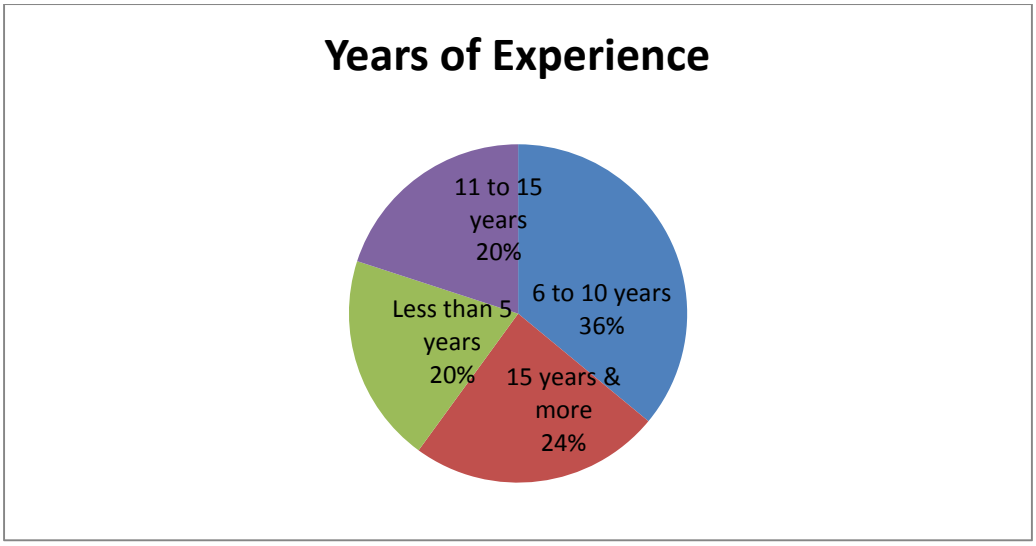

Figure 2: Distribution of Respondents by Years of Experience

2.3 Vehicles Running Long Distance When Only Partially Loaded

Table 1: Chi Square test of Vehicles Running Long Distance When Only Partially Loaded with Fuel Consumption

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.400(a)	14	.714
Likelihood Ratio	.403	14	.162
Linear-by-Linear Association	.086	1	.303
N of Valid Cases	25		

a. 12 cells (100.0%) have expected count less than 5. The minimum expected count is 4.5.

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	.158	.728
	Cramer's V	.158	.728
N of Valid Cases		25	

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

Table 1 shows that there is no significant difference between the vehicles running long distances when only partially loaded in terms of efficiency in fuel consumption (chi square = .40, p = .728). The same result can also be interpreted to mean that there was no significant difference between partially load in terms of fuel consumption. In other words, the IV (vehicles

running long distances when only partially loaded) and DV (efficiency of fuel consumption) are not specified in advance for a chi-square. Phi is interpretable as a nonparametric correlation coefficient, and the Pearson r in terms of the strength and direction of the relationship between these two variables. In this case, phi = .158, which is a weak positive relationship between the two variables. This means that eventhough the trucks run long distance when partially loaded it still does not give any impact on the comsumption of fuel.

2.4 Vehicles Covering Extensive Distances To Reach Their Destination

Table 2: Chi Square test of Vehicles Covering Extensive Distances to Reach Their Destination with Fuel Consumption

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.200(a)	14	.882
Likelihood Ratio	.311	14	.133
Linear-by-Linear Association	.077	1	.202
N of Valid Cases	25		

a. 12 cells (100.0%) have expected count less than 5. The minimum expected count is 4.5.

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	.151	.042
	Cramer's V	.135	.042
N of Valid Cases		25	

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

Table 2 shows that there is significant difference between the vehicles covering extensive distances to reach their destination in terms of efficiency in fuel consumption (chi square = .20, p = .042). In other words, the IV (vehicles covering exensive distances to reach their destination) and DV (efficiency of fuel consumption) are specified in advance for a chi-square. In this case, phi = .151, which is a weak positive relationship between the two variables. The vehicle when covers extensive distance to reach their destination gives impact to the fuel consumption. This is becouse the vehicles run more miles than it should to reach its destination.

2.5 Vehicles are Poorly Maintained, Improper Service/ Maintenance Plan

Table 3: Chi Square test of Vehicles Poorly Maintained, Improper Service/ Maintenance Plan with Fuel Consumption

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.750(a)	14	.878
Likelihood Ratio	.594	14	.155
Linear-by-Linear Association	.075	1	.584
N of Valid Cases	25		

a. 12 cells (100.0%) have expected count less than 5. The minimum expected count is 4.5.

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	.132	.878
	Cramer's V	.143	.878
N of Valid Cases		25	

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

This test in Table 3 shows that there is no significant difference between the vehicles poorly maintained, improper service or maintenance plan in terms of efficiency in fuel consumption (chi square = .75, p = .878). The same result can also be interpreted to mean that there was no significant difference between improper maintenance in terms of fuel consumption. In this case, phi = .132, which is a weak positive relationship between the two variables. There are no impact on fuel consumption even when the vehicles were poorly maintained.

2.6 Improper Route Planning/Schedule

Table 4: Chi Square test of Vehicles Poorly Maintained, Improper Service/ Maintenance Plan with Fuel Consumption

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.485(a)	14	.572
Likelihood Ratio	.540	14	.357

Linear-by-Linear Association	.122	1	.727
N of Valid Cases	25		

a. 12 cells (100.0%) have expected count less than 5. The minimum expected count is 4.5.

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	.169	.572
	Cramer's V	.142	.572
N of Valid Cases		25	

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

Table 4 shows that there is no significant difference between the improper route planning or scheduling in terms of efficiency in fuel consumption (chi square = .485, p = .572). The same result can also be interpreted to mean that there was no significant difference between treatments in terms of which diagnoses patients had. In other words, the IV (improper route planning or scheduling) and DV (efficiency of fuel consumption) are not specified in advance for a chi-square. In this case, phi = .169, which is a weak positive relationship between the two variables. It means the improper plan or schduling does not give any impact on the fuel consumption.

5.0 Discussion and Conclusion

Efficient fleets achieve a better fuel performance, and most of the companies do not have effective fuel management or fuel monitoring programs. The company involves in transport business which have made a substantial investment in building their resources to meet customer demand as well reducing fuel consumption being one of the most expensive operating costs. ICCL prime business focus is for shipment on charter mode instead of console mode. Although this mode being the customer requirement, but one must understand that the disadvantages of having this service and the implication towards company bottom-line.

Generally, the view shall be higher profit margin if shipments are booked in charter mode but the tendency of partial load occurs be it during urgent or non-urgent situation. Most of the time traffic congestion or road repair/maintenance being the main reason for detours and resulted to drive extensive distance to reach the specific destination. During such situation, the driver must be the first person, to inform the respective customer. This scenario is beyond the control of any fleet operator but journey during the peak hours must be avoided. The fact, one must accept and preferably for longer journey the most senior person must be deployed to carry out the task. Vehicle, which is poorly maintained, will inevitably consume more fuel. At ICCL the service/maintenance is not carried out regularly thus increase in breakdown. The intervals at which servicing should be carried out are left to the owner's discretion depending on the work on which the vehicle is employed, in much the same way as the intervals for inspection are decided. To give the owner some guidance, however, vehicle manufacturer usually provide a service schedule which the owner can use in his own workshop or which his agent will use when vehicle are sent in for servicing. Planning/scheduling is generally regarded as one of the primary functions of management because it is the first function that has to be performed. Daily

delivery/pick-up of shipment was performed during the day and all the orders are receive from customer daily through phone call. This situation at times may create miscommunication between the fleet operator and customer. By introducing basic interventions and advancement which implied by several fleet operators of same business nature with ICCL, substantial financial benefits that can be obtained of fuel efficient interventions, upgraded mechanical condition for old fleets, adequate service, maintenance, inspection plan and systematic driver training. Gradually, the operating cost will be minimized thus develop a more fuel-efficient culture. Savings of RM 8,646.00/month or RM 103,000.00/annum are achievable if ICCL reinforce and implement the action items in this research paper.

As a conclusion, the fuel economy of an automobile is the fuel efficiency relationship between the distance traveled and the amount of fuel consumed by the vehicle. The management of logistic companies should have proper route planning to avoid their vehicles from running more miles to reach their destination. This will make their business to run efficiently and at the same time save their cost for fuel.

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