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# Guidelines for a short course on Egyptian marine officers' responsibilities for the marine environment

Mohammed Alaa Kamel Farag
*WMU*

AUPH

WORLD MARITIME UNIVERSITY
Malmö, Sweden

# GUIDELINES FOR A SHORT COURSE ON EGYPTIAN MARINE OFFICERS' RESPONSIBILITIES FOR THE MARINE ENVIRONMENT

By

MOHAMMED ALAA` KAMEL FARAG
Egypt

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## DECLARATION

I certify that all the material in this dissertation that is not my own work has been identified, and that no material is included for which a degree has previously been conferred on me.

The contents of this dissertation reflect my own personal views, and are not necessarily endorsed by the University.

14.10.1996

Supervised by:

Name: **Prof. Theodore Sampson**

Office: **GMA&EP Course Professor**

World Maritime University

Assessed by:

Name: **Cpt. Jan Horck**

Office: **GM&EP Lecturer**

World Maritime University

Co-assessed by:

Name: **Prof, Dr. Karl Lidgren**

Office: **Director**

The International Institute for Industrial Environmental Economics. (Lund University)

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***THIS DISSERTATION IS DEDICATED TO***

***THE SPIRIT OF MY MOTHER***

## ABSTRACT

Egypt has a strategic geographical location straddling both the Mediterranean and the Red Seas that constitute two of the major enclosed coastal seas in the world. Egyptian coasts have a total length of about 1630 km in the Mediterranean and Red Seas. A large part of the coastal areas in Egypt is contaminated with oil from various sources. Shipping activity contributes significantly to the current situation regarding oil pollution of the country's territorial waters.

The reasons for oil pollution in Egyptian waters are many, and Egyptian marine officers play a significant role in contributing to the pollution of the marine environment.

This research examined the causes behind the prevailing lack of knowledge among Egyptian marine officers regarding oil pollution matters. The methodology adopted was the development of a questionnaire that was distributed to a sample of marine officers represented the overall situation among Egyptian marine officers. Through an analysis of the completed responses, a better understanding of the causes of oil pollution in Egyptian water was revealed.

The analysis revealed that the lack of knowledge relating to international conventions, especially MARPOL 73/78, reflected the area of greatest ignorance. The potential damage resulting from oil spills holds the second position of greatest ignorance. The significance of ship/shore safety check lists and the existence of oil spill contingency plans occupy the third and forth positions respectively.

This research has also focused on explaining the importance of each subject area identified for inclusion in the short course. It concludes with a recommended model for a short course curriculum aiming to assist those marine officers to have a greater appreciation for the importance of protecting the marine environment from oil pollution from ships.

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## LIST OF ABBREVIATIONS

| | |
|---|---|
| API | American Petroleum Institute (reverse of specific gravity) |
| GESAMP | United Nations Group of Experts on the Scientific Aspects of Marine Pollution |
| GMT | Greenwich Mean Time |
| GRT | Gross Register Tonnage |
| ICES | International Council for Exploration of the Sea |
| IGOSS | Integrated Global Ocean Station System |
| IMO | International Maritime Organisation |
| IOPPC | International Oil Pollution Prevention Certificate |
| LAPIO | Low API Oil |
| MARPOL 73/78 | International Convention for the Prevention of Pollution from Ships, 1973, as Modified by the Protocol of 1978 |
| MEPC | Marine Environment Protection Committee |
| NAH | Non-Aromatic Hydrocarbons |
| NLSC | International Pollution Prevention Certificate for the Carriage of Noxious Liquid Substances |
| NRC | National Research Council |
| OCIMF | Oil Companies International Marine Forum |
| PAH | Polycyclic Aromatic Hydrocarbons |
| ROPME | Regional Organisation for the Protection of the Marine Environment |
| UN | United Nations |
| VLCC | Very Large Crude Carrier |

# CHAPTER (1)

## The Need of the Training Course

### 1.1 Egypt is a Coastal Country

#### 1.1.1 Physical Geography

The Arab Republic of Egypt occupies the north-eastern corner of the African continent with an extension across the Gulf of Suez into the Sinai region which is usually, but not always, regarded as lying in Asia. The area of Egypt is 997,738.5 sq.km (385,229 sq. Miles) but only 6% can be said to be permanently settled, the remainder being desert or marsh.

The greatest distance from north to south is 1,024 km (674 miles), and from east to west 1,240 km (770 miles), giving the country a roughly square shape (Regional Survey of the World, 1995). The Mediterranean and Red Seas form respectively the northern and eastern boundaries.

Egypt has political frontiers on the east with Israel, on the south with the Republic of Sudan, and on the west with the Great Socialist People's Libyan Arab Jamahirya. The actual frontiers run, in general, as straight lines drawn directly between defined points, and do not normally conform to geographical features.

Egypt occupies a significant place in the world as a region where, in all probability, the earliest developments of civilisation and organised government took place. Although many archaeologists would not wholly subscribe to the view of Egypt being the first civilised country, there can be no doubt that from very early

times the lower Nile Valley has been prominent as possessing strongly marked unity with a highly specialised and characteristic way of life.

### 1.1.2 Coastal Features

Egyptian coasts have a strategic geographical location straddling both the Mediterranean and the Red Seas which constitute two of the major enclosed coastal seas in the world. The northern coast in the Mediterranean Sea has a length of about 800 km (497 miles) whereas, the eastern coast in the Red Sea is about 830 km (515 miles). The two seas are connected by the Suez Canal, 162 km (101 miles), which is considered by many to be the most important artificial marine passage in the world. Ships that pass through the Suez Canal number about 80 ships per day of varying sizes and types (Regional Survey of the World,1995).

The Gulf of Suez occupies part of the north-eastern coast of Egypt. It is a shallow body of water, with maximum depth of between 60 and 70 meters, and a length of about 310 km (Regional Survey of the World, 1995). The Gulf of Suez is the largest marine passage for oil tankers in the world. More than 90% of the oil that is transported by sea from the Arabian Gulf area to Europe and the USA passes through the Gulf of Suez and the Suez Canal (Shou Ma, 1995).

### 1.1.3 Coastal Zone Activities

Throughout Egypt`s long coast, a variety of activities occur which include those of the shipping industry, oil exploration, tourism, and fishing.

With regard to the **shipping industry**, most of Egypt`s foreign trade is conducted through Egyptian ports. The main ports in Egypt are Alexandria (the second largest port in the Mediterranean after Marseilles), Domietta, Port Said, port of Suez, and the port of Safaga. Shipyards are also found in the main ports for ship repairs and building new ships. Oil terminals are situated in the area, especially in

Alexandria and the Gulf of Suez. In addition, the pilotage operations in the Suez Canal occupy a significant sector in the port activities of that area. The national economy depends very much upon the Suez Canal income.

**Offshore oil exploitation** is another activity conducted within the country's territory. Most of Egypt's oil rigs and platforms are located in the Gulf of Suez. Moreover, refineries are found near the main ports in Alexandria and in the Gulf of Suez. Sumid is a large private oil terminal located west of Alexandria. It supplies oil tankers with crude oil that has been pumped through land pipelines connected from the Suez Gulf. Since oil exploration is an important activity in the Gulf of Suez, there is consequently, a high density of oil rigs in that area.

**Tourism and recreational activities** have accelerated significantly in the last decade. The Gulf of Suez and the Red Sea coasts are considered as the most attractive areas for marine tourism activities in the region. Those waters have a high coral diversity, hundreds of species of hermatypic corals and also hundreds of species of soft corals in addition to a wide range of fish species and reef fish. Such unique and rare ecological characteristics attract scuba diving hobbyists from all over the world. There are a number of diving resorts located in Na'ama bay, Nuweiba, Ras Mohammed Hurgada and Sharm El Sheikh, the later being the most popular one.

**The fishing industry** is not as developed as the previous industries. However, small fishing ports can be found along the northern coast. Fish products nearly cover the domestic needs, if fresh water fish products from the Nile river and Lake Nasser in the south are included. At the same time, the industry does not contribute significantly to the generation of employment.

## 1.2 The Situation of Egyptian Coasts with regard to Oil Pollution

Regretfully, most of the coastal areas in Egypt are not in good condition. The region has been degraded and damaged by improper use, pollution impacts, and neglect. In spite of the fact that the Mediterranean and Red seas were designated as "Special Areas" in which the discharge of oil from ships is prohibited according to the International Convention for Prevention of Pollution from Ships (MARPOL 73/78), oil and tar balls cover large portions of the sea surface.

The following two case studies demonstrate the existing situation:

- **The first case study** was conducted by Prof. Aly M. A. Abd-Allah in March 1994 from the Marine Environment Research Division, National Institute of Oceanography and Fisheries, and Prof. Abd-EL-Khalik El-Sebae in the department of Pesticide Chemistry, Faculty of Agriculture, Alexandria University and was puplished the report in Toxicological and Environmental Chemistry, Volume 47, 1995. The report addressed Hydrocarbon Contamination of the Egyptian Mediterranean Coast, as shown in figure 1.1.

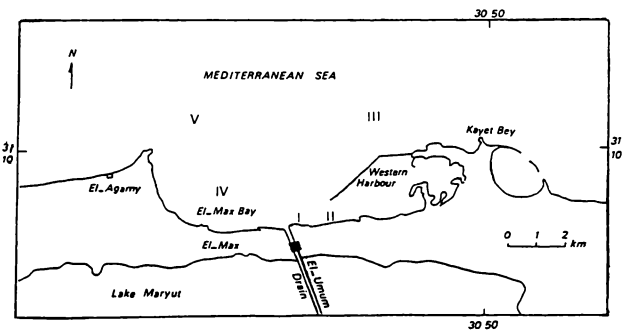


**Fig. 1.1** ***Location of sampling in El-Max Bay.***

The report is introduced by declaring that the total input of petroleum pollutants from all sources in the Mediterranean Sea is best estimated as 0.35 million metric tons/year, **and 45% of this value is related to marine transportation activities.** Further attention was devoted to exploring residue levels in two species of fish commonly favoured by Egyptians in their diet as well as being widely distributed throughout Egypt.

The study looked at

The distribution and origin of non-aromatic hydrocarbons (NAH) and polycyclic aromatic hydrocarbons (PAH) in sediments and fish tissue from El-Max Bay, west of Alexandria. UV-fluorescence spectroscopy technique was used for the analysis of total hydrocarbons against PH-chrysene and also ROPME oil (Kuwait Oil) at 250-550 nautical miles from El-Max Bay. Hydrocarbon compounds were extracted from sediments and fish samples and then analysed. Fish were collected from different locations in El-Max Bay.

The study revealed that

The (NAH) concentrations ranged from 4.5 to 10.3 μg/g as dry weight in sediment. Remarkable variations were noted among stations (5 stations). The level of (NAH) was 104.0 and 570.0 μg/g respectively, in Sardina Pilchards and Saprus Auratus (the two fish species), while the values were 69.0 and 409.0 μg/g for (PAH).

Results and Discussions

The authors described the results of the study as follows:

> "The concentration of the main hydrocarbon series and diagnostics in studied sediment samples are found in station (2) within (5) stations as shown in figure 1.1. Station (2) gave the highest levels of 252.0μg/g in the case of Chrysene oil while this value was 109.0 μg/g

when ROPME oil was used. The levels average in fish tissue were 15.6-20.0 and 22.0-38.0 μg/g in Sardina pilchardus and Sparus auratus respectively, equivalent to Chrysene while these values were 96.0-145 and 180-230.0 μg/g in the same respect." See table 1.1.

| Components Concentrations (μg/g) in Studied Fish Samples in El-Max Bay | | |
|---|---|---|
| **Component** | **Sardina Pilchardus** | **Sparus Auratus** |
| RH-Crsene Oil | 15.6- 20.0 μg/g | 22.0- 38.0 μg/g |
| RH-Ropme Oil | 96.0- 145.0 μg/g | 180.0-230.0 μg/g |

**Table 1.1** *Source: Toxicological and Environmental Chemistry, Vol. 47.*

The study contains more scientific analysis about the non-aromatic hydrocarbons and polycyclic aromatic hydrocarbons that do not directly relate to the discussions in this particular dissertation. However, this data can be interpreted to indicate that the concentrations of oil as a result of pollution in the physical environment in this region is finding its way into the food chain that is directly utilized by the people of the area.

- **The second field study** was done by B. Dicks and S.S.C. Westwood, of the Oil Pollution Research Unit, Field Studies Coicil Orielton Field Centre, Pembroke, Dyfed, UK. It looked at Oil and the Mangroves of the Northern Red Sea (Fate and Effects of Oil in Marine Ecosystem 1987).

**The report described the location of the study and the existing situation there as follows**

In the northern Red Sea, mangal stands are rare and non-specific. Only the black mangrove, Avicenia marina has been recorded this far north; at Ras

Mohammed, the Geisum Islands and Abu-Minqar at the mouth of the Gulf of Suez and outer regions of the Gulf of Aqaba. These species live around the middle and high water mark in these micro-tidal habitats, and also extend into areas of nearshore lagoons in embayments or inshore of fringing coral reefs, in areas which may not dry out at low water.

Aviciennia marina mangroves are sensitive to the effects of spilled oil which cause defoliation and death of trees by coating breathing roots and penetrating into sediments. Whilst some areas of mangrove have been killed on the south shore of South Geisum, equally heavily oiled mangal nearby, along the west shore and on Abu-Miqar Island have not perished, in spite of a 100% cover of oil on breathing roots and heavy (up to 5 cm thick) accumulations on sediments.

The remainder of the research sought to identify the reasons why such mangroves survived in spite of being covered with a thick layer of oil. The study has clearly described the situation in some parts of the eastern coast of Egypt. Also, the study has given some reasons for oil pollution in those areas. It is reported that the exponential growth of coastal and offshore oil exploration and production in the Gulf of Suez, and more recently amongst the Ashrafi, is a great cause for concern regarding damage to habitats of both coral and mangrove. Wenink and Nelson Smith (Fate and Effects of Oil Spill, 1987) have reported heavy oil spills along considerable lengths of the Red Sea coastline from shipping, refining and oil production. They have also warned that more recent surveillance of this coastline reveals that the situation may be deteriorating rather than improving.

These two case studies indeed reflect the current situation along the Egyptian coasts. Moreover, oil pollution exists in the main ports such as Alexandria and Suez. This means that pollution comes, not only from ships that sail in the territorial waters

and pass through the Suez Canal, but also from ships that call at the national ports, originating either from national or foreign ships.

### 1.3 Main Reasons for the Current Situation

There are many reasons for oil pollution in the Egyptian waters. But the most important ones could be lack of political will and institutional indifference.

With regard to the **political will,** Egypt is considered to be among one of the first countries to have ratified most of the international conventions dealing with the protection of the marine environment and control of pollution. In addition, the national Parliament has recently developed an environmental law (number 4 for year 1994). This law deals with all environmental matters including the marine environment.

In spite of the existence of this legislation previously mentioned, they are not fully complied with. The reasons for this can be found in the following:

- The people who are involved in these matters lack the relevant education. They do not appreciate the damage that results from oil when it is spilled into the sea, and how much it threatens the marine environment and their own existence.
- The people have a shortage of equipment to enable them to track those responsible for oil spills and to collect the evidence needed to pursue legal recourses. Such equipment includes boats, communication facilities and chemical laboratories.
- The people lack funds to cover the expenses of observing operations as well as the repair and maintenance of the little existing, and exhausted equipment.
- Employers lack financial and personal motivation to do their best to keep the national waters always clean.
- Administrative problems, including, poor demarcation of administrative and sectoral responsibilities results in friction and duplication of government efforts.

Institutional Indifference

With regard to institutional indifference, a survey was conducted where certain questions were designed to highlight the role played by marine officers in contributing to the pollution of the marine environment. This point must be considered in the context of the institutions from which they graduated.

*The remainder of this chapter seeks to examine the causes that result in violations of national and international regulations that govern marine pollution. The methodology adopted was the development of questionnaires that were distributed to a sample of marine officers representative of the majority of the marine officers in Egypt. Through an analysis of the completed responses, a better understanding of the causes of oil pollution in Egyptian water is revealed.*
*(The complete questionaire is included in appendix I).*

### 1.4 Questionnaire Analysis

This survey was conducted in December 1995 and January 1996. It was intended that the range of questions posed, would adequately reveal the broad dimension of the causes behind the prevailing institutional indifference. All respondents were instructed to provide short clear answers in order that such could be clearly and easily understood. The questions were devised in such a way as to relate to the main responsibilities on board any merchant ship, in the deck and engine departments. A total of one hundred and three (103) papers were distributed to the officers in both departments. Fifty-nine (59) of the questionnaires were returned with thirty-one (31) coming from the deck officers and twenty-eight (28) from the engineers.

- **The first question** that was posed to the officers required them to define the damages caused from oil spillage in the marine environment.

This question was of great significance in determining the proclivity of an officer to discharge oily wastes overboard with little or no regard for the consequences to the environment.

The collected responses were studied and evaluated in four categories, according to their levels of knowledge and understanding as shown in table 1.2.

| The Respondents Understanding Regarding the Effects of Oil Spills on the Marine Environment | | | | | |
|---|---|---|---|---|---|
| | Good | Intermediate | Little | No | Total |
| Deck officers | 22% | 29% | 39% | 10% | 100% |
| Engineers | 7% | 11% | 46% | 36% | 100% |

**Table 1.2**

Table 1.2, indicates that nearly half of the deck officers (48.4%), and (82%) of the engineers have little or no knowledge about these effects. This result indicates that most marine officers in Egypt are ignorant about the marine environmental damage that can result from oil spills in the sea.

-**The next two questions** sought to assess the level of the officers' knowledge regarding international conventions generally and MARPOL 73/78 in particular. This type of knowledge is extremely important since it will provide the officers with the necessary guidelines and regulations that they would need, to prevent or control pollution of the sea by oil, even if they are unaware of the damages associated with an oil spill.

A good understanding of these regulations and how they ought to be implemented has two main objectives. The first is to stop the dumping of oily water

and the other hazardous materials into the sea except in certain limited circumstances according to these regulations. The second is to avoid ship's detention and the extremely high fines in case of violating these rules in the national and foreign territorial waters. In some countries these fines are extremely high, and if violations are repeated it could result in prison terms. Realization of both objectives by Egyptian marine officers would result in their contributing to the protection of the marine environment.

The following table 1.3 reflects their responses concerning this issue:

| Respondents' Knowledge Regarding International Conventions Especially MARPOL 73/78 | | | | |
|---|---|---|---|---|
| | Deck Officers | | Engineers | |
| | number | percentage | number | percentage |
| **Informed** | 10 | 32.3% | 4 | 14.3% |
| **Uninformed** | 21 | 67.7% | 24 | 85.7% |
| **Total** | 31 | 100% | 28 | 100% |

**Table 1.3**

After analysing the results, it was found that more than 67% of the deck officers and 85% of the engineers have no idea at all about these conventions, especially MARPOL 73/78. This means that the vast majority of Egyptian marine officers need to study these rules and regulations and how to implement them. Otherwise, their vessels will most likely become the subject of claims and enforcement actions when abroad. Moreover, the current situation regarding oil pollution in the Egyptian waters will surely worsen.

- **Questions 4 and 5** focused on the existence of a shipping company's instruction book that identifies the national and international regulations dealing with oil

pollution prevention from ships, and whether the officers have studied it or not. While these two questions are related to the previous two, their aim was to determine the reason(s) behind this persistent lack of awareness regarding the conventions.

The respondents who were informed of the existence of the instruction book concerned (67.7% of deck the officers and 53.6% of the engineers) mentioned that they knew it and they had studied the rules and regulations that these booklets contain. The rest of the respondents were unaware of the existence of it. The responsibility for this lack of awareness well may fall on their companies' administrative and management policies. It is important to supply each vessel with these instruction books to ensure that the officers have a full understanding about the national and international regulations relating to marine environment protection.

- **The next two questions 6 and 7** concerned shipboard contingency plans to deal with oil spill accidents when they occur on board the ship, and whether the officers are prepared and capable to execute such plans. These contingency plans have to be found on board every ship, especially tankers. The officers are required to know them completely. It is the way by which the ship's crew can combat any oil spill accident that might occur on board their vessels. If they are well trained in such plans, they can reduce and control the spill and eliminate or limit the consequent damage that might result from the spill.

The capability to respond to any oil spill immediately and effectively, requires experience and training on the part of the ships' officers. Furthermore, every member of the crew is required to be aware of and capable of executing the contingency plan. Marine officers carry out this responsibility by conducting simulation exercises based on the contingency plan. If they do not know how to perform their duties, it is likely that the crew will not be able to effect a proper response.

The responses collected from the officers who have served on board national ships specifically and indicated their knowledge regarding the existence of and understanding of the shipboard contingency plan.

Responses varied from one group to the other, e.g. 14 (45.2%) from the deck officers and 16 (57.1%) from the engineers were informed of the existence of the contingency plan on board their ships. They had studied it and knew how to execute it in case of any oil spillage accident. Whereas 8 (25.8%) and 5 (17.9%) from the deck officers and engineers respectively were not aware of the existence of such plans and 6 (19.4%) from deck the officers and 3 (10.7%) from the engineers were aware of the existence of the plan but had not studied it. The rest of the deck officers 3 (9.6%) and the engineers 4 (14.3%) indicated their ignorance about such plans.

It is concluded that about 50% of the marine officers in Egypt do not know how to respond effectively to oil spillage from their ships. It is important that they learn this vital information to combat any oil pollution incidents in a timely manner to reduce the damage as much as possible.

- **Questions 8 and 9** concerned the existence and usage of a check list regarding loading and discharging of cargo and the transfer of fuel oil on board ship.

There are various methods by which oil can enter the sea and cause pollution, many of which can be prevented. One of these methods of prevention is through the use of a check list to avoid and prevent the discharge, spillage and leakage of oil into the sea from routine operations. Marine officers, especially engineers, should know and understand those lists, and use them successfully during every stage of these operations.

The objective of these questions was therefore to determine the existence of these lists and whether the officers utilise them.

The following table 1.4 contains the statistics regarding their responses:

| Existence and Usage of Check Lists | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Positive | | Negative | | Not available | | Total | |
| | No. | % | No. | % | No | % | No | % |
| Deck Officers | 15 | 48.4% | 10 | 32.3% | 6 | 19.3% | 31 | 100% |
| Engineers | 12 | 42.9% | 7 | 25% | 9 | 32.1% | 28 | 100% |

**Table 1.4**

Note: All respondents who indicated they were aware of the existence of the check lists, also indicated that they used them.

The survey showed that more than 51% of the deck officers and 57% of the engineers were not aware of the existence of these check lists, or that they failed to utilise them. The statistics also demonstrated that the negative responses from the engineers were greater than for the deck officers. This is particularly noteworthy in that most of these operations are under the control of the ships' engineers. These figures indicate a lack of awareness regarding the importance of the check lists among the officers.

- **Questions 10 through 13** elicited the number of accident(s) that resulted in oil pollution during the officers' service on board ships. The objective of these questions was to gain insight to whether these accidents were caused by negligence, ignorance, both of these, or force majeure.

The collected responses are shown in table 1.5 as follows:

| Number and Reason(s) of Accidents that Caused Oil Pollution to the Sea | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Number of respondents | Accidents' freq. | & number | Neg. | Ign. | Neg. & Ign. | Force majeure | Total | % |
| 32 | Zero | Zero | - | - | - | - | 32 | 54 |
| 22 | One | 22 | 9 | 4 | 7 | 2 | 22 | 37 |
| 1 | Two | 2 | - | - | 1 | - | 1 | 2 |
| 3 | Three | 9 | 1 | 1 | 1 | - | 3 | 5 |
| 1 | Four | 4 | - | - | - | 1 | 1 | 2 |
| 59 | Total | 37 | 10+ | 5+ | 9+ | 3=27 | 59 | 100 |

**Table 1.5**

*Key words: (Neg.) Negligence, (Ign.) Ignorance.*

Analysis of the figures in table 1.5 shows that 46% of the marine officers in this survey were present on board ships on which oil pollution accidents occurred. This ratio is high considering the hazards resulting from such accidents. Very few accidents were attributed to force majeure, and most were attributed to negligence and nearly the same number attributed to a combination of negligence and ignorance, while only a small number were attributed to ignorance alone. (See figure 1.2)

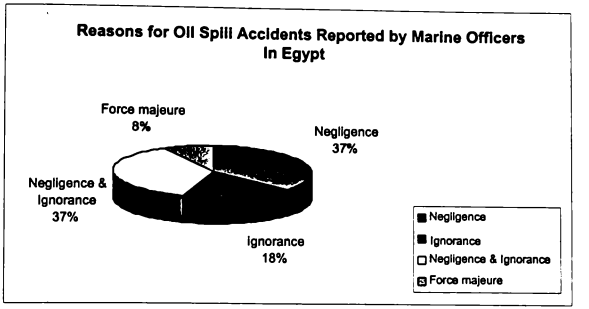


**Fig. 1.2**

These numbers suggest that greater knowledge of the means that can be taken to avoid oil pollution, and a greater appreciation of the consequences and related damages associated with oil spills from ships may go a long way to reduce the incidents of oil pollution from the ships manned by Egyptian officers.

- **Questions 14 and 15** sought to determine the responsible officers' reaction in the event of an oil spill accident on board their ships; and, if they have reported/informed the nearest port authorities about these accidents.

The purpose of these questions was to allow evaluation of their behaviour when handling this problem. Did they try to control the oil spill? Or did they deal with it carelessly?

The answers varied from one to another, and the 15 responses can be summarised by the following reactions:

- Attempts to control the spill and inform the nearest port authorities. (5 cases)
- Confusion and uncertainty existed during the situation because there were no prepared contingency plans. (4 cases)

- Oily water was dispersed from the sea surface by using the ship's propeller. (1case)
- The ship was shifted away from the polluted area where it was anchored without calling the harbour pilot. (1 case)
- No response was provided to incidents occurring while the ships were sailing in the open sea. (4 cases)

These answers suggest that marine officers in Egypt, when involved in an oil spill, will respond appropriately in only a third of the instances. The statistics show that 33% of them dealt with the accidents correctly, while 67% tried to avoid their responsibility with illegal actions. If these actions took place in a country with well defined and enforced pollution prevention law, it would end tragically for the shipowners, operators and officers involved..

**-The last two questions** (numbers 16 and 17) sought to determine what the procedure/s were, if any, for the relevant authorities in Egypt to follow in the case of an oil spill accident in the national ports. The objective was to examine if there was a relationship between such repeated accidents and the authorities' reactions.

The responses revealed that 8 cases out of 12 were met with indifference from the authorities concerned. Three respondents indicated that some of the inspectors were willing to receive bribes as an expedient way of dealing with the situation. The last respondent observed that neither the ship`s master reported the accident nor were there any government officials patrolling and monitoring the area/or situation.

The outcome of the previous responses clarified that the lack of patrolling and monitoring, as well as indifference on the part of the relevant authorities, combines to produce the current situation regarding oil pollution response in the region. This apathy among government authorities must affect the attitude of shipowners, the

ships' officers, and, in turn, the entire crews' lack of compliance with stated rules concerning oil pollution. Essentially there appears to be no correct enforcement of such oil pollution prevention regulations.

### 1.5 Conclusion

Throughout this survey, the prime objective was to ascertain the level of knowledge that Egyptian marine officers possessed with regard to a variety of issues including international conventions, national regulations and environmental awareness. Although, a significant number of these officers already follow the right procedures to protect the marine environment, a still larger number was found to be deficient in that regard. The reasons may be many, but the lack of general awareness and knowledge appear to be two of the most important.

From this survey an important number of deficiencies have been revealed. The officers' level of knowledge with respect to each individual issue differed.

The following diagram (fig. 1.3) shows these values as a percentage of the total number of the respondents. Each value reflects the negative responses indicating a lack of familiarity with regard to each subject.

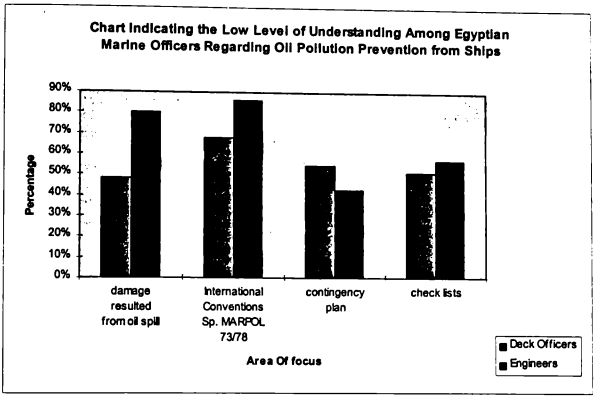


**Fig. 1.3**

From fig. 1.3, it is clear that the lack of knowledge relating to the international conventions and MARPOL 73/78, reflects the area of greatest ignorance. The potential damage resulting from oil spills holds the second position of greatest ignorance. The significance of check lists and the contingency plans occupy the third and forth positions respectively.

The following chapters will focus on explaining the importance of each subject area to prevent oil pollution in Egyptian waters. This research effort is intended to assist in the development of a model short course curriculum in this subject area. The Egyptian marine officers are in need of such courses in order to implement already ratified conventions and consequently protect the marine environment from oil pollution incidents.

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## CHAPTER (2)

## International Conventions Dealing with Oil Pollution Prevention (Focusing on MARPOL 73/78)

From the survey among Egyptian marine officers that was discussed in chapter (1), it was found that (67.7%) of the deck officers and (85.7%) of the engineers have no idea about the international conventions that deal with marine oil pollution, especially MARPOL 73/78. These conventions have information of significance, which every marine officer who works on board a merchant ship should understand. They contain definitions, regulations and guidelines by which they can perform their job on board ships without causing an oil spill that may threaten the marine environment. Knowledge of those provisions is also important to avoid the civil liabilities or detention of their ships arising from violation of these regulations. Consequently, familiarization with these conventions will contribute to the protection of the seas and oceans from environmental damage that could be easily avoided.

This chapter will introduce in a summary form, the main conventions that deal with this matter, with most detail being provided on the MARPOL Convention 73/78 especially Annex I.

*MARPOL Convention 73/78 is considered the most important agreement dealing with marine pollution prevention from ships. It covers all the technical aspects of pollution and applies to ships of all types. It is also the most recent convention that the majority of contracting parties in IMO have ratified and*

*implemented. Therefore, Egyptian marine officers, in their turn, must understand its regulations and fulfil its requirements on board their ships. This will enable them to operate in accord with the concerns of the international community.*

## 2.1 Background

All of the following conventions were adopted under supervision of the International Maritime Organisation (IMO). This organisation is one of the seventeen Intergovernmental Agencies under the umbrella of the United Nations (UN) that operate by special agreements. It works with the (UN) through co-ordinating machinery of the Economic and Social Council. (Zagorin, 1995).

## 2.2 International Maritime Organisation (IMO)

IMO originated as a result of a convention, drawn up in 1948, that came into force in March 1958 when it was ratified by 23 governments. Now there are 153 member states of IMO and 2 associate members. (Focus on IMO, November 1995). Its aims and purpose are to promote greater safety at sea, protection of the marine environment and greater navigational safety. It encourages the universal adoption of global standards for these basic objectives and has a technical co-operation program to foster the adoption and implementation of these standards.

The structure of IMO consists of an assembly, a council and four main committees. The Marine Environment Protection Committee (MEPC) is one of IMO's four main committees. The MEPC is empowered to consider any matter within the scope of the organisation concerned with prevention and control of pollution from ships. In particular it is concerned with the adoption and amendment of conventions and other regulations and measures to ensure their enforcement.

## 2.3 Summary of IMO's Conventions Dealing with Marine Pollution

### 2.3.1 International Convention for the Prevention of Pollution of the Sea by Oil, 1954, As Amended in 1962, 1969 and 1971

**Adoption:** 12 May 1954.

**Entry Into Force:** 26 July 1958.

**1962 Amendments Adopted:** April 1962.

**Entry Into Force:** 18 May/ 28 June 1967.

**1969 Amendments Adopted:** 21 October 1969.

**Entry Into Force:** 20 January 1978.

**1971 ( Great Barrier Reef) Amendments Adopted:** 12 October 1971.

**Entry Into Force:** never entered

**1971 ( Tanks) Amendments Adopted:** 15 October 1971.

**Entry Into Force:** never entered.

(Focus On IMO, January 1995)

This one of the earliest indications of global concern over marine pollution as a problem requiring international control was the pollution of the sea by oil. In 1954, the International Convention for the Prevention of Pollution of the Sea by Oil was adopted. It has now been superseded by MARPOL 73/78, but is described here because of its historic importance, and so marine officers in Egypt can recognise how long the international community has been concerned with marine pollution and aimed to prevent it. As one of the IMO's first initiatives, it carried out a world-wide inquiry into the general extent of oil pollution, the availability of shore reception facilities and the progress of research on methods to combat the increasing threat.

The convention prohibited the deliberate discharge of oil or oily mixtures from all sea going vessels, except tankers of under 150 tons gross and other ships of under 500 tons gross, in specific areas called (Prohibited Zones). Prohibited Zones

included 50 miles at least from all land areas, although zones of 100 miles and more were established in areas which included the Mediterranean and Adriatic Sea, the Gulf and Red Sea, the coasts of Australia, Madagascar and some others.

The convention prescribed that every ship which used oil fuel and every tanker should be provided with a book in which all the oil transfers and ballasting operations were to be recorded in a so called Oil Record Book. The oil record book was to be inspected by authorities of any contracting parties which had the right to inform another contracting party when one of the later is ships violated the provisions of the convention. The government so informed was to investigate the matter and, if satisfied that sufficient evidence was available, cause proceedings to be taken. The reporting government and IMO were to be given the result of such proceedings. Any violation of the provisions of the convention shall be an offence punishable under the law of the (Flag State). Penalties for unlawful discharge outside that state's territorial sea were to be not less than penalties which could be imposed for the same violations within a state's territorial sea. The contracting governments agreed to report to the organisation the penalties actually imposed for each infringement.

*In this regard, it is understood that the oil record book has had a significant importance since ratification of the first convention that dealt with oil pollution prevention from ships, and today still has the same level of importance. Therefore, Egyptian marine officers should recognise that the oil record book requirements must be fulfilled and kept in a good order continuously. This document records any movements of oil on board the ship during its trip and information that is written in it must be accurate and real. Ships' operators must be aware and very careful when transferring oil from, to or inside their ship's tanks.*

Although the restrictions imposed by the 1954 convention were very effective, the enormous growth in oil movement during the 1960s made it necessary to introduce more stringent regulations.

**2.3.1.1 (1969) amendments**

In October 1969, further extensive amendments to the Oil Pollution Convention and its Annex were approved, these were generally based upon the principle of total prohibition of oil discharge and gave international recognition to the load-on-top system.

The restrictions included:

(a) Limitation of the total quantity of oil which a tanker could discharge in a ballast voyage to 1/15,000 of the ship's total cargo-carrying capacity;

(b) Limitation of the rate at which oil could be discharged to a maximum of 60 litters per mile travelled by the ship;

(c) Prohibition of discharge of any oil whatsoever from the cargo spaces of a tanker within 50 miles of the nearest land.

A new form of oil record book was also formulated to facilitate the task of the officials concerned with controlling the observance of the convention.

**2.3.1.2 (1971) amendments**

In 1971, two further amendments were approved by the IMO assembly. One recognised the need to protect the Great Barrier Reef (in the north-eastern coast of Australia) as an area of unique scientific importance.

The other introduced a limitation on the size of individual cargo tanks in VLCCs and was designed to limit the outflow of oil in the case of collision or grounding. The implication of this oil outflow limitation varies according to various factors, such as the arrangement of tanks, the fitting of double bottoms, the interposing of clean water ballast tanks, etc.; but in the case of normal single hull

tankers of up to 422,000 tons dwt, with two longitudinal bulkheads, the capacity of a single centre tank and a wing tank were limited to 30,000 cubic meters, and thereafter gradually increased to 40,000 cubic meters and 20,000 cubic meters, respectively, for a tanker of one million ton dwt.

### 2.3.2 Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972 (London Convention)

**Adoption :** 13 November 1972;
**Entry into force:** 30 August 1975.

The inter-Governmental Conference on the Convention on Dumping of Wastes at Sea, which met in London in November 1972 at the invitation of the United Kingdom, adopted this instrument, generally known as the London Convention. The convention came into force on 30 August 1975 and IMO was made responsible for the secretariat duties related to it, (Focus in IMO, January 1996). The convention has a global character, and represents a further step towards the international control and prevention of marine pollution. It prohibits the dumping of certain hazardous materials, requires a prior special permit for the dumping of a number of other identified materials and a prior general permit for other wastes or matter.

Dumping has been identified as the deliberate disposal at sea of wastes or other matter from vessels, aircraft, platforms or other man-made structures, as well as the deliberate disposal of these vessels or platforms themselves. Wastes derived from the exploration and exploitation of sea-bed mineral resources are, however, excluded from the definition. The provision of the convention shall also not apply when it is necessary to secure the safety of human life or of vessels in cases of force majeure. Among other requirements, contracting parties undertake to designate an authority to deal with permits, keep records, and monitor the condition of the sea.

Other articles are designed to promote regional co-operation, particularly in the fields of monitoring and scientific research. Annexes list wastes which cannot be dumped and others for which a special dumping permit is required. The criteria governing the issuing of these permits are in a third annex which deals with the nature of the waste material, the characteristics of the dumping site and method of disposal.

#### 2.3.2.1 (1978) amendments (incineration)

**Adoption:** 12 October 1978;
**Entry into force:** 11 March 1979.

The amendments affect annex I of the convention and are concerned with the incineration of wastes and other matter at sea.

#### 2.3.2.2 (1978) amendments (disputes)

**Adoption:** 12 October 1978;
**Entry into force:** 60 days after being accepted by two thirds of contracting parties.
**Status:** the amendments have been accepted by 18 states.

As the amendments affect the articles of the convention they are not subject to the tacit acceptance procedure and will enter into force one year after being positively accepted by two thirds of contracting parties. They introduce new procedures for the settlement of disputes.

#### 2.3.2.3 (1980) amendments (list of substances)

**Adoption:** 24 September 1980;

**Entry into force:** 11 March 1981.

These amendments are related to those concerned with incineration and list substances which require special care when being incinerated.

#### 2.3.2.4 (1989) amendments

**Adoption:** 3 November 1989;

**Entry into force:** 19 May 1990.

The amendments establish the procedures to be followed when issuing permits under annex III. Before this is done, consideration must be given to whether there is sufficient scientific information available to assess the impact of dumping.

#### 2.3.2.5 (1993) amendments

**Adoption:** 12 November 1993;

**Entry into force:** 20 February 1994.

The amendments ban the dumping into the sea of low-level radioactive wastes. In addition, the amendments:

- phase out the dumping of industrial wastes by 31 December 1995;
- ban the incineration at sea of industrial wastes.

*It is noticed that, although all three disposal methods were previously permitted under the convention, attitudes towards the use of the sea as a site for disposal of wastes have changed over the years. In 1983 the contracting parties to the LC adopted a resolution calling for a moratorium on the sea dumping of low-level radioactive wastes. Later resolutions called for the phasing-out of industrial*

*waste dumping and an end to the incineration at sea of noxious liquid wastes. The resolutions to end the dumping and incineration of industrial wastes were both adopted by consensus.*

### 2.3.3 The International Convention for the Prevention of Pollution from Ships, 1973, as Modified by the Protocol of 1978, Relating thereto (MARPOL 73/78)

This is a combination of two treaties:

1. The International Convention for the Prevention of Pollution from Ships, 1973,was adopted on 2 November 1973, and entered into force on 2 October 1983; and
2. The Protocol of 1978, adopted on 17 February 1978, entered into force on 2 October 1983.

The IMO realised that levels of global industrialisation are increasing rapidly. As a result, the movement of shipborne trade increased tremendously. Oil pollution from ships also increased due to this process. IMO decided to take further actions to deal with pollution from ships. The IMO assembly convened in 1969 an international conference to prepare a suitable international agreement to put restraints on the pollution of the sea, land and air by ships. The protocol was adopted in November 1973. It covers all the technical aspects of pollution from ships, except the disposal of waste into the sea by dumping, and applies to ships of all types, although it does not apply to pollution arising out of exploration and exploitation of sea-bed mineral resources.

The convention contains twenty (20) articles, five annexes and two protocols. The first protocol deals with reports on accidents involving harmful substances

(refers to article 8) and the second deals with arbitration (refers to article 10). The five annexes contain regulations for the prevention of various forms of pollution.

*The following information is intended to highlight, in brief the regulations that concern the marine officers (ship's operators) only. This information is aimed at enabling them to understand their duties towards oil pollution prevention in the frame of the MARPOL convention during their service on board ships.*

### 2.3.3.1 Annex I: Regulations for The Prevention of Pollution by Oil

**Entry into force:** 2 October 1983.

Annex I contains four (4) chapters, three (3) appendices. Through Annex I there is a listing of Unification Interpretations to the regulations of the Annex (other six appendices). The applicability of this annex is for all vessels except where expressly indicated otherwise (regulation 2). Hydrofoils, air-cushion vehicles and other new types of vessels are allowed to provide an equivalent means of protection. The most important aspects needed to be identified from this annex are the following:

**(A) Definitions**

There are three significant definitions which seem to be most appropriate for the understanding of ship operators (chapter one regulation one) which are:

1- "Oil" means petroleum in any form including oil, fuel oil, sludge, oil refuse and refined products.

2- (New Ship) and " New Tanker Ship" respectively mean that a ship which has a building contract after 31 December 1975; or its keel laid after 30 June 1976; or delivered after 31 December 1979 or has a major conversion after the above dates.

3- (Special Areas) are selected sea areas where, due to recognised technical reasons related to oceanographic or traffic characteristics, restrictions for the prevention of

sea pollution are needed. Special areas, as identified in regulation 10 (1), are the Mediterranean Sea, the Baltic Sea, the Black Sea, the Red Sea, the Gulfs Area, the Gulf of Aden and the Antarctic Area.

**(B) Surveys and the International Oil Pollution Prevention Certificate (IOPPC)**

Oil tankers of 150 GRT and above and all other ships of 400 GRT and above (chapter I regulation 4) shall be subject to surveys or inspections as listed below:

- initial survey before the ship is put in service to ensure that IOPPC may be awarded. The duration of this certificate shall not exceed five (5) years.
- intermediate survey during the period of validity of the IOPPC.
- Mandatory annual survey or unscheduled inspections.
- periodical survey at intervals not exceeding five (5) years to ensure that IOPPC may be renewed.

The form of the IOPPC is provided by the Appendix II to Annex I, together with its two supplements:

- Form (A) for ships other than oil tankers and form (B) for oil tankers.

**(C) Requirements for Control of Operational Pollution From Ships (Chapter II)**

The control of operational oil discharges is considered as a crucial part of MARPOL Annex I. As a general rule, oil discharges are prohibited, unless specific conditions are taken into account in relation to:

- ship's types;
- sea areas;
- distance from land and ship's movement;
- ship board equipment controlling oil pollution;
- types and origin of oily mixtures/residues;

- oil content; and
- rate and quantities of oil discharged.

Relating to the above conditions the following attempts to summarise the relevant requirements imposed by the regulation 9 and 10 of chapter II annex I:

1- Oil tankers of all sizes (with respect to oil discharges from cargo tanks areas including pump room):

A- Within special areas or, outside of them, but within 50 nautical miles (n.m.) of the nearest land, discharges are prohibited except for clean or segregated ballast.

B- Outside special areas but more than 50 n.m. from the nearest land, discharges are prohibited, except clean or segregated ballast, or when:

- a tanker is proceeding en route; and
- the immediate rate of oil discharged does not exceed 30 litters per nautical mile; and
- the total quantity of oil discharged does not exceed:

I ) for an existing tanker 1/15 000 of the cargo.

II ) for new tankers 1/ 30 000 of the cargo which was last carried; and

- a tanker has in operation and oil discharge monitoring and control system and slop tank arrangement that is operating in accordance with specified requirements.

2- Oil tankers of all sizes and other ships of 400 GRT and above with respect to oil discharges from machinery spaces):

A) Within special areas, oil discharges are prohibited except when:

- the ship is proceeding en route; and
- any oil in the effluent without dilution does not exceed 15 parts per million (ppm) ; and
- the ship has in operation filtering equipment with an automatic 15 ppm stopping device which will ensure that the discharge is automatically stopped when oil content of the effluent exceeds 15 ppm; and
- bilge water is not mixed with any residues of oil cargo or the cargo pump room bilges.

Note:

In respect of the Antarctic Area, any discharge into the sea of oil or oily mixtures is prohibited. (The 1990 amendments)

B) Outside special areas, oil discharges are prohibited except when:

- the ship is proceeding en route; and
- the oil content of the effluent without dilution does not exceed 15 ppm ; and
- the ship has in operation equipment as specified by the requirements in regulation (16).

Note:

For ships delivered before 6 July 1993, and not fitted with equipment as required from regulation 16, the above provisions will not apply until 6 July 1998 or the date on which the ship is fitted with such equipment, whichever is earlier. Oil discharges are prohibited except when:

- the ship is more than 12 n.m. from the nearest land; and
- the ship is proceeding en route; and
- the oil content of the effluent is less than 100 ppm; and
- the ship has in operation oily water separating equipment approved by the administration; however
- bilge water not mixed with any oil cargo residues, and not exceeding 15 ppm of oil may be discharged without other restrictions, when outside special areas.

3- Ships of less than 400 GRT, other than oil tankers, with respect to oil discharges from machinery spaces:

A) Within special areas, oil discharges are prohibited except when oil in the effluent does not exceed 15 ppm.

(With respect to the Antarctic Area, any discharge into the sea of oil or oily mixtures shall be prohibited, 1990 amendments).

B) Outside special areas, oil discharges are prohibited except when, in the judgement of the flag state, the requirements of regulation 9 (1) (b) are satisfied; and:

- the ship is proceeding en route; and
- the oil content of the effluent without dilution does not exceed 15 ppm; and
- the ship has in operation equipment as specified in the requirements of regulation 16.

Note:

Oily mixtures which are not mixed with oil cargo residues, and not exceeding 15 ppm may be discharged without other restrictions, when outside special areas.

*Knowing when, where and how much quantity of oily mixtures may be dumped is the main point in this part of Annex I. Great awareness and monitoring from ships operators are required when accessing these procedures. In order to know the most appropriate time and location to undertake these actions, co-operation between deck officers and engineers is required.*

**(D) Oil Discharge Monitoring and Control System and Oil Filtering Equipment (Regulation 16)**

Regulation 16 deals with oil discharge monitoring and control systems and oily water separating and oil filtering equipment which are required to be installed onboard all new or existing ships to prevent accidental or intentional discharge of oily effluents into the sea. All ships of 400 GRT or above must be equipped with an oily water separating system suitable to attain less than 100 ppm of oil. All ships of 10,000 GRT or above must, in addition, be equipped with an oil discharge monitoring and control system. The above ships can replace both of the previously mentioned systems with approved 15 ppm oil filtering equipment that includes an alarm when the level exceeds the 15 ppm.

All ships of 400 GRT or above in case of carrying large quantities of fuel oil (unless they never carry ballast in a fuel oil tank) must be equipped with discharge monitoring and control system. Such ships can replace both systems with an

approved 15 ppm oil filtering equipment that includes an alarm system when the level exceeds the 15 ppm. Ships less than 400 GRT must be equipped with a storage tank to retain oil and oily mixtures on board to discharge it to reception facilities.

*Validity of the IOPPC depends on the conditions of this equipment, so that, this equipment must be maintained and kept in good condition all the time. Marine officers must realise that this equipment could be inspected at any time by the flag state or any port state control inspectors, and keeping this equipment working properly will avoid any fine or detention for their ships by these authorities.*

**(E) Exceptions**

Ships are exempted from the oil discharge requirements under regulations 9 and 10 under the following circumstances: (Regulation 11, Chapter II)

- for securing the safety of a ship or saving life at sea; or
- when the discharge results from damage, provided that all precautions have been taken and neither the owner nor the master have acted intentionally or recklessly; or
- when substances containing oil, have been approved by the administration for use to combat specific pollution incidents in order to minimise the damage from pollution.

*Any such discharge is subject to the approval of any government in whose jurisdiction the discharge happens. In any case of exceptional discharge of oil, the master must report the particulars of the incident, without any delay, to the nearest coastal state. It should also be mentioned in the oil record book.*

**(F) Oil Record Book**

In accordance with regulation 20 chapter II, the oil record book must be kept by the following:

- oil tankers of 150 GRT and above; and

- all ships, other than oil tankers, of 400 GRT and above.

There are two parts of the oil record book:

- Part I for all ships, including oil tankers, regards machinery space operations; and
- Part II, for oil tankers, only regards cargo/ballast operations.

Each operation must be recorded in the respective part of the book in the official language of the state whose flag the ship is entitled to fly, and for ships holding an IOPPC in English or French. The oil record book shall be preserved for three years after last the entry has been made.

Note

The revised form of parts I and II of the oil record book are described at Appendix III of Annex I having entered into force on 4 April 1993.

**(E) Carriage of Ballast Water**

Regulation 14 Chapter II prohibits the carriage of ballast water in an oil fuel tank. It is applied to any new ship of 400 GRT and above other than an oil tanker and to new oil tankers of 150 GRT and above. In abnormal conditions, or when the ship has to carry ballast water in the fuel tank in large quantities, the ballast water if it is not clean, must be discharged to reception facilities or into the sea according to regulation 9 requirements and with the use of equipment specified by regulation 16 (2) of Chapter II. In such cases it should mentioned in the ship's oil record book.

It is prohibited to carry oil in the forepeak tank or any tank forward the collision bulkhead on any ship of 400 GRT or above of which the building contract has been placed after first of January 1982 or its keel has been laid after first of July 1982. All ships should comply with these prohibitions as far as is reasonable and practical.

**(F) Shipboard Oil Pollution Contingency Plan**

As prescribed in Regulation 26 Chapter IV, every oil tanker of 150 GRT and above and every ship other than an oil tanker of 400 GRT and above shall carry on board a shipboard oil pollution emergency plan approved by the administration. *The shipboard contingency plan will be discussed in more detail in the next chapter of this document.*

### 2.3.3.2 Annex II Control of Pollution by Noxious Liquid Substances

**Entry into force:** 6 April 1987.

**(A) Brief Identification of Annex II**

This Annex applies to all ships, that carry noxious liquid substances in bulk, to which MARPOL 73/78 applies (Article 3). Substances posing a threat of harm to the marine environment are divided into four categories (A, B, C and D) as listed in Appendix II to this Annex. Category A substances are those posing the greatest threat to the marine environment, while category D substances are those posing the smallest threat.

Annex II prohibits the discharge into the sea of any effluent containing substances falling into these categories except, when the discharge is made under conditions which are specified in detail for each category. For certain sea areas, identified as (Special Areas) more stringent discharge criteria are given. These special areas, as identified in Regulation 1 (7) refer to sea areas where for recognised technical reasons in relation to oceanographic and ecological conditions or with respect to the particular character of its traffic, the adoption of special mandatory methods for the prevention of sea pollution by noxious liquid substances is required. Special areas include the Baltic Sea area and the Black Sea area.

Annex II requires that every ship be provided with pumping and piping arrangements to ensure that each tank designated for the carriage of category B and C substances does not retain, after unloading, a quantity of residue in excess of the quantity given in the annex. For each tank intended for the carriage of such substances, an assessment of the residue quantity has to be made. Only when the residue quantity, as assessed, is less than that prescribed by this annex may a tank be approved for the carriage of a category B or C substance.

The discharge operations of certain cargo residues and certain cleaning and ventilation may only be carried out in accordance with approved procedures and arrangements based upon standards developed by IMO. To comply with this requirement, a manual is required which contains all the particulars of the ship's equipment and arrangements, operational procedures for cargo residues, for tank washing, for slops collection, and for ballast.

**(B) Discharge Requirements**

The prohibitions and conditions for discharge of tank washings and residues of noxious liquid substances into the sea are given in regulation 5 and are shown in tables 2.1 (a) and 2.1 (b).

**(C) Survey and Certification**

Under regulation 10 requirements, surveys are required for all ships. Ships must have annual surveys within 3 months before or after the anniversary of the certificate's issue date. An International Pollution Prevention Certificate for the Carriage of Noxious Liquid Substances (NLSC) shall be issued by the administration without exceeding five (5) years from the date of issue (regulation 12). NLSC is required for ships in the international trade (regulation 11 and 12). A certificate is not required for ships in domestic trade but may be required by the maritime administration in conjunction with the required survey.

| Discharge Conditions for Effluents Containing Noxious Liquid Substances Outside a Special Area | | | | |
|---|---|---|---|---|
| **Conditions Reg.(5)1,2,3,4** | **Category "A"** | **Category "B"** | **Category "C"** | **Category "D"** |
| **Maximum concentration of substance at time of discharge** | Virtually nil | 1 ppm in wake of the ship | 10 ppm in wake of the ship | 1 part of substance in 10 parts of water in discharge mixture |
| **Maximum quantity of cargo discharged from each tank** | Virtually nil. Tank washed and transfer washings to reception facility | 1 cubic meter or 1/300 of tank capacity | 3 cubic meters or 1/1000 of tank capacity | No limit |
| **Discharge of effluent** | Below the waterline | | | |
| **Minimum depth of water** | 25 meters | | | No limits |
| **Minimum distance from land** | 12 nautical miles | | | |
| **Minimum speed of ship:** | | | | |
| **- self propelled** | → 7 Knots | | | |
| **- not self propelled** | → 4 Knots | | | |

**Table: 2.1 (a)** *Source: MARPOL how to do it, 1993.*

| Discharge Conditions for Effluents Containing Noxious Liquid Substances Within a Special Area | | | | |
|---|---|---|---|---|
| **Regulations (5) 4, 7, 8, 9** | **Category "A"** | **Category "B"** | **Category "C"** | **Category "D"** |
| **Maximum concentration of substance at time of discharge** | virtually nil | 1 ppm in wake of the ship | 1ppm in wake of the ship | 1 part of substance in 10 parts of water in discharge mixture |
| **Maximum Quantity of cargo discharged from each tank** | virtually nil. Tank part washed and discharge washings to reception facility | virtually nil. Tank part washed and discharge washings to reception facility | 1 cubic meter or 1/3000 of tank capacity | no limit |
| **Discharge of effluent** | below the waterline | | | |
| **Minimum depth of water** | 25 meters | | | no limit |
| **Minimum distance from land** | 12 nautical miles | | | |
| **Minimum speed of ship:** **Self propelled** **not self propelled** | → 7 knots → 4 knots | | | |

**Table: 2.1 (b)** *Source: MARPOL how to do it, 1993.*

**(D) Exceptions**

Regulation 6 provides exceptions to the discharge prohibitions under the following circumstances:

- for the safety of the ship or safety of lives; or
- when discharges result from damage to the ship or its equipment; or
- when specifically being used to combat specific pollution incidents.

Any such discharges must be reported to the nearest port and mentioned in the Cargo Record Book.

**(E) The Cargo Record Book**

Every ship to which this Annex applies must have has a Cargo Record Book as specified in appendix IV to this Annex. In case of any of the following operations, on a tank to tank basis, it should be recorded in the cargo record book:

- loading cargo;
- internal transfer of cargo;
- unloading of cargo;
- cleaning of cargo tanks;
- ballasting of cargo tanks;
- discharge of ballast from cargo tanks;
- disposal of residues to reception facilities;
-discharge into the sea or removal by ventilation of residues in accordance with regulation 5.

**(F) (Oil-like) substances**

Regulation 14 has identified certain noxious substances under categories C and D of this annex as oil-like substances. The ship that carries such substances must comply with the provisions of Annex I of the convention as applicable.

**(G) Appendices**

Annex II has five (5) appendices as follows:

Appendix I provides the guidelines that are used to categorise the noxious liquid substances addressed by this annex;

Appendix II gives lists of the noxious liquid substances carried in bulk as category A, B, C and D substances;

Appendix III provides a list of the "other liquid substances", those found not to be covered under the regulations of this annex;

Appendix IV contains the form and content of a cargo record book; and

Appendix V provides the form the International Pollution Prevention Certificate for the Carriage of Noxious Liquid Substances (NLSC).

*This Annex deals with specific types of ships that carry noxious liquid substances in bulk. Officers who work on board these types of ships must study its regulations in detail and know how to execute its requirements very carefully. Tables 2.1 (A and B) simplify the discharge conditions for effluents containing noxious liquid substances outside special areas.*

### 2.3.3.3 Annex III: Regulations for the Prevention of Pollution by Harmful Substances Carried by Sea in Packaged Form, or in Freight Containers or Portable Tanks or Road and Rail Tank Wagons.

**Entry into force:** 1 July 1992.

Annex III applies to (1) ships entitled to fly the flag of a party; and (2) ships not entitled to fly the flag of a party but which operate under the authority of a party and carry harmful substances in packaged form. Harmful substances means marine pollutants in the International Maritime Dangerous Goods Code (IMDG code). Package form means any form of containment other than the structure of the ship

and includes packaging, freight containers, portable tanks and road and rail tank wagons as specified in the IMDG code.

Annex III prohibits the carriage of harmful substances except in accordance with the conditions laid down in the annex. These conditions contain information on packaging, marking and labelling, documentation, stowage, quantity limits and exceptions when carrying harmful substances. The annex prohibits jettisoning of harmful substances carried in package form (regulation 7) except where necessary for the purpose of securing the safety of the ship or life at sea.

Annex III contains seven (7) regulations and a single appendix containing guidelines for identification of harmful substances in package form.

*Extra care should be given to Harmful Substances whose carriage is regulated by this Annex. Carriage by vessels of these various types of goods requires specific measures so that marine pollution can be avoided and human health be protected.*

### 2.3.3.4 Annex IV: Regulations for the Prevention of Pollution by Sewage from Ships

**Entry into force:** 12 months after being ratified by 15 states whose combined fleets of merchant shipping constitute at least 50% of the world fleet

**Status:** The annex has been accepted by 51 states whose fleets represent 41% of world fleet tonnage.
(Focus on IMO, January 1996).

**(A) Definitions**

Sewage means:

- drainage and other wastes from any form of toilets, urinals, and WC scuppers;
- drainage from medical premises via wash basins, wash tubs and scuppers located in such premises;
- drainage from spaces containing living animals; or
- other waste waters when mixed with the drainage defined above.

**(B) Discharge of Sewage**

Ships are not permitted to discharge sewage within four nautical miles of the nearest land unless they have in operation an approved sewage treatment plant. (Regulation 8). Between four and twelve nautical miles from land, sewage must be at least comminuted and disinfected before discharge.

Table 2.2 summarises regulation 8 that deals with the discharge conditions for sewage from ships:

Notes :

1- Regulation 3(1)(a)(i) deals with the treatment plant that should meet the operational requirements according to the standards and test methods developed by IMO.

2- Regulation 3(1)(a)(ii) deals with the system of comminuting and disinfecting the sewage which should be approved by the administration.

3- Regulation 8 (1) (a) prohibits the discharge of sewage into the sea except when:
- discharging comminuted and disinfected sewage by using a treatment system approved from the administration at a distance more than four miles from the nearest land; or
- discharging sewage which is not comminuted and disinfected at a distance more than twelve miles from the nearest land; or
- in the case where the sewage is stored in holding tanks, the discharge should be

done at a moderate rate, when the ship is under way at a speed not less than four knots. The rate of discharge must be approved by the administration based upon standards developed by IMO.

| Discharge Conditions for Sewage from Ships (Regulation 8 Annex IV) | |
|---|---|
| **Sea Area** | **Discharge Criteria** |
| **Within 4 nautical miles from land** | No discharge except from approved sewage plant certified to meet regulation 3 (1)(a)(i) and 8 (1)(b) |
| **Between 4 and 12 nautical miles from land** | No discharge except from:<br>(1) approved sewage treatment plant certified to meet regulations 3(1)(a)(i) and 8(1)(b) or;<br>(2) an approved system for comminuting and disinfecting sewage meeting regulations 3(1)(a)(i) and 8(1)(a). |
| **More than 12 nautical miles from land** | Discharge from either (1) or (2) above or, sewage which is not comminuted or disinfected when the ship is proceeding at not less than 4 knots and the rate of discharge is approved by the administration. |

**Table 2.2** *Source: MARPOL how to do it, 1993.*

**(C) Certification**

An International Sewage Pollution Prevention Certificate (1973) is issued after satisfying the conditions in this annex. This certificate is not valid beyond five years from the date of issue. The form of the certificate should correspond to the model shown in the appendix to this annex. It should be drawn up in the official language of the issuing country. If the language used is neither English or French, the text shall include a translation into one of these languages.

**(D) Exceptions**

Ships are exempted from regulation of discharging sewage into the sea in the following conditions:

- for the purpose of securing the safety of the ship and safety of life at sea; or
- when the discharge results from damage to a ship or its equipment when all reasonable precautions have been taken before and after the occurrence of the damage for preventing or reducing the discharge.

Annex IV contains nine regulations and one appendix. The appendix deals with the form of the International Sewage Pollution Prevention Certificate (1973).

*MARPOL Convention 73/78 is not only concerned with pollution prevention caused from oil and chemical substances, but also with other sources of pollution such as sewage and garbage. Although Annex IV has not come into force yet, 41 members of IMO have already ratified it including Egypt (Egyptian law number 4 for 1994, article 66). This law implements all regulations that are mentioned in this Annex. In this regard, all marine officers in Egypt are required to follow up its provisions when disposing of their ships sewage into the sea.*

### 2.3.3.5 Annex V Regulations for the Prevention of Pollution by Garbage from Ships

**Entry Into force:** 31 December 1988.

This annex deals with different types of garbage and specifies the distances from land and the manner in which they may be disposed of. One of the most important features of annex V is the complete ban imposed on the dumping into the sea of all forms of plastic.

**(A) Definitions**

The most appropriate definitions that must be known are:

1- Garbage; meaning all kinds of victual, domestic or operational waste generated during the normal operation of the ship and liable to be disposed of continuously or periodically, excluding fresh fish and their parts.

2- Special areas; means a sea area where for recognised technical reasons in relation to its oceanographic and ecological condition and the particular character of its traffic the adoption of special mandatory methods for the prevention of sea pollution by garbage is required. The special areas as listed in regulation 5 of this annex are:

- the Mediterranean Sea;
- the Black Sea;
- the Baltic Sea;
- the Red Sea;
- the Gulfs Area;
- the North Sea (October 1989 amendments);
- the Antarctic Area (November 1990 amendments); and
- the Wider Caribbean Region (July 1991 amendments).

**(B) Disposal Requirements**

Table 2.3 demonstrates the restrictions on disposal of garbage as required in regulations 3, 4 and 5 in this annex.

**(C) Exceptions**

Ships are exempted from the provisions of this annex, as listed in regulation 6, in the following conditions:

- for the safety of the ship and those on board, or for saving of life at sea;
- when escape of garbage results from damage to a ship or its equipment, if all reasonable precautions have been taken before and after the accident to prevent

or minimise the escape;

- when synthetic fishing nets are accidentally lost, if all reasonable precautions have been taken to prevent the loss.

Note:

No equipment, record books, surveys or certificates are specified under this annex. In spite of that, arrangements will be necessary in order to enable and ensure compliance. It is essential to allocate a space on board to store garbage until it can be disposed of to a shore reception facility, or incinerated or discharged in accordance with the permitted conditions in table 2.3.

Annex V contains seven regulations and guidelines of actions and requirements for implementation of its regulations to shipowners, operators, marine administrations and ports. These guidelines are listed in seven sections.

The average amount of the dumped garbage into the seas is stated by (US National Academy of Science, decade of 1970) as:

> `Every year 6.3 million tons of garbage are being dumped into the seas of our planet. This amount is generated by all types of vessels, offshore oil platforms as well as from the land when garbage is carried to the sea during storms`.

*Annex V intended to serve as an important contribution to the control of this type of pollution caused by vessels and offshore oil production platforms. Ratification of such a convention is not enough, but implementation is the most important issue. Ships' operators, especially marine officers, must follow these regulations in order to protect the marine environment from such source of pollutants.*

| Restrictions on Disposal of Garbage (Annex V regulations 3, 4 and 5) | | | |
|---|---|---|---|
| **Garbage Type** | **Outside special Areas** | **In special Areas** | **Offshore Platforms and Ships Within 500 meter of them** |
| **Plastics including: ropes, fishing nets, and plastic garbage bags** | Disposal Prohibited | | |
| **Floating dunnage, lining and packing materials** | 25 nautical miles offshore or more | Disposal Prohibited | |
| **Paper, rags, glass, metal, bottles, crockery and similar refuse** | 12 nautical miles offshore or more | Disposal Prohibited | |
| **All other garbage including: paper, rags, glass, etc. Comminuted or ground** | 3 nautical miles offshore or more | Disposal Prohibited | |
| **Food waste not comminuted or ground** | 12 nautical miles offshore or more | | Disposal Prohibited |
| **Food waste comminuted or ground** | 3 nautical miles offshore or more | 12 nautical miles offshore or more | |
| **Mixed refuses types** | the more stringent requirements (regulation 3(2)) | | |

**Table 2.3** *Source; MARPOL how to do It,, 1993.*

### 2.3.4 International Convention on Oil Pollution Preparedness, Response and Co-operation, 1990

**Adoption:** 30 November 1990.
**Entry into force:** 13 May 1995.

The purpose of this convention is to provide a global framework for international co-operation in combating major incidents or threats of marine pollution. Ships are required to carry a shipboard oil pollution emergency plan. Ships are also required to report incidents of pollution to coastal authorities and the convention details the actions that are to be taken. The convention calls for the establishment of stockpiles of oil spill combating equipment, the holding of oil spill combating exercises and development of detailed plans for dealing with pollution incidents.

*In conclusion, this chapter sought to address the most important conventions dealing with oil pollution prevention from ships. There are more resolutions and amendments added periodically aiming to impose more restrictions within the regulations aimed at reducing pollution possibilities of the sea from ships. This chapter focused on the MARPOL Convention 73/78 because it is the most vital convention dealing with this issue. Egyptian marine officers must understand this convention and know how to implement its regulations, especially those of annex I.*

*From the questionnaire analysed in the first chapter of this document, it is clear that the lack of knowledge on the part of the marine officers in Egypt is not limited solely to the international conventions. Their lack of knowledge includes two more important items. The first is the principles of oil and its effects to the marine environment and human health. The second is their knowledge about shipboard*

*contingency plans in case of oil spill from ships and the non-existence or lack of usage of a check list when dealing with oil on board ships.*

*The next chapters seek to give a good understanding of each of these issues. The effects of oil spills on our marine environment and on human health is addressed next. Its aim is to create a greater appreciation of the damage that results from oil spills to the human being as well as to the marine environment.*

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# CHAPTER (3)

## The Scientific Principles of Oil and its Effects to the Marine Environment and Human Health

As a result of a survey of marine officers in Egypt, the questionnaire analysed in Chapter I, it was found that 38% of the deck officers and 46% of the engineers had only a very basic idea about to the approximate impact of oil spills on the marine environment and human health. The analysis also indicated that 10% of the deck officers surveyed and 36% of the engineers surveyed had no idea at all about this issue. This lack of knowledge reflects one of many reasons for the existing situation regarding oil pollution in the Egyptian marine environment. Marine officers who do not realise the damage and threat to the aquatic life and human health when ships oily residues are dumped, might carelessely continue this action. It is necessary for them to know that controling the dumping of these pollutants into the sea is not only to avoid penalties or detention of their ships, but it is necessary to reduce the damages affecting directly or indirectly their own living conditions and those of their children in the future.

This chapter seeks to identify the fate and effects of oil spills on the marine environment and on human health. Marine officers in Egypt need to understand the potential damage to better appreciate the risks resulting from the spillage of oily residues into the sea. The result should be a convincing reduction in their dumping of

these oily wastes into the sea and polluting the marine environment. Chapter (3) will also discuss the economic consequances of oil spilled from ships into the sea.

## 3.1 Questions and Answers

### 3.1.1 What is oil?

Crude oil or petroleum, a transformation product of fossil (often marine) organisms, is a liquid mixture, occurring underground, of many thousands of organic compounds amongst which hydrocarbons predominate. Some of its component hydrocarbons are the same as contemporary biosynthetic products, and many are products of transformation into compounds more stable thermodynamically under the conditions to which oils are exposed in source rocks and reservoirs. In addition to hydrocarbons, i.e. compounds composed exclusively of the elements carbon and hydrogen, sulphur, oxygen and nitrogen derivatives of hydrocarbons are also present in mineral oils in varying proportions, as are complexes of organically bound nickel, vanadium and cobalt. Nickel and vanadium are often present in μg/g quantities (NRC,1985) and their ratios can be used to characterise a crude oil. Depending upon source materials, the history of pressures and temperatures during formation and the structure and chemical composition of source rocks, and the migration to and the condition in reservoirs, the compositions of crude oils may vary widely.

The specific gravity of whole crude oils usually is less than 1.0, i.e. they float on water. All oil components are, to a certain degree, soluble in water. Aqueous solubility depends on the structural type, with normal alkanes being least and aromatic hydrocarbons being most soluble in water (ca. 0.7 grams of benzene dissolve in 1 kg of water). Solubility in water are also inversely proportional to molecular weights (McAuliffe, 1966). Therefore, the fraction of an oil which, upon release on the surface of a natural water body, dissolves in it has a composition different from the original oil, with an enrichment of the more water soluble low-molecular-weight aliphatic and aromatic components (She et al., 1990).

### 3.1.2 What is contamination and what is pollution?

The view taken by most scientists who study pollution, and that recommended by such international advisory bodies as the United Nations Group of Experts on the Scientific Aspects of Marine Pollution (GESAMP) or the International Council for the Exploration of the Sea (ICES), is that a distinction must be made between contamination and pollution. **Contamination** is the presence of elevated concentrations of substances in the water, sediments or organisms, i.e. concentrations that are above the natural background level for the area and for the organism.

**Pollution** is the introduction by man, directly or indirectly, of substances or energy to the marine environment resulting in deleterious effects such as harm to living resources, hazards to human health, hindrance of marine activities including fishing, impairment of the quality for use of sea water and reduction of amenities.

### 3.2 Input of oil into the marine environment

The input of oil from anthropogenic sources into the marine environment has decreased during the past decade. This is largely due to measures required by international conventions on the prevention of marine pollution by oil from shipping. Estimates in 1981 showed that 3.2 million tons of oil per year enters the marine environment from all sources; the estimate for 1990 is 2.35 million tons (GESAMP Reports and Studies No.50, 1993).

Annual amounts can vary greatly, depending upon accidents and acts of war. At least 15% comes from natural seeps. Anthropogenic sources include chronic discharge from loading and discharge facilities and refineries, discharges from tankers and other shipping along major routes, accidental events such as oil spills and ruptures of pipelines. Sources also include river-borne discharges, diffuse discharges from industrialised municipal areas, offshore oil production, and the atmosphere. The sources vary in importance geographically but primary inputs are generally from land

based sources (refineries, municipal wastes, urban run-off). Recently wars have resulted in major inputs (i.e. Arabian/Persian Gulf, Iraq/Kuwaiti war).

Due to measures required by international conventions on prevention of oil pollution, the input of oil into the marine environment from maritime operations has decreased during the past three decades. In this regard, the entry into force of MARPOL 73/78, Annex I in 1983 has had a substantial positive impact in decreasing the amount of oil that enters the sea from transportation activities, with inputs decreasing from 1.47 million tons in 1981 to 0.54 million tons in 1989 (IMO, 1990).

However, the input has varied by more than a factor of 10 from year to year, with 1979 (IXTOC blowout), 1983 to 1988 ( Iran-Iraq war), and 1991 (the Gulf Conflict) showing extra inputs which were many times the average of intervening years. Total floating tar observed in 1985 in shipping lanes and their associated surface currents was one-fourth or less of that observed in 1971-72, based on measurements in the Sargasso and Mediterranean Seas. Tanker accidents constitute 5% of the oil input to the sea, based on 1990 estimates, but volumes spilled annually are highly variable, making the identification of trends difficult (GESAMP Reports and Studies, No 50, 1993).

Tables number 3.1 and 3.2 show the estimates of inputs of petroleum hydrocarbons per year to the world's oceans and estimated inputs of petrol hydrocarbons into the oceans due to marine transportation activities respectively.

**Estimates of Inputs of Petroleum Hydrocarbons per Year to the World's Oceans (in thousands of tons)**

**(Ranges of inputs shown in parenthesis)**

| Source | Year: | 1973 | 1979 | 1981 | 1981 |
|---|---|---|---|---|---|
| | Ref.: Source | NRC (1975) | Kornberg (1981) | Baker (1983) | NRC (1985) |
| **Urban run-off and discharges** | | 2500 | 2100 | 1430(700-2800) | 1080 (500-2500) |
| **Operational discharges from tankers** | | 1080 | 600 | 710 (400-1500) | 700 (400-1500) |
| **Accidents from tankers at sea** | | 300 | 300 | 390 (350-430) | 400 (300-400) |
| **Losses from non-tanker shipping** | | 750 | 200 | 340 (160-640) | 320 (200-600) |
| **Atmospheric deposition** | | 600 | 600 | 300 (50-500) | 300 (50-500) |
| **Natural seeps** | | 600 | 600 | 300 (30-2600) | 200 (20-2000) |
| **Coastal refineries** | | 200 | 60 | --- | 100 (60-600) |
| **Other coastal effluents** | | --- | 150 | 50 (30-80) | 50 (50-200) |
| **Offshore production losses** | | 80 | 6 | 50 (40-70) | 50 (40-60) |
| **Total discharge** | | 6110 | 4670 | 3570 | 3200 |

**Table 3.1** *Source: Adopted from Freedman, 1989.*

| Estimated Inputs of Petroleum Hydrocarbons into the Oceans due to Marine Transportation Activities (in thousands of tons) | | |
|---|---|---|
| Year / Source | 1981 (million tons) | 1989 (million tons) |
| **Tanker operations** | 700 | 159 |
| **Tanker accidents** | 400 | 114 |
| **Bilge and fuel oil discharge** | 300 | 253 |
| **Dry-docking** | 30 | 4 |
| **Marine terminals** (including bunker operations) | 22 | 30 |
| **Non-tanker accidents** | 20 | 7 |
| **Scrapping ships** | ---- | 3 |
| **Total** | 1470 | 570 |

**Table 3.2** *Source: NRC, 1985; IMO, 1990.*

The best known cause of oil pollution is that arising from tanker accidents. Although these contribute a comparatively small percentage of the total oil entering the seas in a year, the consequences of an accident can be disastrous to the immediate area, particularly if the ship involved is a large one and the accident occurs close to the coast. The wrecks of the Tory Canyon (1967), Amoco Cadiz (1978), and Exxon Valdez (1989) are clear examples.

### 3.3 Global Oil Pollution and its Extent

The only known truly global survey of oil pollution was conducted in the late 1970s- the Integrated Global Ocean Station System (IGOSS) Pilot Project on Marine Pollution (petroleum) Monitoring (Levy et al., 1981, and Levy, 1984B9). This study made visual observation of oil slicks and sampled floating particulate petroleum residues, dissolved and dispersed petroleum residues, and tar stranded on beaches.

One of the primary conclusions was that, based on nearly 100,000 observations and measurements at the sea surface, concentrations of dissolved/dispersed petroleum residues in the low µg/l range were present nearly everywhere (Levy, 1984b); such concentrations, representing both natural and anthropogenic sources, are currently below known toxicity thresholds for aquatic organisms. In addition it was declared that floating forms of oil pollution (i.e. tar lumps) are closely associated with the tanker lanes and other areas of ship activity and that distribution on a larger scale can be accounted for in terms of transport from these areas of input by surface ocean currents (Levy et al., 1981). This knowledge of oil distribution is based in part on observations from ships crews, supplemented by wider chemical sampling and other observations across the oceans.

The truly global extent of petroleum caused by oil spillage is well illustrated in the recent State of the Earth Atlas (Seager, 1990) which maps the distribution of recently reported spills from ships and oil platforms.

### 3.4 Physical and Chemical Fate of Spilled Oil

Although the particular composition of crude oil in its natural state may be stable over geological time spans, its composition changes once it is exposed to water, oxygen, sunlight, micro-organisms and other factors. Change occurs rapidly in the initial stages, but with diminishing speed as thermodynamic equilibrium with conditions in the environment is approached. Volatile components evaporate, at rates depending upon vapour pressure and mass-transport conditions, leaving behind a residue which may become dense enough to sink (Payne and Phillips, 1985). Some low API gravity residual fuel oils, called "LAPIO", are to a very limited extent, being used for generation of electric power. These fuels have a density very near to or higher than sea water, and are expected to sink immediately, causing problems with their recovery if spilled.

With vigorous wave action, water-in-oil emulsions (chocolate, mousis) are formed with an oil content of approximately 30%. Oil may be dispersed down into the water column as fine droplets and then slowly rise back to the surface. Soluble components of oil will dissolve into the water. Energetic photons from the short wavelength band of the solar spectrum can trigger chemical reactions (oxidation, decomposition, polymerisation) in the well illuminated surface layer, whose thickness is inversely proportional to the turbidity of the water. The photo-oxidation process is dependent on the intensity of sunlight, temperature, and the chemical composition and the physical state of the oil on the water surface. Thin films oxidize more rapidly than thick oil or mousse. At the sea surface photooxidation occurs fairly rapidly, over the course of a few hours or days after the initial spill. Studies have shown that as much as 40 barrels spread over a square mile of ocean surface could be degraded in a few days by photooxidation, given adequate sunlight. Forty barrels of oil spread over a square mile would create an oil layer about one-ten thousandth of an inch thick. (Kuiper and Brink, 1987)

In aqueous solution, and specially in particulate form, either suspended or deposited on the sea floor (Burns, 1981), components of oil are degraded microbially. Sufficient nitrogen and phosphorous compounds are needed to sustain the growth and metabolism of oil-degrading micro-organisms. Rates of microbial decomposition depend upon structure and molecular weight, with rates decreasing in the order n-alkanes > branched-chain alkanes > aromatic hydrocarbons > alicyclic hydrocarbons, and with increasing molecular weights (Watkinson, 1978).

Thus, the composition of a given oil not only reflects its origin but also, if spilled, the duration of exposure to and the conditions in the environment. The tarry oil deposits that are often found on beaches are rather stable residues which are composed of high-boiling components and are largely protected against microbial decomposition by their small surface/volume ratios.

Figure 3.1 represents schematically the fate of oil spilled on the sea surface and on shorelines, identifying key processes such as dissolution, advection, evaporation and sorption onto suspended solids.

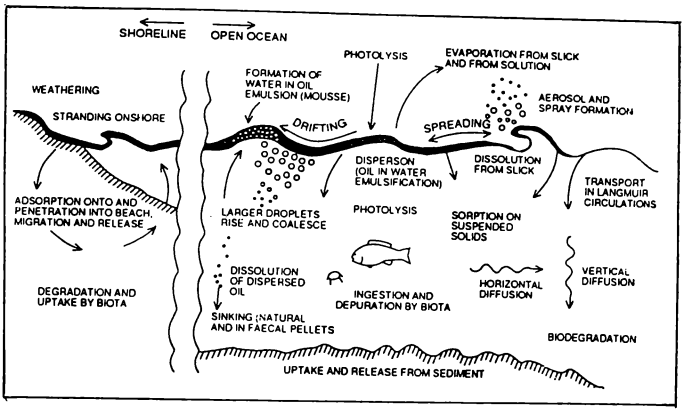


**Fig. 3.1** *Source: Mak Kay in Engelhardt (1985).*

## 3.5 Ecological Impact of Oil Pollution

### 3.5.1 Rocky Substrata

On rocky high-energy shorelines stranded oil is quickly removed from the intertidal region by wave action and water movement. This does not negate environmental harm but generaly reduces the length of time that such shorelines are affected compared with elsewhere. Oil is removed most slowly from locations of extreme high tides and sheltered crannies where wave energy is least. Depending on the nature and age of oil, a considerable variety of animals and the sensitive red and

green algae are killed. Much of the oil reaching the beaches is crude oil or bunker fuel which has been at sea for some days and has lost most of its toxic constituents and it may poison few organisms on the beach. Limpets have been observed to graze dried oil from the rocks without coming to harm. Many seaweeds secrete micins which prevent oil from adhering to them, but when it strands within fronds, the seaweed can then be torn from their steps during storms because of their increased weight. Large amounts of stranded oil may kill animals by smothering them.

### 3.5.2 Soft Substrata

Stranded oil is not readily removed from low-energy sedimentary beaches, and if still liquid, it drains down into the substratum. Here the low oxygen concentration does not favour bacterial degradation of the oil which may therefore retain its toxic properties for some time.

In September 1969, the barge Florida ran aground in Buzzard's Bay, Massachusetts, near West Falmouth and spilled 10 000 gallons of diesel oil. Although this was a relatively small oil spill, the toxic nature of the oil (containing 41 per cent aromatics) and the circumstances of the spillage made it unusually damaging. Winds and strong surf drove oil into Wild Harbour, on to beaches, and churned up bottom sediments with which the oil became incorporated and was carried down to the bottom. Subsequent sediment transport extended the contaminated area. There was an immediate kill of fish, particularly in the shallow creeks and bays which shelter juveniles of commercial species such as Flounders and Blue Fish, and the adults of a variety of bait fish. Lobsters, crabs, shrimps and bivalves were killed in large numbers. Scallops were particularly badly affected, oysters and soft-shell clams less so. Commercial shellfish beds had to be closed because of tainting on a long-term basis due to the continued risk of contamination by oil released from the shifting sediments. Detailed studies of the sub-tidal benthic community revealed instability persisting for more than five years in the most

polluted parts of Wild Harbour; less contaminated areas began to show a successional recovery two years after the spillage. (Clark, 1985).

### 3.5.3 Plankton

Note: This term (plankton) refers to very small microscopic plants (phytoplankton) and animals (zooplankton) that are carried by the water and moved by the currents. Phytoblankton produces food and oxygen from sunlight. Zooplankton feed on phytoplankton and are eaten by other larger organisms forming the base of the food chain.

Plankton living in the top few centimetres of the sea, might be supposed to be particularly at risk because it is exposed to the highest concentration of water-soluble constituents leaching from floating oil. Oil and oil fractions are toxic to a wide range of planktonic organisms, aromatic compounds which are benzene, naphthalene and indane are more so than aliphatic those which are ethane, n-alkane and tricyclic naphthene.

### 3.5.4 Fixed Vegetation

Salt marshes and, in the tropics, mangrove swamps are affected similarly to intertidal mud-banks, being typically low-energy areas they are likely to trap oil. The plants which form the basis for these ecosystems suffer accordingly. Those are important ecosystems at the boundary between land and sea. The effect of oil pollution on plants living in these areas kills these plants and recovery may require two or three season depending upon reseeding from outside areas.

### 3.5.5 Sea Birds

Whatever other effects oil pollution may have, the loss of sea birds may attract the greatest public concern. It is difficult to give a precise estimate, but it is quite possible that tens or even hundreds of thousands of sea birds are oiled in the

north-east Atlantic every year. It is feared that sea birds might show a population decrease as a result of this heavy and persistent mortality.

Unlike most of the organisms in the sea, sea birds are harmed through the physical properties of floating oil, and the toxicity of its constituents is of minor importance. When 230 000 tons of crude oil was lost from the Amoco Cadiz on the Brittany coast, the known sea birds casualties numbered 4572, but the largest known kill of sea birds from oil pollution was in the Skagerrak in January 1981 when 30 000 oiled birds stranded on the beaches, and this appears to have been caused by small amounts of oil discharged by two vessels. The estimated loss of 12 000 birds on the north-east coast of England in January and February of 1970 from oil slicks whose source was never identified, equals the estimated bird loss following the wreck of the Tory Canyon off Tend`s End in March 1967. (Clark, 1989)

### 3.5.6 Marine Mammals

Although there have been occasional reports of seal pups being severely oiled and possibly killed by crude or bunker oil, there is no evidence that cetaceans are particularly at risk from oil pollution. Body-temperature problems probably do not affect oiled cetaceans but do affect polar bears and sea otters after they have been oiled. After the Exxon Valdez disaster, in March 1989 in Prince William Sound, the oil had severe affects on wildlife, especially otters and sea birds, in the short term. Approximately 2-3,000 of the 10-11,000 animals were killed outright and undoubtedly many more subsequently perished. Although there were valiant rescue efforts, many otters died from ingesting oil, causing liver damage associated with low blood sugar and low body temperature. Once a sea otter is in contact with fresh oil, the animal has only a 50% probability of survival. (Waldichik, 1990).

### 3.6 Effects of Oil Spills on Human Health

The paper that was introduced by Laster, 1981, and reviewed by NRC, 1985 on the effects of hydrocarbons on people addressedcontained three concerns:

- the acute effects of contact with oil or its constituents;
- the carcinogenic potential of oil-derived hydrocarbons in humans; and
- linked to second, the potential for hydrocarbons to be transferred to humans via seafood.

The report clearly states that intake of hydrocarbons can be through inhalation, skin contact and even accidental ingestion. The volatile aromatic benzene is of particular concern in that it has been established as a human carcinogen. There is clinical evidence that hyperplastic bone marrow leukemia is associated with exposure to benzene. Direct skin contact with oil can lead to irritation and dermal corrosion. At spills, effects on people from exposure to oil and to oil fumes include headaches, dizziness, nausea, sensation of inebriation, vomiting, abdominal pains, skin irritation and erythema after contact with oil, but no signs of changes in blood chemistry. The report also revealed that specific hydrocarbon constituents commonly found in natural curdes, refined products and other related fossil fuel sources can result in the introduction of cancer in humans and animals.

In the case of large oil spills, such as tanker accidents, the greatest hazard to human health is from explosion and fire at the spill site in the early hours after the spill has occured. While other people are at risk from the hazards of hydrocarbons at various times and distances from the site of the spill, (especially during clean-up operations); while these effects may be serious, these hazards are not of the magnitude of the the risk of fire and explosion.

### 3.7 Commercial Damage from Oil Pollution

#### 3.7.1 Fisheries

Fixed installations where fish or shellfish are held in intensive mariculture are particularly vulnerable to damage from oil pollution because the animals cannot escape. A slick of oil drifting through such an installation may inflict commercial damage quite incommensurate with the size of the spill. In the open sea, and as a rule in inshore waters, adult fish of commercial importance appear to be able to avoid areas affected by floating oil and are rarely killed. Since fish eggs and larvae are more sensitive then adults to toxins and are commonly in surface waters where they are likely to encounter high concentrations of petroleum hydrocarbons, they are expected to be particularly vulnerable to damage by oil pollution. (Clark, 1986)

On the other hand, floating and submerged oil has an impact on fishing and acquaculture activities by fouling gear. Apart from making the gear messy and awkward to handle, contact with fouled gear can contaminate the produce and render it unsuitable as food.

#### 3.7.2 Tainting

As serious as losses are resulting from deaths of fish and shellfish, the most important commercial damage is from tainting. Light oils and the middle-boiling range of crude oil distillates are the most potent source of tainting, but all crude oils, refined products, refinery effluents and the exhaust from outboard motors burning oil-petrol mixtures can impart an unpleasant flavour to fish and seafood which is detectable at extremely low levels of contamination. Oily petroleum flavours are not harmful to human health but are generally repulsive to humans. Fish tainted in this way is unmarketable. Low levels of contamination may produce indefinite, but certainly detectable off-flavours which may significantly damage the marketing of fish products from the region surrounding the affected area.

### 3.7.3 Tourism

Tourists prefer their bathing beaches free from oil and most coastal resorts put a good deal of effort into removing tar and oily residues from their amenity beaches. The impact of an oil spill might last years after the original clean-up of nearby massive oil spill accidents because oil which has infiltrated beaches can be brought to the surface by later storm action. Coastal areas and inshore waters throughout the world are often important tourist centres, or have the potential to be so. Some areas have been declared as land or marine nature reserves or national parks. Any damage to these areas above or below the water line, or any impoverishment of the flora and fauna by oil pollution will reduce their tourist value as well as their biological value.

### 3.7.4 Industrial Uses

Some power stations and industrial processes use sea water for cooling or for processing purposes, and the presence of floating or dispersed oil can interfere with this activity. Desalinization plants producing drinking water, such as those in the Arabian/Persian Gulf, are particularly susceptible to interference from oil pollution.

*From the previous discussions, there is be little doubt that the spillage of oil into the sea can cause extreme harm to the global community. Thousands of studies and reports on oil pollution have been made during the last decade researching and explaining the damage that has an impact on the marine environment, on human health and on other interests. Also, tens of international conventions, bilateral and multilateral agreements have been initiated in and among different nations in order to govern and regulate the discharge of oily wastes and other pollutants into the sea.*

*There is no doubt that a large number of the marine officers in Egypt share the responsibility for the current situation among the Egyptian coasts relating to oil pollution from ships. It is time for them to realise that to continue to act in this manner unconsciously, neglecting rules and human principles, is a great mistake for*

*their society, their children, themselves and for the future generations. It is needed to understand why national and international organisations are calling continuously for protection of the marine environment from all sources, including ships.*

*In this chapter, the scientific impact of hydrocarbons on the marine environment and on human health and activities has been highlighted. In chapter II the international regulations that govern the discharge or dumping of oily mixtures from ships into the sea with minimum harm to the marine environment. It remaine, from the practical point of view, to address how to prevent oil spills from ships when crude oil, or bunkers, are loaded, discharged or transfered internally among the ship tanks. Further, how to control and eliminate oil pollution must be addressed for cases when oil is accidentally spilled from the ship into the sea during these operations.*

*The following chapter addresses the ships contingency plan designed to allow implementation of immediate response actions in the case of accidental oil spills from the ship into the sea. It also explains the usefulness of shipboard check lists when dealing with cargo oil or bunkers in the ships' tanks.*

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# CHAPTER (4)

## Shipboard Oil Spill Contingency Planning and Ship/Shore Safety Check Lists

Referring to responses of questions number 6 and 7, in chapter one, from the questionnaire that has been prepared for marine officers in Egypt regarding the existence of shipboard contingency plans for oil spill incidents and whether the officers are prepared to execute such plans, it revealed that:

- 45% of the deck officers and 57% of the engineers were informed of the existence of the contingency plan on board their ships;
- 26% and 18% of the deck officers and the engineers respectively were not aware of the existence of such plan;
- 19% of the deck officers and 11% of the engineers were aware of the existence of the plan but had not studied it; and
- 10% and 14% of the deck officers and the engineers, respectively, indicated their ignorance about such plans.

This suggests that about 50% of the marine officers in Egypt do not know how to respond to oil spills in the case of accidents occurring on board their ships. Shipboard contingency plans are important for every crew member, especially officers, to know, including, how and where to execute them. Furthermore, international regulations, especially MARPOL 73/ 78, require shipboard contingency plans that need to be fully understood address the procedures necessary in order to reduce or control oil spill from ships.

This chapter provides guidance to the marine officers and ships crews in Egypt with the various steps which might be taken prior to and following an oil spill incident, as well as, general information that might be contained within the plan in order to provide them with a better understanding of the various issues involved.

## 4.1 Regulatory Requirements

Regulation 26 of Annex I of MARPOL 73/78 requires every oil tanker of 150 tons gross tonnage and above, and every ship other than an oil tanker of 400 tons gross tonnage and above, to have a shipboard contingency plan.

The plan must contain four essential elements:

- procedures for reporting oil pollution incidents;
- a listing of authorities to be notified;
- a detailed description of actions to be taken by the vessel's crew to reduce or control an oil discharge; and
- procedures for co-ordinating shipboard activities with national and local authorities.

*Before describing each of these elements, it is important to identify the meaning of a contingency plan, and discuss the factors relevant to the preparation of a shipboard oil spill contingency plan.*

## 4.2 What is a Contingency Plan?

A shipboard contingency plan is a plan prepared to assist personnel to deal with an unpredictable event. It must be:

- realistic, practical and easy to use;
- agreed and understood by all involved parties, both ashore and onboard; and
- tested, evaluated and updated regularly.

The need for pre-determined and properly structured contingency plans is clear when one considers the pressures and multiple tasks facing personnel when confronted with an emergency situation. In the heat of the moment, lack of planning will often result in confusion, mistakes, and the key people who should be advised of the incident being overlooked. Delays will be incurred and time will be wasted; time during which the situation may well worsen. As a consequence, the ship and its personnel may be exposed to increasing hazards and greater environmental damage may occur.

Effective planning will ensure that the necessary actions are taken in a structured, logical and timely manner. Routine exercises involving all interested parties will ensure that both ship and shore personnel are familiar with the contents of the contingency plan and that any deficiencies in it are highlighted and corrected. The contingency plan cannot be issued and then ignored, but must be routinely reviewed and updated in order to preserve the accuracy of the data and information it contains.

In summary, an effective contingency plan will serve to promote a trained and practised response when personnel are faced with an emergency situation.

### 4.3 Factors Relevant to the Preparation of Shipboard Oil Spill Contingency Plans

The shipboard oil spill contingency plan should be developed by the ship owner as an integral part of overall emergency planning. Although the shipboard plan may be used as a stand-alone document, it is essential that the elements of the plan complement those of contingency plans prepared for other parts of the organisation, such as head office and regional locations. In the event of a spill, all responsible personnel within the organisation will thus be aware of what is expected of them,

who should be contacted, how contact should be made and what information is required.

The ship's responsibilities and priorities in a spill situation are relatively straightforward and do not call for a complex contingency plan. Immediate action must be taken to minimise danger. Responsible authorities ashore, together with owners, charterers and other interested parties, must be provided with detailed advice of the incident and nature of the spill and steps must be taken to ensure that clean-up activities are initiated in a timely manner. Action must be taken on board to minimise the escape of oil but, when considering any cargo transfer operations, in case of tanker incident, due account must be taken of hull stress implications and the stability of the ship.

When spillage occurs at sea through either operational error or a casualty such as a collision or grounding, the reporting procedures will not be as clearly defined as they are in the in-port situation. The shipboard contingency plan must therefore provide specific advice and guidance as to who should be advised and how contact should be made. In a casualty situation, many additional factors involving the safety of personnel and the ships may take priority and relevant details provided to those authorities responsible for search and rescue, salvage and oil spill response. In many countries, a marine emergency centre will co-ordinate all response activities, whatever the nature of the casualty. In others, co-ordination and control may not be so clearly defined and local shipping agents may have to be utilised to alert responsible agencies and authorities on the ship's behalf. Language differences must be borne in mind, especially when using technical terms, and descriptions should be given clearly and concisely.

### 4.4 Reporting Procedures for Oil Pollution Incidents

Coming back to the four main elements that a shipboard contingency plan should include, reporting procedures for the oil pollution incident is the first element required. Notification of the nearest coastal state, without any delay, in case of oil spill incident from the ship is mandatory.

Article 8 and Protocol I of MARPOL 73/78 require that the nearest coastal state should be notified of actual or probable discharges of oil to the sea. The intent of the requirement is to ensure that coastal states are informed without delay of any incident giving rise to pollution, or threat of pollution, of the marine environment, as well as the need for assistance and salvage measures, so that appropriate action may be taken.

The reporting procedure to be followed by the master or other person in charge of the ship after an oil pollution incident is based on guidelines developed by **the IMO by resolution A 648(16). (General Principles for ships Reporting Incidents Involving Dangerous Goods, Harmful Substances and/or Marine Pollutants).** If the ship is involved in a pollution incident, reports must be made both to coastal state or port contacts, as appropriate, and to contacts representing interests in the ship.

#### 4.4.1 When Notification is Required

The provisions of MARPOL 73/78 require an incident report to be made by the ship to the nearest coastal state whenever the incident involves:

- a discharge, or probable discharge, resulting from damage to the ship or its equipment, or for the purpose of securing the safety of a ship or saving life at sea; or
- a discharge during the operation of the ship in excess of the quantity or instantaneous rate permitted under the present Convention.

It should be borne in mind that the master has a requirement to report even when actual spill has not occurred but there is a probability that one could.

### 4.4.2 Who to notify

The contingency plan should provide details of all parties to be advised in the event of an incident and this information may be provided in the form of a contact list. When compiling such lists it should be remembered that, in the event of a serious incident, ship's personnel will be fully engaged in saving life and taking steps to control and minimise the effects of the casualty. They should therefore not be hampered by having onerous communications requirements imposed on them. The master will obviously need to make the required initial reports to the relevant shore authorities and will need to advise full details to his owners.

In some companies, the master may have to alert all interested parties and the contingency plan should detail who these are and in what order they should be contacted. Such details will be entirely company specific and will to a certain extent depend on the back-up available from the shore management structure.

When compiling contact lists, due account must be taken of the need to provide 24 hour contact and to nominate alternates to the designed contact. Furthermore, details must be routinely updated to take account of personnel changes and alterations in telephone, telex and fax numbers.

Company organisational charts can be used to complement the contact lists in order to provide a clear outline of the departments involved in the spill response and the inter-relationships between them.

The contingency plan should also contain advice to the master on how approaches from the press and media should be dealt with. At times of peak

workload, such approaches directed to the ship will cause considerable distraction and may hamper essential communications by, for example, engaging satellite channels.

### 4.4.3 Transmission or Statutory Reports

The master has a statutory obligation to report an incident to the nearest coastal state which should be kept advised of the way the casualty situation progresses. Full co-operation should be extended to the authorities and all reasonable requests for information should be met.

Such reports should be transmitted either:

- to the nearest coast radio station on appropriate frequencies in the bands 405-525 k Hz, 1605-2850 k Hz or 156-174 M Hz;

or

- if the ship is not within reach of an MF or VHF coast radio station, the most appropriate HF coast stations or on a relevant satellite communication system;

or

- when the ship is within or near to an area where a ship movement reporting system has been established, to the designated radio station of that system.

### 4.4.4 Information to be Provided

The following instructions, regarding the ships masters report in the event of oil spill from the ship, are based on the **IMO Resolution A 648(16) in 1989,** taken from the report entitled **"Model Shipboard Oil Pollution Emergency Plan" published by the International Chamber of Shipping.**

#### 4.4.4.1 Initial Report

When transmitting initial reports to the authorities of the nearest coastal state, the format should conform with the guidance contained in A 648 (16) and the report should contain the following information:

A) Name of ship, call sign and flag.

B) Date and time (GMT) of incident: a 6-digit group giving day of month (first two digits), hours and minutes (last four digits).

C) Ship's position, giving latitude: a 4-digit group in degrees and minutes suffixed with N (North) or S (South); and longitude: a 5-digit group in degrees and minutes suffixed with E (East) or W (West);

or

D) Ship's position by true bearing (first 3 digits) and distance (stated) from a clearly identified landmark.

E) True course (as a 3-digit group).

F) Speed (in knots and tenth of a knot as a 3-digit group).

L) Route information - details of intended track.

M) Full details of radio stations and frequencies being guarded.

N) Time of next report (a 6-digit as in B).

O) Draught (a 4-digit group giving draught in meters and centimetres).

P) Types and quantities of cargo and bunkers on board.

Q) Brief details of effects, damage, efficiencies or other limitations. These must include the condition of the ship and ability to transfer cargo, ballast, or fuel.

R) Brief details of actual pollution. These should include the type of oil, an estimate of the quantity discharged, whether the discharge is continuing, the cause of the discharge and, if possible, an estimate of the movement of the slick.

S) Weather and condition, including wind force and direction and relevant tidal or current details.

T) Name, address, telex, facsimile and telephone numbers of the ship's owner and representative (manger or operator of the ship, or their agents).

U) Details of length, breadth, tonnage and type of ship.

W) Total number of persons onboard.

X) Miscellaneous- to include relevant details including, as appropriate:

- Brief details of incident.
- Names of other ships involved.
- Action taken with regard to the discharge and movement of the ship.
- Assistance or salvage resources which have been requested or provided.
- Personnel injuries sustained.
- Whether medical assistance is required.

If no outside assistance is required, this should be clearly stated.

Note:

The reference letters in the listing above do not follow the complete alphabetical sequence as certain letters are allocated to information required for other reporting formats.

#### 4.4.4.2 Follow-up Reports

After transmitting the initial report, by the ship, to the concerned parties, further reports must be regulatory sent. in order to keep them informed as the incident develops. Follow-up reports should be in the same way given in section 4.4.4.1. It should include information on any significant changes in the ship's condition such as, the rate of release and spreads of oil, any changes in weather conditions and detailed of agencies notified and any clean-up activities underway. Ship owner should also be advised of contact details for the on-scene commander appointed for controlling the clean-up. (ICS,1993)

#### 4.4.4.3 Probability of Discharge

The master has a duty to report to the nearest coastal state when an incident involves the probability of a discharge. In judging whether there is such a probability

and whether the report should be made, the following factors are amongst those that should be taken into account:

a) the nature of the damage, failure or breakdown of the ship, machinery or equipment; and

b) the sea and wind state, the proximity to land or other navigational hazards, and the traffic density.

Whilst is impractical to lay down precise definitions for all types of incidents involving probable discharge which could warrant an obligation to report, the contingency plan should contain general guidance to the master. For example, reports should be made in case of:

a) damage, failure or breakdown which affects the safety of the ship, such as collision, grounding, fire, explosion, structural failure, flooding; and

b) failure or breakdown of machinery or equipment which results in the impairment to safe navigation, such as failure or breakdown of steering gear, propulsion plant or electrical generating system. (ICS, 1993)

If in doubt, the master should always make a report. In all cases, the authorities should be kept informed as to how the situation progress and be advised when all threat of pollution has passed.

### 4.5 Steps to Minimise the Escape of Oil

#### 4.5.1 Operational Spills ( preventive measures)

Several items in the Ship/Shore Safety Check List specifically address measures aimed at preventing oil pollution or minimising the effects should a minor spill occur. These include the provision of experienced and responsible personnel to monitor operations, agreed communication systems, understanding and agreement of oil transfer and emergency shutdown procedures and other issues addressing

hardware-related items such as the adequacy of scupper plugs, and the blanking of unused oil connections.

If, despite the adherence to proper procedures, an oil spill does occur, all oil and bunker operations should be stopped by the quickest means and should not be re-started until the source of the leak has been identified and cured and hazards from the released oil have been eliminated. In most cases, the cause of the leak will be obvious but, in some instances, such as spillage resulting from slight hull leakage, the source may be difficult to locate, requiring the services of a diver.

#### 4.5.1.1 Pipeline Leakage

Should the leakage be from the ship's on deck pipe work, the affected sections should be drained down to an available empty or slack tank. Should it be suspected that the source of leakage could be the pump room sea valves (in tankers). Measures should be taken to relieve any pressure from the relevant sections of the line. The way that this is done would vary from ship to ship and the contingency plan should provide specific guidance. Pressure could be relieved by opening up the line to an empty tank; other methods could involve using a stripping pump to empty and depressurise the line.

#### 4.5.1.2 Tank Overflow

Should the spillage be due to overflowing a oil tank, the level within the tank should be lowered by dropping oil back to an empty or slack tank. Shall all other tanks be full, pumps should be readied and excess oil transferred ashore.

#### 4.5.1.3 Hull Leakage

Should spillage be due to suspected hull leakage, measures should be taken to reduce the head of oil in the tank involved either by internal transfer or discharge ashore. Unless timely corrective action is taken, oil will continue to flow out to sea

until hydrostatic balance is achieved between the head of oil remaining in the tank and the sea water pressure exerted on the outer hull. Should it not be possible to identify the specific tank from which leakage is occurring, the levels of all tanks in the vicinity should be reduced, taking into account the effect on hull stress and stability. Should it be suspected that leakage is from a fracture in the bottom plating or lower shell plating, consideration should be given to reducing the level in the tank, if full, and then pumping a water bottom into the damaged tank to prevent any further oil spillage.

In all cases where action is taken to prevent or minimise oil spillage, oil segregation and quality concerns must be secondary to preventive measures and the contingency plan should clearly state the company's policy in this regard. Furthermore, no action should be taken that in any way could jeopardise the safety of personnel either onboard or ashore.

### 4.5.2 Spills Resulting from Causalities

#### 4.5.2.1 Priority Actions

In the event of a casualty, the master's priority will be to ensure the safety of personnel and to take action to prevent escalation of the incident. In casualties involving spills, immediate consideration should be given to measures aimed at preventing fire and explosion, such as altering course so that the ship is upwind of slick or shutting down non-essential air intakes. If the ship is aground, and cannot therefore manoeuvre, all possible sources of ignition should be eliminated and action taken to prevent flammable vapours entering accommodation and engine room spaces. When it is possible to manoeuvre, the master in conjunction with the appropriate shore authorities, many consider moving his ship to a more suitable location in order, for example, to facilitate emergency repair work or lightering operations, or to reduce the threat posed to any particularly sensitive shoreline areas.

Prior to considering remedial action, the master will need to obtain detailed information on the damage sustained by his ship. A visual inspection should be carried out and all tanks and other compartments sounded.

If the casualty involves grounding, breaching of the outer hull, or other structural damage for which calculations of stability and damaged longitudinal strength are beyond the ship's resources, assistance must be sought from shore. An appendix can be referred to, which could include guidance on information that would be needed by a classification society to enable it to make damage stability/survival calculations.

The shipboard contingency plan should clearly indicate who the master should contact in order to gain access to these facilities. When the ship is damaged, the following information should be sent to the owner or operator in order that the stability of the ship can be calculated:

a) Loading condition (intact)
   i) cargo/ballast, amount and disposition
   ii) fuel oil, amount and disposition
   iii) draught, when free loading

b) Damage
   i) location and extent

c) Condition of the ship
   i) extent to which aground (soundings around the ship)
   ii) draught, forward, amidships (port and starboard), and aft
   iii) cargo and fuel, loss or change in amount or disposition
   iv) action already taken

d) Local conditions
   i) tide, range and whether rising or falling
   ii) wind, strength and direction

iii) sea and swell, height and direction

iv) current

v) weather forecast

vi) air and sea temperature

vii) nature of bottom

viii) other locally significant features

The above information, some of which will only be relevant in the case of grounding, should be supplemented as much as possible. Once the stability of the ship has been computed, the owners will be in a position to advise the master on action that can be safely taken to minimise damage and prevent further pollution.

***General Guidance on Emergency and Casualties Procedures***

*Masters should be provided with guidance on emergency and casualty procedures, including advice on priority counter-measures to be taken in the event of an incident. In this regard, the ICS/OCIMF publication (Peril at Sea and Salvage) contains valuable information on actions to be taken and consideration should be given to referencing this publication in the contingency plan or to including relevant extracts.*

### 4.5.3 Initiating the Clean-up Response

#### 4.5.3.1 Small Operational Spills

In most instances, the ship's initial report to terminal or harbour authorities will trigger the mobilisation of the local response organisation. It is not normally practical for ship's personnel to be directly involved in the clean-up activities and their prime role must be to provide as much information as is necessary to assist the response and to co-operate fully with clean-up personnel. However, where there is no local response or there is a delay in it being activated, the master should consider the use of available shipboard materials to clean up or contain the spilled oil by, for example,

using ship-stocked sorbents or utilising mooring ropes or air-filled hoses as makeshift booms.

In case of small operational spills, the ship should take whatever actions are necessary to prevent oil from escaping over the side and, having done so, will need to take action to clean up the oil contained on deck. The shipboard contingency plan should provide details of the type, quantity and location of spill response material kept on board for dealing with minor spillage on deck. This could usefully include sorbent material, degreasant, dispersant and portable pumps, all of which should be maintained ready to respond rapidly to minor spills.

It must be stressed within the plan that spilled oil should never be washed over side, unless however, such poses a risk to the ship in not doing so, in which case such could result in an explosion or fire. Neither should dispersants or degreasants be used on oil spills in the water as their use may contravene local regulations. Once the oil is in the water, there is very little that the ship can do to respond practically and reliance must be placed on shore authorities and organisations.

#### 4.5.3.2 Larger Spills

In the case of larger spills, the ship is even more restricted as to what action it can take to respond practically to the spill. In the case of casualty, the safety of the ship and crew will also take priority. Invariably, therefore. ship's actions will be limited to reporting details to the relevant authorities, owners, and P and I Club, and to requesting the appropriate clean-up response.

The master should act as the Company's initial on-scene representative and will be responsible for overseeing the actions of any salvage or oil spill contractors employed until such time as he is formally advised by his company that he has been relieved of these responsibilities.

### 4.6 National and Local Co-ordination

Quick, efficient co-ordination between the ship and coastal state or other involved parties becomes vital in mitigating the effects of a pollution incident. In most countries it is accepted that an oil spill can be tackled most effectively from the shore and there is normally no requirement on the part of the ship owner or the ship's crew to organise the clean-up response in respect of oil lost overboard. Operational spills usually occur in port at an oil or bunkering facility and tend to be cleaned up by facility operator. In the case of casualties, the responsibility for organising and controlling the clean-up response is usually assumed by an agency of government. In both cases the spiller would be expected to co-operate fully, and pay the reasonable costs of clean-up and any damages caused, up to a specified limit of liability based on the tonnage of the ship.

This section of the plan should contain information to assist the master in initiating action by the coastal state, local government or other parties. Detailed information on spill response arrangements and capabilities for specific areas may be included as appendices to the plan. In the case of coastal states which require the ship owner to organise the clean-up, greater detail will be required in the plan to assist the master in the early stages following the incident before shore based representatives arrive on-scene.

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From the questionnaire analysed in Chapter I, it was declared that more than 51% of the deck officers and 57% of the engineers in Egypt were not aware of the existence of check lists for dealing with oil (as a cargo or bunker) in the routine operations on board their ships. The usage of such check lists can prevent or avoid discharges, spillage or leakage of the oily mixtures into the sea. It is a quick and easy way by which the ship's operators can ensure that all safety precautions have been taken prior, during and after dealing with oil in order to avoid accidental spills into the sea. It will also assist them not to forget, byrpass or neglect one or more of the appropriate steps in the operating procedures when loading/discharging oil and oily mixtures from or to their ships.

### 4.7 Precautions that should be Taken to Prevent Accidental Pollution by Oil

The following precautions should be observed by ships operators when bunkering or discharging, oily mixtures:

Before discharging/bunkering operations, check that

- The operation has been planned in advance and written down. All persons to take part in this operation have been briefed, and copies of the plan are given to them for strict adherence to the procedure.
- Effective communications systems with shore staff or barge crew are established. An alternative system is agreed upon, in case of failure of the main one.
- The displaced atmosphere can escape freely from the air vent pipes.
- The unit of measurement being used is well defined.
- All sea and observed valves connected to the operating system are closed.
- Operating system valves and connections not in use are closed and blank flanged.
- All deck scuppers are effectively sealed (e.g. plugged and cemented).
- Oil booms, if carried, are ready for quick launching.

- Drip trays are in position below connections and vents.
- Hoses are in good condition, properly tested, connected and supported.
- Dry absorbent materials (such as sawdust) are readily available.
- The piping system is lined up correctly.
- The valves to the tanks designated to receive first the incoming bunkers are open.

After checking all of the above items, the terminal or barge can be notified to commence the operation.

During bunkering/discharging operations, check that:

- Bunker hoses and connections are not leaking.
- Pressure is relieved in tanks being topped up, either by slowing down the rate of the incoming bunkers or by controlled flow of the next tank(s) to be loaded.
- Loaded tanks are closed and the finished ullage is maintained, while other tanks are being loaded.
- Permission is asked from the supply terminal before closing any valve on the fuel line.
- Ample warnings are given to the terminal before the final notification for the interruption of the flow.
- Ample ullage space is left in the last tank to allow for draining of the hoses and for the relief of any air locks in the system.

On completion of bunkering/discharging operations, check that:

- Hoses are drained before disconnecting.
- Operating system valves are closed.
- Hoses are blank flanged as soon as they are disconnected.
- Operating system connections are blank flanged as soon as hoses are disconnected.
- Fuel line and tank filling valves are securely closed.
- Final soundings of all fuel oil tanks have been taken. Ample space is left for expansion.

**4.7.1 Ship/shore Check List**

**It is a simple check list as amended by the Maritime Safety Committee (December 1980 and 1983, Appendix 4)**

*Ship's Name* ----------

*Berth* ---------- *Port* ----------

*Date of Arrival* ---------- *Time of Arrival* ----------

**Instructions For Completion**

*The safety of operation requires that all questions should be answered affirmatively (Y). If an affirmative answer is not possible, the reason should be given and agreement reached upon appropriate precautions to be taken between the ship and the terminal. Where any question is not considered to be applicable a note to that effect should be inserted in the remarks column.*

☐ the presence of this symbol in the columns "ship" and "terminal" indicates that check lists shall be carried out by the party concerned.

The presence of the letters **A** and **P** in the column "Code" indicates the following:

**A-** the mentioned procedures and agreements shall be in writing and signed by both parties.

**P-** in the case of a negative answer the operation shall not be carried out without the permission of the Port Authority.

| Bulk Liquids-General | Ship | Terminal | Code | Remarks |
|---|---|---|---|---|
| 1) Is the ship securely moored? | ☐ | ☐ | | |
| 2) Are emergency towing wires correctly positioned? | ☐ | ☐ | | |
| 3) Is there safe access between ship and shore? | ☐ | ☐ | | |
| 4) Is the ship ready to move under its own power? | ☐ | | P | |
| 5) Is there an effective deck watch in attendance on board and adequate supervision on the terminal and on the ship? | ☐ | ☐ | | |
| 6) Is the agreed ship/shore communication system operative? | ☐ | ☐ | A | |
| 7) Have the procedures for cargo, bunker and ballast handling been agreed? | ☐ | ☐ | A | |
| 8) Has the emergency shut down procedure been agreed? | ☐ | ☐ | A | |
| 9) Are fire hoses and fire fighting equipment on board and ashore positioned and ready for immediate use? | ☐ | ☐ | | |
| 10) Are cargo and bunker hoses/arms in good condition and properly rigged and, where appropriate, certificates checked? | ☐ | ☐ | | |
| 11) Are scuppers effectively plugged and drip trays in position, both on board and ashore? | ☐ | ☐ | | |
| 12) Are unused cargo and bunker connections including the stern discharge line, if fitted, blanked? | ☐ | ☐ | | |

| Bulk Liquids-General (continued) | Ship | Terminal | Code | Remarks |
|---|---|---|---|---|
| 13) Are sea and overboard discharge valves, when not in use, closed and lashed? | ☐ | ☐ | | |
| 14) Are all cargo and bunker tank lids closed? | ☐ | ☐ | | |
| 15) Is the agreed tank venting system being used? | ☐ | ☐ | A | |
| 16) Are hand torches of an approved type? | ☐ | ☐ | | |
| 17) Are portable VHF/UHF transceivers of an approved type? | ☐ | ☐ | | |
| 18) Are the ship's main radio transmitter aerials earthed and radars switched off? | ☐ | | | |
| 19) Are electric cables to portable electrical equipment disconnected from power? | ☐ | ☐ | | |
| 20) Are all external doors and ports in the amidships accommodation closed? | ☐ | ☐ | | |
| 21) Are all external doors and ports in the after accommodation leading onto or overlooking the tank deck closed? | ☐ | ☐ | | |
| 22) Are air conditioning intakes which may permit the entry of cargo vapours closed? | ☐ | ☐ | | |
| 23) Are window-type air conditioning units disconnected? | ☐ | ☐ | | |

| Bulk Liquid-General (continued) | Ship | Terminal | Code | Remarks |
|---|---|---|---|---|
| 24) Are smoking requirements being observed? | ☐ | ☐ | | |
| 25) Are the requirements for the use of galley and other cooking appliances being observed? | ☐ | ☐ | | |
| 26) Are naked light requirements being observed? | ☐ | ☐ | | |
| 27) Is there provision for an emergency escape possibility? | ☐ | ☐ | | |
| 28) Are sufficient personnel on board and ashore to deal with an emergency? | ☐ | ☐ | | |
| 29) Are adequate insulating means in place in the ship/shore connection? | ☐ | ☐ | | |
| 30) Have measures been taken to ensure sufficient pump room ventilation? | ☐ | | | |

***Source: Ship/shore safety check list, Appendix 4, Part A, IMO, 1983***

*Prevention is better than cure. Well understanding of the previous precautions when dealing with oil and oily mixtures on board ships, and usage of a check list after wards, will reduce the probabilities of oil spill incidents from ships.*

This chapter has discussed, in detail, the operational procedures that should be taken in case of oil spill incidents from ships. The basic principles of development of a shipboard contingency plan have also been explained.

Ship operators in Egypt and their related administrators are required to develop of and supply these plans as per the IMO Resolution A 648 (16). Masters and chief

engineers on board every Egyptian ship must ensure the existence of such plans. Procedures for training and exercises, and for updating the plans, should be defined. Regular exercises will ensure that contingency arrangements function properly and that those likely to be involved in a spill, or the threat thereof, become fully familiar with their particular responsibilities.

Prevention of the marine environment in Egyptian waters starts with its national ships crews. Ships officers and crews must contribute effectively in the protection of the marine environment in order to achieve sustainable development in this country for the benefit of the existing population and the coming generations.

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# CHAPTER (5)

## Guidelines for the Suggested Short Course

### 5.1 Conclusion

The main finding of this paper is based on the questionnaire analysed in chapter 1. It is concluded that the lack of knowledge among marine officers in Egypt has a significant influence on the existing situation regarding the pollution of Egypt's coastal waters and shorelines. The questionnaire also reveals the areas of weakness that need to be clarified and understood by those officers.

The main objective of this research is to provide guidelines for a short course through which marine officers in Egypt can gain a thorough understanding of pollution matters, thus enabling them to enhance their performance when dealing with oil on board ships. A result of such a course would be that, Egyptian coasts are protected from operational and accidental oil spills from the national fleet and contamination of the marine environment from those oil spills will be avoided.

### 5.2 Why Short Course?

> "A short course is a "short" intensive and specialised course through which job requirements are met by an increase in qualification"
> (Zade, 1988).

From this meaning, it is clear that trainees on such courses already have a little background knowledge regarding the contents of the course. They are already

graduated and are performing their jobs on board ships. Long courses therefore, do not meet their requirements. Rewntree has stated,

> "...the term ' course' is used for a sequence of structured learning of technical or methodological subject. ' Short' is interpreted as duration within few days and weeks. ' Intensive' refers to the style in which a short course should be and is normally carried out and ' specialised' is to indicate that the subject of short course is mostly narrow, in contrast to longer courses with an often broad subject, and that knowledge is available on which a specialisation can be built" (Rewntree, 1981)

The questionnaire methodology was used in this research with the aim of diminish the area of subjects required to be covered in this short time period (5 days). As a result, the net outcome of the respondents analysis identified four main areas of weaknesses that need to be examined intensively. These areas are:

- international conventions dealing with oil pollution prevention (with more focusing on MARPOL 73/78 Annex I)
- the scientific principles of oil and its effects to the marine environment and human health
- the shipboard contingency plan in case of oil spill incidents, and
- ship/shore safety check list when dealing with oil/bunker.

### 5.3 Scope

The proposed short course provides information for masters, deck officers and engineer officers in Egypt to enable them to maintain and operate their ships in accordance with the international regulations regarding oil pollution prevention (especially MARPOL 73/78 Annex I). It has the following aims;

- protecting Egyptian and other coastal waters against oil pollution from their ships;
- ensuring safe and environmentally sound ship and tanker operators; and

- preventing their ships being delayed or embossed fines in ports as a result of port state control actions.

### 5.4 Objectives

The opjectives of the course are to enable officers to appreciate the concern about pollution of the marine environment; understand the impact of oil pollution to marine environment and human health, be aware of, how much ships contribute to this form of pollution and know the international rules aimed at preventing such pollution. Trainees will also be able to comply with those rules and describe the monitoring measures designed to ensure compliance. In addition, they will be able to develop a shipboard contingency plan (especially masters and chief engineers) in case of oil spill incidents. They will understand how to use check lists in case of dealing with oil/bunker during routine operations between ship and shore terminals.

All of the aforesaid aims will serve the main object of this research which is to eliminate and minimise oil pollution from ships by marine officers in Egypt.

### 5.5 Detailed Teaching Syllabus

The suggested time period for this short course is five days, within six hours taught each day.

**5.5.1 Subject: The Need of the Training Course (1.5 hours)**

**5.5.1.1 Introduction** (1.5 hours)

Guidance Notes:

- explain the current situation regarding the current situation of the marine environment in Egypt
- state the different reasons of this situation
- describe the level of knowledge regarding this matter among marine officers in Egypt

- explain why such course it needed
- a brief introduction and overview of IMO and its functions

### 5.5.2 The International Conventions Dealt with Oil Pollution Prevention from Ships (Focusing in MARPOL 73/78 Annex I) (9 hours)

#### 5.5.2.1 Historical Background and Introduction to MARPOL 73/78 (1.5 hours)

Guidance Notes:

- state the historical background regarding international conventions and why the international community started to develop such legislation
- list the international conventions and amendments dealing with the different forms of pollution with a brief overview of each convention and what area it covers
- explain the need for more comprehensive convention dealing with pollution from ships (a preamble to MARPOL 73/78)
- define MARPOL 73/78 (the Convention and the Protocol)
- describe in which respects MARPOL differs from the earlier conventions
- state the five Annexes of the convention and what is each Annex deals with
- state which Annexes must be accepted by the convention (mandatory ratification of Annexes I and II), and which Annexes are optional (Annexes III, IV and V)
- state that Egypt has ratified this convention and developed its national legislation based on it (law number 4 for the year 1994)

#### 5.5.2.2 MARPOL 73/78 and Introduction to Annex I (1.5 hours)

Guidance Notes

- state how many chapters and appendices in this annex
- explain the main definitions that seem to be most appropriate for the understanding of ship operators. These definitions are:

- oil
- new ship
- special areas
  * lists special areas
  * describe the way in which special areas differ from other seas as far as ship' s operators are concerned
  * state that other sea areas may be designated special areas in the future

- describe the International Oil Pollution Prevention Certificate and its importance, related periodical surveys and its duration

**5.5.2.2.1 Annex I (continued)**

**Machinery and cargo oil residues and oily wastes** (1.5 hours)

Guidance Notes

- state that although the principles of environmental protection apply to both machinery space oil and cargo oil, the measures for protecting the marine environment differ for these two categories
- describe briefly the two approaches
- list the source of oil and water mixtures that must be disposed of
- explain measures to minimise the generation of such wastes
- state that oily wastes must either be dealt with on board or discharged to shore
- describe the means of disposal on board

**5.5.2.2.2 Annex I (continued)**

**Control of Discharges from machinery Spaces (Discharge Provisions)**

(1.5 hours)

Guidance Notes

- explain the requirements of control of operational pollution from ships with regard to:
  - oil tankers of all sizes (within and outside special areas)

- oil tankers of all sizes and other ships of 400 GRT and above (within and outside special areas)
- ship of less than 400 GRT other than tankers (within and outside special areas)

- explain requirements of oil discharge monitoring and control system and oil filtering equipment.
- state exceptions of the previous point
- describe the oil record book, its significance and how to fulfil its requirements
- explain the provisions regarding the carriage of ballast water in an fuel or cargo tanks

**5.5.2.2.3 Disposal of Residues and MARPOL 73/78 Annex II**

(1.5 hours)

Guidance Notes

- explain that the prohibition on discharge into the sea results in residues being retained on board
- list ways of disposing of residues as:
  - mixing with bunkers
  - discharge to shore reception facilities
  - incineration
- state that the disadvantage of mixing residues with fuels is that the total volume of oily residues increases
- state that the disadvantage of dependence on reception facilities is that these are not always available when needed
- state the disadvantage of incineration is an increase in fuel consumption

**Annex II**

- identifie briefly Annex II
  - state the four categories of noxious liquid substances
  - identifie special areas

- state Annex II requirements regarding pumping and piping arrangements to be provided in ships

- explain discharge conditions for effluents containing noxious liquid substances outside special areas
- explain discharge conditions for effluents containing noxious liquid substances within special areas
- describe surveying and certification under Annex II conditions
- state exceptions of discharge prohibitions of noxious liquid substances under certain circumstances
- describe the cargo record book and its basic contents

states the five appendices in Annex II and what does each one deal with

**5.5.2.3 MARPOL (73/78) Annexes III, IV and V** (1.5 hours)

**(A) Annexes III, IV**

Guidance Notes

- identifie Annex II describing to which types of ships it applies
- state the conditions that laid down in Annex III by which ships can carry harmful substances (i.e., packaging, marking and labelling ....etc.)
- identifie briefly Annex IV and states its status regarding entry into force
- define the meaning of sewage
- explain regulations 8 of Annex IV regarding the discharge conditions of sewage from ships outside and within special areas
- describe Sewage Pollution Prevention Certificate and its time of validity
- state exceptional conditions from regulation of discharging of sewage into the sea

**(B) Annex V**

Guidance Notes

- identifie Annex V and its regulations
- define the meaning of:

- garbage
- special areas

- explain the disposal requirements of garbage as mentioned in regulations 3,4 and 5 in Annex V
- state exceptions from the provisions of Annex V

**5.5.3 Subject**

**The scientific principles of oil and its effects to the marine environment and human health (3 hours)**

**5.5.3.1 Introduction** (1.5 hours)

Guidance Notes

- introduction
- define:
  - what is oil?
  - what is contamination and what is pollution?
- explain the input of oil into the sea
- describe the estimates of inputs of petroleum hydrocarbons into the marine environment
- describe the estimated inputs of petroleum hydrocarbons into the oceans due to maritime transportation activities
- explain the physical and chemical fate of spilled oil to the sea

**5.5.3.2 Ecological impact of and commercial damage from oil pollution** (1.5 hours)

Guidance Notes

- explain the impact of oil pollution to:
  - rocky substrata

- soft substrata
- plankton
- fixed vegetation
- sea birds
- marine mammals

- explain the effects of oil spills to the human health
- explain the commercial damage resulted from oil pollution to:
  - fisheries
  - tourism
  - industrial uses
- conclusion

**5.5.4 Subject:**

**Shipboard Oil Spill Contingency Planning (4.5 hours)**

**5.5.4.1 Introduction** (1.5 hour)

Guidance Notes

- state marine officers' responses (statistics) regarding existence of such plans on board their ships.
- define the meaning of a contingency plan
- explain why a contingency plan is needed on board every ship
- state the regulatory requirements regarding these plans (e.g. MARPOL 73/78)
- explain the factors relevant to the preparation of shipboard oil spill contingency plan

**5.5.4.2 Reporting Procedures for Oil Pollution Incidents** (1.5 hours)

Guidance Notes

- identifie requirements of IMO resolution A 648 (16)
- explain when notification is required
- explain who to notify

- state the different ways of transmitting statutory reports
- explain information that must be provided in the initial report (based on IMO resolution A 648 (16))
- explain the follow up reports
- explain the master's duty regarding reporting action when an incident involves the probability of discharge

**5.5.4.3 Steps to Minimise the Escape of Oil** (1.5 hours)

Guidance Notes

**A) Operational Spills**

- explain procedures that must be taken in case of:
  - pipelines leakage
  - tank overflow
  - hull leakage

**B) Spills Resulting from Causalities**

- explain the priority actions in the event of a causality
- describe information that should be sent to ship's owner or operator in order that the stability of the ship can be calculated which are:
  - loading conditions
  - damage
  - condition of the ship
  - local conditions
- identifie guidelines by which ship's master could be provided on emergency and casualty procedures (e.g. ICS/OCIMF publication)
- explain duties of ship's personnel in clean-up response in case of:
  - small operational spills
  - large spills

- explain the importance of full co-ordination between ship and coastal state for mitigating the effects of a pollution incident

**5.5.5 Practical Exercise of Oil Pollution Prevention and Oil Pollution Response in Case of Oil Spill Incident** **(6 hours)**

(A) Oily-water Separator: (1 hour)

- describe the operating principle of the equipment
- explain the predicted problems of this equipment:
  - the limited capacity of the oily water separator;
  - the separation process is adversely affected by detergents used in cleaning the engine room at its bilge, or emulsifies present in lubricating oil; and
  - the deterioration in the quality of fuel oil, which has resulted in larger quantities of sludge after purification than originally anticipated
- state that the equipment is usually fitted with an alarm to indicate a high oil level
- describe the functioning of filters/coalesces
- describe the operating principle of a bilge oil monitor
- explain why oily water separators may not function properly, even if well maintained and correctly operated
- An Audio-visual Show (video tape) (25 minutes)
  Oily Water Separators (Catalogue No. C010, Code No. 124)

- **Practical Exercise for operating oily-water separator** (1.5 hours)

(B) Exercise on Oil Pollution Response (1 hour)

- explain actions that should be taken in case of oil spill incidents
- state the duties of each personnel when dealing with an oil spill incident
- describe the different methods for combating oil spills:

i) Sorbents and Sorbent Booms:

- describe the different types of sorbents such as

* natural organic materials (e.g. bark, peat moss, straw, hay, feathers, coconut husks and sugar cane waste);
* mineral-based materials (e.g. vermiculite, perlite and volcanic ash)
* synthetic organic sorbents (e.g. polyurethane foam and polypropylene fibers)
* oil philic

ii) Booms:

- describe the use of boom (when it is available) by ship' s life boats to restrict the spread of the oil over the surface of the sea and to concentrate and retain it for recovery.

iii) Chemical Dispersant:

- explain the use and application technique of chemical dispersant for clean-up operation
- explain the main two types of dispersants which are:
  * hydrocarbon or conventional dispersants; and
  * concentrate or self-mix dispersants.

- An audio-visual show (25 minutes)

  Fighting Oil Spill (Catalogue No. C010, Code No. 124)
- **Practical Exercise on Oil Spill Response** (1.5 hours)

**5.5.6 Subject: Ship/shore Safety Check List (3 hours)**

**5.5.6.1 Introduction** (1.5 hours)

Guidance Notes

- explain importance of the existence of such check lists on board ships when dealing with oil/bunker
- state statistics showing the existence of such lists on board merchant ship's in Egypt

**5.5.6.2 Precautions that must be taken to Prevent Accidental Pollution by Oil**

(1.5 hours)

Guidance Notes

- explain precautions that must be observed by ships operators when bunkering or discharging oily mixtures in the following conditions:
  - before discharging/bunkering operation
  -during bunkering/discharging operation
  - on completion of bunkering/discharging operation
- describe the ship/shore check list and explains how to use it

**5.5.7 Evaluation** **(1.5 hours)**

The suggested method of evaluation is a simple test consisting of a group of questions. This evaluation depends upon what the trainee is expected to achieve in terms of knowing, comprehending and applying the course content.

It is important that the trainees must be informed of this evaluation at the beginning of the course. It will make them more conscious of the lectures, trying to collect the information given and asking for clarification when it is needed. It will achieve the main objective of such course of developing understanding, knowledge and ability to perform their duties in emergency situations.

**5.5.8 Discussion** **(1.5 hours)**

An open discussion with the trainees in order to clarify any missing information and review their answers, and explaining the incorrect information. It is also an opportunity to evaluate the course in terms of the teaching method, teachers' levels and other teaching aids whether it is video tapes, overheads or handouts.

***The recommended course timetable is shown on the following page***

## Course Timetable

| Period/Day | Day 1 | Day 2 | Day 3 | Day 4 | Day 5 |
|---|---|---|---|---|---|
| •1st Period (1.5 hours) | •The need of the training course | •MARPOL 73/78 Annex I (contd) - control of oil discgarges from machinery spaces | •Ecological impact and commercial damage from oil pollution | •Practical exercise of oil pollution prevention: - oily water separator •An audio-visual show | •Ship/shore safety check list (introduction) •Precautions that must be taken to prevent accidental pollution by oil |
| •2nd Period (1.5 hours) | •Historical background •MARPOL 73/78 (introduction) | •MARPOL 73/78 Annex I (contd.) - dispsal residues •MARPOL 73/78 Annex II | •Shipboard oil spill contingency planning (introduction) | •Practical exercise of oil pollution prevention - oily water separator (continued) | •Precautions that must be taken to prevent accidental pollution by oil (continued) •Ship/shore check list |
| •3rd Period (1.5 hours) | •MARPOL 73/78 Annex I - special areas - OPPC | •MARPOL 73/78 Annexes III, IV and V | •Reporting procedures for oil pollution incidents | •Practical exercise of oil pollution response •An audio-visual show | •Evaluation |
| •4th Period (1.5 hours) | •MARPOL 73/78 Annex I (contd) - machinery and cargo oil residues - oily wastes | •Scientific principles of oil and its effects (introduction) | •Steps to minimise the escaped oil - Operational spills - Spills resulting from casualties | •Practical exercise of oil pollution response (continued) | •Discussion |

**5.6 Recommendations**

Protection of the marine environment is not a responsibility of merchant marine officers solely. It is the responsibility of all parties who are involved in any of the marine activities at all levels (personnel, institutions, local, national and international). The following recommendations are seen to have a vital importance to effectively influence achieving the main objective of protection of the marine environment from oil pollution.

(A) Personnel's responsibility

A good understanding of the fate of oil in the marine environment, and its effects on human health and commercial activities is required by seafarers. They must recognise the hazards that result from oil spills from their ships. They also must understand national and international regulations that govern the discharge of oily wastes to the sea and implement preventive provisions adequately. They must avoid, for commercial reasons, any delays of their ships, or imposition of fines by flag/and port state control actions related to protecting the seas from oil pollution.

This research covered these related matters in detail. Following the instructions provided should contribute effectively to the protection of the marine environment from oil pollution from ships.

(B) Marine institutions' responsibility

Students in the marine institutions should have a good knowledge regarding oil pollution problems and should develop on understanding of the related national and international regulations during their basic and advanced studies. Refreshing short courses are also recommended for marine officers in order to remain a breast of any regulatory changes and developments in oil pollution response techniques.

Such courses, long or short, should be given by suitably qualified teaching staff. Instructors dealing with these courses' contents require a nautical, engineering

and legal background each in his respective area. The course package should be attentively and thoroughly studied. This is vital if a clear understanding is to be obtained of what is required, in terms of the resources necessary to successfully implement these courses.

(C) Government's responsibility

Ratification of international regulations and development of national laws to protect the marine environment from pollution by oil are not enough. Implementation of these regulations is more important in terms of:

- Enforcement of the law adequately, strictly and with impartiality;
- Supplying of equipment necessary to monitor the country's waters, tracking those responsible for oil spills and collecting evidence needed to pursue legal recources;
- Offering more funds required to combat spilled oil from the sea and shorelines; and
- Developing comprehensive educational programs for the public at all levels of education in order to get more appreciation for keeping the marine environment always clean.

(D) International organisations' responsibility

Although the IMO has developed model courses for the various maritime subjects, based on STCW, there are no specific courses for teaching about the fate and effects of oil spilled in the marine environment or about international conventions that deal with marine environment protection. Such courses are recommended to be taught to students in basic and advanced studies in maritime institutions. Protection of the marine environment from oil pollution from ships would seem to demand the same level of concern as any nautical or engineering studies. This subject is recommended to be mandatory as a minimum requirement for certification of deck and engineering officers in charge of navigational and an engineering watches on ships of all gross tonnage.

Finally, protection of the marine environment is a common task for every person who is involved in any marine activities.

***Of course, marine pollution is not normaly seen as a hazard directly affecting the ship or its personnel. However, it is a very real threat to the lives and livelihood of all. Even relatively small amounts of petroleum discharged into the sea, particularly in coastal waters, can have a devestating and persistant effect on sea life in the area. Its effects on the shoreline are only too well known. Life may have started in the ocean; do not let it come to its end there.***

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## APPENDIX 1

### Sample Questionnaire

For examining the merchant marine officers' knowledge regarding oil pollution problems in the marine environment:

- Please answer the following questions in a short and clear form
- Rank: ..... Certificate: .....
- Shipping company:

☐ National ☐ Arabian ☐ Foreign

Questions

1) Do you recognise the hazards resulting from discharging oily mixtures into the sea? What are these hazards?

☐ Yes ☐ No

- The hazards are:

1)

2)

3)

4)

2) Do you know the conventions that govern the discharging of oily mixtures into the sea?

☐ Yes ☐ No

3) What do you know about MARPOL ?

4) Has your shipping company provided you an instruction book concerning the national and international regulations that dealt with oil pollution prevention from ships?

☐ Yes ☐ No ☐ I don't know

5) If yes, have you studied it?

☐ All ☐ Some ☐ None

6) Do you have a shipboard oil spill contingency plan on board your ship?

☐ Yes ☐ No ☐ I don't know

7) If yes, have you studied it, and do you have the ability to execute its instructions?

☐ Yes ☐ No

8) Do you have a ship/shore safety check list for oil/bunker transfer on board your ship?

☐ Yes ☐ No

9) If yes, do you follow its instructions?

☐ Yes ☐ No

10) How many accidents have happened on board your ship and caused oil pollution to the sea ?

11) State briefly the cause(s) of those accidents.

-
-
-
-

12) Did those accidents happen in the open sea or inside the port?

☐ In the open sea ☐ Inside the port

13) The reason(s) for those accidents was (were):

☐ Ignorance ☐ Negligence

☐ Ignorance & negligence ☐ Force majeure

14) What were the reactions of those on your ship who were in charge of responding?

-
-
-
-

15) Were the nearest port authorities notified about the incident?

☐ Yes ☐ No ☐ I don't know

16) What was the reaction of the authorities?

- ☐ Investigation and fine
- ☐ Investigation and detaining the ship
- ☐ Investigation and arrest of the responsible person
- ☐ No reaction
- ☐ Other

17) Has any accident happened in your national waters?

☐ Yes ☐ No

18) If yes, what was the reaction of the national authorities?

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