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QUALITY MANAGEMENT PRINCIPLES IN THE MANAGEMENT OF SHIPBOARD DISCHARGES

ABSTRACT

Environmental control of vessels is a management function that requires applied technology, training and diligent management. Quality Management is a tool for developing environmental programs to control corporate environmental exposures. The management of environmental regulations, requirements and concerns requires a systematic approach. Quality Management (QM) embodies principles of policy delineation, operations accountability, documentation and review. These principles are all transferable to most aspects of ship management. Properly implemented, they assign respective responsibilities for both shore side and shipboard staff. Both ISM and ISO-9000 Certification requirements embody the principles of QM as requirements for certification. If, however, one looks beyond the certification process, these principles make good business sense. The benefits of QM are both economic as well as assisting in corporate risk management. This paper will focus on the risk management benefits as they apply of environmental health programs in the marine environment including ports.

KEY WORDS

management, environment, shipboard discharges

1. INTRODUCTION

The regulatory oversight and control of environmental conditions on ships cover a broad array of environmental concerns, ranging from sanitation related issues such as drinking water quality, to cost-effective methods of solid waste management and the safe control of oily water. Ships are under constant vigilance from many different regulatory authorities. Regulatory oversight requires both regulatory compliance and operation of vessels to standards established under regulatory authorities. Such regulatory standards are often used as bench-marks for the safe and effective operating conditions of the vessels. Those vessels operating outside of these normally acceptable practices are often singled out and criticized. Resulting corporate risk exposures can include regulatory fines, criminal sanctions, large third party court settlements, and adverse publicity. Decisions by potential litigants and their councils, regulatory agencies and the media as to how to pursue a case aggressively is often related to the degree of variance from a standard defined by regulatory authorities. Therefore, compliance with the intent of the regulatory requirements is paramount for successful cruise ship operations.

2. QUALITY MANAGEMENT

Systematic approach must include the following:

1. knowledge of regulatory requirements;
2. assessing the impact of such regulations on fleet operations;
3. developing corporate policies to address these operating impacts;
4. implementing the necessary directives to ships;
5. training of staff on requirements and how to implement;
6. providing the necessary hardware/equipment and materials to allow for ship compliance,
7. modifying policies to meet operational constraints of existing equipment and itineraries;
8. working with ships to allow for permeations in implementation;
9. auditing for compliance;
10. allowing for changes in policy and/or policy implementation adjustments.

Figure 1 shows an overview of the Quality Management process. Although, as seen in Table 1, ships provide relatively little air pollution compared to other modes of transportation, air pollution from ships is usually quite visible and readily subject to regulatory oversight. Air emissions generated while inside territorial waters can be regulated by respective authorities.

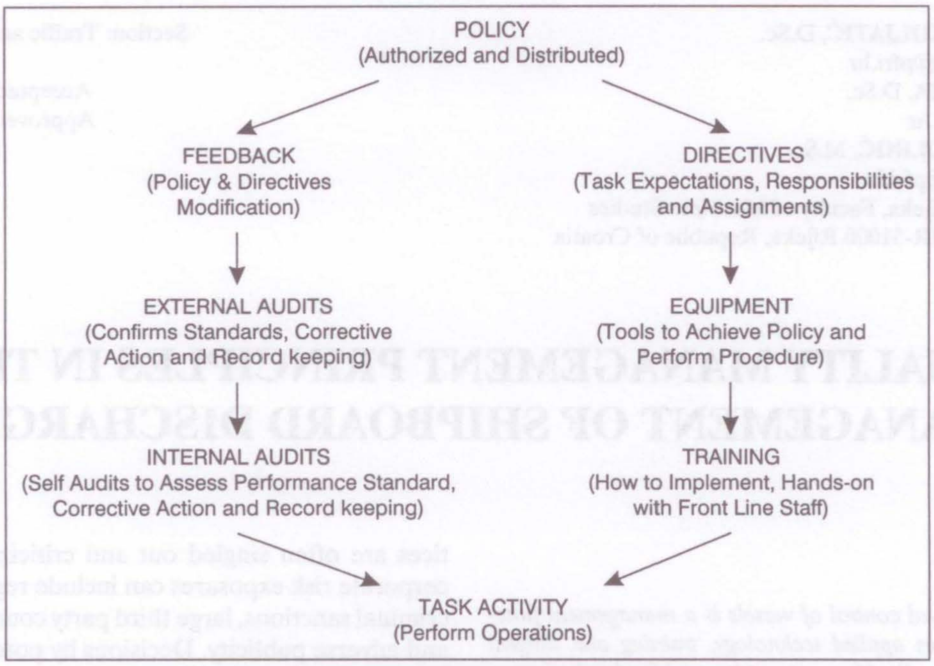

Figure 1 - Quality Management [4]

Table 1 - Energy used and air emission for different modes of transportation [3]

Kg	Rail	Water	Road	Air
Primary energy consumption (kJ/t-kn)	337	212	1445	7920
Carbon dioxide (CO_2)	20	15	103	603
Hydrocarbon (HC)	0.03	0.02	0.15	1.0
Nitrogen Oxides (NO_x)	0.1	0.2	1.8	2.75
Carbon monoxide (CO)	0.025	0.6	1.2	0.7

Using air quality as an example, this paper will highlight the application of QM methods for safe and effective environmental management of ships. Several nations are not satisfied with the slow pace of IMO decisions, and have imposed unilateral NOx and SOx restrictions. Baltic nations have designated special area that requires routine vessel traffic to use low sulphur fuel. The manufacturers are producing lower NOx emission ships through the use of delayed combustion techniques or use of water fuel injectors. Some ships have installed expensive Selective Catalytic Reactors (SCR) to reduce NOx emission.

QM helps the operator to address this complex array of operating air pollution constraints. Using principles of QM the first step is to collect all the regulatory requirements, ship equipment data, future itinerary plans, any history of air pollution problems from the fleet and air emission data from the literature and vendors.

Although many regulatory agencies want to have owners conduct air emission inventories, such air studies are difficult and costly. Results can also vary significantly depending on a number of fuel, equipment and test conditions. Currently, no such requirements exist for commercial shipping vessels. The air emission data from marine diesels presented in the open literature is limited. The use of engine manufacturer's emission test data and national air studies can provide guidance. The next step is to project itineraries relative to local air pollution operational constraints.

3. POLICY FORMULATION

Based on this analysis, policy decisions can be made as how to best operate the fleet or an individual ship in a cost-effective manner yet allowing it to operate within the constraints of environmental conditions.

Operating parameters can then be matched with the company's desired environmental policy, economic considerations, and physical limitations of the vessel and its equipment. A written operating policy can then be developed which specifies individual company policy regarding air emission controls. An example of a policy might be: "Company X will comply with all air pollution environmental regulations within its geographic business parameters".

Once the written policy is developed and circulated, specific written instructions should be given to shore side and ship staff. It should be noted that although this example is for pollution only, most environmental policy statements address a broad array of environmental concerns.

3.1. Fleet directives

Once policies are established, written fleet directives are then developed which will serve as a benchmark for the future ship audits. These directives should outline who is responsible for the task, when and how that task is to be performed, and how records are to be maintained. These instructions should be "Beta Tested" to insure they are reviewed against actual operational constraints of respective vessels. These directives are often generated shore side and then reviewed onboard with the ship staff. The ship staff is then able to add relevant information and actively access real time operating constraints of the formulated policy and directives.

A training program is then implemented fleet wide. This training will review the policy and fleet directives, assign tasks to responsible parties, inform ship staff of reporting requirements, as well as when and how to request compliance variances. For each directive, areas of exception can be expected.

For example, fleet directives might involve ways to minimize air emissions from the ship. The following actions explore ways to reduce air emissions, for example, for a 56000t diesel-electric cruise ship. Air emissions may be controlled by any or all of the following:

1. Engine maintenance: clean injectors and exhaust system and assure proper training of engineers. Possibly more extensive engine rebuild will be required if the engine is heavily worn. The directives should give specific maintenance schedules and system checks, as well as maintenance record keeping requirements.
2. Limit incinerator use: limit operation to areas away from port or under such conditions as to prevent visible air discharge.
3. Limit the burning of plastics and fuels to reduce air emissions. Waste placed in the incinerator should be a mixture of diesel fuel.
4. Control pre-departure routines: limit warm-up times to the amount of time required to warm engines properly for safe manoeuvring, but not for an excessive increased amount time at higher rev/min and under load while at dock.
5. Clean air flow: assure clean air flow into engine, e. g. direct that the air intake system is checked and records generated assuring such was completed.
6. Clean superchargers: clean superchargers if visible air emission persists. The cleaning of superchargers should be part of the routine maintenance program.
7. Quality control: quality control over fuel bunkers, sulphur and viscosity ratings. Directions are given to shore staff and port agents which specify in detail fuel to be used. Quality control checks are then made on the fuel provided.
8. Standby tank: have standby tank of higher quality fuel for use in areas where low sulphur fuel or cleaner burning fuel is required.
9. Fuel treatment: assure proper maintenance and operation of fuel clarifier equipment.
10. Control speed: control speed of vessel in designated areas: Itineraries should be developed in recognition of lower speeds in certain areas.
11. Avoid sudden manoeuvring: directives should ask the ship's staff to avoid, whenever possible, sudden manoeuvring operations that require heavy engine loading.
12. Use tugs: the ship should be instructed to employ the use of tug boats where such would be cost effective in recognition of environmental constraints.

3.2. Variance management

As condition changes, the QM process provides ships with a formal method to inform shore side staff when compliance may not be possible due to operational difficulties. An example of an acceptable variance would be as follows:

- Company policy is to use low sulphur fuel for all Baltic cruises. Problem: The size of fuel tanks on one vessel does not allow for enough low sulphur fuel bunkered to meet the itinerary limitations given overall port bunker availability. Options explored: change itinerary; grand exception for certain areas of itinerary; cancel cruise; change over of tanks/fuel loads.

Company decisions are made and a written document is then given to the ship stating option - grand exception for certain areas of itinerary- is granted. Normal fuel is to be used for areas up to the boundaries of the Baltic special designated area. Reduced speed in the Baltic will allow for more economic use of available low sulphur fuel. Shore side staff; simultaneously make special arrangements to bunker additional low sulphur fuel. The ship is then following company policy, and is still in compliance with regulatory constraints. This provides clear guidance to the ship and does not put the ship and its crew in a difficult situation of operating a vessel knowingly out of compliance.

3.3. Auditing

Once directives and training are in place, the ship is then periodically and systematically audited to assure compliance with the aforementioned policies and directives. If deficiencies are found, the ship is given a specific amount of time to comply. Individuals are held accountable for corrective actions unless variances are requested and granted. The best quality control systems allow for internal and external auditing. This process provides better risk management for the owner and brings priority to serious deficiencies. As with any human/equipment management system, nothing remains static. Regulatory requirements change, staff on ships change, technology evolves, equipment fails and definitions of acceptable practices change. Thus all policies, directives and auditing items will change over time. The QM system must therefore be able to accommodate changes as listed earlier. The best way to achieve this is to date all directives and periodically update them as required. This updating is done by shore side staff after going through the process discussed previously. Thus, all directives are dated and updated. Likewise, the need for refresher training is highlighted.

4. CONCLUSION

For assurance of environmental compliance to a broad array of shipboard environmental compliance constraints, the use of QM methods afford both ship-owners and operators a valuable management tool. Owners must specify policy and directives and the ship must comply or apply for a variance. The system provides for documentation and record keeping for compliance follow-up. The same principles apply with the use of the ISM and ISO-9000 Certification process.

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SAŽETAK

PRINCIPI KVALITETNOG MENADŽMENTA U UPRAVLJANJU ISPUŠTANJIMA S BRODA

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KLJUČNE RIJEČI

menadžment, okoliš, ispuštanja s broda

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