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An integral approach to the handling of oily wastes from ships in Peruvian ports: reception, treatment and disposal

Manuel Gilberto Hinojosa Lopez

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An Integral Approach to the Handling of Oily Wastes from Ships in Peruvian Ports: Reception, Treatment and Disposal

By
Manuel Gilberto Hinojosa López
Perú

A dissertation submitted to the World Maritime University in partial fulfilment of the requirements for the award of the degree of

MASTER OF SCIENCE
in
MARITIME SAFETY AND ENVIRONMENTAL PROTECTION
(Operational)

1999

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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.

..............................................

16 August 1999

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Mi profunda y eterna gratitud a mis padres y hermana por la educación y valores inculcados, así como por siempre estar a mi lado.

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My recognition to my supervisor, Professor Fernando Pardo, for his advice and comments during the development of this dissertation.

A special appreciation is also due to the Professors and staff of the Maritime Safety and Environmental Protection Course, as well as to all the staff of the World Maritime University who offered me assistance in various circumstances.

I would like to extend my thanks to Mrs. Jeanne Ott for her generous support revising the English of this dissertation.

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ABSTRACT

Title of the dissertation: An Integral Approach to the Handling of Oily Wastes from Ships in Peruvian Ports: Reception, Treatment and Disposal

Degree: MSC

This dissertation is a study that comprises the total process of management of oily wastes from ships carried out ashore: collection, temporary storage, treatment, transportation and final disposal.

A relevant legal framework on the protection and preservation of the marine environment related to the topic of this dissertation, which includes global and regional instruments as well as national legislation, is presented.

MARPOL regulations related to the construction, equipment and control of discharges of oil of ships are analysed, as well as their relationship with port reception facilities. Ships not required to comply with construction and equipment requirements are studied.

An analysis of reception facilities required under Annex I of MARPOL 73/78 is presented. Requirements for determining “adequate” reception facilities are established. Problems arising from the lack or inadequacy of reception facilities are studied.

The management of oily wastes ashore is analysed. Equipment used for the collection and temporary storage and alternatives for reuse and recycling of oily wastes are presented. An analysis and comparison of different treatment techniques and methods for final disposal of these wastes are developed. Requirements for the transportation of these wastes are established.

National situation regarding reception, treatment and disposal of oily wastes from ships is studied. An analysis of reception facilities required and provided, as well as their adequacy and cost recovery mechanism is performed.

The enforcement of compliance of provision and use of reception facilities, and impediments for the provision of adequate reception facilities, treatment and final disposal plants are investigated.
Conclusions reached as result of the development of the dissertation are presented. Recommendations are made to improve the provision of adequate port reception facilities for oily wastes, as well as treatment and final disposal plants.

Appendices containing supporting information for the dissertation are developed. Proposals for the content of a national legislation on management of oily wastes from ships, for the development of port waste management plans, and for activities concerning Port State Control on oily wastes from ships are presented.

**KEYWORDS:** Pollution, MARPOL, Reception Facilities, Waste Management, Port State Control
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<th>Description</th>
</tr>
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<tbody>
<tr>
<td>BOD</td>
<td>Biochemical oxygen demand</td>
</tr>
<tr>
<td>BIMCO</td>
<td>Baltic and International Maritime Council</td>
</tr>
<tr>
<td>CBT</td>
<td>Dedicated clean ballast tanks</td>
</tr>
<tr>
<td>COW</td>
<td>Crude oil washing</td>
</tr>
<tr>
<td>DGH</td>
<td>General Directorate of Oil of the Ministry of Energy and Mines</td>
</tr>
<tr>
<td>DICAPI</td>
<td>General Directorate of Captaincies and Coast Guard</td>
</tr>
<tr>
<td>dwt</td>
<td>Tons deadweight</td>
</tr>
<tr>
<td>EIA</td>
<td>Environmental Impact Assessment</td>
</tr>
<tr>
<td>GT</td>
<td>Tons gross tonnage</td>
</tr>
<tr>
<td>HELCOM</td>
<td>Helsinki Commission</td>
</tr>
<tr>
<td>IMO</td>
<td>International Maritime Organisation</td>
</tr>
<tr>
<td>IOPP</td>
<td>International Oil Pollution Prevention</td>
</tr>
<tr>
<td>ISM</td>
<td>International Safety Management Code</td>
</tr>
<tr>
<td>LOT</td>
<td>Load on top</td>
</tr>
<tr>
<td>MARPOL</td>
<td>International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto</td>
</tr>
<tr>
<td>MEPC</td>
<td>Marine Environment Protection Committee</td>
</tr>
<tr>
<td>OBO</td>
<td>Oil Bulk Ore</td>
</tr>
<tr>
<td>ppm</td>
<td>Parts per million</td>
</tr>
<tr>
<td>PSCOs</td>
<td>Port State Control Officers</td>
</tr>
<tr>
<td>RECAAM</td>
<td>Legislation of Captaincies and Maritime, River and Lake Activities</td>
</tr>
<tr>
<td>ROCRAM</td>
<td>Operative Network on Regional Co-operation among Maritime Authorities of South America, Cuba, Mexico and Panama</td>
</tr>
<tr>
<td>SBT</td>
<td>Segregated ballast tanks</td>
</tr>
<tr>
<td>SMS</td>
<td>Safety Management System</td>
</tr>
<tr>
<td>TUPAM</td>
<td>Text of Administrative Procedures of the Peruvian Navy</td>
</tr>
</tbody>
</table>
CHAPTER 1

Introduction

1.1 Topic description

The MARPOL Convention establishes anti-pollution measures to prevent operational pollution from ships. These measures refer to the design, equipment and operation of ships. The objectives of such measures with respect to oil pollution are to minimise the amount of onboard oil-water mixtures that have to be disposed of, and then to ensure the provision of adequate port facilities for receiving the remaining onboard oil.

However, it should be taken into account that the problem of handling of oil residues and oily mixtures from ships does not end with the provision of adequate reception facilities. The problem begins for the shore side at this moment, because then surges the concern of what to do with the wastes collected. After being received, these oil residues and oily mixtures must be temporarily stored, subjected to a special treatment and finally safely disposed of. In this context, the reception of oily wastes from ships, their treatment and final disposal on shore should be considered as a whole.

The topic presents a proposal to examine the stage of compliance of Peruvian ports regarding the provision of adequate reception facilities for oily wastes from ships, as well as the provision of treatment and final disposal plants for such wastes.

Conclusions are drawn and necessary recommendations formulated in order to improve the current system, considering the complete cycle of reception, storage, transport, treatment and final disposal of such wastes.

1.2 Planned objectives of the dissertation
a. To identify the legal framework for the provision of reception facilities for ship-generated oily wastes, and for their subsequent treatment and final disposal.
b. To identify the stage of compliance of Peruvian ports regarding the implementation of MARPOL requirements on the provision of adequate reception facilities for oily wastes.
c. To identify and examine current procedures for the implementation and enforcement of MARPOL requirements on reception facilities for oily wastes, as well as those related to their subsequent treatment and final disposal.
d. To make proposals and recommendations in order to improve the stage of compliance of MARPOL requirements for the provision of adequate reception facilities for oily wastes.
e. To make proposals and recommendations in order to improve the current treatment and disposal methods for oily wastes from ships.

1.3 Relevance of the topic

Perú is bordered by the Pacific Ocean, where it has 200 miles of maritime domain and 2,414 km of coastline. Peruvian waters are part of one of the major upwelling zones of the world, with a big productivity of phytoplankton and zooplankton, which makes them very rich in volume and diversity of marine species. The fishing industry is extremely important to the Peruvian economy and accounts for a significant portion of the country's exports.

Several mariculture industries and tourist infrastructure projects are placed in the coastline. Additionally, there are eleven cargo ports and fourteen oil terminals on the coast, as well as several fishing ports of different sizes, some marinas for pleasure boats and two shipyards providing services to merchant ships.

Due to the above mentioned factors, it is considered extremely important to adopt all necessary measures in order to prevent, control and minimise the pollution of the marine environment. The provision of adequate port reception facilities, as well as treatment and final disposal plants will contribute to this objective and will avoid the degradation of the national marine environment.

After graduation, the author, as Navy Officer working for the Peruvian Maritime Administration, is supposed to be designated as one of the persons in
charge of implementing IMO regulations. In this regard, the topic proposed for this dissertation is considered of great importance to his future career.

1.4 Research method

Contact has been made with the Director of Marine Environment of the General Directorate of Captaincies and Coast Guard of Perú in order to collect information on the current procedures for the approval and certification of reception facilities. In addition, contact has been made with representatives of a shipping company and a consultant company dealing with oil terminals in order to receive their opinions on the provision of oil reception facilities in Perú.

A literature search through the libraries of the World Maritime University, the Finnish Maritime Administration and the Maritime and Coastguard Agency of the United Kingdom, as well as through different Web sites of Internet has been performed. The purpose of this research was to examine international and national legislation related to the topic, and examine how other countries deal with the provision of oily wastes reception facilities, as well as with their subsequent treatment and final disposal.

Resident and visiting experts in the field at World Maritime University have been interviewed. Information on the topic has been collected during the different field trips scheduled for the MSEP-O course. Additionally, foreign national and international organisations have been consulted on the topic.

1.5. Difficulties found during the development of the dissertation

a. Lack of specific national legislation on the treatment and final disposal of oily wastes.

b. No answer to enquiries formulated to Peruvian governmental organisations, such as the Ministry of Energy and Mines and the General Directorate of Environment Matters.

c. No answer to enquiries formulated to foreign national and international organisations, such as the International Association of Independent Tanker Owners (INTERTANKO), and the Solid Waste Company of Southwest Scania of Sweden (SYSAV).
CHAPTER 2

Marine Environment Protection Legal Framework

The marine environment has been object of studies oriented to its protection and conservation at international forums for several years, because this represents a global concern. The hazards that threaten the oceans do not distinguish borders or limits. Therefore, the agreement of States is necessary for its protection.

The following is the relevant legal framework on the protection and preservation of the marine environment related to the topic of this dissertation.

2.1 Global instruments

2.1.1 United Nations Conference on the Human Environment, 1972

This Conference was held in Stockholm, in June 1972, and endorsed a set of “Principles for assessment and control of marine environment,” which were sent to the 1973 Law of the Sea Conference. The 7th principle of the declaration of this conference, known as the Stockholm Declaration, establishes that:

States should take all possible steps in order to prevent the pollution of the seas by substances that are liable to create hazards to human health, to harm living resources and marine life, to damage amenities or to interfere with other legitimate uses of the sea.

The Stockholm Declaration has been an important antecedent to other international legal instruments related to the protection of the marine environment, such as the Basel Convention, United Nations Conference on Environment and Development (UNCED) and Agenda 21.


This convention, which entered into force on 16 November 1994, establishes principles and norms that regulate the relationship among states on marine related
matters. UNCLOS is considered the constitution for the oceans, and it is placed at the same level than the Charter of the United Nations (Nadam, 1998).

Part XII of the convention provides a general framework for the protection and preservation of the marine environment, and gives an integral approach to marine pollution. This Part deals, among other matters, with pollution from both ships and land-based sources.

The provision of port reception facilities involves these two sources of marine environment pollution. On the one hand, these installations receive oily residues from ships, and on the other hand, if treatment of oily wastes is carried out in such facilities, an effluent with some oil content is discharged into the sea. The oil content of these effluents shall be properly regulated and controlled in order to avoid port reception facilities becoming potential land-based sources of pollution.

Article 192 points out the general obligation of states for protecting and preserving the marine environment. States shall take all necessary measures according to the convention, to prevent, reduce and control pollution of the marine environment from any kind of sources of pollution. These measures, among others, refer to pollution from ships and from land-based sources (Art. 194), such as reception facilities with oil content in their effluents not regulated and controlled.

States shall observe, measure, evaluate and analyse the risks or effects of pollution of the marine environment. When states authorise any activity, the effects of such activity shall be monitored in order to determine the risk of marine environment pollution (Art. 204). The installation of reception facilities is a good case in point for this Article.

With respect to pollution from land-based sources, states shall adopt appropriate legislation and any other measures to prevent, reduce and control pollution of the marine environment from these sources. Measures planned to minimise the release of toxic substances into the marine environment, such as those found in effluents discharged into the sea by port reception facilities, shall be included (Art. 207). The legislation adopted shall be enforced by states, which in addition shall implement applicable international rules and standards established through a competent international forum, in order to prevent, reduce and control pollution of the marine environment originated from land-based sources (Art. 213).
According to Article 211, states may establish special requirements for the prevention, reduction and control of the pollution of the marine environment from ships, as a condition for the entry of foreign ships into their ports. The compulsory discharge of oily wastes to port reception facilities can be considered an example of these special requirements.

**Relationship between IMO and UNCLOS**

UNCLOS is considered an “umbrella convention” because most of its provisions are of a general kind, and can be implemented only via specific operative regulations contained in other international treaties. When an UNCLOS provision refers to the “competent international organisation” to adopt international shipping rules and standards in matters related to maritime safety and prevention and control of marine pollution from ships, the International Maritime Organisation (IMO) is considered to be this organisation (IMO Legal Committee, 1997).

For instance, Article 211 of UNCLOS requires states acting through the competent international organisation to establish international rules to combat pollution of the marine environment from ships. This is accepted as referring to the IMO and conventions agreed under its auspices. Therefore, there is an obligation for state parties to UNCLOS to apply the IMO rules and standards.

**2.1.3 International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL 73/78)**

MARPOL 73/78 is intended to reduce the pollution of the marine environment by reducing the accidental and operational pollution from ships. The convention has six separate annexes containing regulations intended to cover all technical aspects of pollution of sea, air and land than can be generated from ships, as well as from other equipment operating in the marine environment, such as drilling rigs.

Annex I, which is one of the two mandatory annexes of the convention, contains regulations for the prevention of pollution by oil. Anti-pollution measures are established in order to prevent operational and accidental pollution from ships. These measures refer to the design, equipment and operation of ships, and their objectives are to minimise the amount of onboard oil-water mixtures that have to be
disposed of, and then to ensure the provision of port facilities for receiving the remaining onboard oil and its wastes.

2.1.4 United Nations Conference on Environment and Development (UNCED), 1992

This conference, denoted as the Earth Summit, was held in Rio de Janeiro, Brazil, in June 1992. The following documents adopted by the conference are related to the topic of this dissertation:

2.1.4.1 Rio Declaration on Environment and Development

The Rio Principles define the rights of states for development and their responsibilities for protection of the environment. Accordingly to Principle 15, states shall apply the precautionary approach to protect the environment. In this context, the provision of reception facilities in ports for shipboard generated wastes can be considered a way of implementing this principle.

2.1.4.2 Convention on Biological Diversity

This convention entered into force in December 1993. According to Article 8 (h), states that join the convention shall, as far as possible and as appropriate, prevent the introduction of, control or eradicate alien species that threaten ecosystems, habitats or species. For instance, these alien species can be found in ballast water of oil tankers with dedicated ballast tanks or other tankers that for some reason have used cargo tanks for ballast.

In this regard, the IMO has adopted by Assembly Resolution A.868 (20) “Guidelines for the control and management of ships’ ballast water to minimise the transfer of harmful aquatic organisms and pathogens.” These guidelines consider that port states should make available reception and treatment facilities for ships’ ballast water.

There is an IMO Working Group on Ballast Water that has been working on the development of globally applicable and legally binding provisions of ballast water management and control procedures to minimise the risk of transferring harmful aquatic organisms and pathogens with ships’ ballast water. The following are the three options for a legal framework on these matters that will be discussed during the 43rd session of the Marine Environment Protection Committee (MEPC):
a. The incorporation of ballast water provisions through the amendments of MARPOL 73/78.

b. The development of a new protocol to add an annex to MARPOL 73/78.

c. The establishment of a new convention.

According to these draft regulations, state parties shall ensure the availability of adequate reception and treatment facilities for ships’ ballast water in ports and terminals where cleaning or repair work of ballast water tanks occurs.

2.1.4.3 Agenda 21

This document is an action plan that comprises 4 sections and 40 chapters. The activity 17.30 (d) of the Programme Area “Marine Environment Protection” of Chapter 17, indicates that states acting within the framework of the IMO should evaluate the need for additional measures to deal with degradation of the marine environment from shipping and ports.

States’ co-operation in enforcing MARPOL discharge provisions more rigorously is a measure that leads to the reduction of the marine environment degradation from shipping. The provision of port reception facilities for the collection of oil and chemical residues and garbage from ships, and the promotion of the establishment of such facilities on smaller scale in marinas and fishing harbours, are measures oriented to reduce the degradation of the marine environment from ports.

2.1.6 Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, 1989

This convention, which entered into force in 1992, regulates the transboundary movements of hazardous wastes and provides obligation to state parties to ensure that such wastes are managed and disposed of in an environmentally sound manner. Waste oils/water, hydrocarbons/water mixtures and emulsions are considered wastes that shall be controlled.

The Basel Convention has relation with the provision of port reception facilities because oily wastes generated onboard ships and discharged to such facilities are considered hazardous wastes. Additionally, the convention establishes principles
for the provision of disposal facilities and mentions the methods that can be employed for the final disposal of such wastes.

2.1.5 UNEP Global Programme of Action for the Protection of the Marine Environment from Land-based Activities, 1995

This program is a non-binding environmental instrument that provides regional and national measures to identify problems and strategies relating to land-based sources of marine pollution. Port reception facilities could become land-based sources of marine pollution if their effluents are not regulated and controlled.

2.2 Regional Instruments

2.2.1 Action Plan for the Protection of the Marine Environment and Coastal Areas of the South-east Pacific

The Permanent Commission of the South Pacific (CPPS) was created in 1952 and is constituted by Colombia, Chile, Ecuador and Peru. This Commission, with the participation of Panama, established this Action Plan, which covers the Pacific Ocean from the basin of Panama up to the South extreme of the American continent, called the South Pacific region. The main objective of the Plan, which is considered as an effective application of Agenda 21, is to protect and preserve the region against all sources and kinds of pollution.

2.2.2 Viña del Mar Agreement on Port State Control

The Maritime Authorities of South America, Mexico and Panama signed this agreement in 1992, and the Maritime Authority of Cuba adhered to it in 1995. The main goal of the agreement is to deter the operation of deficient ships in the region in order to avoid potential risks. Therefore, it is necessary to maintain an efficient and harmonised system of inspections to guarantee that foreign ships operating in the region meet safety standards contained in IMO conventions.

MARPOL 73/78 is one of the IMO conventions considered in this agreement. Therefore, Port State Control Officers (PSCOs) must determine, among other aspects, if all operational requirements of Annex I have been complied with and if reception facilities have been used.

2.2.3 ROCRAM Strategy on Protection of the Marine Environment 1996-2006
The Operative Network on Regional Co-operation among Maritime Authorities of South America, Cuba, Mexico and Panama (ROCRAM), which was established in 1983, has as one of its main objectives the protection of the marine environment.

Taking into account the provisions of UNCLOS, MARPOL 73/78, Agenda 21 and the Convention on Biological Diversity, these Maritime Authorities adopted on 1996 the ROCRAM Strategy on Protection of the Marine Environment 1996-2006.

Regarding the provision of reception facilities required by MARPOL 73/78, Maritime Authorities should promote and approve projects for constructing adequate facilities of low cost in ports where the reception of shipboard wastes is necessary. Maritime Authorities should survey the content of effluents discharged by such facilities and the final destination of the residues. Additionally, these Authorities should ensure that the fees for the reception of shipboard generated wastes are reasonable, in order to provide an incentive to the use of such facilities.

Table 1 indicates the places where reception facilities must be provided and the types of wastes the facilities are expected to receive according to this Strategy.

Table 1. Provision of reception facilities required by the ROCRAM

<table>
<thead>
<tr>
<th>Type of port/terminal</th>
<th>Shipboard generated waste expected to be received</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil terminals</td>
<td>Dirty ballast, tank washing waters, bilge waters and oil residues</td>
</tr>
<tr>
<td>Commercial ports</td>
<td>Bilge waters</td>
</tr>
<tr>
<td>Fishing ports</td>
<td>Used lubricating oil</td>
</tr>
<tr>
<td>Chemical terminals</td>
<td>Chemical residues</td>
</tr>
<tr>
<td>All ports and oil terminals</td>
<td>Garbage</td>
</tr>
</tbody>
</table>


2.3 National legislation

Before dealing with the pertinent national legislation, it is necessary to establish the relationship between national legislation and international treaties.

In conformity to Articles 26 and 27 of the Vienna Convention on the Law of Treaties, every treaty into force is binding upon the parties to it, which must perform the treaty in good faith. A party must not invoke the provisions of its national legislation as justification for not performing a treaty.
According to Article 55 of the Peruvian Constitution, treaties accepted by the State that are into force are part of the national legislation.

### 2.3.1 IMO Conventions

Perú is state party to some IMO conventions. Consequently, it is not only a national obligation but also an international obligation for the Peruvian state to fulfil the requirements of the IMO conventions to which it is party.

#### 2.3.1.1 MARPOL 73/78

The Peruvian state acceded to MARPOL 73/78 on 25 April 1980, and its Annex I entered into force in the country on 2 October 1983. Therefore, in concordance with the national constitution, the state has the duty to implement the convention and ensure the provision of adequate reception facilities at ports and terminals.

#### 2.3.1.2 SOLAS 74/78


Clause 1.2.3 of the code establishes that the Safety Management System (SMS) should ensure compliance with mandatory rules and regulations. Therefore, compliance with provisions of MARPOL 73/78 is required also by SOLAS 74/78.

Additionally, clause 2.1 requires the company to establish a safety and environmental-protection policy that must describe, among other things, how the avoidance of damage to the environment will be achieved. The use of reception facilities can be considered in this regard.

#### 2.3.2 Decree Law 17752 of 24 July 1969: General Law of Waters

Article 22 prohibits the discharging or emission of any solid, gas or liquid residues that can pollute the waters, causing damage or threatening human health or the normal development of the flora and fauna, or that compromises their use for other activities. Residues can only be discharged when they are subject to
necessary previous treatment and when it is verified that the conditions of the receptor of such residues allow the natural processes of purification.

The Sanitary Authority is in charge of establishing permissible concentration limits of pollutant substances that these waters can contain.

2.3.3 Supreme Decree 261-69-AP: Legislation of Titles I, II and III of the General Law of Waters

According to Articles 57 and 58, no discharge of solid, gas or liquid residues can be performed into maritime or land waters without previous approval of the Sanitary Authority. Every project for the discharge of urban or industrial waste waters must be approved by this authority previous to any formality of approval, licence or construction.

Additionally, Articles 70 and 71 state that the Sanitary Authority must keep an official record of the discharges of residues into maritime or land waters, and must study any request related to the discharge of residues to these waters, formulating the corresponding report for approval by superior authorities.

2.3.4 Supreme Decree 41-70-AP: Complement to the Legislation of Title III of the General Law of Waters

Article 173 states that maritime and land waters of the country can only receive solid, liquid or gas residues with previous approval of the Sanitary Authority, subject to the condition that their physical, chemical and bacteriological characteristics do not exceed the maximum conditions established for these waters.

2.3.5 Law No. 26410: Law of the National Council of the Environment

This law creates the National Council of the Environment (CONAM). CONAM is an autonomous body that reports to the President of the Council of Ministers and is responsible for co-ordinating the activities of all governmental organisations in environment matters.

2.3.6 Legislative Decree 613: Code of the Environment and Natural Resources
The code contains the national environmental policy, which has as its objective the protection and preservation of the environment and natural resources. Article 14 prohibits the discharge of pollutant substances that cause degradation of the ecosystems or alter the quality of the environment, without adopting precautions for their cleansing. Additionally, Article 108 establishes that the state must designate the destination of waste waters, establishing aquatic zones where it is forbidden to discharge urban or industrial waste waters without previous treatment and in concentrations that exceed the permissible limits.

2.3.7 Legislation for Environmental Protection Regarding Oil Activities

This legislation establishes norms at the national level for the development of activities related to the exploration, transformation, transport and storage of oily resources, in such conditions that do not originate a negative impact for the populations and ecosystems. Article 4, corresponding to the General Directorate of Oil (DGH) of the Ministry of Energy and Mines, ensures the compliance and application of this legislation.

Article 45 establishes that refineries that possess oil terminals must have a system for the reception and treatment of ballast water, according to the requirements of MARPOL 73/78.

Article 47 states that the transportation of crude oil and products on board barges and oil tankers must comply with the safety requirements established by the General Directorate of Captaincies and Coast Guard (DICAPI), and any discharge from ships must be done according to MARPOL 73/78 regulations.

2.3.8 Supreme Decree 002-87-MA: Legislation of Captaincies and Maritime, River and Lake Activities (RECAAM)

According to Article A-010201, it is the function of DICAPI, which is the Peruvian Maritime Authority, to exert control in order to prevent and reduce the effects of pollution into the sea, rivers and lakes, and in general, to exert control over anything that causes ecological damage.

Article A-130101 prohibits the discharge of pollutant substances into the sea, rivers and lakes from ships, fixed or floating installations, and land installations that are connected to such waters. DICAPI will authorise the discharge or dumping into
the sea of pollutant or noxious substances in quantities and concentrations that do not exceed the regeneration limits of the aquatic environment (A-130204).

All ships sailing in national waters shall be equipped according to respective regulations with separating equipment in order to avoid the direct discharge to the sea of residues from bilges, cargo tanks and ballast (Art. A-130206).

Oil terminals shall be provided with facilities and services for the reception of dirty ballast, bilge water and residues of cargo tanks for ships that require them (A-130207).

2.3.9 Directorate Resolution 0058-96/DCG of 06 March 1996

This resolution, which was issued by DICAPI, states that all ports, terminals, docks, shipyards and dry docks for the service and maintenance of ships shall be provided with installations and services for the reception, storage and treatment onshore of residues and oily mixtures from ships.

2.4 Analysis

a. Perú is not yet state party to UNCLOS. However, the Peruvian legislation on protection of the marine environment is concurrent with the provisions of UNCLOS and other pertinent international instruments concerning this matter.

b. National legislation related to marine environmental protection is under the responsibility of different governmental authorities. Therefore, a great deal of co-ordination among such authorities is needed in order to deal properly with the provision and operation of port reception facilities.

c. In addition to MARPOL 73/78, the provision and use of port reception facilities by ships is required by SOLAS 74/78. Chapter IX of SOLAS 74/78 makes mandatory the ISM Code, which requires compliance with mandatory rules and regulations.

d. The oil content in effluents of reception facilities that treat oily wastes must be adequately regulated and controlled in order to avoid the possibility that such facilities could become potential land-based sources of marine pollution.

e. The types of wastes foreseen to be discharged in the ROCRAM Strategy on Protection of the Marine Environment do not include all possible wastes that ports can receive. For instance, ships arriving to commercial ports may
require reception facilities to discharge not only bilge waters but also oil residues from cargo ships. Fishing vessels arriving at fishing ports may require the discharging of not only used lubricating oil but also bilge waters.

f. RECAAM contains provisions prohibiting the discharge of pollutant substances into the sea from ships and land-installations connected to the sea. However, this legislation not only does not establish permissible limits for discharging oil mixtures and residues, such as those of Annex I of MARPOL 73/78 do, but also does not make reference to this convention.

Regulations that ships shall comply with regarding pollution prevention equipment are not specified. It is only mentioned that ships must be equipped according to respective regulations. Separating equipment is required but this equipment is not frequently found onboard ships because it needs to work in combination with an additional equipment in order to produce an effluent with oil content of less than 15 ppm. Therefore, it is considered more useful to make reference to equipment required under Annex I of MARPOL 73/78.

Additionally, not all types of oily wastes from ships are covered in this legislation. For instance, sludges from fuel oil purifiers and from tank cleaning are not mentioned.
CHAPTER 3

Pollution from Ships in Ports

3.1 Control of discharges of oil under MARPOL 73/78

Regulation I/9 of MARPOL 73/78 establishes the discharge criteria for oil residues and oily mixtures from the cargo tank area of oil tankers and from the machinery space of any oil tanker and other ships of 400 GT and above. Regulation I/10 deals with this aspect but in special areas, which require special methods for preventing oil pollution due to their oceanographic and ecological conditions and the particular character of their traffic.

Whether a discharge of oil or oily mixtures from ships is allowed or not depends mainly on the following factors:

a. The location of the ship at the time of the discharge.
b. The quantity of oil discharged.
c. The oil content in the effluent discharged expressed in parts per million (ppm).
d. The operation of pollution prevention equipment.

Appendices 1 and 2 show tables of control of oil discharge according to Regulations I/9 and I/10. The table in Appendix 1 relates to the control of discharge of oily mixtures from cargo tank areas and some machinery space bilges of oil tankers. The table in Appendix 2 refers to the control of discharge of oil residues from the machinery spaces of all ships.

The oil residues or oily mixtures that cannot be discharged according to these regulations shall be retained on board until they can be discharged to reception facilities. In order to comply with these discharge criteria, ships are required to be built according to constructional requirements and equipped with pollution prevention equipment considered in Annex I of MARPOL 73/78.
3.2 Constructional requirements of ships

Chapter II of Annex I of MARPOL 73/78 deals with requirements for the control of operational pollution, which includes requirements for the construction and equipment of ships. The following is a brief explanation of some of the relevant constructional requirements.

3.2.1 Dedicated clean ballast tanks (CBT)

These are cargo tanks designated for the carriage of ballast water. The same pumping and piping arrangements are used for both oil cargo and ballast water. These tanks may be served by cargo oil piping after flushing according to specified procedures (Meier, 1984, 103). However, this does not completely guarantee that ballast water will not be contaminated with oil.

3.2.2 Segregated ballast tanks (SBT)

These tanks are exclusively allocated for the carriage of ballast water, with pumping and piping arrangements separated from cargo oil and fuel oil systems (INTERTANKO, 1998a). Therefore, oily mixtures are not generated due to ballast operations. Ballast taken in these tanks is considered clean ballast.

3.2.3 Crude oil washing (COW) system

This is a cargo tank cleaning system in which the same crude oil contained in the tanks is used instead of water for washing the cargo residues that remain clinging to the tank walls after the oil cargo has been discharged.

This system not only cleans cargo tanks better than water washing, but also almost eliminates the sludge accumulation (Sasamura, 1984, 5).

3.2.4 Sludge tanks

These are tanks specifically designated to receive the following oil residues:

a. Sludge resulting from purification of fuel and lubricating oil.

b. Oil resulting from drainages and leakages in machinery spaces.

c. Used lubricating oil, hydraulic oil or other hydrocarbon-based liquid that due to deterioration and contamination is no longer suitable to be used in machinery (MEPC/Circ.235).
Regulation I/17(2) establishes that sludge tanks shall be designed and constructed to facilitate the discharge of residues to reception facilities. Therefore, they should be provided with a designated pump for the discharge of their content to such facilities (Unified Interpretation 8.2.4 of Annex I). According to Regulation I/17(3), the standard discharge connection is the only direct connection overboard that piping to and from these tanks shall have.

3.2.5 Slop tanks

These are tanks specifically designated in oil tankers for the collection of tank drainings, tank washings and other oily mixtures, such as dirty ballast residues. Slop tanks may also receive oil residues from the oil filtering equipment and oily mixtures from the pump room (ROCRAM, 1992, 27).

3.2.6 Machinery space bilges

Machinery spaces bilges receive filterings and residues of lubricants and fuel, as well as waters from engine room washing (ROCRAM, 1992, 25), which makes bilge waters oily contaminated. The only possible interconnection between the bilge water piping and the sludge tank discharge piping should be a common pipe leading to the standard discharge connection (Unified Interpretation 8.2.3 of Annex I).

3.2.7 Bilge-water holding tanks

These are tanks arranged for receiving the daily generation of bilge water before it is discharged overboard through the 15 ppm oil filtering equipment or to port reception facilities. Bilge-water holding tanks are not mandatory under Annex I of MARPOL 73/78, but they permit ships to operate safely during stays at port, when sailing in waters where the discharge of bilge waters is not allowed, or when the 15 ppm oil filtering equipment is in maintenance.

Appendix 3 shows a summary of the constructional requirements for ships under Annex I of MARPOL 73/78.

3.3 Types of oily wastes generated on board ships

Oil is defined in Regulation I/1(1) as petroleum in any form including crude oil, fuel oil, sludge, oil refuse and refined products. Oily mixtures, which are covered by
Annex I as well, are defined in Regulation I/1(2) as mixtures with any oil content.

The transport of oil in bulk, and the use of oil as fuel and lubricant in the propulsion and auxiliary machinery of ships, bring as consequence the generation of oily wastes on board ships. These wastes are produced on both the machinery spaces of any ship and the cargo section of oil tankers. Oily wastes from machinery spaces can be considered rich mixtures, with high oil content but limited volume, and oily wastes from the cargo section can be considered lean mixtures, with low oil content but large volume (Théobald, 1984, 258).

It is important to point out that there is no single classification of the types of oily wastes generated on board ships. Table 2 shows the types of oily wastes considered in documents issued by the Baltic and International Maritime Council (BIMCO), the Helsinki Commission (HELCOM), IMO and ROCRAM.

Table 2. Oily wastes considered by BIMCO, HELCOM, IMO and ROCRAM

<table>
<thead>
<tr>
<th>Source</th>
<th>Publication</th>
<th>Types of oily wastes</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIMCO</td>
<td>BIMCO Reporting Form for alleged inadequacy of port reception facilities</td>
<td>Dirty ballast, cargo residues/slops (including washings containing chemical additives), oily bilge/sludge, other</td>
</tr>
<tr>
<td>HELCOM</td>
<td>HELCOM Recommendation 19/11. Specific Port Waste Management Information Sheet</td>
<td>Cargo slops/dirty ballast, bilge water, sludge, other</td>
</tr>
<tr>
<td>IMO</td>
<td>Comprehensive Manual on Port Reception Facilities (Chapter VII)</td>
<td>Dirty ballast water, oily tank washings, oily bilge water, sludges, used lubricating oil, fuel residues</td>
</tr>
<tr>
<td>ROCRAM</td>
<td>Guidelines on Reception Facilities in Ports of Latin America</td>
<td>Dirty ballast, slops, bilge waters, sludges</td>
</tr>
</tbody>
</table>

Source: BIMCO, HELCOM, IMO, ROCRAM

In Table 2 can be seen that not only the names but also the number of oily wastes considered by these organisations are different. According to Circular MEPC.3/CIRC.3 of 6 October 1998 “Facilities in ports for the reception of oily wastes from ships,” there are five types of oily wastes that reception facilities in ports are expected to accept. Due to the fact that topic of this dissertation deals with the provision of reception facilities for oily wastes in ports, and in order to harmonise
terminology, the types of oily wastes that are going to be considered are those indicated in this MEPC circular.

3.3.1 Tank washings (slops)

The water washing of cargo tanks produces slops. The following are some reasons that make tank washing necessary:

a. When people have to enter into the cargo tanks for inspecting them.

b. When a different cargo is going to be loaded and contamination with the previous cargo is not allowed, or when these two cargoes are incompatible.

c. When tanks need to be free of gas prior to repairs or maintenance work in these tanks (Olson, 1992, 131).

According to Regulations I/13(6) and I/13(8), the COW system is required for new crude oil tankers of 20,000 dwt and above, and is considered as an alternative for existing crude oil tankers of 40,000 dwt and above. Crude oil tankers to which these regulations do not apply can wash their cargo tanks with water, which becomes contaminated with the remaining oil in tanks.

With regard to COW, it should be mentioned that not all crudes are suitable for this type of washing. If one of these crudes is intended to be loaded in a tanker provided only with a COW system, this ship must comply with the requirements of SBT or CBT according to Regulations I/13(7) or I/13(9), respectively (IMO, 1990, 10). In the latter case, slops can be produced due to tank washing.

Cargo tanks of combination carriers that have transported oil need to be cleaned before loading dry bulk cargoes, which implies the removal of oil residues and the generation of water contaminated with oil due to the tanks’ water washing.

It is important to point out that all tankers, regardless of whether they have SBT, often need to clean their cargo tanks before loading new cargoes, which produces oily water (INTERTANKO, 1998b).

3.3.2 Dirty ballast water

Ballast water is taken on board in order to maintain the ship’s stability in good conditions when there is no cargo on board or the amount of cargo is very limited (Olson, 1992, 131). Dirty ballast water is ballast water contaminated with oil that
adheres to the sides and bottom of cargo tanks of oil tankers. If ballast is discharged through an oil discharge monitoring and control (ODMC) system and its oil content exceeds 15 ppm, such ballast is considered dirty ballast (Regulation I/1(16)).

Regulation I/13 establishes the requirements of SBT for oil tankers. However, these requirements do not apply to the following ships, and consequently it can be expected that such ships can carry dirty ballast:

a. New crude oil tankers of less than 20,000 dwt.

b. New product carriers of less than 40,000 dwt.

c. Existing product carriers of less than 40,000 dwt.

Regulation I/13(3) considers exceptions for the carriage of ballast water in cargo tanks of oil tankers with SBT, such as severe weather conditions that make it necessary to carry additional ballast water for the ship’s safety. This additional ballast becomes oily contaminated.

Combination carriers, such as Oil Bulk Ore (OBO), can carry either oil or solid cargoes in bulk, and they represent another potential source or dirty ballast. When the unloading port of an oil cargo and the loading port of a bulk cargo are located in different places, the ship may need to carry ballast water in cargo tanks for sailing between these ports (Sasamura, 1984, 8).

Departure ballast can be carried on cargo tanks that have been crude oil washed but not water rinsed, which is the water washing process carried out in connection with tank cleaning after COW. Therefore, this departure ballast is considered dirty ballast (IMO, 1990, 16).

3.3.3 Sludges (oil residues) from fuel oil purifiers

Marine fuel oil is purified on board ships in order to be used in the propulsion system. This purification generates sludges or oil residues that cannot be discharged into the sea and must be retained on board in tanks. In the case of oil tankers, this sludge may be transferred into the slop tanks. Ships other than oil tankers should store these oil residues in sludge tanks for later discharge to reception facilities (Sasamura, 1984, 9).
The amount of sludges generated depends on the type of fuel used. For instance, more sludges are produced when using heavy fuel oil rather than diesel fuel oil (IMO, 1995, 134).

In ships other than oil tankers, residues produced by fuel oil purification account for 74 per cent of the total amount of oil residues generated on board, which is equivalent to almost 3 times the quantity of bilge waters. Sludges from fuel oil purifiers and bilge waters represent 95 per cent of the oily mixtures and oil residues generated in ships other than oil tankers (ROCRAM, 1992, 27).

3.3.4 Oily bilge water

Regardless their type or tonnage, all self-propelled ships accumulate bilge waters in their machinery spaces. The amount of bilge waters generated depends mainly on the type of engine, ship's age and general condition or state of maintenance of the engine (ROCRAM, 1992, 29).

3.3.5 Scale and sludge from tank cleaning

Cargo tanks need to be cleaned and in gas free condition before dry-docking or repair work on these tanks. Scales and sludges, which have high solid content, are removed from cargo tanks as a result of these cleaning operations. (IMO, 1995, 155).

3.4 Pollution prevention equipment required under Annex I of MARPOL 73/78

3.4.1 Oil discharge monitoring and control system

It is a system that monitors and controls the discharge into the sea of oily mixtures from cargo pump rooms and cargo tank areas, such as dirty ballast water and oily tank washings (IMO, 1997c, 36). The following requirements for ODMC systems are established in Regulation I/15(3)(a):

a. The system shall continuously record:

   (1) The discharge of oil in litres per mile and total quantity of oil discharged; or
   
   (2) In lieu of the total quantity of oil discharged, the oil content of the effluent and rate of discharge.

This record shall be identifiable as to time and date.
b. The system shall come into operation when there is any discharge of effluent into the sea.

c. The system shall automatically stop any discharge of oily mixture when the instantaneous rate of discharge of oil content exceeds 30 litres per nautical mile.

d. The discharge shall be stopped in case of any failure of the monitoring and control system.

Dirty ballast water or oil contaminated water shall not be discharged into the sea through outlets that are not controlled by the ODMC.

3.4.2 Oil/water interface detector

According to Regulation I/15(3)(b), oil/water interface detectors shall be used in slop tanks and in other tanks where oil and water are separated by gravity and from which is intended to discharge effluents direct into the sea. Such instruments, which may be portable or permanently installed, shall rapidly and accurately determine the oil/water interface in these tanks and should be capable of detecting the vertical position of the interface at any level of the tank.

3.4.3 Oil filtering equipment

This equipment is designed to remove enough oil of oily mixtures from machinery space bilges and from fuel oil tanks that carry ballast, in order to ensure the oil content of any oily mixture discharged into the sea after passing through the system does not exceed 15 ppm.

The effluent from this equipment should be able to be recycled to the bilge or bilge water holding tank (MEPC/Circ.235). The removed oil residues are retained on board in sludge tanks and later discharged to reception facilities.

Oil filtering equipment may be provided with a bilge alarm, which comprises an oil content meter for measuring the oil content of the oily mixtures treated by the equipment. The alarm is activated when the oil concentration of the effluent to be discharged exceeds 15 ppm.

Table 3 shows the pollution prevention equipment required on board ships according to Annex I of MARPOL 73/78. The equipment required for oil tankers to
deal with oily wastes from slop tanks as well for any kind of ship to deal with oily wastes from machinery space bilges is indicated.

Table 3. Pollution prevention equipment required under Annex I of MARPOL 73/78.

<table>
<thead>
<tr>
<th>Type of ship</th>
<th>Equipment</th>
<th>Regulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil tankers ≥ 150 GT</td>
<td>ODMC system</td>
<td>I/15(3)(a)</td>
</tr>
<tr>
<td></td>
<td>Oil/water interface detector</td>
<td>I/15(3)(b)</td>
</tr>
<tr>
<td>Any ship ≥ 400 GT and &lt; 10000 GT</td>
<td>15 ppm oil filtering equipment</td>
<td>I/16(1,4)</td>
</tr>
<tr>
<td>Any ship ≥ 10000 GT and</td>
<td>15 ppm oil filtering equipment with bilge alarm and</td>
<td>I/16(1,2,5)</td>
</tr>
<tr>
<td>Any ship ≥ 400 GT and &lt; 10000 GT and</td>
<td>automatic stopping device</td>
<td></td>
</tr>
<tr>
<td>carrying ballast water in fuel oil tanks</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: MARPOL 73/78 Annex I

Appendix 4 shows the applicable IMO guidelines and specifications for the pollution prevention equipment mentioned above.

3.4.4 Exemptions

Regulation I/15(5) considers cases in which the Administration may waive the requirements of slop tanks, ODMC and oil/water interface detectors for oil tankers. Regulation I/16(3)(a) considers cases for waiving the requirements of oil filtering equipment. However, in both cases ships shall retain on board all oily mixtures and bilge waters, respectively, for subsequent discharge to reception facilities.

Ships of 400 GT and above but less than 10,000 GT, carrying ballast water in fuel oil tanks in which is not reasonable to fit 15 ppm oil filtering equipment with alarm and automatic stopping device, should retain on board dirty ballast waters from fuel oil tanks and discharge them to reception facilities (Unified Interpretation 7.1.1.1.2 to Regulation I/16(1)).

Regulation I/2(2) establishes that ships other than oil tankers, fitted with cargo spaces constructed and utilised to carry oil in bulk of an aggregate capacity of 200 m³ or more, shall comply with certain requirements that are applicable to oil tankers, such as slop tanks and ODCM systems. Table 4 shows the conditions for exemption from such requirements to this kind of ship that carry less than 1,000 m³ of oil in bulk.
Table 4. Exemption of requirements for non-oil tankers carrying 200 m\(^3\) or more but less than 1,000 m\(^3\) of oil in bulk as cargo

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Conditions for exemption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slop tanks</td>
<td>Retention of oil on board for discharge to reception facilities</td>
</tr>
<tr>
<td>ODMC system</td>
<td>Retention of all oily water on board for discharge to reception facilities</td>
</tr>
</tbody>
</table>

*Source: MARPOL 73/78 Annex I*

3.5 Oil sludge incinerators

Oil sludge incinerators are another means for the disposal of oil residues generated from shipboard operations. The composition of an oil sludge incinerator system is indicated in the MEPC Circular MEPC/Circ.235 of 13 December 1990 "Guidelines for systems for handling oily wastes in machinery spaces of ship."

This type of equipment is not indicated in the regulations of Annex I. However, incinerators for oil residues and auxiliary boilers suitable for burning oil residues are included in the Record of Construction and Equipment for ships other than oil tankers and for oil tankers, Forms A and B, respectively, of the International Oil Pollution Prevention (IOPP) Certificate, as means for the disposal of residues in addition to sludge tanks.

Additionally, in the Oil Record Book, Part I - Machinery Space Operations, which applies to all ships, incineration is considered among the methods for the disposal of oil residues. The sludge produced as a consequence of the incineration has to be disposed of to reception facilities (Sasamura, 1984, 9).

The MEPC adopted the Resolution MEPC.59(33) “Standard specification for shipboard incinerators,” which later was amended by Resolution MEPC.76(40). This specification applies to incinerator plants with capacities up to 1500 kW per unit. The design, manufacture, performance, operation, functioning, testing and certification of incinerators intended to incinerate garbage and other shipboard wastes generated during the ship’s normal voyage service, such as wastes associated with maintenance and operation, are covered by this specification. This specification applies to oil sludge, because it is waste generated due to the ship’s operation, but excludes oil generated slops from the cargo area.
Regarding the use of incinerators, it is important to take into account provisions on this regard of the Helsinki Convention. According to Regulation 9 of Annex IV of this convention, the incineration of ship-generated wastes on board ships, irrespective of their nationality, operating in territorial seas of contracting parties of the Helsinki Convention is prohibited. The fact that the presence of chemicals in the exhaust gases emanating from incineration is harmful for the environment and human health is one of the supporting reasons for the inclusion of this regulation in the Helsinki Convention (HELCOM 14/8, 1993).

3.6 Ships not requiring pollution prevention equipment

Oil tankers of less than 150 GT are not required to have on board slop tanks, ODMC systems and oil/water interface detectors. However, according to Regulation I/15(4), these ships shall retain on board all oily mixtures and subsequently discharge them to reception facilities.

Ships of less than 400 GT are not required to have oil filtering equipment. However, these ships shall be equipped to retain all oil or oily mixtures on board, or alternatively, be fit with 15 ppm oil filtering equipment to discharge such mixtures when at sea (Regulation I/16(3)(b)).

An example of the application of this provision is found in the HELCOM Recommendation 19/10, which attaches “Guidelines for the prevention of pollution of the sea by oil from machinery spaces of ships of less than 400 gross tonnage.” This document states that such ships have two possibilities:

a. Be fitted with approved oil filtering equipment and sufficient tank capacity for oil residues; or

b. Be equipped with a holding tank or tanks to retain generated bilge water and other oil residues on board for subsequent discharge to reception facilities.

In both cases, tanks should be equipped with pumping facilities and a standard discharge connection to enable the connection of the pipes/hoses of reception facilities.

Small ships, such as fishing vessels and pleasure craft, represent another potential source of oily wastes. These ships are not required to have either oil filtering equipment or sludge tanks, but they generate oily wastes, which originate from
machinery space bilges and dirty engine sump oil (IMO, 1995, 284). However, they shall not discharge oil residues into the sea and therefore shall keep them on board and discharge them to reception facilities (MEPC, 1998, 27).

A case in point of Peruvian national provisions dealing with oily wastes from fishing boats and ships of less than 400 gross tonnage is the Directorate Resolutions No. 342-91-DC/MGP and 058-96/DCG of 18 December 1991 and 08 March 1996, respectively, issued by DICAPI. These documents require that fishing vessels of less than 400 GT, and any other ship of less than 400 GT not carrying oil as cargo, shall have installed a holding tank to retain generated bilge water and other generated oil residues on board for subsequent discharge to reception facilities.

### 3.7 ISM Code and oily wastes from ships

The use of port reception facilities for oily wastes is not expressly mentioned in the ISM Code. However, its clause 1.2.3 establishes that the SMS should ensure the compliance with mandatory rules and regulations. Therefore, the ship and the SMS must comply with MARPOL 73/78 and consequently with its provisions on the use of port reception facilities for the discharge of its oily wastes.

Furthermore, according to clause 7 of the Code, procedures for the preparation of plans and instructions for the key shipboard operations concerning the safety of the ship and the prevention of pollution must be established by the company. Oil transfer operations, such as bunkering and discharge of oil residues to reception facilities are considered key operations. Therefore, the ship must develop and implement procedures covering such operations (Hindburg, 1999).
ODMC systems should comprise the following parts (IMO 1997, 39):

a.Oil content meter, for measuring the oil content of the effluent in ppm.
b. Flow rate indicating system, for measuring the rate of effluent that is being discharged into the sea.
c. Vessel speed indicating device, for giving the ship’s speed in knots.
d. Sampling system, for transporting a sample of the effluent to the oil content meter.
e. Overboard discharge control. It is a device that automatically initiate the stopping sequence of the discharge of oily mixtures into the sea in alarm conditions. It prevents the discharge during the alarm condition.
f. Starting interlock, for preventing the initiation of the opening of the discharge valve or other discharge arrangements before the ODMC system fully operational.
g. Control section, which comprises in general:
   (1) A processor that accepts signals of the oil content in the effluent, effluent flow rate and ship’s speed.
   With these values the processor obtains the instantaneous rate of discharge of oil (litres discharged per nautical mile) and the total quantity of oil discharged.
   (2) Means to provide alarm when the oil content of the effluent exceeds 30 litres per nautical mile
   (3) A recording device for recording at least the following data:
       - Instantaneous rate of discharge of oil in litters per nautical mile.
       - Instantaneous oil content in ppm.
       - Total quantity of oil discharged in m³ or litters.
       - Time and date of discharging (GMT)
       - Ship’s speed in knots
       - Effluent flow rate
       - Status of the overboard discharge arrangement.
- Alarm condition
- Override action. For instance manual override, calibration.
- Failures, such as fault, no flow.
- Oil type selector setting if applicable.

(4) Data display to exhibit at least the following current operational data:
- Instantaneous rate of discharge of oil in litters per nautical mile.
- Total quantity of oil discharged in m³ or litters.
- Instantaneous oil content in ppm.
- Effluent flow rate
- Ship’s speed in knots
- Status of the overboard discharge arrangement.

(5) Manual override system to be used if the ODMC system fails.
In oil tankers of more than 150 GT but less than 4000 dwt, starting interlock is not required, the stopping of the discharge may be performed manually, and the rate of discharge may be estimated from the pump characteristics.

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The following are the constituent elements of an oil sludge incinerator system:

a. Incinerator, steam boiler or heater of thermal fluid systems.
b. Oil burner.
c. Oil sludge processing system. It consists of:
   - Mixing tank where oil residues are mixed with fuel oil:
   - Oil sludge preheating system
   - Filter
   - Homogenisation system, which assure the total content of the mixing tank is processed into a homogeneous and combustible mixture.
d. Tanks for separated sludge (MEPC/Circ.235)
CHAPTER 4

Reception Facilities and Management of Oily Wastes from Ships

The operational discharge of oily wastes into the sea that ships are allowed to carry out is limited. Some ships can reduce the amount of oil residues and mixtures they generate by applying constructional requirements and by using pollution prevention equipment. Other ships to which constructional and equipment requirements are not applicable shall retain onboard their oily wastes. However, both types of ships need to make use of port reception facilities in order to discharge their oily wastes.

4.1 Reception facilities required under Annex I of MARPOL 73/78

A port reception facility is considered anything capable of receiving shipboard residues and mixtures containing oil, noxious liquids or garbage (IMO, 1995, 13).

Regulation I/12 establishes that state parties shall provide reception facilities at oil loading terminals, repair ports and other ports where ships that have on board oil residues and oily mixtures to discharge arrive. These facilities shall be provided in ports and terminals according to the following:

a. Crude oil loading terminals serving oil tankers that have arrived on a ballast voyage of less than 72 hours or less than 1200 nautical miles.

There shall be sufficient reception facilities in these terminals for receiving oil and oily mixtures that cannot be discharged according to Regulation I/9(1)(a) from all oil tankers arriving from the short ballast voyages described above. Facilities are required for receiving dirty ballast water from crude oil tankers because the length of these short voyages is not enough for the load on top (LOT) procedure. These tankers do not have the chance of cleaning cargo tanks sufficiently to reach a clean ballast condition before their arrival at the
loading terminal. Additionally, these ships may need to discharge oily bilge water and sludge from fuel and lubricating oil purification.

b. Product oil loading terminals whose loading average is more than 1000 m$^3$ per day.

These terminals shall have sufficient reception facilities for receiving oil and oily mixtures that cannot be discharged according to Regulation I/9(1)(a) from oil tankers loading product oil. Facilities in these terminals may expect to receive sludge from fuel and lubricating oil purification, oily bilge water, oily tank washings and dirty ballast from ships on short ballast voyages.

c. Ports having ship repair yards or tank cleaning facilities.

Sufficient reception facilities are required for receiving all oil residues and mixtures that remain onboard for disposal and which shall be discharged to such facilities before the ship enters the repair yards or tank cleaning facilities. These installations may expect to receive oily tank washings and dirty ballast, as well as scales and sludges removed from cargo tanks due to cleaning operations.

d. Ports and terminals receiving ships provided with sludge tanks.

These ports and terminals shall have sufficient reception facilities for receiving all residues retained according to Regulation I/17 from all ships that may be expected to arrive. According this regulation, sludge tanks are required on board ships of 400 GT and above.

e. Ports handling ships that retain oily bilge water and other oil residues that cannot be discharged according to Regulation I/9.

There shall be sufficient reception facilities for oily wastes from the following ships:

(1) Any oil tankers or other ships of 400 GT or more: oil residues from machinery space bilges.

(2) Ships of less than 400 GT other than oil tankers: oil residues stored on board.
f. Loading ports for bulk cargoes that receive combination carriers whose oil residues can not be discharged according to Regulation I/9.

The cleaning of cargo tanks of combination carriers, such as OBO ships, is needed when these ships have unloaded liquid cargo and are going to load dry bulk cargo. Oil residues resulting from tank cleaning must be discharged to reception facilities if they cannot be discharged into the sea according to Regulation I/9.

The above provisions state that there shall be sufficient reception facilities in ports and terminals for receiving oil residues and mixtures that cannot be discharged according to Regulation I/9 and are retained on board in accordance with Regulation I/17. However, the term “sufficient” is not explicitly defined and must be determined by each Administration.

As a reference, Appendix 5 indicates the criteria for reception facilities for oily wastes in ports and terminals of the United States of America, where the term "sufficient" has been quantified. The capacity of reception facilities has been established according to the type of port/terminal and type of waste expected to be discharged.

### 4.2 Adequacy of reception facilities

Reception facilities required under Regulation I/12 shall be adequate to meet the needs of ships that use them, which must not be unduly delayed for such use. An agreement on a common definition of “adequate” is needed in order that state parties can uniformly comply with this regulation.

A Correspondence Group on Reception Facilities was established during the 41st session of the MEPC in order to examine certain issues relating to the adequacy of waste reception facilities. After reviewing the report of this Correspondence Group (MEPC 42/6/2, 1998), the author considers the following items should be taken into account for determining whether or not a port reception facility for oily wastes is adequate:

- It is fully used by mariners instead of discharging their ships’ wastes into the sea. Therefore, it should meet the needs of its users and of the environment.
b. It has the capacity for receiving the oil residues that can be reasonable expected to be generated by ships using the port. The frequency of ships’ arrival should be considered in this regard.

c. If necessary, it should be capable of storing and pre-treating for ultimate disposal received oily wastes in an environmentally safe manner. For this purpose, treatment techniques applied in the facility are highly important because they determine the oil content of the effluent.

d. It is available during a ship’s visit to the port. In this regard, the working hours of ports should be considered, because some ports work all day and night without stopping, while others have restricted working hours. Facilities should be available for ships’ use at any time of the working day, which means meeting the ship’s needs.

e. It is available to receive oil residues and mixtures from ocean-going ships within 24 hours after notification of the need for reception facilities. This requirement applies not only to the providers of reception facilities but also to ship masters, shipowners or ships’ representatives. They are responsible for notifying the appropriate authority in the next port of call of, among other matters, the type and amount of wastes to be discharged at least 24 hours in advance.

f. Its use does not cause undue delay to the ships. Such delay may occur when the time a ship spends in port for the disposal of oily wastes exceeds its normal turn-around time in that port. The following items must be taken into account in this regard:

(1) Formalities for the use of reception facilities, such as customs and health and environmental formalities, should as far as possible be simple and expeditious and not cause undue delay to the ship (IMO, 1995, 29). For instance, discharged oily waste is considered imported oil that has not paid customs duty and therefore must be declared (Donaldson, 1994, 117).

(2) The transfer time should not cause undue delay to the ship. Once the reception facility is ready to receive wastes, it must be capable of receiving such wastes at a rate that causes the ship no undue delay.
(3) A delay is not considered undue if it is due to fault of the ship, its master or its representatives, safety requirements or normal port procedures (ANZECC, 1997, 12).

(4) Delay in a ship’s departure can have economic implications for the ship because it can be subject to extra port dues and demurrage (Donaldson, 1994, 117).

g. It is conveniently located, easy to find and easy to use. The following aspects should be considered in this regard:

(1) Installations for mooring, connection and/or collection should facilitate the discharge operations for all ships needing to make use of them. Facilities that receive oily bilge water must have standard discharge connections that meet the requirements of Regulation I/19 and that attach to each hose or pipe that removes oily bilge water from ships. Regulation I/18 requires every oil tanker have a discharge manifold on the open deck for the connection to reception facilities in order to discharge dirty ballast or oil contaminated water. However, the type of connection to be used with such manifolds is not specified. Therefore, standard connection bridles used in the oil industry (ASA-API norms) are required in reception facilities to make easier the connection to ships’ discharge manifolds (ROCRAM, 1992, 49).

(2) Its use does not interfere with cargo operations.

h. Its cost for receiving and processing wastes should be covered in such manner that fees, if charged, would not provide a disincentive for ships’ waste disposal. However, this coverage of cost should ensure that the owner of the facility fully recovers from the ship all costs reasonably incurred for providing this service.

i. It is periodically reviewed in order to ensure it remains adequate.

Opinions of two different interested parties in the provision of reception facilities should be considered: the providers and the users of the service. Each port has its own reality and each user has its own needs. Consequently, each port should determine what facilities need to be provided, and potential users of such facilities should be consulted during the process of determining their adequacy.
However, the requirements of both parties can be very different. Therefore, a balance between criteria of providers and users of reception facilities is needed in order to determine the adequacy of such facilities.

In addition, specific criteria to compare with are required in order to determine the adequacy or inadequacy of a port reception facility. For instance, Regulation I/15 establishes the total capacity of a ship's slop tank or tanks. A port reception facility could be considered inadequate if it cannot receive a volume equal to the slop tank size from the largest ship that calls at its port (INTERTANKO, MEPC 42/6/2).

Furthermore, reception facilities in the United States of America are required to be capable of completing the reception of oily ballast in less than 10 hours after waste transfer operations begin. The time considered for the reception of other oil residues and mixtures is 4 hours. Reception facilities are considered inadequate if they cannot comply with these transfer times (33 CFR Part 158).

4.3 Problems arising from the lack or inadequacy of reception facilities

Flag and port states enforce MARPOL requirements upon ships. However, not all state parties comply with their obligation of providing adequate reception facilities. States are sovereign, and therefore there is no external authority that can legally enforce them to fulfil their obligations regarding reception facilities.

According to Regulation I/12(4), ports of state parties to MARPOL 73/78 shall have been provided with adequate reception facilities no later than 02 October 1984. However, 15 years later, the lack and/or inadequacy of reception facilities for shipboard generated wastes in many ports is one of the main reasons for the pollution of the marine environment from ships (Khalimonov, 1998).

This non-fulfilment of obligations by state parties affects not only the marine environment but also the shipping industry. Shipowners make a high investment in order to comply with constructional and equipment requirements. For instance, the installation cost of an ODMC system, required under Regulation I/15, varies from US$0.5 to US$1 million per ship, and its operating cost is around US$10,000 per annum (INTERTANKO, 1998a).

This investment in constructional and equipment requirements, and compliance with provisions of discharge criteria for oil residues and oily mixtures by ships, is not
enough for reducing the pollution of the seas if reception facilities are not provided or are not adequate. Furthermore, inadequate or non-existent facilities in many ports of developing countries and developed countries as well, contributes to the fact that ships cannot comply with MARPOL’s discharge requirements.

The lack or inadequacy of reception facilities can have commercial implications for ship operations. If a ship cannot discharge its oily wastes to reception facilities, it has to retain them on board for subsequent discharge at ports where facilities are available. This is particularly important for oil tankers that have to retain dirty ballast and slops, because their cargo carrying capacity is reduced.

Under the contractual terms of oil charterers’ requirements, tankers might be required to arrive with clean ballast at loading ports, which represents a great concern when reception facilities are not available. This is more significant for non-SBT tankers operating in special areas or performing short voyages, which cannot discharge oily wastes according to Regulation I/9 (Nishizawa, 1994, 124).

The availability of reception facilities can have implications when a shipping company plans trading routes, and consequently interferes in the fair market competition. Some ports might not be selected, if they do not provide reception facilities or these are not adequate, and it is not possible to discharge oily wastes according to Regulation I/9 during the ship’s voyage. However, there could be some “low-quality” shipowners/operators who accept such routes and illegally discharge ship wastes in the open sea in order to continue trading at such destinations (Blix, 1999).

4.4 Management of oily wastes

MARPOL 73/78 does not contain specific requirements for the oil content of effluents of port reception facilities. Once a ship discharges its oily wastes to such facilities, the procedures to which these wastes are subject to are no longer covered by MARPOL regulations. The handling of these wastes becomes a coastal activity, and therefore it is regulated by national legislation, which involves other governmental authorities besides the Maritime Administration.

Appendix 6 contains a flow chart indicating the management process of oily wastes from when they are collected from ships until the moment of their final
disposal. This process can be applied to any kind of waste, regardless of its composition. Practices carried out on board ships and on shore by reception facilities and treatment plants are shown in this flow chart in order of preference.

Regarding on board practices of waste management, avoidance of oily waste is performed for instance by using LOT, COW and SBT. Using diesel fuel oil rather than heavy fuel oil reduces the amount of oil residues resulting from fuel oil purification. Segregation of oily wastes is done by using different tanks for different wastes, such as bilge water holding tanks, sludge tanks and slop tanks. Following are the practices carried out on shore relating to shipboard generated oily wastes.

4.4.1 Collection

Oily wastes can be collected from ships by the following collection equipment:

a. Mobile reception facilities: They can be either floating facilities, such as barges, or land vehicles, such as tank trucks, or other mobile facilities.

b. Stationary reception facilities: There is one central shore-based waste collection point in the port. Fixed piping that conveys residues and mixtures from ships to the collection point can be used (IMO, 1995, 119).

4.4.2 Temporary storage

Storage is the holding of waste for a temporary period of time, at the end of which the waste is treated, disposed of, or stored elsewhere (EPA, 1998).

Storage tanks with pumping facilities for oily wastes are needed regardless of the type of collection facility used. These tanks are used by ships to discharge directly their wastes, as well as by floating and land vehicles to discharge their collected wastes (IMO, 1995, 157). The mixing of different wastes should be avoided as far as possible because it makes more difficult the subsequent treatment and final disposal of such wastes (MEPC 42/6/2, 8).

4.4.3 Reuse

In reuse, waste materials are directly used again for the same grade of use. Reuse of oily wastes is possible in a very few situations, such as the storage of oily tank washings in order to reuse them for future washing of tanks, which is a practice not frequently used (ANZECC, 1997, 9).
4.4.4 Recycling

Waste materials are subjected to treatment in order to use their valuable components in other processes. As reuse, recycling is a practice encouraged because it reduces the amount of waste for disposal. Recycling is considered the preferred option to disposal and its use has increased in recent times (ANZECC, 1997). This is an indication of the profitability of this activity.

The following are three recycling options for oil recovered in port reception facilities:

a. Use as fuel

Recovered oil can be recycled to be used as fuel for some land-based industrial installations or as bunker fuel oil for ships. Table 5 shows the possible uses of oil recovered as fuel, the conditions for these uses, the processes performed and the constraints for each practice.

Table 5. Recycling options for using oily wastes as fuel

<table>
<thead>
<tr>
<th>Use</th>
<th>Conditions</th>
<th>Process</th>
<th>Constraints</th>
</tr>
</thead>
</table>
| Fuel for land-based industrial installations | - Existence of local industry, such as (petro) chemical and power plants  
- Capacity to produce recovered oil of acceptable quality | Recovered oil is blended with the regular fuel oil | - Its use as fuel generates air pollutant gases (SO$_2$)  
- Its incineration may cause air pollution, because recovered oil may contain additives, metals, detergents, etc. |
| Bunker fuel oil for ships       | Existence of port bunkering facilities                                      | Recovered oil is blended with bunkers          | Possible low bunker quality may result in:  
- Air pollution  
- Ship engine failure |

Source: Adapted from IMO Comprehensive Manual on Port Reception Facilities
b. Redistillation

Redistillation is the process that heats a mixture to separate it into several pure components (RCRA, III-34). Recovered oil can be mixed with crude oil and redistilled in either a refinery or a specially built distillation unit for processing waste oil. Table 6 shows the possible options for redistilling recovered oil, as well as the conditions and constraints for each option.

Table 6. Recycling options for redistillation of oily wastes from ships

<table>
<thead>
<tr>
<th>Place</th>
<th>Conditions</th>
<th>Constraints</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refinery</td>
<td>Oil recovered should be free of solids, solvents and large amount of water</td>
<td>- Refineries may not accept recovered oil without information about its composition</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- If profit does not cover processing and handling costs additional reimbursement must be provided</td>
</tr>
<tr>
<td>Distillation Unit</td>
<td>Expected amount of oil to be recovered from oily wastes at local or national level must justify the unit</td>
<td>Specialised engineering skills and experience are needed for the design of these units</td>
</tr>
</tbody>
</table>

*Source: Adapted from IMO Comprehensive Manual on Port Reception Facilities*

c. Applications in civil works

Recovered waste oil and oily sludges have been used in road construction, dust control or as preservative of wood. However, these practices can have negative environmental consequences, such as contamination of soil and ground water. Therefore, these uses are not recommended (IMO, 1995, 217).

4.4.5 Treatment

Treatment is any process that changes the physical, chemical, or biological composition of a waste in order to neutralise its hazardous effects or make it a less hazardous substance. It can be employed to recover energy or material resources from a waste, or make such waste safer for transporting, storing, or disposing of (EPA, 1998).

The following are the main objectives for the treatment of ships’ oily wastes:
a. Remove oil from the water in order to produce an aqueous effluent that meets the discharge standards established by the corresponding national authority.

b. Recover the oil for reuse or recycling (IMO, 1995, 155).

The need for treatment and the technique to be used is determined by the requirement of the later use of the recovered oil and the quality of the effluent desired. However, due to their physical and chemical characteristics, not all oil residues can be treated by the same techniques. The following are some waste treatment techniques currently employed for the treatment of oily wastes from ships.

4.4.5.1 Primary treatment

a. Buffering and equalising tanks

Reception facilities receive oily wastes from ships at irregular intervals, and the amount and composition of these wastes can vary greatly. That is, the inflow of oily wastes that facilities receive is constant neither in volume nor in composition.

This problem can be solved by using buffering/equalising tanks, which consist of a tank with a mixer. The tank, whose size is determined by the average inflow of oily wastes and the treatment plant’s capacity, acts as a buffer or intermediate zone of storage of different discharges. The mixer mixes the different oily wastes collected. Consequently, treatment plants receive a continuous inflow of equalised oily wastes, which increases their efficiency (IMO, 1995, 157).

b. Gravity separation

This method is the simplest form of treatment. It is based on the difference in specific gravity of the water and oil particles of oil/water mixtures, which makes water, oil and sediments separate with time. Settling tanks and lagoons are used for this separation.

Settling tanks

The oil/water mixture is stored in one or more settling tanks. After a repose time, clean water is removed by draining and collected for additional treatment before being discharged into the sea. Oil can be recovered by either overflow or by using skimmers. This recovered oil can be used as fuel after recycling (Olson, 1992, 134).
Lagoons

Open-air lagoons can be used for gravity separation of large volumes of oily mixtures with low oil content, such as dirty ballast water. They are excavated basins whose bottoms are covered with oil resistant PVC lining.

There are contrary opinions regarding to their use. On the one hand, it is stated that they are cheaper than settling tanks of similar capacities, and the separation of oil and water is more efficient because the settling surface is greater and the height the oil particles travel is reduced, which improves the settling. On the other hand, volatile organic compounds (VOC) evaporate to the atmosphere because lagoons are open to the air, which produces air pollution and odours (IMO, 1995, 176).

c. Continuous gravity separation

The following are some separators that work with the principle of gravity separation.

API systems

The oil/water mixture is introduced at one end of a tank. The oil rises to the surface and is removed by a skimmer and transferred into a storage tank. The correct operation of the separator is fundamental, because if the inflow of oily water is bigger than the designed inflow there will not be enough time to perform an adequate separation (ROCRAM, 1992, 58). The principle of these separators is explained in Appendix 7.

Plate Separators

Plate separators work like the API separators. A set of parallel plates is use to make the separation of oil and water faster and more efficient. The plates are placed inclined with respect to the inflow of oily wastes, so the oil droplets only need to travel the distance between plates in order to reach the surface. The surface area for coalescence is increased and the distance oil droplets have to rise in order to be separated from water by a skimmer is reduced. Therefore, the time for treatment is reduced as well (ROCRAM, 1992, 38).
4.4.5.2 Secondary treatment

Gravity separation of emulsified oily wastes is difficult to achieve because the coalescence of oil droplets is suppressed. Therefore, different treatment techniques are required. Bilge water is a case in point, because an emulsion is formed due to the presence of detergents used for cleaning equipment and the ship. Secondary and tertiary treatments are processes more expensive than primary treatment, and their use reduces oil content in the effluent (IMO, 1995, 156).

a. Chemical separation

Coagulation/flocculation

Coagulating chemicals or demulsifiers are added to emulsified oily wastes to break the emulsion. After that, flocculating chemicals are added to this resulting water with coagulated oil particles. The result is large flocs of oily particles that are easier to separate from water (IMO, 1995, 160).

b. Physical separation

Flotation

Induced Air Flotation (IAF) and Dissolved Air Flotation (DAF) are systems that use air bubbles injected into the bottom of a tank containing oily wastes in order to facilitate the flotation of oil. The rising air bubbles attach themselves to oil particles, which are recovered by a skimmer once they reach the surface.

Coagulation/flocculation units can be combined with flotation units. In this case, pre-treatment is done in the coagulation/flocculation unit and the flotation unit carries out the oil separation.

Filtration

Coalescence and precoat filters can be used to remove solids and emulsified oil not removed after the primary treatment. Absorption or adsorption and coalescence of the filter media remove the oil (Olson, 1992, 137).

Usually two filters are used in order to keep the plant continually operating. One filter operates while the other is cleaned (IMO, 1995, 166).
Hydrocyclones

These are static pieces of equipment that use the difference in density between oil and water for their separation, which is achieved by centrifugal force. Figure 3 explains the operation principle of oil/water separation by hydrocyclones.

Some of the main advantages of hydrocyclones over flotation and filter units are the following. Little or no maintenance or operation attention is needed because there are no moving parts other than pumps. Additionally, the quality of the effluent is relatively independent of the oil concentration in the influent, which makes the efficiency of the equipment relatively constant.

One of the main disadvantages of this equipment is its high cost compared with other systems. However, there is a current trend of building cheaper hydrocyclones, which eventually could replace flotation and filter units (IMO, 1995, 168).

Figure 1. Oil/water separation by hydrocyclones

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Waste water stream is fed in under pressure.</td>
</tr>
<tr>
<td>2.</td>
<td>Waste water stream swirls through the tube.</td>
</tr>
<tr>
<td>3.</td>
<td>Centrifugal forces make water concentrate at the outer diameter of the tube.</td>
</tr>
<tr>
<td>4.</td>
<td>Oil collects at the centre of the tube.</td>
</tr>
<tr>
<td>5.</td>
<td>Liquid core flows in the opposite direction to the liquid surrounding core.</td>
</tr>
</tbody>
</table>

*Source: Adapted from IMO Comprehensive Manual on Port Reception Facilities*
Centrifuges

These mechanically rotated equipment also use centrifugal force to separate oil, water and sediments. Figure 2 explains the operation principle of oil/water separation by centrifuges.

Centrifuges are mainly used in oil reception facilities for the following purposes:

a. Dewatering and desludging of waste oil and fuel residues recovered in gravity separation, which upgrades them for reuse.

b. Dewatering of sludges before incineration in order to increase energy recovery (IMO, 1995, 174).

Figure 2. Oil/water separation by centrifuges

1. Oily waste water is fed in.
2. Equipment is mechanically rotated by centripetal turbines. Oil, water and sediments are separated.
3. Light oil goes out.
4. Water goes out.
5. Sediment goes out.

Source: Adapted from IMO Comprehensive Manual on Port Reception Facilities
4.4.5.3 Tertiary treatment

Biological treatment

Micro-organisms are used to remove soluble components of oil that have not been removed after primary and secondary treatment. Additionally, all organic charge is reduced, and consequently the biochemical oxygen demand (BOD) is reduced as well (ROCRAM, 1992, 40).

An initial cleaning of the oily waste water is required because the micro-organisms are sensitive to chemicals and other impurities, whose presence can affect the performance of the treatment (Olson, 1992, 137). Figure 3 shows the principle of biological treatment of oily waste water.

Figure 3. Operation principle of biological treatment of oily waste water

Source: Adapted from IMO Comprehensive Manual on Port Reception Facilities

Appendix 8 gives a table in which is shown the oil content in the effluent obtained by applying the treatment techniques mentioned above. Some relevant comments regarding their performance are indicated as well.
Control of liquid effluents

The content of effluents of reception facilities should be monitored and controlled and shall meet the effluent limitations established by the pertinent national authority. Pollutants present in the discharged effluent may originate a negative cumulative effect on the environment, because the effluent discharge is done at a fixed point (Pardo, 1998).

4.4.6 Final disposal

As can be seen from the process indicated in the Appendix 6, substances not suitable for recycling or reuse, as well as residues from waste treatment, must be disposed of. Waste disposal must be done in an environmentally acceptable manner, which means that it does not originate air, land or sea pollution.

The following are the three main alternatives for final disposal.

4.4.6.1 Incineration

Incineration is a technology that destroys organic constituents in waste materials by burning the waste at high temperatures, usually at 900 to 1400 °C (EPA, 1998).

The initial advantages of waste incineration were the hygiene of the process and the waste volume reduction. Nowadays, the main objective of waste incineration is energy recovery. Energy produced by waste incineration is recovered as heat, which for instance in Sweden is used in heating systems (SYSAV, 1998, 4).

Incineration of shipboard generated oily wastes should not imply the translation of pollution from the sea to the air. Therefore, waste incineration plants must incorporate emissions monitoring and air pollution control systems. Nitrogen oxides (NO\textsubscript{X}) are produced during combustion, which can produce acidification and eutrophication of the environment. Additionally, flue gases contain hydrogen chloride (HCl) and sulphur dioxide (SO\textsubscript{2}), which can cause acidification of land and water. Therefore, flue gases from the incineration process must be cleaned in order to protect the environment. As a reference, Figure 4 shows the flue gas cleaning system employed in the Malmö Waste-to-Energy Plant, where the NO\textsubscript{X} is reduced, HCl and SO\textsubscript{2} are neutralised and dust particles are removed in order to produce a clean gas effluent.
There are several types of incinerators for oily wastes but they usually are not designed to treat all kinds of oily wastes. Therefore, the incinerator used must be suitable for the wastes burned (IMO, 1995, 236).

### 4.4.6.2 Controlled storage/landfill

Landfills are waste management structures where an oily waste layer is covered with an impermeable layer and with soil. Several impermeable layers are required to prevent ground water contamination by filtering water. Draining systems with sampling points must be provided to monitor the ground water quality. Landfill is only suitable for oily wastes with low hydrocarbon content, less than 3 per cent, and high solid content (IMO, 1995, 236).

Once landfills stop receiving waste, they must be closed by putting on an impermeable cover in order to prevent the entering of rainwater.

Landfill has been used for many years in many countries. For instance, the Spillepeng Landfill in Sweden is divided into different parts or cells for the landing of different wastes. Biologically degradable waste is deposited in “biocells,” where biogas is produced as the organic material in the biocells decomposes. This gas consists of 50 to 60 per cent methane gas, and the rest is carbon dioxide (CO₂).
Methane gas is collected to avoid its contribution to the greenhouse effect and to utilise its high energy content to generate heat and electricity for the plant buildings (SYSAV, 1999,4).

Regardless the success of landfill, many countries such as Australia and Sweden are trying to reduce the landfill amount as far as possible and encourage the reuse and recycling of materials and energy recovery.

4.4.6.3 Landfarming

Landfarming is a treatment technique in which oily waste is mixed with the top soil layer, at a depth of 15-20 cm, and then exposed to the air. Micro-organisms present in the ground degrade the oily waste and convert it into CO$_2$ and water. In this way, 80 to 90 per cent of the oil is destroyed within two or three years. Landfarming is not adequate for oily wastes contaminated with chemical additives.

Suitable sites for landfarming are difficult to find. For instance, sites must have low soil permeability to avoid groundwater contamination, and must be relatively flat to reduce run-off. Additionally, the site must be surrounded with a barrier to trap rain run-off. Provisions to treat this run-off are needed.

The maximum hydrocarbon load for landfarming is 10 kg of hydrocarbons per square meter (10 kg/m$^2$). Therefore, more land and maintenance of the site is needed than for landfill (IMO, 1995, 235).

Appendix 9 presents a flow chart that indicates the options for recycling and final disposal for oily wastes.

4.4.7 Transportation

Transportation is highly involved in the management process of oily wastes from ships. Floating facilities and land vehicles are used to collect oily wastes from ships, and land vehicles are the only means to transport such wastes to facilities for temporary storage, treatment and final disposal.

The onshore transport of oily wastes represents a potential risk of oil pollution, which can affect human health and the environment. Therefore, this is an activity that must be subject to regulation and control in order to minimise the consequences of pollution and ensure that the amount of waste delivered is the same as that received.
Reporting procedures should be established in case an oil spill happens during the onshore transport of oily wastes. The transporter must notify the pertinent local authority in order to take measures for protecting human health and the environment.

Additionally, a documentation system covering the total transport of oily wastes should be established. After receiving oily wastes from a ship, the transporter must sign and date a document to acknowledge receipt of the type and quantity of waste indicated in this document. A copy of this receipt must be returned to the ship. The transporter must deliver the complete amount of waste received to the next designated transporter, for instance from barge to tank truck, or to the designated facility. Once the transporter has delivered the waste, it must have a document signed and dated by the recipient with indication of the amount and type of waste received.
CHAPTER 5

Peruvian National Situation Regarding Reception, Treatment and Final Disposal of Oily Wastes from Ships

5.1 Authority and responsibility

5.1.1 Reception facilities for oily wastes

According to Peruvian legislation the General Directorate of Captaincies and Coast Guard (DICAPI), which is an administrative body of the Peruvian Navy, is in charge of performing the duties of Maritime Administration. It is responsible for enforcing the fulfilment of national laws and international conventions ratified by the state concerning its jurisdiction and for preparing the required complementary legislation. Additionally, it is responsible for preventing, controlling and combating the effects of aquatic pollution. Consequently, DICAPI has the responsibility for the implementation of the MARPOL Convention and has the authority for its enforcement, which includes ensuring not only the provision of reception facilities for oily wastes in ports but also their use by ships calling at Peruvian ports.

Article 45 of the Legislation for Environmental Protection Regarding Oil Activities establishes that refineries with oil terminals must have systems for the reception and treatment of ballast water. The General Directorate of Oil (DGH) of the Ministry of Energy and Mines is responsible for enforcing this legislation.

5.1.2 Treatment and final disposal

During the development of this dissertation, the author has not been able to identify specific authorities in charge of the approval of installations dedicated to the treatment of oily wastes and/or the final disposal of residues after treatment. In addition, the author has not identified national regulations on the type of treatment techniques and final disposal methods of oily wastes from ships, as well as
requirements for these procedures, such as oil content in the effluent and emission of gases resulting from the incineration of oily wastes.

5.2 Current procedures

The Text of Administrative Procedures of the Peruvian Navy (TUPAM) contains the procedures for the services provided by DICAPI. There are procedures for obtaining authorisation for installing reception facilities for oily mixtures and residues in ports, terminals, marinas and shipyards, as well as for obtaining and renewing the corresponding Certificate of Adequacy.

5.2.1 Authorisation for the installation of reception facilities

An application with the details of the requirement must be submitted to the Director of Environment of DICAPI for approval. The description of the project and a copy of the plans for design and building of the facility must be included. The staff of the Environment Directorate studies these documents and an authorisation for installation of reception facilities is issued if they are found adequate.

There is no uniform pattern of information that applicants must follow to submit the application form. The author considers the information required is insufficient for authorising the installation of reception facilities.

Due to the fact that reception facilities are placed ashore, there could be an overlap of jurisdiction over such facilities between DICAPI and the DGH.

It is up to the Sanitary Authority to keep an official record of the discharges of residues into maritime or land waters and to study any request related to the discharge of residues into these waters. However, the opinion of this authority is not included in the procedure for authorising the installation of reception facilities. Additionally, it is not determined if DICAPI has considered among its procedures informing the Sanitary Authority on the discharges of reception facilities in order to update its official records.

The author considers that the DGH and the Sanitary Authority must be involved in some manner in the process of authorising the installation of reception facilities.

The operator of the facility has the obligation of providing to the ship, if required, a copy of the Certificate of Adequacy of the facility and a document attesting to the
reception of oily wastes, with indication of the type and quantity of waste received. The author considers that this document must be given in all cases to the ship, and must be signed by both the ship captain and the facility operator. Both of them must have a record of such documents for further control by port authorities.

It has not yet been taken into account the case in which the reception facility delivers oily wastes or residues to a transporter for their processing in a treatment or final disposal plant. In this event, a certificate of delivery of oily wastes must be signed by both the reception facility operator and the transporter, with indication of the type and amount of waste delivered.

5.2.2 Certificate of Adequacy of reception facilities

After obtaining the authorisation for installing a reception facility, the applicant must obtain a Certificate of Adequacy of such facility in order to start its operation. An application with the details of the requirements must be submitted to the Director of Environment of DICAPI. Personnel of the Directorate control the functioning of the facility, and a Certificate of Adequacy is issued if the installation works according to the conditions established in the corresponding authorisation for installation of reception facilities.

The Certificate of Adequacy, which is valid for one year, allows the facility to operate. This certificate must ensure that the reception facility is “adequate” according to the terms expressed in paragraph 4.2 of this dissertation. This means to meet the needs of ships that make use of the facility as well as the needs of the environment and not to cause undue delay to such ships. The certificate must ensure the facility operates in an environmentally sound manner.

5.2.3 Annual renewal of Certificate of Adequacy of reception facilities

An application for the renewal of Certificate of Adequacy must be submitted to the Director of Environment of DICAPI. A sworn statement certifying that the installations for reception and treatment of oily wastes are operating according to the conditions established in both the authorisation for installation and the Certificate of Adequacy of the reception facility must be attached to the application.
The author considers that an inspection by the personnel of the Environment Directorate of DICAPI is needed in addition to the sworn statement in order to renew the Certificate of Adequacy. The functioning of the installation and its equipment as well as the records of samples and analyses of effluents discharged must be checked. The certificates of reception and delivery of oily wastes must be verified to track the destination of the oily wastes from the moment of their discharge to shore facilities until their final disposal. This inspection must determine if the facility continues to be “adequate” for the use of ships.

5.2.4 Approval of treatment and final disposal plants

The author has not been able to identify regulations establishing procedures for approving the installations of plants for the treatment and final disposal of oily wastes from ships, as well as for the corresponding control of functioning.

These procedures are very important in order to achieve total control over oily wastes from ships from when they are discharged to port reception facilities until their final disposal, and ensure the processes undertaken in the handling of such wastes are safe and environmentally sound.

The management of oily wastes should be considered as a single process. This process will not be complete and therefore will fail if inadequate activities are carried out in treatment and final disposal plants.

5.3 Stage of compliance with Regulation I/12 of MARPOL 73/78

The Circular MEPC.3/CIRC.3 of 6 October 1998 “Facilities in ports for the reception of oily wastes from ships,” lists all information on oily waste reception facilities submitted by state parties to MARPOL 73/78 up to June 1998. In this circular there is no information on reception facilities for oily wastes in Peruvian ports because Peru has not submitted such information.

The author has collected information from DICAPI as well as from a shipping company and a consultant company that provides services in Peruvian ports. This information is not complete, and must not be considered one hundred per cent accurate, but reflects from a general point of view the stage of compliance at the national level with Regulation I/12 of MARPOL.
5.3.1 Distribution of ports and oil terminals

There are fourteen main ports on the Peruvian coastline. In some of them there are cargo ports, oil terminals, fishing ports, marinas and/or shipyards. All self-propelled ships that arrive to any of these ports or terminals need to make use of reception facilities for discharging their oily wastes generated on board.

Appendix 10 lists the main ports placed along the coastline. It is indicated whether or not there are cargo ports, oil terminals, fishing ports, marinas and/or shipyards in such areas. The number of each of these ports and terminals is also indicated when there is more than one of such installations.

5.3.2 Analysis of reception facilities required and provided

DICAPI has not authorised either the installation or the operation of any reception facility at the national level up to the moment. This is due to the fact that the corresponding legislation that establishes the requirements that reception facilities must comply with and that enforces the fulfilment of the procedures considered in the TUPAM has not been issued yet (Lema, 1999). The author considers that this is appropriate because the procedures for obtaining authorisation to provide reception facilities have been adopted, but there is no legislation that makes it mandatory to comply with such procedures prior to initiating the handling operations of oily wastes. As will be seen later on, reception facilities for oily wastes are placed only in some oil terminals.

Regulation I/12 of MARPOL establishes in which ports and terminals oil reception facilities shall be provided according to their traffic activity and oil cargo movement, as well as the type of oily residues and mixtures such facilities must have the capacity to receive. Appendix 11 lists the fourteen main Peruvian ports with indication if reception facilities are required according to the corresponding paragraph of Regulation I/12(2) of MARPOL 73/78. It is also indicated whether these facilities are provided or not.

Cargo ports and oil terminals are run by different operators and therefore are placed separately in Appendix 11, because the provision of reception facilities is the responsibility of each operator. Information on whether loading ports for bulk cargoes receive combination carriers whose oil residues cannot be discharged
according to Regulation I/9, or not, has not been found. For the purpose of this dissertation it has been assumed that Peruvian ports do not receive this type of ship and therefore are not required to provide reception facilities for such ships.

Oil Terminals

There are fourteen oil terminals on the Peruvian coast, of which four are loading terminals and the others are unloading product terminals. There is a table in Appendix 12 that has been done in basis of information from users of these oil terminals and a consultant company, which shows the types of operations carried out by each terminal. A comparison between wastes received by these terminals and wastes they are expected to receive according to the type of terminal is also shown.

As can be seen from the table of Appendix 12, none of these oil terminals fully comply with MARPOL requirements on oil reception facilities. Such facilities are placed only in five out of the fourteen 14 oil terminals: Talara, Bayovar, Chimbote, La Pampilla and Conchán. However, these facilities do not receive all oily wastes they must receive from ships and may not be available when ships require them, which seems to be the case of the Conchán terminal.

By law, the refineries of Talara, La Pampilla and Conchán must have systems for receiving and treating ballast water. Information from DICAPI indicates that these refineries have systems for receiving oily residues from ships, which are treated with other residues of the refinery. However, information from users of these terminals indicates that the oil terminals of La Pampilla and Conchán do not receive ballast water from ships. Additionally, INTERTANKO has published that there are no reception facilities available for dirty ballast and slops in Peruvian Ports (INTERTANKO, 1998c, 111). It might be possible that these refineries have reception facilities for ballast water but they are not always available for ships or they are not properly publicised.

Cargo ports

None of the eleven cargo ports placed on the Peruvian coast have reception facilities for oily wastes from ships. These ports must have the capacity for receiving oily bilge water and sludges from ships.
Shipyards

There are two shipyards that provide services to merchant ships, placed in the ports of Callao and Chimbote. Shipyards must be capable of receiving all residues and oily mixtures that remain on board ships that will make use of such installations. As a reference, Title 33, Part 158 of the Code of Federal Regulations of the United States of America establishes that shipyards must have a capacity for receiving the following oily wastes from ships:

a. Ballast from bunker tanks, as well as wash water and residues from the cleaning of bunker tanks and sludge tanks.
b. Oily solids from cargo tanks.
c. Oily ballast water and wash water from in port tank washing.
d. Liquid cargo residues.

The author has not been able to identify information on the provision of reception facilities at these shipyards, but it is considered that they are not able to receive all oily wastes mentioned above.

Fishing ports and marinas

Reception facilities for oily wastes from fishing vessels and pleasure boats are available neither in fishing ports nor in marinas. These ports must have the capacity of receiving oily bilge water and used lubricating oil.

5.3.3 Adequacy

The following aspects must be taken into account in order to determine the adequacy of the existing reception facilities:

a. Reception facilities are not provided in cargo ports, fishing ports, marinas and shipyards. Facilities are provided in only five out of fourteen oil terminals.
b. The facilities provided by these terminals are not designed to receive all oily wastes they are required to receive according to MARPOL 73/78.
c. It is unknown if the capacity of the existing reception facilities has been calculated according to the amount of oily wastes expected to be generated by ships using the terminals. Furthermore, the capacity for each type of waste that
reception facilities must have according to the type of port/terminal has not been established.

d. A transfer time in which the discharge of oily ballast and other oily residues and mixtures must be completed has not been established.

e. The maximum oil content in effluents of reception facilities is not established. For instance, the facility of Talara considers the maximum 15 ppm, and the facility of Bayovar uses a “minimum” amount of hydrocarbons in the effluent.

f. The destination of the sediments, solids and other residues generated as a consequence of the treatment of oily wastes from ships in the refineries that provide reception facilities, which are Talara, La Pampilla and Conchán, as well as in the terminals of Bayovar and Chimbote, is unknown.

g. According to information received from some users of reception facilities provided in oil terminals, the following aspects may be said in general:

- Not all reception facilities are always available when ships require them.
- They are conveniently located, easy to use and there is no need to shift the ship to a different berth to make use of them. Their use does not cause undue delay to the ships.
- In some cases it is necessary to give notice for using the facilities more than 24 hours in advance.
- In most cases the availability of reception facilities is not publicised or is publicised in a limited manner.

5.3.4 Cost recovery mechanism

Information from the oil terminals that provide reception facilities on the cost for using such facilities has not been obtained. However, it has been possible to receive this information with respect to four oil terminals from an oil tanker that trades in Peruvian waters and calls at these terminals. This information is shown in Table 7, where it can be seen that the cost varies from facility to facility.

The “fee system” is applied for the use of reception facilities because only ships that use the facility pay for the service, which is an amount per ton of waste. The cost for using reception facilities is not regulated by the Peruvian government, and each provider of the service sets it.
Table 7. Cost for using reception facilities for oily wastes in Peruvian oil terminals

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Waste received</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Talara</td>
<td>Dirty ballast</td>
<td>US$ 0.30 per metric ton</td>
</tr>
<tr>
<td></td>
<td>Dirty ballast with detergents</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bilge water</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Slops</td>
<td></td>
</tr>
<tr>
<td>Bayovar</td>
<td>Dirty ballast</td>
<td>US$ 0.095 per metric ton</td>
</tr>
<tr>
<td>Chimbote</td>
<td>Slops</td>
<td>No charge</td>
</tr>
<tr>
<td>La Pampilla</td>
<td>Slops</td>
<td>No charge</td>
</tr>
</tbody>
</table>

Table 8 shows the cost for using reception facilities in the ports of three South American countries. The “fee system” is applied in these facilities as well. However, the cost is higher than in Peruvian terminals.

Table 8. Cost for using reception facilities for oily wastes in South American ports

<table>
<thead>
<tr>
<th>Port</th>
<th>Country</th>
<th>Type of waste</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>San Lorenzo</td>
<td>Argentina</td>
<td>Slops</td>
<td>US$ 3.00 per cubic meter</td>
</tr>
<tr>
<td>Rio de Janeiro</td>
<td>Brazil</td>
<td>Clean/dirty ballast, slops, bilge water</td>
<td>US$ 23.00 per cubic meter</td>
</tr>
<tr>
<td>Bajo Grande</td>
<td>Venezuela</td>
<td>Clean/dirty ballast</td>
<td>US$ 0.80 per metric ton</td>
</tr>
</tbody>
</table>

*Source: Reception facilities for tankers (INTERTANKO, 1998c)*

Regarding the cost for using reception facilities, the report presented by the Correspondence Group on the Available Financing Schemes for the Establishment and Operation of Port Reception Facilities should be referred to (FAL 25/12/12). According to this report, which gathers information submitted by 87 port authorities from 31 countries, the most applicable financing system is the “fee system”, which is used by 51 of these ports. The second is the system of “costs of disposal included in port dues/charges”, which is applied by 15 of these ports. The third is the “free-of-charge” system, which is applied by 13 of these ports.

Additionally, 66 of these ports do not consider the financing scheme applied to have effects on inter-port competition. However, for example, the “free-of-charge” system as applied in Denmark and the “no-special fee” system as applied in Sweden represent a financial disadvantage for ports of these countries because the waste is
discharged “free”. Consequently, they receive more wastes than ports of neighbouring countries.

5.4 Enforcement of compliance with provision and use of reception facilities

The RECAAM and the Directorate Resolution 0058-96/DCG establish requirements for the provision of reception facilities. It is mandatory for cargo ports, oil terminals, fishing ports, marinas and shipyards to comply with these regulations. However, they do not fulfil this obligation, as has been seen during the development of this chapter.

It is known that some Captains of Port, in whose jurisdictions are placed these ports and terminals, have issued additional individual notifications to each port and terminal in order to enforce the obligation they have of providing reception facilities. However, no positive result has been obtained up to now.

Information on how DGH enforces that refineries provide facilities for the reception and treatment of ballast water from ships has not been obtained.

Regarding the enforcement of the use of reception facilities by ships, there is no legal requirement for ships to deliver their oily wastes to port reception facilities when they are available. However, PSCOs must verify if oily wastes have been illegally discharged into the sea.

5.5 Impediments to the provision of adequate port reception facilities and treatment and final disposal plants

It is considered that the main reason for not providing reception facilities as well as treatment and final disposal plants is the high cost that it might represent to provide and upgrade these installations. Providing reception facilities may demand the building of tanks for storing and decanting oily waters, and tanks for storing recovered oil, as well as the acquiring of special equipment for the primary treatment of wastes received and for the continuous control of the discharge of treated waters. Treatment and final disposal plants might be technically complicated to build and operate, and the equipment and other materials used in the processes of these plants might be highly costly.
Ports and terminals have been run by the state, which has other activities with higher priority for investment than reception facilities, as well as treatment and final disposal plants, such as the welfare, food and education of the population.

However, in 1998 began the privatisation of oil terminals, which are now operated by private operators, and the privatisation of ports is currently in process. This will facilitate the provision of reception facilities because private operators will have better possibilities to obtain the necessary funding than the state. Additionally, it will facilitate the enforcement of compliance by the Maritime Authority because sometimes it is easier to enforce the compliance of regulations by private companies than by governmental organisations.

Moreover, private operators of ports and terminals will face the concern of how to recover the costs of installation and operation of such facilities. The charge for the use of reception facilities might influence ships not to use reception facilities, as well as constitute a disincentive to ships for using these ports or terminals. It might interfere with the inter-port competition, because shipowners might prefer to use other ports that do not charge for this service or simply do not provide it.

The economic factor would be the greatest concern for providing reception facilities at fishing ports, marinas and shipyards. Fishing ports are owned by municipalities, marinas are owned by private yachting organisations and the two existing shipyards are run by the state.

There are other factors that restrict the provision of reception facilities as well as the provision of treatment and final disposal plants:

a. Lack of legislation designating a specific “land” authority to be responsible for the approval and control of treatment and final disposal plants.

b. Lack of harmonised legislation dealing with the entire life process of ships' oily wastes from the moment they are discharged to port facilities until they are disposed of. DICAPI is responsible for matters relating to reception facilities and their use by ships. However, there is no legal link between the control that DICAPI and the “land” authority must carry out in order to track the destination of oily wastes discharged from ships and ensure their environmentally sound disposal.
c. Lack of specific legislation establishing the maximum permissible levels for effluents from port reception facilities and treatment plants.

d. Lack of local knowledge and experience on the establishment of reception facilities and treatment and final disposal plants. There are not many nationals well trained and experienced in the building and operation of these installations and the associated equipment.

e. A study of the reception facilities required in ports and terminals on the Peruvian cost has not been carried out. The amount of oily wastes that ships might deposit in each port and terminal and consequently the capacities of corresponding reception facilities have not been determined.

f. A study on the treatment and final disposal plants required in connection with the reception facilities for oily wastes from ships that must be provided has not been carried out.

g. Some refineries have installations for receiving oily wastes from ships, but they do not receive all wastes they must receive. Some of them do not accept oily wastes contaminated with detergents or cleaning agents, such as bilge water, because they are emulsified mixtures. These wastes are difficult to deal with and require special equipment for their treatment, because the oil separation is not easy to achieve and they can harm the refinery’s installations.

h. Ship traffic movement and the amount of oily wastes to be collected by some ports may not justify the construction of facilities with equipment and tanks for treatment in all ports that must provide such facilities according to regulation I/12. Small cargo ports, fishing ports and marinas, mainly, face this situation.
CHAPTER 6

Conclusions and Recommendations

6.1 Conclusions

The following are the conclusions reached as a result of the development of this dissertation.

Difficulties for the provision of adequate reception facilities and treatment and final disposal plants

The following are the main reasons for the lack of reception facilities, the inadequacy of the existing ones and the absence of plants for further treatment and final disposal of oily wastes from ships:

a. The high cost of providing and upgrading these installations.
b. The lack of local knowledge about their establishment and operation.
c. The absence of harmonised legislation dealing with the entire process of ships’ oily wastes from the moment they are discharged to port reception facilities until their final disposal.

Legislation

a. Peru is State Party to MARPOL 73/78, which is part of its national legislation. Consequently, the country has a national and international obligation to provide adequate reception facilities. Otherwise, the state will fail not only to comply with its national legislation but also to fulfil its international obligations.
b. The national environmental legislation dealing with port reception facilities as well as with treatment and final disposal plants for oily wastes from ships is dispersed among several governmental sectors. There are some jurisdictional overlaps as well as legal gaps not covered by any governmental sector. DICAPI is responsible for enforcing the provision of oil reception facilities in ports and terminals and DGH is responsible for enforcing that refineries with
oil terminals have reception facilities and treatment plants for ballast water. However, the “land” authority responsible for matters dealing with treatment and final disposal plants for oily wastes from ships is not clearly defined.

c. This legislation, with its existing gaps, does not cover the entire management process of oily wastes from ships, which comprises the reception, temporary storage, transportation, treatment and final disposal of such wastes. All these activities are interrelated and there must be a legal and operational link among them in order to secure the safe treatment and final disposal of these wastes. However, there is no legal provision for the co-ordination and control that the Maritime Authority and the corresponding “land” authority must carry out in order to track the destination of oily wastes discharged from ships and ensure their environmentally sound disposal.

d. Complementary legislation dealing with reception facilities has been issued, such as the RECAAM and the Directorate Resolution 0058-96/DCG. However, this legislation needs to be reviewed and updated. For instance, the oil and pollutant content limit of effluents discharged from reception facilities and the type of treatment techniques authorised are not specified. Additionally, other sectors, such as the Sanitary Authority and the DGH, have issued legislation which in some extent deals with activities of port reception facilities.

e. Specific regulations establishing oil concentration limits in effluents discharged from treatment and final disposal plants have not been identified. The oil and pollutant content in effluents of these installations needs to be limited, but it must be taken into account that there are no internationally agree standards on such matters.

Operational matters

a. Annex I MARPOL 73/78 contains provisions on ships’ construction and equipment, and operational measures for preventing discharges of oily wastes that could pollute the marine environment. One of these measures is to retain wastes on board and discharge them to port reception facilities. However, if ports do not provide such facilities or they are not adequate, the whole purpose of the convention, which is to reduce the accidental and operational
pollution from ships, will not be fulfilled. Furthermore, inadequate reception facilities provide a disincentive for shipowners to use them and increase the risk of illegal discharges from ships.

b. There are ships not required to comply with MARPOL provisions on construction and/or pollution prevention equipment. Oil tankers of less than 150 GT are not required to have slop tanks, ODMC system and oil/water interface detector. Ships of less than 400 GT are not required to have oil filtering equipment. Small ships, such as fishing and pleasure boats, are not required to have either oil filtering equipment or sludge tanks. However, all these ships shall not discharge their oily wastes into the sea and therefore they shall be kept onboard and discharged to port reception facilities.

c. Reception facilities and treatment and final disposal plants for oily wastes from ships could become potential land-based sources of pollution if the oil content in their effluents and the processes performed in such installations are not adequately regulated and controlled. For instance, the composition of gases emitted from incineration plants and the selection of suitable sites for landfill and landfarming must be regulated and controlled.

d. The transportation of oily wastes from reception facilities to treatment and final disposal plants should be regulated and controlled in order to ensure the safe transport of such wastes and the permanent track of their location.

Current Procedures

The current procedures established by DICAPI for authorising the installation of reception facilities, for obtaining the corresponding Certificate of Adequacy and for the annual renewal of this certificate must be reviewed and updated.

Enforcement

a. The Maritime Administration have difficulties in enforcing the compliance of the provision of port reception facilities for oily wastes from ships by commercial ports, oil terminals, fishing ports, marinas and shipyards. The issuance of complementary legislation in this regard by DICAPI has not succeeded in its objective of reception facilities being provided.
b. PSCOs cannot enforce ships to discharge their oily wastes to reception facilities if such facilities are either not provided or inadequate. This is a restriction of the corrective actions that PSCOs can require ships to take.

Stage of compliance

a. Reception facilities are not provided in cargo ports, fishing ports, marinas and shipyards. These facilities are only provided in five out of fourteen oil terminals, but they are not adequate, because they do not receive all oily wastes they shall receive according to Regulation I/12 of MARPOL.

b. It is unknown if the capacity of the existing reception facilities has been calculated according to the amount of oily wastes expected to be generated by ships using the respective terminals.

c. A transfer time in which the discharge of oily ballast and other oily residues and mixtures must be completed has not been established.

d. The existing reception facilities use different parameters for the oil content in their effluents.

e. The availability of reception facilities is not duly publicised.

f. There is a fee system for the use of reception facilities. Fees are set by each provider of the service without government participation.

g. Only three refineries have been identified as places where treatment of oily wastes from ships is carried out. There have not been identified plants for the final disposal of oily residues from such refineries and oily residues in general.

6.2 Recommendations

The following are some recommendations the author considers would lead to the provision of adequate reception facilities in Peruvian ports and their subsequent use by ships, as well as to the provision of treatment and final disposal plants.

Legislation

a. Oily wastes received from ships are part of the total wastes handled by ports, which similarly are part of the wastes generated at the national level. All these wastes should be treated according to the same principles. Therefore,
a national legislation covering the whole process of waste management is needed. Appendix 13 indicates a proposal for the content of this legislation dealing with the management of oily wastes from ships.

b. In addition to this legislation, a national plan for ship-generated wastes in ports should be developed. This plan would be an efficient control measure for the appropriate ashore handling and final treatment of such wastes at the national level.

c. The initial step of this plan should deal with the handling of oily residues and mixtures from ships. This would lead to the provision of adequate reception facilities in Peruvian ports, which would contribute to the reduction of illegal discharges and consequently to the preservation of the marine environment.

d. As part of the national plan for ship-generated wastes in ports, plans for the management of oily wastes in ports should be developed. Port waste management plans must be oriented to improve the provision of adequate oil reception facilities and to encourage their use by ships. The design and operation of reception facilities must minimize the risk of adverse environmental impacts.

Due to the fact that each port is different, each port must determine what facilities need to be provided and develop its own waste management plan. However, all these plans must be developed according to a common approach and submitted to DICAPI for approval. Appendix 14 presents a proposal for the content that these waste management plans must have.

e. The reception, treatment and final disposal of oily wastes from ships should be carried out in a uniform. As a reference, Appendix 15 shows the “Guidelines concerning basic principles of ashore handling of ship-generated wastes,” issued by the HELCOM Recommendation 19/13.

**Operational matters**

In addition to the activities concerned with the proposed national legislation on management of oily wastes from ships, it is considered important that DICAPI, in co-operation with the “land” authority in charge of the provision of treatment and final disposal plants, carry out the following activities. The information obtained
would be used to evaluate the waste management plan that each port should develop. Additionally, it would contribute to the provision of adequate service to ships, as well as appropriate treatment and final disposal of oily wastes.

a. Identification of existing reception facilities and evaluation of their performance and use by ships.

b. Classification of ports in order to define the type of facility to be provided. The ships’ traffic movement and the amount of oily wastes to be collected by some ports may not justify the construction of facilities with equipment and tanks for treatment of oily wastes.

c. Definition of the different types of reception facilities and the equipment each facility shall have. As a reference, Appendix 16 shows the types of facilities dealing with oily wastes from ships developed by Spain.

d. Establishment of parameters such as transfer rate of oily ballast as well as of other oily residues and mixtures (m$^3$/hour), and the maximum time for completing the reception of these wastes.

e. Determination of the treatment and final disposal plants required according to the location of port reception facilities. Reception facilities as well as treatment and final disposal plants must be geographically distributed in such a manner that the service to ships is guaranteed. Furthermore, the cost for transporting oily wastes from reception facilities to treatment plants should not be economically unfavourable.

Procedures

a. Authorisation for the installation of reception facilities

(1) DICAPI should consider issuing an application form for obtaining this authorisation. This will facilitate not only for applicants the submission of information but also for the staff of DICAPI the evaluation of applications with uniform parameters.

Appendix 17 contains a proposal for the content of this application form.

(2) There are two other authorities that should participate in the evaluation of these applications. The Sanitary Authority would assist to determine if the physical, chemical and bacteriological characteristics of the effluents
discharged into the sea are within the national limits. DGH would assist in the evaluation of equipment and installations of the facility.

(3) Two documents should be included among the requirements to obtain this Authorisation. First, an Operations Manual containing all the standard operations carried out at the facility as well as emergency procedures, such as fires and spills of oily wastes, must be required. Second, an Environmental Impact Assessment (EIA) for reception facilities where treatment of oily wastes is performed must be required in order to predict potentially adverse impacts of effluents discharged into the sea. The EIA will contribute to determining the feasibility of approving this type of facility.

(4) The authorisation for the installation of the reception facility is issued if the project is approved on the basis of the information submitted by the applicant.

b. **Obtaining of the Certificate of Adequacy of reception facilities**

An inspection of the facility by technical personnel of DICAPI must be carried out after the facility is established and before it starts its operations. A Certificate of Adequacy is issued if the inspection determines the facility operates according to the information submitted. Proposal of changes can be issued if the inspection finds some non-conformities or deficiencies in the functioning of the facility.

c. **Annual renewal of Certificate of Adequacy of reception facilities**

(1) Inspection of the facility by personnel of the Environment Directorate of DICAPI should be included among the procedures for renewing this certificate in order to determine if the facility continues to be adequate for ships’ use.

(2) The participation of the Sanitary Authority must be considered in order to evaluate the records of samples and analyses of effluents discharged.

**Enforcement**

a. As port state, DICAPI should ensure PSCOs are trained in the inspection of machinery spaces of ships in order to determine if oily mixtures and residues generated onboard have been illegally discharged into the sea. PSCOs should be trained as well in operational controls related to procedures for the handling of oily mixtures and residues from machinery spaces and cargo tank areas. In this regard, the training of PSCOs should be based in
IMO Resolution A.787 (19) "Procedures for Port State Control." Appendix 18 contains some activities recommended to PSCOs while carrying out control of oily wastes from ships.

After inspecting the ship, PSCOs may inform the operators of reception facilities on how aware the ship is regarding the availability and arrangement for the use of such facilities. This information would be used to evaluate and improve the procedures for providing information about the facility to ships. Additionally, Captaincies of Port should carry out and investigation and take pertinent actions when they receive a report from ships alleging that reception facilities are inadequate.

b. As coastal state, DICAPI should arrange sea surveillance by its air and surface units in order to detect illegal discharges of oily wastes from ships.

c. As flag state, DICAPI must ensure national ships are constructed according to MARPOL provisions. With regard to ships to which MARPOL does not apply, DICAPI must ensure they are equipped with oily residue holding tanks, as required by the Directorate Resolution 342-91-DC/MGP. Additionally, Captaincies of Port must verify these ships do not illegally discharge their oily wastes into the sea.

d. DICAPI shall establish unscheduled inspections of reception facilities in order to verify the functioning of the installations and their equipment. Records of samples and analyses of effluents discharged must be checked. Documents of reception and delivery of oily wastes must be verified in order to track the destination of oily wastes since the moment of their discharge to shore facilities until their final disposal. If the inspection determines the facility is not adequate for the use of ships the Certificate of Adequacy must be suspended.

e. The competent “land” authority in charge of enforcing provisions on treatment and final disposal plants should carry out inspections of such installations as well as of treatment facilities of oil refineries in order to verify their correct functioning and operation.

Additionally, this “land” authority should verify transporters of oily residues are duly authorised and comply with the documentary system for the reception and delivery of such wastes.
Funding

It is important to develop a financing scheme for the establishment and operation of adequate reception facilities in all ports where they shall be provided, as well as for the required treatment and final disposal plants. In this way, the level of investment necessary from the private sector and the central government, as well as from international organisations, can be determined. Having an estimation of the required level of investment will allow to the central government to determine the feasibility of providing port reception facilities and treatment and final disposal plants.

Private operators run oil terminals, and the privatisation of ports is currently in process. Therefore, these private organisations are responsible for obtaining the necessary funding for the establishment of required reception facilities in ports and oil terminals they operate.

State participation in the funding process might be necessary for providing reception facilities at fishing ports and marinas, which are owned by municipalities and by private yachting organisations, respectively. The two existing shipyards are run by the state and the provision for reception facilities will require state investment.

By law, refineries with oil terminals must have systems for the reception and treatment of ballast water, which is the case of the refineries of Talara, La Pampilla and Conchán. The operators of these refineries are responsible for providing adequate reception facilities, which must be able to receive all types of oily wastes ships making use of the terminals may be required to discharge.

Port/terminal operators, private or public, do not need to provide reception facilities by themselves. Private contractors can supply the service of reception of oily wastes from ships. However, state involvement would be necessary in order to verify these private contractors dispose the wastes in an environmentally sound manner and according to established parameters.

The financial involvement of the state would be higher with regard to treatment and final disposal plants. Treatment of some oily wastes discharged in another ports/terminals might be performed in oil refineries. However, those wastes
that cannot be treated in such refineries or that are collected at distant ports/terminals need to be delivered to special treatment plants.

Additionally, final disposal plants are required in order to deal with residues from refineries and from other treatment plants for oily wastes. In this context, state investment would be required if the private sector were not interested in the establishment and operation of these plants.

**Cost recovery mechanism**

Private operators of ports and terminals as well as the state will look for mechanisms to recover the costs of installation and operation of reception facilities and treatment and final disposal plants.

Regarding reception facilities, the most immediate mechanism would be to charge users for the service provided. This cost should be carefully calculated to not provide a disincentive for ships for not using not only the facilities but also the port itself if the use of such facilities is compulsory. However, such cost should allow the provider of the facility to recover all cost incurred for providing the service.

There are two main options by which treatment and final disposal plants would, if not totally recover the investment for the provision of the service, at least cover the operation costs. The first is by recycling recovered oil to be used as fuel for land-based industrial installations or as bunker fuel oil for ships. Recovered oil can also be mixed with crude oil and redistillated in refineries. These activities would originate a profit for the operators of such plants. The second option is considering for final disposal the incineration of oily wastes with energy recovery. This energy is recovered as heat and can be used in heating and power facilities.

**National co-ordination**

The National Council of the Environment (CONAM) is responsible for co-ordinating the activities of all governmental organisations in environmental matters. Therefore, it is considered the most suitable organisation for co-ordinating the activities of DICAPI regarding the provision of reception facilities with the activities of the other governmental authorities related to treatment and final disposal plants.

**Regional co-ordination**
The establishment of regional agreements through the ROCRAM for the adoption of harmonised policies and measures on the provision of reception facilities and the enforcement of their use by ships is important. In this way, the provision and use of reception facilities will not interfere with the competition among ports. The following items might be taken into account:

a. The application of a uniform financing scheme for the establishment and operation of port reception facilities would avoid the charge for the use of reception facilities having influence on inter-port competition.

b. The establishment of a regional system for the control of ships’ discharges to port reception facilities would allow better criteria for detecting illegal discharges and for enforcing the discharge of oily wastes to reception facilities. Information on whether a ship has used a reception facility in the area and the estimation of the amount of waste generated onboard during the voyage should be exchanged.

c. The establishment of a harmonised regional system of fines in case a ship violates anti-pollution regulations would avoid the perception that some states have more stringent sanctions than neighbouring states, which would be chosen as places to illegally discharge wastes. Additionally, this measure will have a deterrent effect on illegal discharges and will encourage ships to use reception facilities.

International co-operation

The Peruvian government should consider requiring technical assistance from the Technical Co-operation Committee of the IMO and from other organisations, such as the European Union, in order to receive expert advice on port reception facilities and treatment and final disposal plants. Furthermore, on-the-job training to Peruvian personnel in regard to the establishment and operation of these installations should be required from such organisations.

Additionally, financial assistance could be required from international institutions such as the World Bank, the Inter-American Development Bank (IADB), the European Union, and the Global Environmental Facility (GEF). GEF is a fund that offers funding possibilities for projects like the establishment of port reception facilities (MEPC 42/6/1), and whose managing partners are the United Nations
Development Programme (UNDP), the World Bank and the United Nations Environment Programme (UNEP).

**Stimulation of the establishment of reception facilities and their use by ships, and establishment of treatment and final disposal plants**

It is important to involve the participation of the private sector in cases where the financial participation of the state is needed for the provision of reception facilities, for instance in shipyards. Involvement of the private sector in the establishment of treatment and final disposal plants is also required. These activities are very useful because it would be difficult to grant national funds for the establishment of such installations.

The participation of private organisations in the establishment of reception facilities and treatment and final disposal plants could be stimulated by providing state subsidies and tax reduction to these organisations.

Regarding the use of reception facilities by ships, the following are some measures that would stimulate the discharge of their wastes to such facilities:

a. Improvement of the service provided by the facilities.

b. Adequate publicity of the facilities and their service.

c. Direct contact to the ship offering the service of reception of wastes.

d. Audits and inspections of oily wastes of ships by the pertinent national authority.

e. Discounts on port dues or extra services to ships that deliver their wastes to reception facilities.
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Baltic and International Maritime Council (BIMCO). BIMCO reporting form for alleged inadequacy of port reception facilities.
## Appendix 1

**Control of discharge of oily mixtures from cargo tank areas and some machinery spaces bilges of oil tankers**

<table>
<thead>
<tr>
<th>Sea Area</th>
<th>Discharge Criteria</th>
<th>Regulation</th>
</tr>
</thead>
</table>
| Outside a special area and more than 50 nautical miles from nearest land | No discharge except either: 1. Clean or segregated ballast; or 2. When a. The tanker is proceeding on a voyage; b. The instantaneous rate of discharge of the oil content \( \leq 30 \text{ litres/nautical mile} \); c. The total quantity of oil discharged does not exceed:  
   (1) For existing tankers: \( \frac{1}{15,000} \) of the total quantity of the particular cargo of which the residue formed a part  
   (2) For new tankers: \( \frac{1}{30,000} \) of the total quantity of the particular cargo of which the residue formed a part; and d. The tanker has in operation an ODMC system and a slop tank  
In both cases, discharge must be above the water line in the deepest ballast condition | I/9(4) I/9(1)(a)*  |
| Outside a special area and within 50 nautical miles from nearest land    | 1. No discharge except clean or segregated ballast  
2. Discharge must be above the water line in the deepest ballast condition  
3. Segregated and clean ballast may be discharged below water line in ports or at offshore terminals, or at sea by gravity if surface of ballast has been examined before the discharge to ensure it is not contaminated with oil | I/9(4) I/18(2) I/18(6)(i),(ii) |
| Within a special area                                                    | 1. No discharge except clean or segregated ballast  
2. Discharge must be above the water line in the deepest ballast condition | I/10(2)(a), I/10(3)(a) I/81(2) |

* Regulation I/9(1)(a) applies to discharges of oily mixtures from:  
  1. Cargo tank areas of oil tankers  
  2. Machinery space bilges of oil tankers where mixed with cargo oil residue or when transferred to slop tank  
  3. Cargo pump-room bilges of oil tankers (Unified Interpretation 3.1.1.1 of Annex I)
Appendix 2

Control of discharge of oil from machinery spaces of all ships

<table>
<thead>
<tr>
<th>Sea Area</th>
<th>Application</th>
<th>Discharge Criteria</th>
<th>Regulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outside special area</td>
<td>1. Any ship of 400 GT and above other than oil tanker; and 2. Oil tankers of all sizes, provided that a. The bilge water does not originate from cargo pump room bilges; and b. The bilge water is not mixed with cargo oil residues</td>
<td>No discharge except when: 1. The ship is proceeding on a voyage; and 2. The oil content of the effluent without dilution does not exceed 15 ppm; and 3. The ship has in operation an oil filtering equipment according to Regulation I/16</td>
<td>I/9(1)(b)</td>
</tr>
<tr>
<td></td>
<td>Ships of less than 400 GT other than oil tankers</td>
<td>They shall be equipped as far as practicable and reasonable to store machinery spaces bilge water onboard and discharge them to reception facilities or into the sea according to Regulation I/9(1)(b)</td>
<td>I/9(2)</td>
</tr>
<tr>
<td>Within special area</td>
<td>1. Any ship of 400 GT and above other than oil tanker; and 2. Oil tankers of all sizes, provided that a. The bilge water does not originate from cargo pump room bilges; and b. The bilge water is not mixed with cargo oil residues</td>
<td>1. The ship is proceeding on a voyage; and 2. The oil content of the effluent without dilution does not exceed 15 ppm; and 3. The ship has in operation a 15 ppm oil filtering system with alarm and automatic stopping device</td>
<td>I/10(3)(b)</td>
</tr>
<tr>
<td></td>
<td>Ships of less than 400 GT other than oil tankers</td>
<td>No discharge except when the oil content of the effluent without dilution does not exceed 15 ppm</td>
<td>I/10(2)(b)</td>
</tr>
<tr>
<td>Antarctic</td>
<td>All ships</td>
<td>No discharge</td>
<td>I/10(2)(a)</td>
</tr>
</tbody>
</table>
Appendix 3

Constructional requirements for ships under Annex I of MARPOL 73/78.

<table>
<thead>
<tr>
<th>Type of ship</th>
<th>Requirement</th>
<th>Regulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>New crude oil tanker ≥ 20,000 dwt</td>
<td>SBT with protective location and COW</td>
<td>I/13(1)/13E I/13(6)</td>
</tr>
<tr>
<td>New product carrier ≥ 30,000 dwt</td>
<td>SBT with protective location</td>
<td>I/13(1)/13E</td>
</tr>
<tr>
<td>Existing crude oil tanker ≥ 40,000 dwt</td>
<td>SBT or COW</td>
<td>I/13(7) I/13(8)</td>
</tr>
<tr>
<td>Existing product carrier ≥ 40,000 dwt</td>
<td>SBT or CBT</td>
<td>I/13(10)</td>
</tr>
<tr>
<td>Oil tanker ≥ 150 GT</td>
<td>Slop tank/tanks</td>
<td>I/15(2)</td>
</tr>
<tr>
<td>New oil tanker ≥ 70,000 dwt</td>
<td>At least 2 slop tanks</td>
<td>I/15(2)</td>
</tr>
<tr>
<td>Any ship ≥ 400 GT</td>
<td>Sludge tank(s)</td>
<td>I/17(1)</td>
</tr>
<tr>
<td>Oil tankers ≥ 5000 dwt</td>
<td>Cargo tanks protected with double bottom tanks and wing tanks (“brand new” oil tankers)</td>
<td>I/13F(3)</td>
</tr>
<tr>
<td>Oil tankers ≥ 600 dwt and &lt; 5000 dwt</td>
<td>Cargo tanks protected with double bottom tanks (“brand new” oil tankers)</td>
<td>I/13F(7)(a)</td>
</tr>
<tr>
<td>Existing oil tanker</td>
<td>Rebuilding to comply with regulation 13F no later than 30 years after its delivery date</td>
<td>13G(4)</td>
</tr>
<tr>
<td>New oil tanker</td>
<td>Rebuilding to comply with regulation 13F no later than 25 years after its delivery date</td>
<td>13G(5)</td>
</tr>
<tr>
<td>Every oil tanker</td>
<td>Discharge manifold on the open deck on both sides of the ship, for connection to reception facilities for the discharge of dirty ballast water or oil contaminated water from cargo tank area</td>
<td>I/18(1)</td>
</tr>
<tr>
<td>All ships to which regulations of Annex I apply</td>
<td>Standard discharge connection, to connect ship’s discharge piping for machinery space bilge residues to pipes of reception facilities</td>
<td>I/19</td>
</tr>
</tbody>
</table>

Source: MARPOL 73/78 Annex I

The definition of “new oil tanker” according to regulation I/1(26) shall be applied to regulations I/13, 13E and 13G. See I/13F (1) for application of regulation I/13F.
Appendix 4

IMO Guidelines and Specifications applicable for pollution prevention equipment

Oil discharge monitoring and control system

<table>
<thead>
<tr>
<th>Ship’s construction</th>
<th>Applicable IMO document</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil tankers built on or after 02 October 1986</td>
<td>Resolution A.586(14)</td>
</tr>
<tr>
<td>Oil tankers built before 02 October 1986</td>
<td>Resolutions A.496(XII) and MEPC.13(19); or Resolution A.586(14)</td>
</tr>
</tbody>
</table>

Oil/water interface detector

<table>
<thead>
<tr>
<th>Ship</th>
<th>Applicable IMO document</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any ship</td>
<td>Resolution MEPC.5(XIII)</td>
</tr>
</tbody>
</table>

Oil filtering equipment

<table>
<thead>
<tr>
<th>Date of equipment’s installation</th>
<th>Applicable IMO document</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment installed onboard on or after 30 April 1994</td>
<td>Resolution MEPC.60(33)</td>
</tr>
<tr>
<td>Equipment installed onboard before 30 April 1994</td>
<td>Resolution A.393(X) or MEPC.60(33)</td>
</tr>
</tbody>
</table>

*Source: Pollution Prevention Equipment under MARPOL 73/78*
## Appendix 5

Criteria for reception facilities for oily wastes in ports and terminals of the United States of America

<table>
<thead>
<tr>
<th>Type of Port/Terminal</th>
<th>Type of oily waste</th>
<th>Capacity Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ports and terminals loading crude oil</td>
<td>Sludge from onboard fuel and lubricating oil processing</td>
<td>10 metric tons</td>
</tr>
<tr>
<td></td>
<td>Oily bilge water</td>
<td>- 10 metric tons; or</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- 2 metric tons multiplied by the daily vessel average, whichever quantity is greater</td>
</tr>
<tr>
<td></td>
<td>Oily ballast</td>
<td>30% of the deadweight tonnage of the largest of the oceangoing tankers loading crude oil at the port or terminal that do not have CBT, SBT or COW, multiplied by one or the daily vessel average, whichever quantity is greater</td>
</tr>
<tr>
<td>Ports and terminals loading more than 1,000 metric tons of oil other than crude oil or bunker oil.</td>
<td>Sludge from on-board fuel and lubricating oil processing</td>
<td>10 metric tons</td>
</tr>
<tr>
<td></td>
<td>Oily bilge water</td>
<td>- 10 metric tons; or</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- 2 metric tons multiplied by the daily vessel average, whichever quantity is greater</td>
</tr>
<tr>
<td></td>
<td>Oily ballast</td>
<td>30% of the deadweight tonnage of the largest of the oceangoing tankers loading oil other than crude oil or bunker oil at the port or terminal, that do not have CBT or SBT, multiplied by one or the daily vessel average, whichever quantity is greater</td>
</tr>
<tr>
<td></td>
<td>Cargo residue</td>
<td>0.2% of the total cargo capacity of the largest of the</td>
</tr>
<tr>
<td>Source: US Code of Federal Regulations Title 33 Part 158</td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ship repair yard</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ballast from bunker tanks, and wash water and residues from cleaning of bunker tanks and sludge tanks</td>
<td>8% of the bunker capacity of the largest oceangoing ship serviced</td>
<td></td>
</tr>
<tr>
<td>Oily solids from cargo tanks</td>
<td>0.1% of the deadweight tonnage of the largest oceangoing tanker serviced</td>
<td></td>
</tr>
</tbody>
</table>
| Oily ballast water and wash water from in-port tank washing | - 1,500 metric tons; or  
- 4 1/2% of the deadweight tonnage of the largest oceangoing tanker serviced |
| Liquid cargo residues                                | Following percentages of deadweight tonnage of the largest oceangoing tanker serviced:  
- For crude oil oceangoing tankers: 1%.  
- For black product oceangoing tankers: 0.5%  
- For white product oceangoing tankers: 0.2% |
| Reception facilities for ports and terminals other than those above mentioned | Sludge from on-board fuel and lubricating oil processing | - 10 metric tons; or  
- 1 metric ton multiplied by the daily vessel average, whichever quantity is greater |
| Oily bilge water                                     | - 10 metric tons; or  
- 2 metric tons multiplied by the daily vessel average, whichever quantity is greater |
Appendix 6
Management process of oily wastes from ships

Onboard practices

- Waste avoidance
  - Waste reduction
    - Waste segregation

Onshore practices

- Waste collection
  - Temporary Storage
    - Possible reuse
      - Y: Treatment needed → Y: Treatment → Reuse
      - N
    - Possible recycling
      - Y: Treatment needed → Y: Treatment → Recycling
      - N
    - Possible energy recovery
      - Y: Energy recovery
      - N
    - Treatment needed for safe disposal
      - Y: Treatment
      - N

Note:  □ : Decision  □ : Action

Source: Adapted from HELCOM Recommendation 19/13 and ANZCC, 1997
Appendix 7
Operation of API separator

1. Oily water enters
2. Screw pump moves water/oil
3. Oil rises to the surface
4. Skimmer removes oil from top layer
5. Oil goes to storage tank through a drain
6. Clean water goes out

Source: Adapted from Olson, P H (1992)
## Appendix 8

### Treatment techniques for oily wastes from ships

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Technique</th>
<th>Oil concentration in effluent</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primary Treatment</strong></td>
<td><strong>Settling tanks</strong></td>
<td>At best 50 ppm (OLSON, 1992, 135) 100-150 ppm (ROCRAM, 1992, 39)</td>
<td>Effluent must be treated by a better grade separator before being discharged into the sea (Olson, 1992, 134).</td>
</tr>
<tr>
<td></td>
<td><strong>Lagoons</strong></td>
<td>50 ppm (ROCRAM, 1992, 39)</td>
<td>Not recommended because volatile organic compounds (VOC) evaporate to the atmosphere, which produces air pollution and odours (IMO, 1995, 176).</td>
</tr>
<tr>
<td></td>
<td><strong>API systems</strong></td>
<td>50-200 ppm (IMO, 1995, 158)  Down to 40 ppm (Olson, 1992, 135)</td>
<td>Effluent oil content depends on the substances contained in the influent (Olson, 1992, 135).</td>
</tr>
<tr>
<td></td>
<td><strong>Combination of settling tank (24 hours of repose) and API separator</strong></td>
<td>50 ppm (ROCRAM, 1992, 39)</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Plate separators</strong></td>
<td>20-100 ppm (IMO, 1995, 158) 30 ppm (Olson, 1992, 136)</td>
<td>Effluent oil content depends on the type of separator and the quality of the influent. Frequent cleaning of the plates is required in order to remove the oil residues adhered to them (Olson, 1992, 136).</td>
</tr>
<tr>
<td></td>
<td><strong>Combination of settling tank (24 hours of repose) and plate separator</strong></td>
<td>15-20 ppm (ROCRAM, 1992, 39)</td>
<td></td>
</tr>
<tr>
<td>Secondary Treatment</td>
<td>Chemical separation: Coagulation/flocculation</td>
<td>Use of chemical demulsifiers is costly. They usually are not suitable for all types of oils. Excessive use can increase the BOD. Use of flocculating chemicals is costly. The recovered oil can be difficult to reuse or recycle (ROCRAM, 1992, 40).</td>
<td></td>
</tr>
<tr>
<td>---------------------</td>
<td>---------------------------------------------</td>
<td>-------------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Physical separation: Flotation</td>
<td>The separated oil contains a lot of water and must be treated with a centrifuge to make possible the reuse of the recovered oil, for instance as fuel (IMO, 1995, 164).</td>
<td></td>
</tr>
</tbody>
</table>
|                     | Coagulation/flocculation unit combined with flotation unit | Usually less than 5 ppm (Olson, 1992, 136)  
20-40 ppm (IMO, 1995, 164)  
These combined plants are technically complicated and expensive to build and operate (Olson, 1992, 136). |
|                     | Filtration                                  | Emulsions cannot be treated well by coalescence filters (IMO, 1995, 166). |
|                     | Filters with added flocculating chemicals   | 5 ppm (IMO, 1995, 166)  |
|                     | Hydrocyclones                               | 5-15 ppm (IMO, 1995, 168)  
Highly costly equipment (IMO, 1995, 168). |
|                     | Centrifuges                                 | Less than 5 ppm (Olson, 1992, 136)  
- Treated water must be recycled to primary separator unit (IMO, 1995, 170).  
- Capacity usually low for oil port applications. Oil effluent concentrations may vary greatly (Olson, 1992, 136). |
| Tertiary Treatment  | Biological treatment                        | Less than 1 ppm (IMO, 1995, 174)  
Less than 1 ppm (Olson, 1992, 137)  
Well-trained operators and high attention to the process procedures are needed. |
Appendix 9
Flow chart of recycling and disposal options for oily wastes

Oily waste

Free of solids

Initial separation

Liquid

Possible Oil-freeing

Possible Incineration

Possible Landfarming

Possible Landfill

Recuperation

Application in civil works

Recycling

Use as fuel

Recycling

Redistillation

Application in civil works

Oily material

Primary/secondary separation

Oily material

Liquid oil

Liquid oil

Liquid oil

Liquid oil

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### Appendix 10

**Distribution of ports and terminals in the Peruvian coast line**

<table>
<thead>
<tr>
<th>Port area</th>
<th>Cargo port</th>
<th>Oil terminal</th>
<th>Fishing port</th>
<th>Marina</th>
<th>Shipyard</th>
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</thead>
<tbody>
<tr>
<td>Zorritos</td>
<td>No</td>
<td>No</td>
<td>Yes (2)</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Talara</td>
<td>No</td>
<td>Yes</td>
<td>Yes (3)</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Paita</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes (3)</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Eten/Pimentel</td>
<td>No</td>
<td>Yes</td>
<td>Yes (2)</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Pacasmayo</td>
<td>Yes</td>
<td>No</td>
<td>Yes (2)</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Salaverry</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Chimbote</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes (3)</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Supe</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes (2)</td>
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<td>Huacho</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Callao</td>
<td>Yes</td>
<td>Yes (3)</td>
<td>Yes (5)</td>
<td>Yes(4)</td>
<td>Yes</td>
</tr>
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<td>Yes</td>
<td>Yes</td>
<td>Yes (3)</td>
<td>No</td>
<td>No</td>
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<td>San Juan</td>
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<td>Yes</td>
<td>Yes (2)</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Mollendo/Matarani</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes (3)</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Ilo</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes (2)</td>
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### Appendix 11
Provision of oil reception facilities in Peruvian ports and terminals

<table>
<thead>
<tr>
<th>Port/terminal name</th>
<th>Zorritos</th>
<th>Talara</th>
<th>Paita</th>
<th>Eten/ Pimentel</th>
<th>Pacasmayo</th>
<th>Salaverry</th>
<th>Huacho</th>
</tr>
</thead>
<tbody>
<tr>
<td>Port/terminal</td>
<td>Port</td>
<td>Terminal</td>
<td>Port</td>
<td>Terminal</td>
<td>Port</td>
<td>Port</td>
<td>Port</td>
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<td>R</td>
<td>P</td>
<td>R</td>
<td>P</td>
<td>R</td>
<td>P</td>
<td>R</td>
</tr>
<tr>
<td>Crude oil loading terminals serving oil tankers that have arrived on ballast voyage of less than 72 hours or 200 nm</td>
<td>No</td>
<td>NA</td>
<td>No</td>
<td>NA</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Product oil loading terminal whose loading average quantity is more than 1000 m³ per day</td>
<td>No</td>
<td>NA</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>NA</td>
<td>No</td>
</tr>
<tr>
<td>Ports having ship repair yards or tank cleaning facilities</td>
<td>No</td>
<td>NA</td>
<td>No</td>
<td>NA</td>
<td>No</td>
<td>NA</td>
<td>No</td>
</tr>
<tr>
<td>Ports and terminals receiving ships provided with sludge tanks</td>
<td>No</td>
<td>NA</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Ports handling ships that retain oily bilge water and other residues that cannot be discharged according to Regulation I/9</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
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<tr>
<td>Loading ports for bulk cargoes receiving combination carriers whose oil residues cannot be discharged according to Regulation I/9</td>
<td>No</td>
<td>NA</td>
<td>No</td>
<td>NA</td>
<td>No</td>
<td>NA</td>
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</tr>
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</table>

Note: R: Required  P: Provided  NA: Not applicable
<table>
<thead>
<tr>
<th>Port/terminal name</th>
<th>Chimbote</th>
<th>Supe</th>
<th>Callao</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Port</td>
<td>Terminal</td>
<td>Port</td>
</tr>
<tr>
<td>Crude oil loading terminals serving oil tankers that have arrived on ballast voyage of less than 72 hours or 200 nm</td>
<td>R P R P</td>
<td>No NA No NA</td>
<td>No NA No NA</td>
</tr>
<tr>
<td>Product oil loading terminal whose loading average quantity is more than 1000 m$^3$ per day</td>
<td>R P R P</td>
<td>No Yes No Yes</td>
<td>No NA No NA</td>
</tr>
<tr>
<td>Ports having ship repair yards or tank cleaning facilities</td>
<td>R P R P</td>
<td>Yes No No NA</td>
<td>No NA No NA</td>
</tr>
<tr>
<td>Ports and terminals receiving ships provided with sludge tanks</td>
<td>R P R P</td>
<td>Yes No Yes No</td>
<td>Yes No Yes No</td>
</tr>
<tr>
<td>Ports handling ships that retain oily bilge water and other residues that cannot be discharged according to Regulation I/9</td>
<td>R P R P</td>
<td>Yes No Yes No</td>
<td>Yes No Yes No</td>
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<tr>
<td>Loading ports for bulk cargoes that receive combination carriers whose oil residues cannot be discharged according to Regulation I/9</td>
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<td>No NA No NA</td>
<td>No NA No NA</td>
</tr>
</tbody>
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Note: R: Required  P: Provided  NA: Not applicable
<table>
<thead>
<tr>
<th>Port/terminal name</th>
<th>Pisco</th>
<th>San Juan</th>
<th>Matarani/Mollendo</th>
<th>Ilo</th>
<th>Tablones</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Port</td>
<td>Terminal</td>
<td>Port</td>
<td>Terminal</td>
<td></td>
</tr>
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<td>MARPOL Regulation I/12(2)</td>
<td>R</td>
<td>P</td>
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<td>R</td>
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<tr>
<td>Crude oil loading terminals serving oil tankers that have arrived on ballast voyage of less than 72 hours or 200 nm</td>
<td>No</td>
<td>NA</td>
<td>No</td>
<td>NA</td>
<td>No</td>
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<tr>
<td>Product oil loading terminal whose loading average quantity is more than 1000 m³ per day</td>
<td>No</td>
<td>NA</td>
<td>No</td>
<td>NA</td>
<td>No</td>
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<tr>
<td>Ports having ship repair yards or tank cleaning facilities</td>
<td>No</td>
<td>NA</td>
<td>No</td>
<td>NA</td>
<td>No</td>
</tr>
<tr>
<td>Ports and terminals receiving ships provided with sludge tanks</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Ports handling ships that retain oily bilge water and other residues that cannot be discharged according to Regulation I/9</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Loading ports for bulk cargoes that receive combination carriers whose oil residues cannot be discharged according to Regulation I/9</td>
<td>No</td>
<td>NA</td>
<td>No</td>
<td>NA</td>
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Note: R: Required  P: Provided  NA: Not applicable
## Appendix 12

Comparison between oily wastes currently received and oily wastes required to be received by Peruvian oil terminals

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Operations</th>
<th>Type of terminal</th>
<th>Wastes that must be received</th>
<th>Wastes received</th>
</tr>
</thead>
<tbody>
<tr>
<td>Talara</td>
<td>- Products loading/unloading</td>
<td>II and III</td>
<td>- Oily ballast water</td>
<td>- Oily ballast water</td>
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<tr>
<td></td>
<td>- Crude oil unloading</td>
<td></td>
<td>- Oily bilge water</td>
<td>- Oily ballast water with detergents</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Sludge</td>
<td>- Oily bilge water</td>
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<td></td>
<td></td>
<td></td>
<td>- Cargo residue (slops)</td>
<td>- Slops</td>
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<tr>
<td>Bayovar</td>
<td>- Crude oil loading</td>
<td>I</td>
<td>- Oily ballast water</td>
<td>- Oily ballast water</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>- Oily bilge water</td>
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<td></td>
<td>- Sludge</td>
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</tr>
<tr>
<td>Eten</td>
<td>- Products unloading</td>
<td>III</td>
<td>- Oily bilge water</td>
<td>NIL</td>
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<td></td>
<td></td>
<td></td>
<td>- Sludge</td>
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<tr>
<td>Salaverry</td>
<td>- Products unloading</td>
<td>III</td>
<td>- Oily bilge water</td>
<td>NIL</td>
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<td></td>
<td>- Sludge</td>
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<td>Chimbote</td>
<td>- Products unloading</td>
<td>III</td>
<td>- Oily bilge water</td>
<td>- Slops</td>
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<td>- Sludge</td>
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<tr>
<td>Supe</td>
<td>- Products unloading</td>
<td>III</td>
<td>- Oily bilge water</td>
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<td></td>
<td></td>
<td>- Sludge</td>
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<tr>
<td>La Pampilla</td>
<td>- Products loading/unloading</td>
<td>II and III</td>
<td>- Oily ballast water</td>
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<td>- Crude oil loading</td>
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<td>- Oily bilge water</td>
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<td>- Sludge</td>
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<td></td>
<td>- Cargo residue (slops)</td>
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<td>Callao Pier 7</td>
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<td></td>
<td>- Sludge</td>
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<td>Conchán</td>
<td>- Products loading</td>
<td>II and III</td>
<td>- Oily ballast water</td>
<td>NIL</td>
</tr>
<tr>
<td></td>
<td>- Crude oil unloading</td>
<td></td>
<td>- Oily bilge water</td>
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<td>- Sludge</td>
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<tr>
<td>San Juan</td>
<td>- Products unloading</td>
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<td>- Oily bilge water</td>
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<td>- Sludge</td>
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<td>Terminal</td>
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<td>Type of terminal</td>
<td>Wastes that must be received</td>
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<td>------------------</td>
<td>------------------</td>
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<td>----------------</td>
</tr>
<tr>
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<td>- Oily bilge water</td>
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<td></td>
<td></td>
<td>- Sludge</td>
<td></td>
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<tr>
<td>Tablones</td>
<td>- Products unloading</td>
<td>III</td>
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<td></td>
<td>- Sludge</td>
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<tr>
<td>Ilo</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>- Sludge</td>
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</table>

Note: Oil terminals have been classified according to the following:

Type I: Crude oil loading terminals serving oil tankers that have arrived on ballast voyage of less than 72 hours or 200 nautical miles

Type II: Product oil loading terminals whose loading average quantity is more than 1000 m³ per day

Type III: Terminal other than terminals types I and II
Appendix 13

National legislation on management of oily wastes from ships - Proposal of content

This legislation should cover the collection, temporary storage, transportation, treatment and final disposal of wastes. Among others, the following aspects should be covered by this legislation:

1. Designation of specific authorities that will enforce the compliance of the legislation regarding the provision and functioning of port reception facilities, treatment and final disposal plants, and companies in charge of the transportation of oil residues. Pertinent levels of authority and responsibility must be defined from the moment oily wastes are discharged to reception facilities until their final disposal.

   In this regard, it corresponds to DICAPI to deal with matters related to port reception facilities. The DGH is responsible for enforcing the Legislation for Environmental Protection Regarding Oil Activities and has personnel dealing with matters related to refineries and plants for oil processing. Therefore, it is considered the most suitable governmental organisation to deal with the provision and operation of treatment and final disposal plants for oily wastes.

2. Definition of the responsibilities of providing adequate port reception facilities, as well as treatment and final disposal plants.

3. Establishment of communication and co-ordination lines between responsible authorities during the whole process of management of oil wastes from ships.

4. Establishment of the maximum permissible limit of oil content in effluents that reception facilities and treatment plants can discharge into the sea. This concentration should be stricter than that required by MARPOL because the discharge is done at a close distance from shore and at a fixed point.

The Directorate Resolution 030-96-EM/DGAA, issued by the General Directorate of Environmental Matters (DGAA) of the Ministry of Energy and Mines, establishes maximum permissible levels for liquid effluents from oil activities of exploration, exploitation, transport, refinery, process, storage and commercialisation of liquid oil and its derived products. However, effluents of reception facilities are not covered by this resolution. Additionally, the General Law of Waters establishes permissible concentration limits of noxious
substances that waters can receive, such as bacteriological limits, BOD limits, and limits of substances potentially dangerous (cadmium, mercury, zinc, etc.). Both the Directorate Resolution 030-96-EM/DGAA and the General Law of Waters must be taken as terms of reference when such limits are established. The sensitivity and use of the waters receiving the discharged effluents must be taken into account as well during the establishment of such limits.

(5) Specification of the type of oily wastes each reception facility shall receive according to the types of ships handled in the corresponding port.

(6) Definition by legislation of the term “adequate” in relation to reception facilities, and the conditions reception facilities must comply with.

(7) Definition of the type and parameters of treatment techniques and disposal methods to be used in treatment and final disposal plants, respectively. The oil content in the effluent produced by the selected treatment techniques must be below the limit that will be established by law.

(8) Establishment of the obligation for oil tankers of 150 GT and above and other ships of 400 GT and above of informing the respective Captaincy of Port of the type and quantity of oily wastes carried on board, at least 24 hours before entering the port. Appendix 19 shows as a reference the form “Declaration of residues”, which is based on a similar document used by Spain.

(9) Obligation of ships of informing the respective Captaincy of Port and reception facility of the amounts and types of oily wastes to be discharged according to the following criteria:
   a. If the port of call is known: at least 24 hours before arrival.
   b. If the port of call is unknown: as soon as the port of call is known, if this information is available less than 24 hours prior to arrival.
   c. If the voyage lasts less than 24 hours: at least upon departure from the previous port.

(10) Requirement for reception facilities of having a special book for recording the operations of reception, treatment and delivery of oily wastes. There should be concordance between the amounts of wastes subjected to primary treatment and delivered for further treatment and final disposal and the amounts of oily wastes received from ships.
(11) Establishment of a documentation system for the reception and delivery of oily wastes from ship to reception facility, from reception facility to transporter and from transporter to treatment and/or final disposal plants. Both the deliverer and the receiver of the waste must sign and date these documents with indication of the type and amount of waste delivered. As a reference, Appendix 20 shows the “Marpol” Certificate of residues reception from ships, which is used by Spain.

(12) Approval, registration and control of companies that will transport oily wastes from reception facilities to treatment and final disposal plants by the competent “land” authority.

(13) Definition of administrative actions to be taken in cases where reception facilities are found inadequate, such as suspension or revocation of the Certificate of Adequacy.

(14) Establishment of liability schemes for environmental damage produced by port reception facilities, as well as treatment and final disposal plants.

(15) Establishment of compensation schemes for environmental damage produced by port reception facilities, as well as treatment and final disposal plants.

(16) Definition of penalties in cases of legislation violation. The severity of these penalties should discourage violations of the legislation.

(17) Consideration of establishing mandatory discharge of oily wastes in ports or terminals where reception facilities are provided.

(18) Distribution of the Revised Consolidated Format for Reporting Alleged Inadequacy of Port Reception Facilities developed by the IMO (MEPC/Circ. 349) to ships at its arrival to Peruvian ports/terminals. Ships’ masters should be instructed to submit such format to the corresponding Captaincy of Port in case reception facilities are not available or are inadequate. The MEPC/Circ. 349 is shown in Appendix 21.

Appendix 14

Port Waste Management Plan - Proposal of Content

1. Consultation with potential users and parties interested in the provision of the facilities, and with the Maritime Authority, which regulates the provision of reception facilities. This activity is to ensure that port reception facilities meet the needs of their users and providers, and comply with relevant regulations.

2. Analysis of the amount and type of wastes that might be discharged by ships using the port in order to facilitate the port in assessing what facilities should be provided.

3. Analysis of what type and capacity of waste reception facilities are adequate to receive the types and amount of waste likely to be received in the port.

4. Description of procedures for the collection and reception of wastes from ships.

5. Description and location of waste collection facilities. Facilities should be easy to use in order to avoid disincentives towards their use.

6. General information on temporary storage and treatment of wastes, including pre-treatment equipment and processes within the port.

7. Description of how the wastes are finally disposed of.

8. Evaluation of the cost for using the facility in order to stimulate its use by ships and discourage illegal disposal of waste.

9. Provisions for the periodic revision and updating of the plan in order to ensure that port waste management facilities are adequate and up to date.

10. Procedures for providing the following information on the facility to all ships using the port/terminal:
   a. Location of collection facilities applicable to each berth.
   b. List of oily wastes that the facility can receive.
   c. Description of procedures for the delivery of oily wastes.
   d. Cost for using the facilities.
   e. Transfer rate of oily ballast as well as of other oily residues and mixtures in m³/hour or tons/hour.
   f. Maximum time for completing the reception of oily ballast as well as other oily residues and mixtures.
g. Indication if the facility can receive oily wastes within 24 hours of notification.

h. Availability of standard discharge connections for oily bilge water and standard connection bridles for dirty ballast and tank washings.

i. Type of facility, stationary or mobile (land or floating) used for the collection of oily wastes from ships.

j. Means of communication with the ship for co-ordinating the discharge of oily wastes.

k. Procedures for reporting inadequacy of reception facilities.

l. List of contact points.


12. Procedures for recording the amounts of different categories of wastes received and tracking such wastes.

13. Person (s) designated responsible for implementing the plan and for the waste management within the facility.


15. Training programmes for operators of the facility. Personnel working in reception facilities must have knowledge not only of the operation of the facilities but also of transfer operations from ship to shore in order to guarantee the safety of the discharge of oily wastes.

16. Co-ordination between ship and port for the use of reception facilities. In addition to the notification on the type and amount of waste to be discharged, means of discharge must be co-ordinated according to the type of ship and waste to be discharged. These co-ordinating activities will contribute to reducing possibilities of delay in the use of reception facilities.

17. Submission of a report to the government for approval and to provide evidence that the waste management process has been complied with, as well as to provide a document that can be utilised by port users.

References: HELCOM RECOMMENDATION 19/12, ANZECC, 1997
Appendix 15

HELCOM Recommendation 19/13

Guidelines concerning basic principles of ashore handling of ship-generated wastes

General principles applicable to ashore handling of wastes

- Waste treatment should be carried out in a planned, consistent, and systematical manner, licensed or otherwise formally approved and supervised by competent authorities.
- Waste reduction and management should be based on the widely recognized hierarchy:
  * Avoidance and minimization of waste generation
  * Reuse or material recovery of wastes
  * Energy recovery of wastes
  * Environmentally sound and safe disposal of wastes
- Waste reduction, recovery and final disposal should be firmly based on the principles of best available technology (BAT) and best environmental practice (BEP).
- Wastes should be handled by a competent and trained staff.
- Waste reception and treatment should be recorded in a way which provides appropriate information for the competent authorities.
- Treatment and final disposal of ship-generated wastes will be considered in accordance with the general principles and requirements described above and in line with the treatment and disposal of other wastes having the same characteristics. Permit conditions are to be equal to those of other waste facilities.

Treatment of wastes in the port

Oil and noxious substances
- Oily wastes and other hazardous wastes must be recovered, finally treated or disposed of in accordance with the requirements of the competent authorities.

Garbage (solid wastes)
- Ports should provide reception of separated waste fractions from ships to the extent which the local/regional waste management system accepts. Where ships are charged for waste reception, the reception of separated wastes (against unseparated) should be strongly encouraged by economic incentives.

- In special events such as an epidemic in the previous ports of call of the ship, special sanitary precautions may be ordered based on a case by case consideration.

Sewage
- Sewage from the ships should be discharged to or transported to a municipal sewage treatment plant.

- In special events such as an epidemic in the previous ports of call of the ship, special sanitary precautions may be ordered based on a case by case consideration.

Treatment and final disposal of wastes outside the port
- Treatment and final disposal of ship-generated wastes should generally be integrated with other waste treatment. Separate treatment or recovery of ship-generated wastes is justified only in special cases such as noxious substances endangering treatment of other wastes.

- Treatment and facilities for final disposal must be designed so as to have sufficient capacity to receive ship-generated wastes without any operational disturbances whatsoever.

Information services
- Ships should be given instructions on how to avoid generation of unnecessary wastes, how to separate wastes and how to keep hazardous wastes apart from non-hazardous wastes.

- Ships should also be well informed of local waste management practices and fees.
1. Types of Facilities

Three basic types of facilities are considered:

a. Facilities for reception and temporary storage

Oily wastes collected are temporarily stored in the facility until they are transported to a primary treatment facility. These facilities are advisable for fishing ports and marinas where it is foreseen that the amounts of oily wastes collected will not reach enough volume to make profitable a service of tank trunks or barges that daily deliver such wastes to a treatment facility.

b. Facilities for primary treatment

In addition to the storage of oily wastes, water with oil content of less than 15 ppm is separated from oil. This separation considerably reduces the stored volume. These facilities receive oily wastes stored in reception and temporary storage facilities, which are periodically collected from nearby ports. This type of facility is advisable for commercial ports as well as for fishing ports with high traffic.

c. Facilities for total treatment

These facilities receive effluents from different primary treatment facilities. They also can receive directly oily wastes from reception and temporary storage facilities. Recoverable oils are extracted and residual products are destroyed or neutralised and some of them are used as a source of energy that is employed in the treatment process. These facilities can also be used for treatment and recycling of oily wastes from land-based activities, which would increase their performance.

2. Basic elements for each type of facility
a. Facilities for reception and temporary storage

(1) Facilities for commercial and fishing ports
   - One or more fixed or mobile tanks of enough capacity to receive the foreseen demand of the service without causing considerable delay to ships.
   - An independent pumping system on each tank that allows the suction of oily wastes from the shipyard and their subsequent discharge to the transport means for their delivery to treatment plants.

(2) Facilities in marinas
   There are two alternatives:
      - Fixed collection system: This system consists of a tank with the characteristics mentioned above and a piping network through the piers with connections on each berth, as the connections for water, electricity or telephone are placed.
      - Mobile collection system: This system consists of special containers placed in the vicinity of the berths, which later are discharged by the company in charge of providing the service, as is done with the trash bins.

b. Facilities for primary treatment

In order to guarantee convenient primary treatment, which is the separation of water and oil, it is necessary that the facility minimally contain the following elements:

(1) Storage and primary separation phase
   - One or more tanks for storing oily wastes from ships

(2) Separation and effluent control phase
   - One separation system
   - One system of coalescence filters
   - One system for registration and continuous control of effluents treated in the previous phases
   - One return circuit for treated water whose discharge has been refused by the control system
(3) Storage of recovered oil phase  
   - One or more tanks for storing oily wastes from ships.

All component elements of these three phases must be interconnected through a fixed piping network, whose diameter and characteristics must be adequate for the projected service.

c. Facilities for total treatment

These facilities must be provided, as a minimum, with the following equipment and systems:

(1) Storage and primary separation phase  
   - One or more tanks for storing oily wastes from ships, where the first settling process is carried out

(2) Separation and effluent control phase  
   - One separation system.  
   - One system of coalescence filters  
   - One system for registration and continuous control of effluents treated in the previous phases  
   - One return circuit for treated water whose discharge has been refused by the control system

(3) Sludge removal and homogenisation phase  
   - One circuit with independent pumping system

This system conducts the paraffin and semi-solid products deposited at the bottom of the storage tanks and separation system to a homogeniser, which produces the dilution of these products with the recovered oil
   - One tank for extraction of sediments  
   - One homogeniser  
   - One system for the separation of metallic solids  
   - One system for inert solid residues that cannot be recovered

(4) Storage of recovered oil phase  
   - One or more tanks adequate for storage of oil

(5) Co-generation phase

There are two alternatives for this phase
- Vapour production for heating system:
  * One boiler of adequate size and characteristics for the volume of the facility
  * One vapour circuit that heats the product through serpentines installed on the tanks of the facility

- Electricity production service for the facility:
  * One motor-generator adapted for using as fuel the homogenised mixture obtained from the previous phases
  * One alternator of adequate power
  * One electric network of power and lighting

Source: MARPOL Project (Spain)
Appendix 17

Application form for obtaining authorisation for installation of reception facilities
Proposal of content

a. Person in charge of the facility.
b. Description of the project.
c. Plans of the facility.
d. Description of tanks, equipment, etc. used in the facility.
e. Description of the operations carried out by the facility.
f. Type of wastes the reception facility can receive.
g. Indication if treatment of oily wastes or only the reception and storage of such wastes is carried out in the facility.
h. If treatment of oily wastes is carried out in the facility:
   (1) Description of the treatment technique and equipment used
   (2) Oil content in the effluent in ppm
   (3) Environmental Impact Assessment
i. Estimated daily capacity of the facility and estimated daily capacity required by the port or terminal in tons or m\(^3\).
j. Ship types visiting the port/terminal (crude oil tanker, fishing vessels, etc.).
k. Transfer rate for oily ballast as well as that for other oily residues and mixtures in m\(^3\)/hour.
l. Maximum time for completing the reception of oily ballast as well as other oily residues and mixtures.
m. Indication if the facility can receive oily wastes within 24 hours of notification.
n. Availability of standard discharge connections for oily bilge water and sludge, and standard connection bridles for dirty ballast and tank washings.
o. Type of facility, stationary or mobile (land or floating), used for the collection of oily wastes from ships.
p. Means of communication with ships to co-ordinate the discharge of wastes.
q. Operations Manual containing all the standard operations carried out at the facility as well as emergency procedures.
r. Documentation system for the reception and delivery of oily wastes.
Appendix 18

Activities recommended to PSCOs regarding control of oily wastes from ships

The following are some activities recommended to Port State Control Officers (PSCOs) while carrying out control inspections of oily wastes from ships. The aim is to determine the destination of oily mixtures and residues generated on board, and find out if they have been illegally discharged into the sea.

1. Inspection of the International Oil Pollution Prevention Certificate (IOPP) in order to determine if it is still valid and if the corresponding annual and intermediate surveys have been carried out.

2. Comparison of the information contained in the Declaration of residues submitted by the ship’s master with the Log Book, IOPP Certificate, Oil Record Book Part I and II, as applicable, in order to determine the concordance of such information.

3. Performance of the following activities related to the Oil Record Book:
   a. Verification of whether the last discharge of oily wastes to port reception facility indicated in the Declaration of residues has been recorded in the Oil Record Book and with the correct operational code.
   b. Verification if oily bilge waters, as well as oily mixtures from cargo tank area, such as and dirty ballast waters and slops, have been discharged into the sea through the oil filtering equipment and the Oil Discharge Monitoring and Control System (ODMC), respectively.
   c. Verification if operations and methods of disposal of oil residues (sludge) have been entered into the Oil Record Book. Additionally, verification if the equipment used for the disposal sludge is recorded in the Supplement of the IOPP Certificate.
   d. Verification of receipt issued by the corresponding port reception facility in case the ship has discharged its oily wastes to such facility. The amounts and date stated in such receipt shall correspond to the entries in the Oil Record Book.
   e. Comparison of the dates and geographic positions recorded in the Oil Record Book with those recorded in the Log Book in cases a discharge of oily wastes into the sea through the oil filtering equipment or the
ODMC system is registered in the Oil Record Book. In addition, such positions should be plotted in the corresponding nautical chart to verify the ship's location at the moment of the discharge of oily wastes.

4. In cases port reception facilities in other ports have not been used because they were inadequate, PSCOs should advise the master to report such inadequacy to the ship's flag state and the authorities of the port state, according to the MEP/Circ. 349 of 18 November 1998.

If after this verification of documentation there are doubts regarding the accuracy of the information or there are significant differences on the amounts of oily residues registered, it is advisable to carry out the following activities:

5. Inspection and sounding of sludge and slop tanks, bilges, tank top and any tank containing oily wastes. This inspection is in order to verify if the characteristics of such tanks correspond to those indicated in the IOPP certificate, as well as the information on the Declaration of residues submitted by the ship. The real volume of oily residues existing onboard can be determined with the sounds taken and with respect to the calibration tables of such tanks.

In this regard, PSCOs must take into consideration the following items:

a. Quantity of oily mixtures and residues generated on board.

b. Capacities of the sludge, slop and bilge water holding tanks.

c. Capacity of the oil filtering equipment.

d. Capacity of incinerator for oil residues, if fitted.

The existing volume of oily wastes must correspond to the amount of generated oily wastes since the last disposal.

6. Inspection of pollution prevention equipment and verification of the correct functioning. Ship's personnel must operate the equipment and test the alarms and automatic stopping devices if they exist.

7. Verification if in ships to which their Administration, according to Regulation I/16 (3), has waived the requirements of Regulations I/16 (1) and (2) on the provision of oil filtering equipment, all bilge waters are retained onboard for subsequent discharge to reception facilities.
8. Determination if the ullages of tanks holding oily wastes are adequate for receiving the expected generated oily wastes during the next intended voyage. For instance, if sludge tanks are full or at such a level that the sludge generated during the intended voyage will exceed the sludge tanks’ capacity, the ship will not be authorised to leave the port without discharging its oily wastes.

However, if reception facilities are not available in the port or in the vicinity, the ship can be authorised to port under the following conditions:

a. Sealing valves of discharges into the sea from bilges, slop tanks and sludge tanks; and

b. Designating other adequate tanks for storing oil residues generated during the trip to the next port having reception facilities.

The Maritime Authority of the next port of call should be informed about this ship’s condition in order to verify the discharge of oily wastes to reception facilities.

9. Performance of operational control in order to determine if the responsible officers are familiar with the procedures for the handling of oily mixtures and residues from machinery spaces and the cargo tanks area: sludge, bilge water, slops and dirty ballast water.

References: Resolution A.787(19), Royal Decree 438/1994 (Spain)
Appendix 19
Declaración de residuos
Declaration of residues

D. ........................................................................................................................................

Mr

Capitán del buque: .............................................................................................................

Master of the ship:

de bandera: .....................................................................................................................

flag of:

informa a las Autoridades Marítimas del puerto de: ......................................................

inform to Maritime Authorities of:

1. Que su buque, en el momento de la llegada a puerto lleva a bordo los siguientes residuos:

   That the ship carry on board the following residues:

<table>
<thead>
<tr>
<th>Anexo</th>
<th>Tipo de residuos</th>
<th>Cantidad (m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Lastre sucio (Dirty ballast)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Slops (Slops)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fangos/lodos/residuos oleosos (Sludges/oil residues)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Aguas oleosas de sentinas (Oily bilge water)</td>
<td></td>
</tr>
<tr>
<td>IV</td>
<td>Aguas sucias (Sewage)</td>
<td></td>
</tr>
<tr>
<td>V</td>
<td>Basuras (Garbage)</td>
<td></td>
</tr>
</tbody>
</table>

2. Que el buque realizó la última entrega de residuos en:

   That the ship had delivered residues last time in:

   | Puerto (Port) |
   | País (Country) |
   | Fecha (Date) |
   | Tipo (Type)   |
   | Cantidad (Quantity) (m³) |

3. Que la capacidad de almacenaje de residuos a bordo es la siguiente:
That the storage capacity of residues on board is the following:

<table>
<thead>
<tr>
<th>Anexo</th>
<th>Tipo de residuos</th>
<th>Cantidad (m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Lastre sucio (Dirty ballast)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Slops (Slops)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fangos/lodos/residuos oleosos (Sludges/oil residues)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Aguas oleosas de sentinas (Oily bilge water)</td>
<td></td>
</tr>
<tr>
<td>IV</td>
<td>Aguas sucias (Sewage)</td>
<td></td>
</tr>
<tr>
<td>V</td>
<td>Basuras (Garbage)</td>
<td></td>
</tr>
</tbody>
</table>

4. Que el próximo puerto de escala con instalación de recepción es el de:

That the next port of call with reception facilities is:

...............................................................................................................................

donde el buque llegará (fecha): ........................................................................

where the ship will arrive (date)

Fecha: ...........................................................................................

Date

El Capitán (Master)

Reference: Adapted from Royal Decree 438/1994 (Spain)
Appendix 20

Certificado “Marpol” de recepción de residuos de los buques
“Marpol” Certificate of residues reception form ships

La compañía abajo mencionada, autorizada por la Administración Española (The below company, authorised by the Spanish Administration)

<table>
<thead>
<tr>
<th>Nombre (Name)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>En el puerto de (In the port of)</td>
<td></td>
</tr>
<tr>
<td>Con número de registro (Registration number)</td>
<td></td>
</tr>
</tbody>
</table>

Certifica que el buque (Certifies that the ship):

<table>
<thead>
<tr>
<th>Nombre (Name)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bandera (Flag)</td>
<td></td>
</tr>
<tr>
<td>Con distintivo (Call signal)</td>
<td></td>
</tr>
</tbody>
</table>

Ha entregado los siguientes residuos (Has delivered the following residues):

<table>
<thead>
<tr>
<th>Cantidad (Quantity) (m³)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Tipo (Type)</td>
<td></td>
</tr>
</tbody>
</table>

En cumplimiento de lo establecido en el “Convenio Marpol 73/78” (In compliance with “Marpol 73/78 Convention”)

Fecha (Date) ...... / ...... / ......

Certificado N° ...... / ......  
(Certificate num:)

Firma y sello de la Compañía Receptora  
Sign and stamp of the reception Company

Firma y sello de la Capitanía de Puerto  
Sign and stamp of the Harbour Master
Este Certificado no es válido sin el sello y la firma de la Capitanía Marítima del puerto donde se haya realizado la entrega de residuos.

El Capitán del buque deberá exigir a la empresa de recepción la autorización de la Administración Española para la recepción de residuos procedentes de los buques o una copia autentificada de la misma.

Solamente las empresas autorizadas están facultadas para expedir el presente certificado.

This certificate is only valid when signed and stamped by Port Maritime Authority where residues have been delivered.

The ship’s Master must require of the reception facility to produce the authorisation issued by the Spanish Administration to receive residues from ships or a legalized copy of the authorisation.

Only authorised reception facilities are allowed to deliver this certificate.

Source: Royal Decree 438/1994 (Spain)
Appendix 21

REVISED CONSOLIDATED FORMAT FOR REPORTING ALLEGED
INADEQUACY OF PORT RECEPTION FACILITIES¹*

MEPC/Circ.349

The Master of a ship having encountered difficulties in discharging waste to reception facilities should forward the information below, together with any supporting documentation, to the administration of the flag State and, preferably, to the competent Authorities in the port State. The flag State shall notify the port State of the occurrence.

1. SHIP’S PARTICULARS
   Name of ship: __________________________________________________
   Owner or operator: ______________________________________________
   Distinctive number or letters: _____________________________________
   IMO No.: ______________________________________________________
   Gross tonnage: _________________________________________________
   Port of registry: _______________________________________________
   Type of ship: _____ oil tanker, _____ chemical tanker, _____ ferry, _____
   cruise ship _____ cargo ship, _____ bulk carrier, _____ or other (specify)
   ______________________

2. PORT PARTICULARS
   Country: ______________________________________________________
   Name of Port Area: ______________________________________________
   Location/Terminal Name: _________________________________________
   (e.g. berth/terminal/jetty)
   Name of company operating reception facility (if applicable): __________
   ______ Unloading port, ______ Loading port, ______ Shipyard
   Date of arrival: ________________________________________________
   Date of occurrence: ____________________________________________
   Date of departure: _____________________________________________

3. TYPE AND AMOUNT²* OF WASTE FOR DISCHARGE TO FACILITY

¹ This format was developed and approved by the forty-second session of the Marine Environment Protection Committee in November 1998
3.1 Oil (MARPOL Annex I)

Type of oil waste:

- bilge water __________________________________________________ m3
- sludge from fuel oil purifier ______________________________________ m3
- scale and slops from tanker cleaning ______________________________ m3
- dirty ballast water _____________________________________________ m3
- tank washings ________________________________________________ m3
- other (specify) ________________________________________________ m3

were facilities available?                                                           Yes ___ No ___
costs involved ___________________

3.2 Noxious Liquid Substances (NLS)(MARPOL Annex II)

Type of NLS residue/ water mixture for discharge to facility tank washings:

- category A substance __________________________________________ m3
- category B substance __________________________________________ m3
- category C substance __________________________________________ m3
- other (specify) ________________________________________________ m3

substance is designated as ____ solidifying or ____ high viscosity

proper shipping name of the NLS involved: ___________________________

were facilities available?                                                           Yes ___ No ___
costs involved ___________________

3.3 Garbage (MARPOL annex V)

Type of garbage:

1: Plastic _________________________________________________m3
2: Floating dunnage, lining, or packing materials __________________m3
3: Ground paper products, rags, glass, metal, bottles, crockery, etc. ___m3
4: Paper products, rags, glass, metal, bottles, crockery, etc. _______m3
5: Food waste ________________________________________________m3
6: Incinerator, ash _____________________________________________m3

other (specify) ________________________________________________m3

were facilities available?                                                           Yes ___ No ___
costs involved ___________________

2 Estimated amount
3.4 Other wastes

4. WAS ANY WASTE NOT ACCEPTED BY THE FACILITY?

5. INADEQUACY OF FACILITIES
5.1 Remarks on inadequacies

5.2 Location of facilities (close to the vessel inconvenient location or vessel had to shift berth involving delay)

5.3 If you experienced a problem, with whom did you discuss this problem or report it to?

5.4 Did you give prior notification (in accordance with relevant port requirements) about the vessel’s requirements for reception facilities?

   Yes _____ No _____

5.5 Did you receive confirmation on the availability of reception facilities on arrival?

   Yes _____ No _____

6. ANY ADDITIONAL REMARKS/COMMENTS

7. Master’s signature _________________________ Date ________________