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MariEMS Learning Material

This is the 28th compilation by Professor Dr Reza Ziarati on the work of the EU funded Erasmus + MariEMS' partners and material extracted from the IMO TTT Course. The material is composed from Chapter 28 of the learning material. Readers are also advised to refer to the papers on IdeaPort and IdealShip projects led by C4FF and published by MariFuture.

28. Overview of Management Systems

28.1 Introduction

28.1.1 Main aspects of a management system

The cornerstone of good management is commitment from the top management and dedication from the operating personnel. In matters of safety, pollution prevention and energy saving, it is the commitment, competence, attitudes and motivation of individuals at all levels that determines the end result. The foundation of the ISM1 Code is largely based on the philosophy of quality management, the key fundamentals of which include:

- Management commitment;

- Staff/personnel empowerment; and

- Continuous improvement.

The role of the top management is crucial when improving the quality or safety or environmental protection or conservation of resources of a company is concerned. Firstly, the management is responsible to set a company policy which describes where and how the company should aim and perform in terms of quality, safety, environmental and energy conservation issues. Secondly, the management is responsible for providing adequate resources and tools in order to ensure that the company policy could be successfully implemented. Also, the management is responsible for setting realistic and achievable targets for the company's quality, safety, environmental and energy performance. The performance should be reviewed on a regular basis and the previous targets should be updated on the basis of actual performance.

The involvement of the personnel is a pre-requisite for a successful management system. Employees should have a feel of ownership in this regard. This is normally achieved by providing an opportunity for them to participate in establishing, implementing and operating the management system at various organisational levels. In many organisations, it is not necessarily lack of knowledge and awareness that is responsible for poor performance but it is the lack of this feel of ownership and motivation to act and commitment that leads to poor performance in various areas.

28.1.2 PDCA cycle of continuous improvement

The concept of "continuous improvement" requires that a company improves the quality of its products and services on a continuous basis and at all organisational levels. A common approach to continuous improvement is the PDCA (Plan – Do – Check – Act) process as shown in Figure 28.1.2.
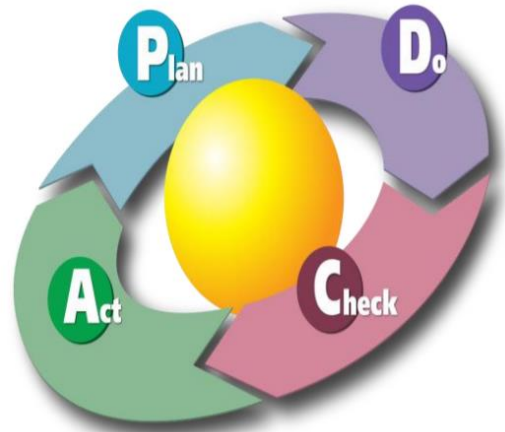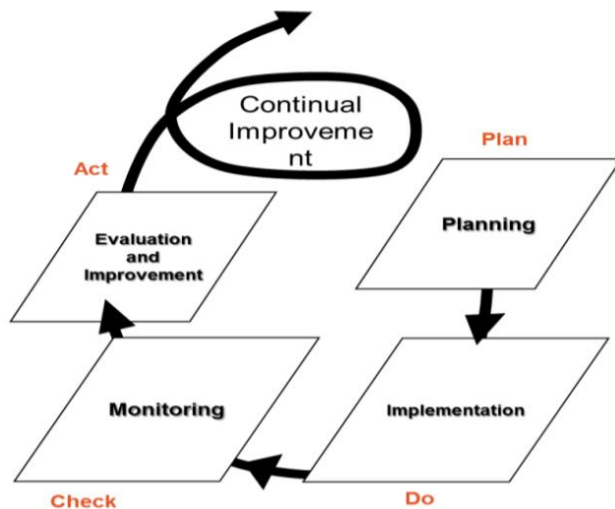
Figure 28.1.2 – PDCA cycle of continuous improvement

The 4 major phases of the continuous improvement cycle are:

- **Plan:** During this first phase of the PDCA cycle, an action plan of the activities that need to be done is prepared together with all relevant implementation details. For this purpose, the company need to have a policy statement and should define the objectives and targets, plan on how to achieve these targets and identify how to implement and how to monitor various activities when the plan is implemented.

- **Do:** In the second phase, the implementation of the selected and documented measures should be carried out in a systematic way. In other words, this is the execution phase of the action plan developed. To be successful, project management of various measures under implementation is very important and the action plan should be executed within the schedule and budget.

- **Check:** In the third phase, one should measure or analyse the results of the implementation via effective monitoring and checking. This is the step under which the results of implementations are measured and monitored to ensure that the perceived objectives are achieved. Without this step, there is no way to know if the implementation has been satisfactory or not. Data collection and analysis plus various aspects of audits and surveys could be used for this purpose.

- **Act:** In in last phase the assessment of the effectiveness of plan is done. The plan is reviewed against the achievements and new targets are set for next cycle of PDCA. If the check shows that the plan that was implemented led to improvements, then new standard or baseline or targets for future cycle of PDCA activities are set. Otherwise, the reasons for not meeting the objectives need to be evaluated and the plan adjusted according and the new cycle to be started. The above PDCA cycle principles apply to any management system irrespective of area of application. In this module, it will be shown frequently that various shipping related management systems also follow the above generic principles.

28.1.3 Management systems and shipping

The concept of "management system" is not new to the shipping industry. One of the most prominent management system that is already mandatory in shipping is the ISM Code that as the name implies

deals with shipping safety at its core. There are other management systems that although not mandatory, are widely adopted by the shipping companies including the following:

- Quality management system, mainly known as ISO 9001

- Environmental management system, mainly known as ISO 14001

- Health and safety systems such as those based on OHSAS 18001.

- Energy management system such as those specified under ISO 50001.

In the following parts of this section, a brief overview of these standards together with their similarities and overlapping aspects will be given.

28.2 ISM Code

According to IMO, the main objective of the ISM code is to provide an international standard for the safe management and operation of ships and for their pollution prevention [IMO Website]. Accordingly:

- Governments are required to take the necessary steps to safeguard the shipmaster in the proper implementation of his/her responsibilities with regard to maritime safety and the protection of the marine environment.

- Recognised the need for the shipping companies to set up appropriate management system to enable them to respond to the need of those on board ships to achieve and maintain high standards of safety and environmental protection.

The ISM code is effectively a shipping-specific International rules and regulations with the ultimate objectives:

- To ensure safety at sea

- To prevent human injury or loss of life

- To avoid damage to the environment and to the ship.

The ISM code is based on some general principles and objectives. These are expressed in broad terms so that ISM code can have a widespread application to all different type of organisations involved in shipping despite their diverse business. Clearly, different levels of management, whether shore-based or ship-board, will require varying levels of knowledge and awareness of the items outlined.

SOLAS adopted the ISM code in 1994 and incorporated it into its chapter IX. By 2002 almost all of the international shipping community was required to comply with the ISM code. In order to comply with the ISM code, each ship must have a working Safety Management System (SMS). Each SMS would consist of the following elements:

- Commitment from top management

- A top level defined policy manual

- A "procedures manual" that documents what is done on board the ship, during normal operations and in emergency situations

- Procedures for conducting both internal and external audits to ensure that the ship is doing what is documented in the "procedures manual"

- A designated person ashore to serve as the link between the ship and shore staff and to verify the SMS implementation

- A system for identifying where actual practices do not meet those that are documented; and the associated corrective actions.

- Regular management reviews.

Another requirement of the ISM code is for the ship to be maintained in conformity with the provisions of relevant rules and regulations and with any additional requirements which may be established by the shipping company itself. As part of ISM code, compliance verification should be in place. Each ISM compliant ship is audited, first by the company itself (internal audit) and then each 2.5 to 3 years by the flag State "maritime administration" to verify the effectiveness of the SMS. Once SMS is verified and it is working and effectively implemented, the ship is issued with a Safety Management Certificate (SMC).

It should also be noted that a ship's planned maintenance scheme is a statutory requirement of the ISM code. The ISM code requires that the ship's management provide sufficient resources to maintain the ship safely and the company must supply the necessary resources in the way of parts or shore-side assistance to do this. Poor maintenance can mean that either the ship cannot meet its commercial obligations (for example unable to meet the minimum speed requirements defined in the contract) or can pose a potential safety or environmental hazard. The management should ensure regular audits of ships to verify that the maintenance required by the planned maintenance system is being carried out. This inspection of the ship should be part of the internal audits required by the ISM code and should not be left for statutory or class surveys at a later stage.

28.3 Standards other than ISM

There are a number of management system standards developed mainly by the ISO that have been extensively used. These are standards and not rules and regulations and as such their use is mostly voluntary. However, some of these well-known standards are widely used by most industries including shipping and will be briefly introduced.

28.3.1 ISO 9001: Quality Management System (QMS)

The ISO 9000 series of standards are related to quality management systems and designed to help organizations ensure that they meet the needs of their customers / clients and other stakeholders while meeting statutory and regulatory requirements related to their delivered products or services. The ISO 9001 certification is highly oriented towards "process improvements" taking into account the customer needs. ISO 9001 is the most commonly utilised standard for quality management. Its wider application started initially in manufacturing companies in 1980s. Later on, its application expanded into service business and public administration mainly in the middle of the 1990s. In shipping, many companies so far have adopted the ISO 9001 quality standard as the basis for their company's "quality management system".

28.3.2 ISO 14001: Environmental Management System (EMS)

ISO 14000 series of standards relate to environmental management and has been developed to help organizations to minimize the negative impacts of their operation on the environment via ensuring compliance to prevailing applicable laws, regulations, and other environmentally oriented requirements as well as best practice. ISO 14001 requires the organization to assess all of its environmental aspects related to the company's activities, products and services. So, in a nutshell, ISO 140001 main requirement is that the significant environmental aspects of a company should be identified, documented and managed. The first international version of ISO 14001 was published in 1996. Like any other of widely used management system standard, ISO 14001 has evolved over time

and the current version of the ISO 14001:2015 includes the concept of continuous improvement process approach.

In a shipping company, the company policy may include the implementation of ISO 14001 on its vessels which contains procedures for selecting the best environmental measures for a particular vessel and then sets objectives for the measurement of relevant parameters along with relevant control and feedback features. The implementation of ISO 14001 has the main advantage of reducing a company's environmental impacts.

As many ships and companies already have an ISM code related management system that should include environmental protection, it would make sense for these companies to have an ISO 14001 compliant environmental management system; however as discussed before this is not mandatory and care should be exercised not cause complications with regard to ISM related Flag State and Port State Control inspections. Once an environmental procedure becomes part of the ship's SMS, it is mandatory to follow the processes even if the requirements are not mandatory in other statuary legislation.

28.3.3 OHSAS 18001: Occupational Health and Safety Assessment Specification

OHSAS 18001 is a British Standard (BS) that is used globally and provides a specification for occupational health and safety management in any organization. The OHSAS 18001 is widely used internationally and is intended to help organizations to control occupational health and safety risks. OHSAS 18001 focuses on the need to identify all occupational health and safety hazards for personnel related to the company's activities and facilities and do relevant risk assessment. The result of these assessments is then used to identify the hazards that have to be eliminated or controlled.

The OHSAS 18001 has been harmonized with the ISO 9001 and ISO 14001 standards so that to help organizations to integrate the quality, environmental and safety management systems easier into one common management system.

28.3.4 ISO 50001: Energy Management System (EnMS)

ISO 50001 is an international standard for an energy management system. The standard specifies the requirements for establishing, implementing, maintaining and improving an energy management system (EnMS). The purpose of EnMS is to enable an organization to follow a systematic approach in achieving continual improvement of energy performance in their organisation. ISO 50001 establishes systems and processes to improve energy performance and as a result, enable reductions in energy costs, GHG emissions and other environmental impacts.

28.4 Commonalities between Management Standards

Although the above categories of standards deal with different management aspects, their overall requirements, processes and procedures have similarities and overlap. Understanding of their similarities and overlaps helps with an integrated approach to their implementation. In this section, some of these aspects are clarified such that if a trainee is familiar with one of these management systems or standards, he/she could relate the other standards to this one as an aid for quicker and deeper understanding. Also, this section aims to provide more information on the requirements of each standard, complementing what mentioned about them in previous section. The commonalities of these standards are so much that there are many publications that compare them and there are many companies who offer an integrated service in dealing with their implementation and certification. In shipping, for example, ABS guidelines for such services [ABS 2012] are written as a unified one that includes all of the above standards in one guideline. DNV also in its publication [DNV 2013] offers a good and systematic comparison of these standards in terms of their common aspects

and also their complementary aspects. The following comparisons are mainly a shortened version of the DNV comparisons in this regard [DNV 2013] that is hereby acknowledged.

28.4.1 On "objectives and policies"

This aspect relates to the role that top-management of the company must play. Many aspects of the requirements for top management roles in the ISM code and the other management standards are similar. Accordingly, the top management shall define policies relevant to the nature of the business and as a framework for objectives and targets. As a minimum, objectives and targets should demonstrate the company's goals for health and safety protection, environmental concern, energy performance and so on. In addition to the above, specific objectives and targets are required by the various standards for compliance purposes.

1.4.2 On "system management"

The "system management" refers to management procedures and assignment of roles and responsibility. Instructions and procedures are required to be in place in order to operate ships safely, protect the environment, control its occupational health and safety risks and comply with relevant international and flag State legislation. Defined levels of authority, responsibility, lines of communication, resources and support, plans for key shipboard operational procedures, risk assessments, accidents and nonconformity reporting procedures, emergency procedures, internal audits and management reviews are all part of the system requirements. For this purpose:

- The ISM code requires designated person(s) to be appointed.

- For ISO 9001, it is required to identify a quality management representative and describe elements in the ISO 9001 standard that not already addressed in the existing safety management system. The customer should be defined and a system for measuring and monitoring the service provided to satisfy the customer's needs have to be put in place.

- For ISO 14001, it is a requirement for top management to appoint an environmental management representative and provide resources to manage and control the environmental system. All environmental aspects shall be assessed, by considering normal and abnormal operations and potential emergency conditions. The significant aspects shall then be identified and managed. Procedures for receiving, documenting and responding to communication from external interested parties shall be established.

- For OHSAS 18001 and similar to ISO 14001, all occupational health and safety hazards must be identified and assessments of risks carried out. A safe system of work must be established, employing a hierarchy of controls. Employee consultation and participation is required.

- As for ISO 50001, the main goal of the standard is a reduction in energy use. This is achieved through continual improvement in energy performance. The organization is required to conduct and document energy planning via an energy review, establish an energy baseline, performance indicators, objectives, targets, action plans etc.

28.4.3 Continual improvement aspects

The following could be related to ISM code and other standards:

- As part of ISM code, objectives to continually improve safety management skills ashore and on-board via analysis of nonconformities, accidents and hazardous situations need to be

achieved. Procedures for maintenance of the ships in the fleet are required. Use of risk assessment techniques is necessary.

- As for ISO 9001, customer needs, expectations and requirements have to be taken into account. A procedure for analysis of data to improve the quality effectiveness of the management system is required. Procedures for eliminating the causes for potential nonconformities are also required.

- For ISO 14001, the company should establish an environmental management programme that addresses all of its objectives and targets including schedules, resources and responsibility for achieving them. The environmental programme helps the company improve its environmental performance and meet its commitment to continual improvement.

- For OHSAS 18001, the company should establish an occupational health and safety programme that addresses all of its objectives and targets, including schedules, resources and responsibilities for achieving them.

- For ISO 5001, the company is required to plan its energy use when working to achieve its energy targets. This means to develop and carry out an energy review and establish energy baselines. The company is required to use performance indicators. Checking and monitoring is done against the indicators.

28.4.4 Human resources/personnel

On human resources and staff, all the management systems give significant priority to train and motivate the staff in related areas:

- For ISM code, the company should ensure that seafarers are qualified, certified and medically fit.

- As for ISO 90001, the organization shall assign personnel to ensure that those who have defined responsibilities are competent. The company should also evaluate the effectiveness of training.

- As for ISO 14001, all employees shall be trained in and be aware of their roles and responsibilities and the significant environmental impact of their work etc.

- As for OHSAS 18001, all employees shall be aware of their roles and responsibilities, the occupational health and safety consequences of their work activities etc.

- As for ISO 15001, employees should be familiar with their roles and responsibilities. Training in energy management system, benefits of energy management etc. is required. This extends to contractors and third parties working on-board that may be affecting energy use.

28.4.5 Ship maintenance system

The ship maintenance management is also part of the management standards including:

- For the ISM code, maintenance procedures covering at least all items that are subject to class, statutory and additional company requirements are required.

- For ISO 90001, planning and control of appropriate procedures are required, as are purchasing procedures. The maintenance must extend to include care for customer property, including where work on-board affects customer property indirectly.

- For ISO 50001, maintenance plans extends to areas identified and considered as significant energy users in order to avoid a failure affecting the energy performance.

28.4.6 Verification and inspections

Measurement, monitoring, verification and inspections are part of all the management systems.

- Based on ISM code, regular on-board verifications and inspections are required.

- In ISO 14001, the company must have a systematic approach to measure, monitor and evaluate its environmental performance.

- In OHSAS 180001, the company must have a systematic approach to measure, monitor and evaluate its occupational health and safety performance.

- For ISO 50001 compliance, the company should define and regularly review energy measurement needs. An energy measurement plan is required. Measurement equipment must be calibrated with records retained. Standard gives minimum requirements to be considered.

1.4.7 Performance monitoring

Common to all standard, effective procedures for reporting non-conformities and hazardous situations are required. New requirements for e.g. energy management should be reflected in the company management system. Data analysis, implementation of preventive actions and continual improvement procedures are required.

- For ISM code purposes, there is a requirement to have a designated person ashore to monitor safety and pollution prevention aspects.

- For ISO 90001, ways of measuring and monitoring operational performance are required. This includes establishing data analysis processes, improving system effectiveness and continual improvement.

- For ISO 140001, procedures for regular monitoring and measuring key operations that have significant environmental impacts are required. Evaluating compliance with relevant environmental legislation and regulations is also required.

- For OHSAS 180001 compliance, procedures for monitoring and measuring occupational health and safety performance on a regular basis. Evaluating compliance with relevant legislation and regulations is also required.

- As ISO 50001, the company should identify energy performance indicators based on the energy review and the energy baseline. Measurement will be carried out against these performance indicators.

1.4.8 Management reviews

Common to all, the company should verify compliance and evaluate the efficiency and effectiveness of the management system. Management reviews covering all of the company's systems at defined intervals, are required, including input from master.

- For ISO 90001, monitoring and measurement of management system performance including customer satisfaction is a requirement.

- For ISO 14001, the organisation shall evaluate the environmental performance and the conformance with the environmental policy, objectives and targets. Evaluating compliance with relevant environmental legislation and regulations.

- For OHSAS 18001, the organisation shall evaluate the health and safety performance and the conformance with the policy, objectives and targets. Evaluating compliance with relevant legislation and regulations.

- For ISO 50001, the management review will evaluate the energy performance, the suitability of the performance indicators and whether or not targets have been met. It will also look at projected energy performance. Outcomes may include changes in baseline, performance indicators, resource allocation etc.

28.5 Certification and Other Aspects

As indicated above, all the shipping related management systems, whether mandatory such as ISM or voluntary such as ISO 140001 and ISO 50001, have general features that are common between them. This is despite the fact that different systems focuses on different aspects of safety, environment or energy efficiency. Management certification is one way of demonstrating, in particular to external parties, that the company is complying with the above standards.

In shipping the main bodies that provide management system certification services to the industry are classification societies. As indicated by two examples [ABS 2012 and DNV 2013], class societies use integrated processes and guidelines to deal with all the above standards. For example, ABS has published a marked-up version of their guidelines on "Guide for Marine Health, Safety, Quality, Environmental and Energy Management" that shows how for example "energy management" has been added to the previously used guidelines that have been dealing with "Marine Health, Safety, Quality and Environmental" only.

Some class societies have published dedicated rules for certification of "ship energy management" that only deals with SEEMP aspect of energy management. Chinese Classification Society (CCS), in 2011, published their "Rules for Certification of Ship Energy Management" that deal with all aspects of certification including system requirements, data requirements, certification and energy audit for ship-board energy management.

On energy efficiency side, all classification societies provide services in "energy management system certification" and a number of companies have been certified so far. Being a new standard (i.e. ISO 50001), the number of certified shipping companies are not many yet. However, it is expected that with time and due to the significance on climate change debates, more and more companies will allocate resources to deal with energy saving and energy efficiency over the time.

28.6 References and further reading

The following list provides references for this section and additional publications that may be used for more in-depth study of topics covered in this section:

1. "IMO train the trainer course material", developed by WMU, 2013. Viewed Dec 2016.

2. ABS 2012, "Guide for Marine Health, Safety, Quality, Environmental and Energy Management (The ABS Guide for Marine Management Systems), APRIL 2012 (Updated February 2014), American Bureau of Shipping publication. Viewed Dec 2016.

3. China Classification Society 2011, "Rules for Certification of Ship Energy Management", 2011, Beijing, website. Viewed Dec 2016.

4. DNV 2013, "Seamless Guidelines for Implementing and Auditing Management Systems - Integrating ISO And ISM Certification", Rev, 1.3-2013. Viewed Dec 2016.

5. Lappalainen, J. 2008. "Transforming Maritime Safety Culture - Evaluation of the impacts of the ISM Code on maritime safety culture in Finland", Turku. Viewed Dec 2016.

6. IMO website "ISM Code and Guidelines on Implementation of the ISM Code 2014", http://www.imo.org/en/OurWork/HumanElement/SafetyManagement/Pages/ISMCode. aspx, Viewed Dec 2016.

7. ISO 50001:2011 "Energy management systems -- Requirements with guidance for use", ISO publications. Viewed Dec 2016.

8. ISO website, "ISO 14000 - Environmental management", http://www.iso.org/iso/home/standards/management-standards/iso14000.htm, Viewed Dec 2016.