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PYP: AY2022-2023 Sem 1 MT0001 Shipping and the Environment

Q1(a) **What define scope 1 and scope 2 air emission? Describe the largest source of environmental impact during the operations at a container terminal for each scope.**

Scope 1 air emission is direct air pollution caused by terminal operations whereas scope 2 air emission is indirect air pollution caused by terminal operations. The largest source of direct air pollution is the operation of Rubber-Tyred Gantry (RTG) at the terminal. RTG is powered by diesel fuel engine and black smoke is emitted during each duty cycle consisting of NO_x, CO, CO₂ and PM. In a typical duty cycle of RTG operation, hoisting up and trolley movements are the greatest sources of air pollution, resulting in high emission levels especially hoisting up. The largest source of indirect air pollution is the operation of Quay Crane (QC) at the terminal. QC consumes electricity that is produced from coal, crude oil, natural gas or nuclear power at the power station.

Q1(b) **The shipping industry is putting enormous efforts to investigate alternative fuel solutions to meet various emission control targets. Comment on the likelihood that the industry would succeed in achieving sustainability in this aspect.**

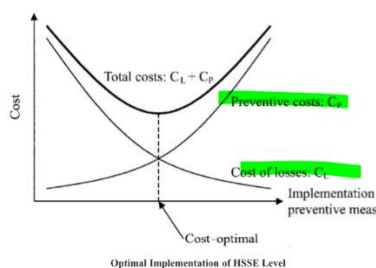
With the many solutions and transitional fuel alternatives available for shipowners, shipping companies and cargo owners ranging from short-term to interim to the long run to utilize, the shipping industry is bound to succeed in achieving sustainability. While shipping companies are working on research and development around net-zero fuels such as methanol, ammonia, and hydrogen to test their feasibility, the shipping industry can interim solutions such as LNG and biofuels while they have the budget for it. Alternatively, refinery fuels derived from fractional distillation can be used as a short-term solution to achieving sustainability.

Q2(a) **Identify and describe the four categories of attributes in the Kano Model. Which category should maritime health, safety, security, and environmental attributes fall under? Briefly explain your answer.**

Kano Model has performance, must-be, attractive and indifferent attributes. Performance attributes demonstrate that the greater the functionality, the greater the satisfaction i.e. laptop having a bigger battery capacity. Must-be attributes are of those are customers simply expect them and such feature do not make customer more satisfied but will just make them not dissatisfied i.e. having clean bedsheets in hotel room. Attractive attributes will invoke positive reaction when such attributes are unexpectedly presented. However, the positive reactions to attractive attribute will decay over time, turning into performance and finally, must-be attributes i.e. smooth touchscreen interface on new mobile phones. Indifferent attributes are of those that their functionality has no effect on customers.

In my opinion, maritime HSE would fall under must-be. Must-be attributes will overtake performance attractive and indifferent attributes. Maritime HSE is a must and foundational to decrease customer dissatisfaction. Furthermore, the consequence of dissatisfaction is larger than the consequence of satisfaction, which could in turn affect quality and of shipping services and profitability of a company.

Q2(b) **With the aid of diagrams, define preventive costs and costs of losses and explain their relationships in the context of maritime HSE. Identify and explain the optional HSE cost for (i) shipowners and (ii) the society.**



Preventive costs are costs involved in implementing HSE measures. Examples of preventive costs are ship inspection costs, training costs and costs of safety equipment and installation onboard ships. Costs of losses are related to avoidable economic consequences from reduction of risks from implementing HSE measures. Examples of cost of losses are total loss of ship and additional costs of getting a new vessel into operations, repair costs and fines and penalties.

(i) Shipowners would want to maximise profit with ships as assets and to do so they must keep their revenue high and their operating costs low. The optional HSSE cost for shipowners is to shift preventive costs (ship/crew/training/equipment maintenance costs) curve to the left, that as a result shifts cost-optimal point towards the lower end of implementation preventive measures.

(ii) For the benefit of society, fines and penalties have to be high to deter shipping, offshore, manufacturing and related companies in the maritime field and shipowners from undesirable consequences such as pollution to the environment via oil-spill clean-up costs, air emission, punitive damages or any other means to cause harm.

Q3(a) Identify and discuss the causes of oil pollution in marine activities with references to operations and accidents.

New building and ship repair operation and accidents will introduce oil and chemicals into the environment. Demolishing activities at ship yards will lead to massive amount of high concentration of oil and grease compound to potentially be released into water bodies. In the case of SOLAS and fire while ships are enroute at sea, the master of the ship ought to dump fuel into the ocean. Human error and equipment failure during bunkering operations could introduce oil into the sea by accident. During holds preparation cargo holds must be cleaned to limit contamination for the next batch of oncoming cargo and it could contain oily-water mixture and ought to be careful not to introduce to the environment. During the regular maintenance of ships, sealing oil and lubrication are used on moving pistons and gears and accidents will introduce oil and chemicals in the environment.

Q3(b) Distinguish between “sludge” and “slop” in shipboard operations. List four required conditions as per MARPOL regulations for lawful discharge of sludge into the sea.

Sludge is waste product from fuel after purification and it will be discharge into a sludge tank located in engine room. Slop is oily water mixture from cargo tank washing onboard tankers and will pass through approved ODME and finally stored in slop tanks onboard tankers. Sludge tanks are found in the engine room of all vessels whereas slop is found only on tankers to store oil water mixture.

Sludge is caused by presence of wax, asphalt, tars, and water along with other impurities. [Did not clarify what is sludge, please do so. Could potentially be under Annex I/II/IV/V. I assumed sludge is garbage: as definition of garbage consists of operational waste.]

Q3(c) What is meant by PSSA? List five such areas as designated by IMO.

PSSA is a sea area that needs special protection through action by IMO because of its significance for recognized ecological reasons (due to unique & rare ecosystem), socio-economic (tourism & recreation) or scientific attributes (biological & historical). Five eg: The Great Barrier Reef (AUS), Malpelo Island (Colombia), The Wadden Sea (Denmark, Germany, Netherlands), Paracas National Reserve (Peru) and Canary Islands (Spain).

Q4 Describe the major requirements in an EMS. Discuss any four typical obstacles in implementing EMS.

A policy statement is needed to guide the EMS from start to finish while ensuring compliances with all applicable statutory and regulatory requirements. All aspects of the community organisation’s activities, products, and services to have significant impacts on the environment must be identified. Objective and performance targets aligned with the policy statement must be set. Implementing EMS to meet the objectives and targets. Establishing a program to periodically audit the execution of EMS. Checking and taking corrective and preventive actions when deviations occur. There must be periodic reviews by top management to ensure its sustainability.

Potential high costs to be covered, the employees could be resistance to do extra work to implement EMS, resultant to limited manpower as a massive amount of documentation, administrative and follow-up has to be done and the uncertainty of finding an external planner if there are no in-house trained staffs are potential constrains in implementing EMS.