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MALAYSIA SHIP OWNER READINESS TOWARDS GREEN SHIP
TECHNOLOGY

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Abstract

Malaysia ship owner readiness and willingness on green ship technology is to use Liquefied Natural Gas (LNG) as maritime fuel for reducing ships emission. Information and direction from Malaysia Ship Owner Association (MASA) and International Maritime Organization (IMO) relating education and information sharing towards the global initiatives on adapting green ship technology for better green environment. Looking at the factors determining ship owner readiness is the main objective of this research and availability of LNG as fuel as the infra-structure supply chain. Green ship technology is focusing on ship engines design and the maritime fuel used. Studies on methods of green ship technology and usage of LNG as maritime fuel proven the potential benefits. IMO has set a global limit for sulphur in fuel on board of ships effective from 1st January 2020 and expecting major health and environmental benefits for the population living near the seaports and coastal areas.

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Keywords: Green ship technology, Liquefied Natural Gas (LNG), transformation readiness.



1. Introduction

Maritime transportation activities using Strait of Malacca and Malaysian seaports is increasing (Erto et al., 2015). Ships emission is polluting the environment, worsen the air quality and pouring high sulphur contents of acid rain. Studies proven that it is not healthy especially to the humans and other living things. Green ship technology is the focusing on the ship engines design and also the maritime fuel used in the operation. The research background is viewing the title from the global issues and towards the industry perspective. Problem statement is detailing the design type and the importance to the objective of this research study. Problem statement will develop the research question that in line with the research objective. The significance of this study explains the practical and theoretical aspects contributing to this research. Scope of this research study are the education and knowledge, information sharing within the industry of Malaysian shipping business. And benefits towards the shipping industry. Environmental impacts from the shipping operation activities and the reliability that is the trust, and benefits to the shipping owner or operator and indirectly to business customers.

Malaysia Ship-owners or the operators doing their shipping business are of many types and sizes. Sea transportation business in Malaysia can be categorised as offshore oil mobile structures supply ships, merchant ships the cargo ships and non-cargo ships. Cargo ships are divided into many types such as general cargo, dry bulk cargo, oil and chemicals and liquid gas. Non cargo ships are those tugboats, dredger, fishing boats, passenger ships and research ships. The entrepreneurs and the companies involved are local and international doing and supporting multimodal transportation business. This research is to communicate with them and study what they are facing towards the green ship technology indirectly greening the environment. The problem statement is about how the shipping owners reacts towards the objective of this study which or what situation are they in either understanding relating the study or they have no ideas or did not understand on what the initiatives are. This will be discussed on what factors are contributing to their readiness regarding the information or knowledge. This section will be further elaborated under the dependent variable (DV) and the independent variables (IV).

1.1. Research question

This is relating on how the ship-owner is getting or did not getting the knowledge or the information sharing about the research initiatives either through appropriate body or organization for example the Malaysia shipping association (MASA) or direction from transportation ministry. How the ship owner getting the technical advises relating the green ship technology and what is that all about. The most important is why they are supposed to apply and implement the green ship technology to their assets. What are the methods or how if ship-owner willing to accept the transformation or change relating the processes in the aspect of investment and their business interruption and resources especially affecting the business performance and profitability? Readiness also not only from the factors of technical and knowledge but it is also the financial aids or incentives from being arranged by the government. All the factors should be categorised and be included in the questionnaires forwarded to the ship owner or during the interviewing session with the owners. As the research topic and initiative is about current technology and issues this research is recommended to be done in a qualitative method.

1.2. Purpose of study and objectives

From the research question it can be predetermined that the objective is to analyse the expected feedback from ship owner towards the main target finding reasons on readiness of the ship owner migrating from traditional or existing technology to green ship technology. To analyse from the findings is the impact to the environment. Studies on environment proven that quality of air is worsen the green or it's polluted the air with the existing shipping operations. The objective and the study is to confirm the factors contributing readiness to the ship owner.

1.3. Research methods

Qualitative and quantitative research method (mixed method) would be used that the data collection are from the ship owner or shipping companies registered under the Malaysia association (MASA). Questions or questionnaires to be prepared and interview questions when doing the session to the selected ship owner or shipping companies. Company selection can be targeted those bigger sizes as they are contributing many issues and most having huge and capitalised investment. Quantitative research is the using of secondary data for the effectiveness and competitiveness for using the liquefied natural gas (LNG) as maritime fuel.

1.4. Findings & Conclusion and Acknowledgments & references

Results and findings will be based and summarised according to factors mostly the knowledge and information sharing, technology towards green shipping and environment and not forgetting business supply chain effectiveness. Summary and outline will be as illustrated and to be followed according the topic of the study.

2. Problem Statement

Shipping is transportation logistics supporting the multimodal supply chain which includes planning, implementation and determining the factors influencing the economic global movement of goods. Shipping services provided by shipping companies or shipping operator facing challenges or even with no knowledge about the green ship technology and the guidelines or the direction especially from marine department and the international body, international maritime organization (IMO).

Ship owners and the businesses are deriving demand and the investment is huge and it's a capitalized expenditure. Green ship technology is global initiatives and the direction is towards green environment expecting ships to have less emission which reduces the pollution. The issues now is whether ship-owners is ready for the change and the guidance and the infra-structure readiness as well as the information sharing of technical knowledge about the green ship technology.

Willingness and acceptance of Malaysian ship owner is the readiness and the guidance towards the change is about relating the cost competitiveness, the impact towards global green environment initiated by IMO and the reliability. Marine environment safety and marine life sustainability is the main objective regarding marine pollution (MARPOL) as regularly reminded in the convention. Factors to be considered are the issues faced towards the readiness will be discussed under the independent variables in this research

where ship owners will be responded mostly relating the knowledge, the objective, their business administration interruptions, capital investment and profitability (Becker,1997).

Readiness of ship owners using LNG as fuel. Detail the factors or issues and obstacles about readiness of the Malaysian ship owners accepting the change. As existing ship-owners and ship operators running their routes operation in the market and the problems statement are the issues will be faced in switching their assets to be powered by LNG are the management (Owners) the operators (benefits and knowledge), operations interruptions (Ship out of service and old technology), financial (Aids and assistance), engineering and safety (Rules and regulations) and infrastructure (Supply and availability of LNG). Liquefied Natural Gas (LNG) the maritime fuel.

International Maritime Organization (IMO) is concerned about the sulphur content in maritime fuel consumed by ships which only permitted 0.50% m/m (mass by mass) and this will reduce sulphur oxide through emission which expecting improvement towards environment that benefits the globe. General characteristics of LNG fuel oil compared to bunker oil (MFO and MDO) are clean/dirty, extremely low flash temp. / High flash temp., high combustion temperature / Low, specialized storage / Simple, limited of supply / Eased of supply and lack of infra-structure / Ready infra-structure.

Maritime fuel and the consumption is the main costs in their operations where they have been using traditionally and made available by supplier when the need or do bunkering. Proposed using of Liquefied Natural Gas (LNG) on commercial ships is cost competitive but the readiness towards the infra-structure availability. Studies proven the benefits and the advantages of using LNG for ships are listed and summarised in the diagram (Figure 01) below.

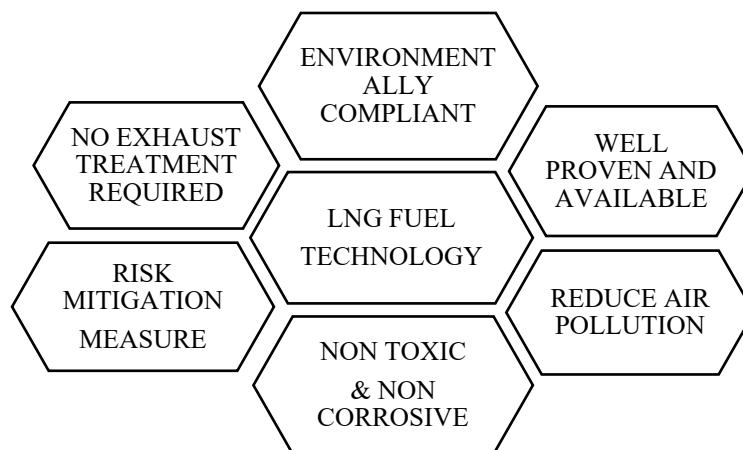


Figure 01. LNG Fuel Technology & Benefits

3. Research Questions

Problem statement develops the research question which later covers the research objectives, purpose of study and the importance of the study. It is important to have clear understanding research question because what we are doing must be aligned with our working details of research or targeted works.

It is the main idea what we suppose to find according to the scope that that we work with. For example, to find the knowledge of respondents or the ship owner regarding the using of LNG towards ships.

Questions to the research will then elaborating the findings target within the area or factors that contributing to the main problem statement which is the dependent variable. It is determining how the independent variables relating to efficiency on costs becoming competitive advantage to the business operation to the ship operator or ship owner. How is the impact of competitive advantage and contribution to environmentally sustainable environment or green environment? Competitive advantage to the ship owner business performance and profitability where costs on maritime fuel usage is reduced.

How to transform the initiatives & green technology to the ship owner or the ships, is there any information or seminar on green shipping or information sharing by the authorities or the marine department about the IMO initiatives that the regulation will be imposed and the target reducing emission from ships. How or any chance the ships engine might be replaced, modified or by upgraded with special equipment for example the use of scrubber to reduce the emission from ships.

With reference to Andres (2011), the effective method to reduce Greenhouse Gas (GHG) emission at the vehicles of road transportation is to introduce low carbon fuel and engine efficiency for the reduction. This related to the light, medium heavy duty vehicles (LDV, MDV and HD). Comparison study through alternative and fossil fuels improve the engines performance and cost reduction. Results showing that electric vehicles (EV) or hybrid vehicles having great increase in efficiency.

The expectation is costs should be lowered and adequate terminals or fueling stations must be set up in meeting the demand. EV vehicles only representing small percentage in the global fleet vehicle (Hecker et al., 2019). This is due to lack of studies and promoting on EV or new model vehicles. Not many studies promoting the green environment and according to (Abusham & Bashir, 2011), only 0.07% out of 12.8 million new car registration in 2011. Government of Norway expressly implied incentives towards EV and more more EV vehicles (Nissan Leaf Model) booked as compared to United States in 2011. Similar to EV Tesla Model S cars where 5.2% were chosen out of the total of 24 vehicles sales.

The above concept is similar to shipping operation as the maritime fuel is the determinants towards the environment for less emission and pollution leading to greening environments that benefits human being and living things surrounding.

3.1. Conceptual Framework

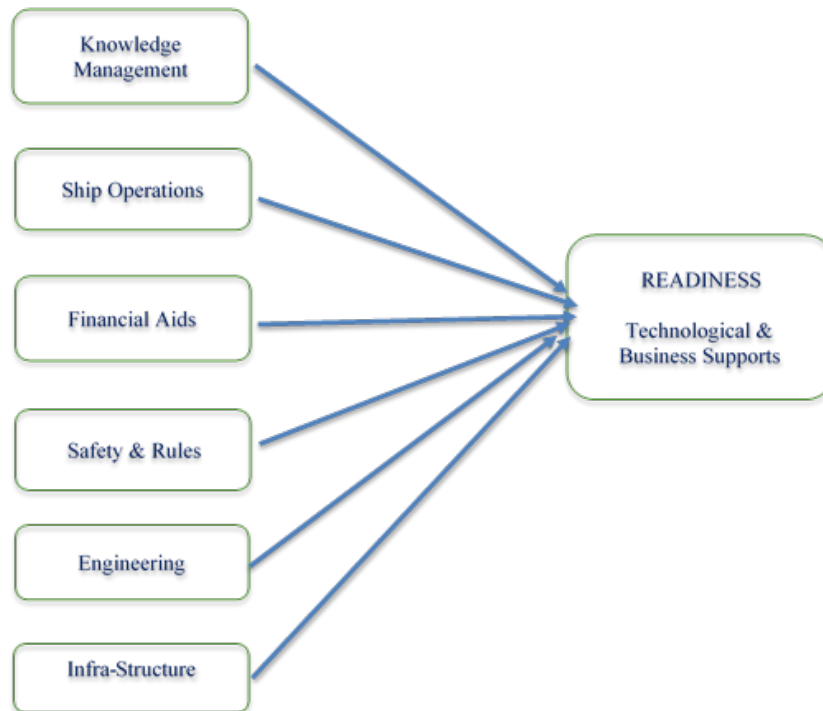


Figure 02. Proposed Conceptual Framework

4. Purpose of the Study

Main purpose and objective of this research study is explaining the practical and theoretical contribution. To provide good understanding and knowledge on the determinants of ship owner readiness on green ship technology. The factors that benefited the shipping business operation that having satisfaction all parties involved and cost effectiveness of shipping organization.

To focus the key factors on costs, environmental factor and reliability. Ba about the factors, ship owner may develop modules relating to costs, environment and reliability. Analyzing or comparative cost statement on maritime fuel usage when adopting green ship technology.

To be used or further development on the application and techniques or design which lead to competitive advantage. Based on the previous researchers and literature review, a research framework is developed as the means to examine the effects of management on the readiness. The relationship between the management theories (issues & obstacles). In this theoretical framework, the six variables of management are independent variables and the “readiness” be the dependent variable. The proposed model reinforces the need of the organization (ship owners) to recognize the influences, factors and determinants of the ship owners’ (issues & obstacles) readiness.

Knowledge Management - Information regarding the importance of green shipping especially greening the environment through the shipping activities must be conveyed to the Malaysian ship owners either from the ministry or the shipping association. The feasibility studies about using the new maritime fuel (LNG) confirmed reducing the emission of nitrous oxide (NO_x), carbon dioxide (CO₂) and for shipping companies one of the benefits is that their ship engines life span is longer compared to diesel engine with

less maintenance and longer intervals of engine service or overhaul (Kjartansson, 2012). Association of shipping companies for example the Malaysia Ship owners Association (MASA) plays an important role to activate the information sharing among their members throughout the nation. The responsibility to highlights the latest information from the international maritime organization (IMO) not only relating to rules and regulation matters but the most important to the ship owners is the benefits and the knowledge about the LNG and the transformation. The factors are management (Ship-owners) the operators (benefits and knowledge), why is it important to know about LNG, information on the usage of LNG as maritime fuel, information sharing from maritime organization or association, what are the benefits using LNG, cost and economic benefits and greening environment and operation.

Shipping Operation - Shipping or sea transportation is the cheapest to move goods or as medium of transport and it is the fundamental reasons the service is increasingly in demand. There are so many type of ships the vehicles used in the industry which having special purpose and also different type of cargoes. The developments and the reasons are the operations – Interruptions. (Ship out of service and old technology), how about operation activity when ships be out of service, effect the sailing schedule services, loss of revenue to ship-owners during out of service, how about the engines “Old technology” ships, capital expenditure will be incurred on ship conversion, old ship might not be economic or not possible at all. Interruptions of ship owners’ business operations, current sailing or voyages to be delayed, delivery to customers not in time and probably dissatisfy customers. Loss of revenue if the assets or the ships need to be upgraded relating to the engine and the installation of new LNG tank storage for the ships.

Financial Aids - Methods of providing financial aids either from the government that is from the ministry for encouraging the use of LNG or moving towards green shipping. Some of the programs and the initiatives that to be highlighted and to be informed to ship owners. The assistance are financial (Aids and assistance), is there any aids and financial assistance when ship is out of service? Subsidies from government on engine conversion or upgrading, any other incentives or financial assistance, Is there any aids and assistance for conversion on the old technology ship? Capital expenditure on upgrading for old ship engine technology, Claim on loss of revenue. Methods or programs or information sharing to be initiated. Financial Assistance

Giving tax reduction/exemption, example by reducing 3% of the import tax when building converting green ships. Allocating subsidies to procurement of green ships, Rating system giving points or ranking green ships owned by private sectors taking into account their quality of performance, Awards - Awarding countries, private companies and individuals for contributing to wide use of green ships.

Regulations making it mandatory /encourage the use of green ships by tightening regulations (including law, ordinances, circulars), teaching and learning, organizing workshops aimed at promoting the use of green ships among ship-owners, shipping companies or governmental officials. Allocating R&D subsidies to institutions studying green ships, conducting research on green ships. Safety & Rules - Rules and regulations that is from the advisory council or from the safety committee of the IMO relating the LNG and the details and technical aspects in using the fuel. Below are some of the points to be addressed to the ship owners. How about the technical standards, rules and regulations or from International Maritime Organization (IMO), reliable on various type of ship, procedures and engineering safety on bunkering, how about old ship technology, safety towards old technology ships and technical advises on old ships.

Some other factors relating safety, rules and regulations needed to be informed and shared to ship owners LNG as fuel – Issues at stake. How do we avoid compromising Safety and make it commercially viable? Standardization and Harmonization – Roles and Responsibilities of stakeholders and who takes the lead? IMO, ISO, SGMF, Class, Flag State, Port State. New innovative designs and Need for new ideas and technologies Manifold, Cargo (and Fuel) Containment System, Transfer System, Custody Transfer System, Boil-Off Gas management, who takes the lead? Role of designers Role of Class validating new technologies and design. LNG as Fuel in Malaysia - What does it need to make it work? First LNG – fuelled ships – Lessons learned Trevor Kletz – the “founding father” of inherent safety – “Hero” of chemical Engineering safety (1922-2013) “What you don’t have, can’t leak” what has become to be known as inherent safety (Trevelyan, 2019). An inherently safe design is a design that eliminates hazards instead of controlling them, e.g. by reducing the number of hazardous operations in a chemical process. “If you think safety is expensive, try having an accident”.

Engineering - Engineering safety when dealing with bunkering of LNG to all ships of many sizes and at which location especially there is hub or station of LNG. How about the technical standards, rules and regulations or from International Maritime Organization (IMO). Reliable on various type of ship. Procedures and engineering safety on bunkering. How about old ship technology? Safety towards old technology ships and technical advises on old ships.

LNG Bunkering Vessel - How to avoid compromising Safety? And make it commercially viable? Common Topics of Discussion for a LNG Bunkering Vessel project: Requirements from Authorities: Flag, Port, which authorities? Multiple Clients Manifold: layout, height, number of lines (L, V), recess (not an IGC Requirement) Transfer System: hoses/arms, Boil-Off Gas management Custody Transfer System (mass flow, energy.) Maneuverability: thrusters, pods, propeller(s). How many? In Case of Conversion from another type of ship (e.g. OSV) – Alternative Arrangement Layout– What GA Layout feasible? Accommodation Block Protection (A60), Venting, Safety (fifi), Stability, need to develop specific Class Notation for this type of unit. Work together to ensure sustainable (Safe et Commercially viable) success, in Malaysia. Need to develop National Standards / Guidelines, based on International Standards (ISO, SGMF, and IACS) need to valorize experience and lessons learned Need to have innovative ideas Codes and Standards are here to support those Developments High potential business opportunities. We will be happy to discuss and together make it happen in Malaysia.

Infra-Structure - Growing infrastructure for LNG will support the availability and the usage of the LNG inclusive effective supply chain that add value for the solution for the environment which supports green shipping imitative. Infrastructure (Supply and availability of LNG). How is the supply distribution and availability of the LNG? Ready distribution and LNG stations. At terminal and ports facility. How the supply of LNG is adequate or matching current consumption? Availability on demand and consumption volume size.

5. Research Methods

Qualitative and quantitative method to be used covers the research design and method to carry out the research data collection, sampling techniques and carrying out data analysis. Types of data is referred to the primary and secondary. Primary data is referred to the information collected fresh and new which

will be collected through structured interviews with the professionals from ship owners from shipping industry. Secondary data is referring to the information collected through from the sources such as media, official statistics from the government, books, journals and case studies from the internet. Associations such as Malaysia ship owners association (MASA) also be contacted and referred.

The research design is to collect data and the information obtained by this research technique are more briefly explained which are helpful and useful to gather concrete information. Qualitative research method is used as it is theoretical. It is very helpful as a research tools as more understanding the subject and encouraging interaction with the professionals. The sampling method is by selecting respondents for interviews are among the ship owners. Established shipping companies that have many years in the industry especially involved multi modal global shipping. Data received will be analyzed using descriptive analysis method to lay out as the basis of foundation to the results and findings through the interview. The conceptual framework is said to illustrate the dependent variable, which is the readiness of ship owners towards using LNG as the maritime fuel. The independent variables are also said to be shown in the framework above. The independent variables stated includes knowledge management, ships operations, financial aids, safety rules, engineering and infra-structure.

This research design is the framework stating how this research will be responded. It is comprehensive strategy that helps or linked various components. It is clear and sensible method ensuring the research problem will be adhered efficiently. This research design will form and constitute coherent objective. This type of research design will be determined from the research problem. Furthermore, quantitative examination will be used in this research on readiness factors of ship-owners using LNG. Quantitative research is used due to mainly common associating the survey research method. It is the study of the relationship between dependent variables (readiness) and also independent variables (knowledge management, ship operation, financial aids, safety rules and engineering & infra-structure).

6. Findings

The data analysis is the process which commonly associated with the size of information and the collected data would be easily handled and then creating summaries including statistical methods. Any responses or feedback require data analysis to further investigate the relationships between variables (Donald et al., 2014). This analysis requires SPSS software which can be interfaced with other databases. The analysis would be descriptive and reliability tests.

Findings on the viability of the LNG as maritime fuel or research on the effectiveness and competitiveness would be done through quantitative method or can be taken other researchers completed research take as supporting the readiness of the ship owner willingness and acceptance towards using green ship technology.

7. Conclusion

The summary of this paper projected relevant and important points for conclusion from the progress entire paper. Describing the knowledge management and global issues on the environment especially towards green shipping. The most important facts and the conclusion must be extracted on the key issues.

Later, the explanation on the final conclusion which focus the consideration that the analysis will be demonstrated as research paper or as the partial conclusion.

The emission and the air pollution regulation relating towards the global emissions that stating the high level readings that alarming unhealthy situation. In addition to the global and international shipping trades, they should working towards reducing sulphur content by or through any means especially the regulations compliance as gazetted.

Developers of technology should design and develop many possible solutions which meeting the limit is targeted as inspired by IMO. CO2 reduction technologies for instance improving the propulsive efficiency and also reducing fuel consumption (Johansson et al., 2017). NOX technology is actually using LNG as maritime fuel. It is proven technically and scientifically usage of LNG is cost competitive and promoting green shipping and the environment.

Engines powered by LNG engines run quieter than diesel engines. Compared to propane, typical emissions savings associated with natural gas are: Greenhouse gas emissions reduced by 15%, NOx emissions reduced by up to 50%, Particulate emissions reduced by up to 10%, Unlike crude oil and crude-derived liquid fuels, LNG spills do not require any remediation of soil, groundwater or surface waters because it evaporates immediately and dissipates quickly into the atmosphere.

Economic benefits, as energy costs continue to increase and grow, it is more and more necessary to find alternative fuels. Using LNG not only brings many environmental benefits, but also substantial economic savings. The technical innovation in the production of LNG has helped to position LNG as one of the least expensive transportable fuels.

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