Implanting Risk Assessment Methodology into the Requirements of ISM Code

دمج منهجية تقييم المخاطر في متطلبات مدونة السلامة البحرية

By
Ehab Etman & Ahmed Onsi
Arab Academy for Science, Technology and
Maritime Transport (AAST&MT)

الخلاصة

أقرت المنظمة البحرية الدولية عدد من التعديلات في مدونة السلامة البحرية (ISM Code) في قرار لجنة السلامة البحرية رقم 273(85) والتي دخلت حيز التنفيذ في يوليو 2010، ومن ضمن أهم تلك التعديلات هو مراجعة المادة رقم 1.2.2.2 والتي تنص علي انه علي الشركات الملاحية تقييم المخاطر المعرض لها السفن والأفراد التابعة لها والبيئة البحرية المتأثرة بتشغيل تلك السفن، وكما هو معلوم في السابق أن الكثير من متطلبات المدونة تتطلب عمل دراسة تقييم مخاطر، وهكذا تكون هذه التعديلات قد أقرت إدماج منهجية تقييم المخاطر صراحة في المدونة بدلا من التلميح لها ضمنيا.

تستعرض هذه الورقة فعالية دور مدونة السلامة البحرية (ISM Code) في صناعة النقل البحري وتأثير تطبيق المتطلبات الجديدة علي الشركات الملاحية.

Abstract

International Maritime Organization (IMO) Resolution MSC.273(85) adopted a number of amendments to the ISM Code which have entered into force on July 2010. Among these changes was the revision of clause 1.2.2.2 which introduces for the first time formal requirement for companies to assess the risks to ships, personnel and the environment arising from their shipboard operations.

The amendment makes explicit what was already implicit in the Code, since it is not possible to comply with many of the Code’s provisions without carrying out some form of risk assessment despite the fact that prior to the introduction of the amendment there was no specific requirement to do so.

The present paper demonstrates in brief the effectiveness of the ISM code and the impact of the implementation of the new requirements on shipping companies.

1. Introduction

The maritime industry plays a vital role in the world economy as the main carrier of international trade and driver of global supply chains. It transports over 90% of the world trade in volume and generates significant income for many States. Furthermore it employs over 1.2 million seafarers globally and contributes significantly to the development of subsidiary businesses and employment (IMO, 2008).

Until around mid of the 20th century, the majority of the ship-owners use to register their ships in their home countries. The custom was to employ local seafarers, such that the ship-owners and seafarers sailing onboard their ships had the same nationality. Since the maritime industry was operated and owned by ship-owners from countries with advanced economies, those States were known as the traditional maritime nations (Alderton and Winchester, 2002).

The traditional maritime nations generally implemented high standards for allowing ships to fly their flags and maintained strict regulatory practices. However, from the mid 1960s, as a consequence of deregulation and the increase of free market capitalism, many ship-owners preferred to register their ships in countries that offered less registration fees and relaxed regulatory systems. These countries are commonly known as the Flags of Convenience, which had little or no genuine link with the ship-owners (Ozcayir, 2001).

As a consequence of flagging out and employing labour from different parts of the world, the authority of States and local trade unions was disappeared. The declining influence of States and trade union organizations therefore posed a new threat in regulating the maritime safety in the maritime industry (Selkou and Roe, 2004; Lillie, 2004; Alderton and Winchester, 2002).

2. Response of Maritime Industry to the Concerns Related to Maritime Safety.

Regulating the maritime industry is a challenging task due to the nature of the business, ships very often do not remain in one State and spend most of the time at sea or in far away ports, remote from their managers and regulatory authorities. Consequently, conducting day to day managerial tasks, regulatory surveillance or implementing of uniform regulatory standards across this global industry possessed major challenges.

The establishment of IMO in 1958 played a great role in setting and harmonizing the maritime safety standards in the industry, by the 1950s; each shipping nation had its own maritime law. There were some international treaties and agreements which were developed as a result of accidents, but, they were not accepted or implemented by all maritime States.

IMO adopts internationally agreed regulations for subsequent implementation and enforcement under national legislation. Thus, regulations in the maritime industry are developed at the global level and involve individual States and industry stakeholders. Once a regulatory consensus is reached, the responsibility for implementing and enforcing the agreed global rules and standards is transferred to the individual States (Boisson, 1999; Li and Wonham, 2001).

In addition to a huge number of regulations and instruments, IMO have implemented the International Safety Management (ISM) Code, the first set of international regulations which attempt to integrate shore-based and shipboard operations to promote the safe operation of ships. The ISM code was introduced after a number of high profile accidents, among the worst was the loss of “the Herald of Free Enterprise” in the English Channel in 1987.

Regrettably, the great majority of the causality ships were technically meeting all the international maritime conventions and complying with safety standards and regulations, the officers were qualified and the crews were sufficient and well trained for their jobs, despite this, the systems failed with tragic loss of life, property and major pollution.

3. Introduction to the ISM Code

The ISM Code was adopted in 1993 and through incorporation into SOLAS Convention as Chapter IX, the ISM Code became mandatory for passenger ships, high speed ships, tankers, bulk carriers and gas carriers on 1 July 1998 and on 1 July 2002, the ISM Code became applicable for all cargo ships over 500 tons gross. ISM code requires those working in the maritime industry to manage safety as integral part of their working practices. But there are no prescriptive rules to say how this must be done only broad guidelines (Anderson, 2003).

ISM Code was introduced as a regulatory requirement, specifically designed to promote a form of regulated self-regulation in the maritime industry; the Code did not add any new technical or operational features but required the shipping companies to abide by the existing rules and regulations as well as guidelines recommended by various industry stakeholders. It further pointed out that the three most important objectives of the Code are to:

- Provide for safe practices in ship operation and a safe working environment.
- Establish safeguards against all identified risks which was amended later to "assess all identified risks to its ships, personnel and the environment".
- Continuously improve the safety management skills of all employees (IMO, 2008).

Principally, the ISM Code provided only a broad infrastructure of functional requirements; the Company is then required to establish and implement a policy and develops procedures, based on the functional requirement to suit their operating style and trading pattern of ships in their fleets, for achieving the objectives. This includes providing the necessary resources and shore-based support.

On the other hand, every company is expected to designate a person or persons ashore having direct access to the highest level of management. The procedures required by the Code should be documented and compiled in a Safety Management Manual (SMM), a copy of which should be kept on board. The organization's specific policies and procedures were commonly known as Safety Management System (SMS) (IMO, 2002a).

Besides the managers, the ISM Code also obliged the Flag States to play an important role in overseeing the implementation of the management system. It required the States to carry out regular audits and certify each shore based ship management unit and each ship belonging to the unit before they could start trading.

The certificate issued to the shore-based management units was known as the Document of Compliance (DOC) while the certificate issued to each ship was known as the Safety

Management Certificate (SMC). The States could issue them for a maximum of five years and were required to conduct intermediate inspections (IMO, 2002a).

The ISM Code is clearly intended to provide a framework that will lead to the adoption by all ship operators of effective management methods that will lead to enhancement of marine safety and pollution prevention. An increased level of safety necessarily means a reduction in the risk levels, requiring a clear assessment of those risks and an analysis of the practical ways that the risks can be managed. Risk assessment and the ISM Code go hand in hand (Pomeroy, 1999).

4. An Overview of the effectiveness of the ISM Code

According to IMO, the success of the ISM Code depends on its effective implementation and is underpinned to a great extent by the competence and continued commitment and motivation of individuals at all levels, in both companies and on board ships. The outcome of the successful implementation of the ISM Code envisages the enhancement of a safety culture throughout the shipping industry.

Phil Anderson, vice-president of the Nautical Institute, undertook a research project to study the benefits of the implementation of the ISM Code (Anderson *et al.*, 2003). The study concluded that the ISM Code has the potential to work, but different companies and individuals experienced different levels of achievement. It revealed how the perceptions of seafarers differed significantly from the managers or other shore-based personnel in the industry. It had also pointed out that leadership, commitment from the top, continuity of employment and good communication between shore and ship were some of the most important factors for the success of the implementation of the Code. Besides, education and training programmes for seafarers were also essential for its implementation.

Inevitably, IMO has recognized the importance of assessing the effectiveness of the impact ISM implementation by collecting and analyzing data from port state control memorandum of understanding, the International Association of Classification Societies (IACS) and other maritime organizations. Furthermore, an Independent Expert Group was established to collect and analyze data to study the impact of the ISM Code and its effectiveness and to submit a report with its findings and recommendations.

A study was conducted between 2004 and 2005 by the IMO. It set out to identify the impact of the ISM Code and its effectiveness in the enhancement of safety of life at sea and protection of the marine environment. The study showed an overwhelmingly positive perception of Flag State administrators towards the effectiveness of ISM code in enhancing the safety of life at sea, 99% of the shore-based personnel believed that the SMS used in their companies was either useful or very useful equally and 95% of the seafarers who responded indicated that as a consequence of the implementation of the ISM Code the ships are now safer places to work.

The group of experts concluded that the ISM Code was beneficial to enhance the safety and pollution prevention standards and revealed that, where the ISM Code is embraced as a positive step toward efficiency through safety culture, tangible benefits are evident. It also identified a number of issues such as the need for better motivation of the seafarers, streamlining and reducing paperwork, greater use of technology and involving seafarers in the continuous improvement of SMSs (IMO, 2006).

Unquestionably, among a number of major hazards which pose very serious threats to the safe operation of ships and which must be addressed, if the ISM Code is to stand any chance of succeeding in fulfilling its objectives are fatigue, safe manning levels and recruitment of seafarers for now and for the future (Anderson, 2005).

Recognizing that one of the most important issues behind implementing the Code was to find a solution to the worsening state of Occupational Health and Safety (OHS) in the maritime industry, however the code was mostly ineffective (Lloyds List, 2008). A major concern has been that many ISM Code certified ships continue to be dangerously operated due to poor management of onboard OHS. Ineffective implementation of the Code raised a question of underlying assumption that self-regulation is an appropriate and effective way of managing OHS in the maritime industry.

The chemical tanker Bow Mariner was lost off the USA Coast in 2004, after an explosion which caused catastrophic structural damage and led to immediate flooding of nearly the entire cargo area. The ship sank with the loss of 21 lives and major spill. The vessel was owned by reputable Norwegian shipping company; the managing operators had in place a sophisticated Safety, Quality and Environmental Management System. The DOC had been revalidated very recently following a revalidation audit and a new SMC had been issued only a month before the tragedy. The authors are in doubt that the management system manuals would have been very well written, or perhaps it was not followed (USCG, 2004).

The authors believe that there is one aspect of the Code, in particular requires developing and clarifying, that is to introduce risk assessment and risk management in a more formalized way as one of the standard proactive accident prevention tools. The Code has been interpreted by many, as involving the use of formalized risk assessment, but it is open to interpretation.

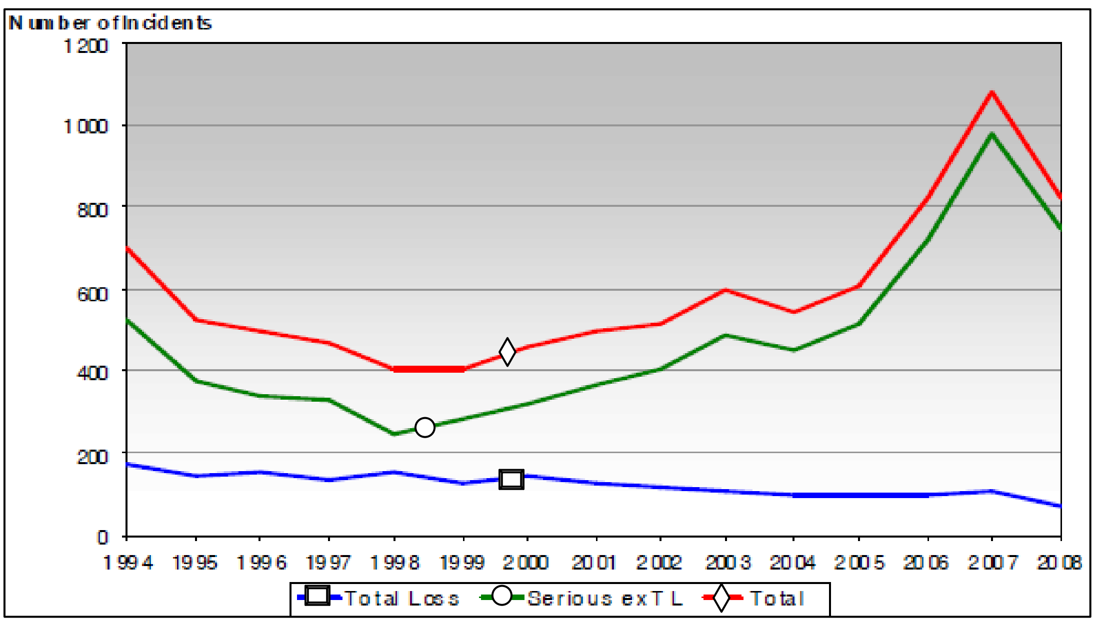

Figure (1): Statistics of number of Serious and Total Losses of ships over 500 GT from1994– 2008
(Source: IUMI 2009 Bruges – Hull Fact Sheet as prepared by the IUMI Facts & Figures Committee
Figures are as at August 2009)

IMO decided to pursue another study to assess the effectiveness of the Code's implementation. Significantly, the working group's report suggested that there was a need for in depth, qualitative research into the ISM related performance of ships and company offices (IMO, 2006). Figure (1) shows the number of serious and total losses of ships over 500 GT from 1994 to 2008. There is no sign of any reduction of the number of accidents after the date of the implementation of the ISM code.

Significant amendments were introduced to ISM code at the 85th session of the IMO Maritime Safety Committee (MSC) with the objective of enhancing the effectiveness of the Code implementation, these amendments came into effect on the 1st of July 2010; moreover, a new guidelines on implementation of the ISM Code by Administrations were adopted.

The new requirements are set out in IMO Resolution MSC.273 (85). It includes many changes such as imposing requirement for masters review their SMS periodically and requires procedures for corrective action include measures to prevent recurrence. Amongst the most fundamental changes is the provision for pro-active risk assessment, with the obligation to assess all risks and establish safeguards and to show in the SMS how these risks were identified.

5. Introduction to Risk Assessment

The use of risk assessment techniques in major hazard industries has grown significantly in recent years. Currently this is particularly true in the maritime industry; as it became a requirement of the ISM Code which has to be fulfilled in parallel with meeting regulatory requirements, industry codes of practice, or Classification Society Rules. In point of fact, risk assessment is now a proven technology for ship operators and shipboard personnel to address hazards in a structured manner and to ensure risks have been reduced to appropriate levels cost effectively.

Before beginning a discussion of risk assessment, it is important to provide a clear definition of the term “risk” and “Hazard” as they represent the main terminology used in the risk assessment field.

- Hazard is a condition which may potentially lead to an undesirable event.

- Risk is defined as the product of the probability with which an event is anticipated to occur and the consequence of the event's outcome.

$$\text{Risk} = \text{Probability} \times \text{Consequence}$$

Risk assessment is the process of gathering data and synthesizing information to develop an understanding of the risk of a particular activity. To gain an understanding of the risk of an operation, one must answer the following three questions: What can go wrong? How likely is it? What are the impacts? Qualitative answers to one or more of these questions are often sufficient for making good decisions. However, as managers seek more detailed cost/benefit information upon which to base their decisions, they may wish to use Quantitative Risk Assessment (QRA) methods (ABS, 2000).

5.1 Risk management process

To use a systematic method to determine risk levels, the Risk management Process is applied. This process consists of four basic steps:

I. Hazard identification

Since hazards are the source of events that can lead to undesirable consequences, analyses to understand risk exposures must begin by understanding the hazards present. Although hazard identification seldom provides information directly needed for decision making, it is a critical step. Figure (2) illustrates The Risk Management Process in which hazard identification comes as a preparatory step to risk assessment.

Figure (2): Risk Assessment Process, source: International Naval Surveys Bureau (INSB), Guide for risk assessment, may 2010

Sometimes hazard identification is explicitly performed using structured techniques. Other times, generally when the hazards of interest are well known, hazard identification is more of an implicit step that is not systematically performed. Overall, hazard identification focuses a risk analysis on key hazards of interest and the types of mishaps that these hazards may create.

II. Risk assessment

Once the hazards and potential events have been identified for an activity or operation, the likelihood and consequences associated with these events have been estimated, we are able to evaluate the relative risks associated with the events. There are a variety of qualitative and quantitative techniques used to do this.

Once assignment of consequences and likelihood is complete, a risk matrix can be used as a mechanism for assigning risk and making risk acceptance decisions, each cell in the matrix corresponds to a specific combination of likelihood and consequence and can be assigned a priority number or some other risk descriptor as shown in Figure (3).

	CONSEQUENCES				INCREASING LIKELIHOOD				
					A	B	C	D	E
Severity	People	Assets	Environment	Reputation	never heard of in the industry	heard of in the industry	has happened in the organization, or more than once per year in the industry	has happened at the location, or more than once per year in the organization	has happened more than once per year at the location
0	no injury or health effect	no damage	no effect	no impact					
1	slight injury or health effect	slight damage	slight effect	slight impact					
2	minor injury or health effect	minor damage	minor effect	minor impact					
3	major injury or health effect	moderate damage	moderate effect	moderate impact					
4	PTD or up to 3 fatalities	major damage	major effect	major impact					
5	more than 3 fatalities	massive damage	massive effect	massive impact					

Figure (3): Risk Matrix, source: Marine Coastguard Agency (MCA), 2009

An organization must define the categories that it will use to score risks and, more importantly, how it will prioritize and respond to the various levels of risks associated with cells in the matrix (MCA, 2009). The risk matrix has to be divided into three risk categories: high risk (unacceptably high), medium risk (acceptable but must be managed) and low risk (acceptable without required further action).

III. Manage the risk to acceptable level.

After the risk has been identified and analyzed, management decides what corrective action, if any, is necessary to manage the hazard at an acceptable and As Low as Reasonably Practicable (ALARP) risk level depending on the nature of the specific hazard(s).

IV. Review and verify hazards and risks.

Depending on the magnitude of risks and the potential consequences of hazards, these should be periodically reviewed by competent staff. The reviews should involve those parts of the organization which are involved in day-to-day management of these hazards i.e. the operations and maintenance functions. As a typical issue for these reviews one should verify if the base assumptions have changed since the risks were assessed previously. (Sagen, 2008)

6. Implanting Risk Assessment methodology into the Safety Management System.

Obviously, regulating occupational health and safety on board ships is not new invention; existing safety measures may already provide a high level of safety for workers. For instance, well-established procedures, inspections by safety officers and the use of "permits to work" which control safety conditions, not only will contribute to accident prevention but also to the identification of hazards and measures for safe working.

The idea of operational risk assessment had always been alluded to in the ISM Code but the original language had stopped short of making this a formal requirement of the Code in an explicit manner. The amendments get much closer and do make it clear that there is an expectation that the company will adopt a risk based approach to manage safety; accordingly companies should adopt the risk assessment approach to their safety management system. This means that all work activities should be considered from a risk assessment standpoint.

The method to be adopted for assessing risk and establishing safeguards is left to each individual company subject to the approval by the relevant administration. Companies may rectify the existing safety management systems to meet the risk assessment principles, taking into account the nature of their operations and the type and extent of the hazards and risks to workers. (GL, 2010)

The authors believe that the assessment of risks must be suitable and sufficient. The process need not to be overcomplicated. That means that the amount of effort that is put into an assessment should depend on the level of risks identified and whether those risks are already controlled by satisfactory precautions or procedures.

It has to be well emphasized that the procedures which exist in the SMS are assessed versus risks, which are identified and managed in earlier stages of SMS development. Accordingly not all operations need to carry out risk managements process, risk management has to be done in the following situations (but are not limited to):

- Operations that are not done frequently.
- Operations which may cause high impact on health or environment.
- Routine operations which are done in adverse (abnormal) conditions.
- Any operation which the master or head of department may consider hazardous enough to carry risk management.

Companies should ensure that their policies and procedures concerning risk assessment are documented; that the associated responsibilities and authorities are clearly defined; that adequate training and guidance have been provided to individual members of staff according to the extent and level of their involvement in the risk assessment process; that procedures and instructions are in place for the assessment methods chosen; and that records of the risk assessments carried out are maintained.(Heijari, Ulla, 2010)

The extent to which individuals on board and ashore are involved in and have responsibility for the conduct of risk assessments will depend on the way in which responsibilities, authorities and competences are distributed within their organizations. Even companies that are engaged in similar operations and have similar organizational structures may decide to use different risk assessment methods.

Regardless of how they choose to conduct their risk assessments, companies must ensure that they can demonstrate that they have carried out a systematic examination of their operations that they have identified where things may go wrong and that they have developed and implemented adequate controls. Where appropriate a company may decide to rely on generic industry guidance.

7. Conclusion

Initially, ISM Code was introduced to establish a management system in shipping companies to ensure the safe operation of ships and the prevention of pollution, however, many shipping accidents and causalities revealed that the Code is not totally effective in many cases; perhaps the main reason was the ineffective implementation processes by many shipping companies.

Integrating the new amendments to the Code is a great opportunity to the shipping companies to apply the risk assessment methodology into their routine work and safety systems in order to achieve the ISM code objectives. However, it is important for the shipping companies to recognize that they are responsible for identifying the risks associated with its particular ships, operations and trade. It is no longer sufficient to rely on compliance with generic statutory and class requirements, and with general industry guidance. These should now be seen as a starting point for ensuring the safe operation of the ship.

Although, the ISM Code does not specify any particular approach to the management of risk, and it is for the company to choose methods appropriate to its organizational structure, its ships and its trades. The methods may be more or less formal, but they must be systematic if assessment and response are to be complete and effective. The entire exercise should be documented so as to provide evidence of the decision-making process.

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