MTIS Project (Marine Terminal Information System) of OCIMF as a tool for improving operational efficiency and safety of terminals of oil and derivatives

Technical Article

REGIONAL ASSOCIATION OF OIL, GAS AND BIOFUELS SECTOR COMPANIES IN LATIN AMERICA AND THE CARIBBEAN

Technical Article - MTIS Project (Marine Terminal Information System) of OCIMF as a tool for improving operational efficiency and safety of terminals of oil and derivatives

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1. Introduction

The objective of this technical paper is to present and deepen knowledge about the urgent need for standardization of characteristics and evaluations of terminals that move oil and derivatives in the world, increasing efficiency and operational safety. The history of accidents occurred in this industry shows us the need for investment in the quality of our operations, with a view to improving efficiency and making processes safer. Companies have met in diverse forums focusing on this issue, each of them having contributed to this objective - the largest of them, OCIMF, which gathers the major oil industries in the world. Several publications were launched containing and sharing decades of knowledge accumulated by specialists of these companies, with the common goal of safeguarding the business, i.e., the quality and profitability of operations, which are performed at the highest level of safety, with total respect for the environment.

2. Background

About seventy-five thousand ships under flags of 171 countries carry out approximately 95 % of international trade across the seas of the entire planet, through the most diverse ecosystems, carrying and bringing goods to millions of people throughout the world. Among these goods are oil and its derivatives, which correspond to approximately 35 % of the cargo transported, and are regarded as potential pollutants in case of accidents. They are not the only ones, but due to the number of ships and the volume transported, they can cause significant damage.

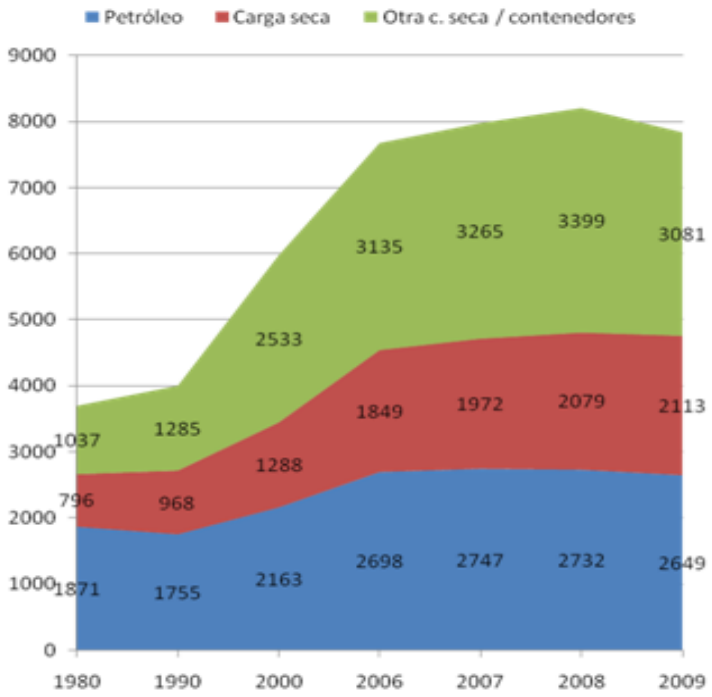

Figure 1

In the case of oil, the production source is generally located away from the refining area, since oil is more concentrated in specific areas of the globe, such as the Middle East, the Gulf of Mexico and the North Sea, often in deep waters. The number of oil-importing countries is greater than the number of oil producers, often distant, what prevents the transfer of the product through pipelines. In these cases, the use of ships

is essential: it allows transporting large quantities at a relatively low cost. The refining areas of a country are also concentrated, and, therefore, derivatives are transported by cabotage, or there are even countries that do not have refineries or do not produce derivatives in sufficient quantity, and consequently derivatives exports are largely transported by ships.

This characteristic of concentration of production areas and refining areas, together with a large dispersion of the consumer market for derivatives, results in a large number of ships carrying a large amount of products through all the seas in the world.

As there is a large number of ships involved in this market, the chances of incidents or even accidents also increases. Over the years, several accidents have occurred with various degrees of environmental impact - something unwelcome to all, both the public and the industry. As expected, these accidents have led the industry to further improve its practices, and thus give a response to society, showing that it is aware of its position in society and the importance of oil and derivatives in the daily lives of thousands of millions of people.

The response of the industry led to the creation of forums for the standardization of its operations. Initially, these forums focused on the standardization of ships and vessels in general, given the proportions of the accidents occurred. With the standardization, the industry best practices were published and implemented, contributing to the reduction of accidents, even despite the increase in the number of vessels and the volume transported in the world.

Once the ships had a consolidated standardization process, it was the time of terminals, as they operate with the same vessels and are the point of entry and exit of these products on the mainland.

3. Events and consequences

Over the years, oil became the main energy matrix in the world. Not only as a substitute for and a complement to coal and electricity, but also proved to be raw material for the production of plastics, rubbers, fabrics and diverse articles that are indispensable to modern life.

Oil extraction increased year after year. In some countries, oil can be found in considerable quantities onshore; however, the growing global demand has gradually extended oil exploitation offshore, in increasingly deeper waters. The use of ships for the transportation of oil and derivatives also grew along with the demand for the product.

Onshore, oil can be transported by pipeline to refineries to be refined, from where its derivatives are then transported through combination pipelines. In deep waters however, it is often necessary to transport oil to the mainland in ships in view of the volume produced.

The increase in demand led to the development of new types of ships: From the old vessels at the end of the nineteenth century, which carried oil in barrels, to the steam-powered ships in the early twentieth century, and the current bunker supertankers In addition to the type and increase in engine power, several other aspects changed in these vessels. Today, the oil is stored in huge tanks inside the ship, which allowed the transport of increasingly larger quantities of products. Standardization was a compelling need for the reduction of construction costs, with ships of the same "family", to increase safety and operational efficiency.

Unfortunately, this need was strongly felt through accidents that occurred over the years. The main accident was that of the *Torrey Canyon*, which sank off the coast of the United Kingdom in 1967, spilling

about 119 thousand tons of oil. This major accident generated a joint reaction of the oil industry, which led to the creation of OCIMF, when these companies felt that they needed to work together on the issue of safety in the interest of the environment and business.

The accident with the largest spill occurred with the *Atlantic Empress*, which spilled 287 thousand tons of oil on the coast of the West Indies in 1979. The most famous accident was that of the *Exxon Valdez*, which caused a real global shock in 1989. The amount of oil spilled may not have been as large as in other accidents, but it occurred in an environmentally sensitive area. It was the signal that stronger actions should be taken. Environmental laws became stricter as did the construction standards for vessels. At present, nobody accepts another *Exxon Valdez*.

Position	Shipname	Year	Location	Spill Size (tonnes)
1	*Atlantic Empress*	1979	Off Tobago, West Indies	287,000
2	*ABT Summer*	1991	700 nautical miles off Angola	260,000
3	*Castillo de Bellver*	1983	Off Saldanha Bay, South Africa	252,000
4	*Amoco Cadiz*	1978	Off Brittany, France	223,000
5	*Haven*	1991	Genoa, Italy	144,000
6	*Odyssey*	1988	700 nautical miles off Nova Scotia, Canada	132,000
7	*Torrey Canyon*	1967	Sicilly Isles, UK	119,000
8	*Sea Star*	1972	Gulf of Oman	115,000
9	*Irenes Serenade*	1980	Navarino Bay, Greece	100,000
10	*Urquiola*	1976	La Coruna, Spain	100,000
11	*Hawaiian Patriot*	1977	300 nautical miles off Honolulu	95,000
12	*Independenta*	1979	Bosphorous, Turkey	95,000
13	*Jakob Maersk*	1975	Oporto, Portugal	88,000
14	*Braer*	1993	Shetland Island, UK	85,000
15	*Khark 5*	1989	120 nautical miles off Altlantic coast of Morocco	80,000
16	*Aegean Sea*	1992	La Coruna, Spain	74,000
17	*Sea Empress*	1996	Milford Haven, UK	72,000
18	*Katina P.*	1992	Off Maputo, Mozambique	72,000
19	*Nova*	1985	Off Kharg Island, Gulf of Iran	70,000
20	*Prestige*	2002	Off the Spanish coast	63,000
35	*ExxonValdez*	1989	PrinceWilliam Sound, Alaska, USA	37,000

Source: www.itopf.com

Table 1: Major Oil Spill Since 1967

One of the visible consequences from the table above is that, even with the increased size of ships and the increase in the cargo of oil and derivatives transported in the twenty-first century, there has been only one accident included in the list of the 20 major accidents (*Prestige*, Spanish coast, 2002, 63 thousand tons spilled) since 1967. The number of spills is decreasing even with the increase of the cargo being carried. This shows that the effort made by the oil industry in safety and standardization was not in vain.

Figura 2

There were several milestones on the path to standardization and improvement in safety, including the creation of IMO, an arm of the United Nations Organization, in 1948.

4. IMO - International Maritime Organization

Initially known as the Inter-governmental Maritime Consultative Organization (IMCO), it became IMO in 1982. It is an international body composed of the majority of maritime countries - 300 people. It was established in 1948 during the Geneva Conference to promote safety at sea.

Some of its main achievements are:

- Update of SOLAS (1960)
- International Traffic - COLREG
- Load Lines
- Transport of dangerous cargo - *IMDG Code*.

Its vision: the best form of prevention is through the development of international regulations.

Its mission: creating mechanisms for cooperation among governments to solve shipping problems

After the accident of the *Torrey Canyon* in 1967, the public opinion started to consider the oil industry as polluting and dangerous. The image of the industry seemed irreparably lost. Efforts to prevent such disasters existed, but companies were not able to handle this on their own. The solution found was to leave differences aside and join efforts in the interest of safety - for the environment and business.

5. OCIMF – Oil Companies International Marine Forum

OCIMF was formed in 1970 in response to the pressure of public opinion and the Government of Great Britain on oil companies, after the major accident of the *Torrey Cannion*. It is a voluntary association of the 79 largest oil companies in the world that work with marine terminals and/or vessels operating with oil, its derivatives and biofuels.

Its main mission is the development of guides and standards for continuous improvement of operations and projects in marine terminals, focused on the protection of the environment and operational safety. It holds consultative status at the IMO.

Chronology of OCIMF:

- March 1967: accident of the *Torrey Canyon*
- April 1970: creation of OCIMF
- May 1975: 1st publication of an OCIMF guide (*Ship to Ship Transfer Guide*)
- November 1977: consultative status at the IMO
- November 1993: launch of the Ship Inspection Report Programme (SIRE)
- January 1998: launch of the 50th publication
- July 2000: SIRE is ISO 9002 certified
- April 2004: *Marine Terminal Baseline Criteria*
- 2012 – MTMSA
- MTPQ

Then other entities were founded with similar objectives, some acting in specific fields, as the case of the *Society of International Gas Tanker & Terminal Operators* (SIGTTO)*;* others in specific geographical areas, such as ARPEL.

SIGTTO was formed in October 1979 as a non-profit organization whose purpose is to promote high quality operations and best practices in gas terminals and ships in the world. SIGTTO provides technical consulting services and support to its members, and represents their collective interests in technical and operational matters.

6. ARPEL - Regional Association of Oil and Natural Gas Companies in Latin America and the Caribbean

Established in 1965, ARPEL, through its Pipelines and Terminals Committee, created a specific working group in 2008 with the aim of developing a set of technical guidelines for operation of terminals, organized under the form of a Manual for Terminals, which included an evaluation process through checklists. The first edition of the Manual was published in 2012, and the second in 2014.

7. INTERTANKO - International Association of Independent Tanker Owners

In the wake of the accident of the *Torrey Canyon,* INTERTANKO was created in 1970, seeking the continuity of *shipping* safely, responsibly and competitively.

In 2004, it launched the *Terminal Vetting Database* (TVD) (site Q88 - already housed a databank of vessels similar to the SIRE), in which the ships assess the terminals where they operate. The terminal is evaluated independently of its will. Despite an initial resistance, it gained strength starting in 2008 with the decision made by OCIMF in favor of the working group of the MTBCL and TIRE.

- It provides support to shipowners in matters relating to vetting, inquisitions, inspections, insurance, etc.
- Today, its databank includes information on 6000 ships in more than 520 locations around the world.
- The evaluations of terminals are steadily growing.
- Access is provided only to members.

8. The industry and the environment

Since the accident of the *Torrey Canyon,* the pressure for safety has been increasing globally. The response of the industry, with the creation of OCIMF and other entities, proved effective, although despite the commitment demonstrated, changes are slow. The modernization of ships, new safer projects, improvements in the navigation conditions in ports, in terminals facilities as well as the development of new technologies and navigation equipment require time for study and maturation. The response became apparently appropriate, but at the time, the accident of the Exxon Valdez occurred.

In 1989, on the coast of Alaska, the *Exxon Valdez*, when exiting a terminal after loading oil, ran aground in an environmentally extremely sensitive area and began to pour oil into the sea. TV and live broadcasts, which were virtually non-existent in 1967 (*Torrey Canyon*), helped spread the severity of the accident. The fact that it occurred near the coast further contributed to its dissemination. The world followed the day-to-day news regarding the accident in real time (for that time). The environmental damage was broadcast on TV around the world during prime time. The image of the industry was seriously affected; perhaps the most serious damage that this industry has ever suffered.

Actions were undertaken on both sides. Laws became considerably stricter. The industry saw that even all the deliberate actions taken were still insufficient. There were new publications, rules and actions intended to prevent the reoccurrence of similar cases.

One of the consequences of the *Exxon Valdez* accident was the increase in environmental awareness. In the world, the environmental issue became more important to a level never achieved before; and it was not only limited to the oil industry. Others that were already under some kind of restriction had a substantial increase in demands. The risk margin for any potentially polluting industry became virtually zero.

Legislation in countries was becoming increasingly environmentally restrictive. The hostility of the media and public opinion toward an industry, necessary but potentially polluting every time an accident occurred causing pollution, made the people in the world ask whether it was worth keeping this type of industry, whether it was really so necessary that it could not be replaced.

The response of that industry - that it may be as or more necessary than it is today, and at the same time increasingly safer and less polluting, is taking place in terms of:

- Effective attention to the increasing environmental demand and legislation restrictions.
- Improvement of the standard of pipeline integrity, mainly after the serious accidents occurred in the decade of the sixties.
- Improvement of the standard of vessels and procedures in general, in response to ship accidents, such as the *Exxon Valdez* in March 1989.

9. Need for standardization

As industries joined in these forums, they saw a vast diversity of equipment and solutions for the most diverse situations. Each one of them with pros and cons, good, bad, cheap and expensive solutions. They also saw a huge difference in the laws of the countries where these companies operated. The challenge was how to increase safety, ensuring continuity of operations, and how to comply with so different laws.

The solution found was to start standardization of the industry. This does not imply that all companies should be strictly the same, although some important points should be considered. Standardization is carried out in management, procedures and equipment, and these forums allow this standardization to evolve by issuing new publications regularly.

One of the main tools of standardization is the dissemination of good practices. The diversity of the industry, in several places in the world, with different cultures and ways of addressing situations, shows several solutions to the same types of situations faced. Analyzing each one, studying what the most relevant solution would be, its adaptability to different scenarios (would the same standard equipment be used with the same efficiency and safety in the Middle East and in a region with temperatures below zero?), its cost and return, is a work intended to be carried out by the leading specialists of the industry. The resulting standardization is the work of these specialists, the fruit of in-depth analyses of the existing problems and conditions. It is an ongoing work: new scenarios and new technologies are developed, and new laws are continuously issued. In addition, just as important as safety: the business must continue profitable and attractive to the world.

Modern society wants to enjoy the benefits of this modernity, but is not willing to pay the price of accidents.

The standardization aims to increase operational efficiency, while maintaining the profitability of the business, and this is only possible with the increase in safety, key element of the process. Accidents involve loss of materials, facilities, products, and sometimes life. It may take years or even decades for the nature to recover from a spill. In the event of an accident, the damage to industry is visible: the image is completely affected, insurance costs increase instantly, legislation becomes stricter, new equipment must be installed to increase safety, millionaire fines are applied. In an accident, everybody loses.

In general, an increase in costs affects directly the business. Specifically, the cost increase in corrective actions in cases of accidents is always much greater than the increase due to preventive actions. Planning what will be spent on improvements of the standardization, spreading over time, the correct choice of what will be standardized allows the industry to maintain its competitiveness. An accident generates immediate actions, usually outside of the annual investment plan of the company, in addition to fines and costs related to the mitigation of the accident itself.

Over the years, several items have already been standardized. The information on the port, for example, allows ship captains to know in advance the conditions of each port in which they are to operate. Being a standardized document, it is exactly known where to find the necessary information.

Several tools were developed for standardization of both management and certain equipment, or even of the evaluations of ships and terminals.

10. SIRE - Ship Inspection Report Programme (OCIMF)

The SIRE was launched in 1993. It is a global database with information about the vast majority of merchant ships, already consolidated as a tool for evaluation of vessels.

11. MTSG - Marine Terminal Survey Guidelines

OCIMF published the *Marine Terminal Survey Guideline*s as a first standard for the evaluation of terminals. This publication evolved into the *Marine Terminal Baseline Criteria*.

12. MTBCFAQ - Baseline Criteria

The *Marine Terminal Baseline Criteria and Assessment Questionnaire* published in 2004 by OCIMF was intended to promote standardization, in terms of safety, of operating standards that govern relations between ships and terminals. It aimed to cover the wharf systems and operations, from the oil tankers operations management system and its interface with the terminal to the equipment requirements, maintenance and control. It was focused on the safety of operations, including the interfaces with the Maritime Authorities, Pilotage and Tugboat Companies, and extended to all that may interfere with the operations and transit of ships to and from the terminal.

With the start of the practical use of the MTSG by diverse companies, the next step was that these companies share their feedback. The new experience, its pros and cons were analyzed for its modernization.

The scenario changed over time: the oil crisis, the occurrence of spills, an ecological-economic focus emerged in various countries; laws were becoming more restrictive and obtaining licenses was becoming more difficult; and some environmental offsets began to be required. The trend was increasing, and the oil industry had to adapt to the new world. In the case of terminals, this led to the creation of a Working Group to evaluate this issue.

Then *Baseline Criteria* was launched. This publication is divided into ten chapters, each of which deals with a specific area of the operation. A milestone for global standardization; a document almost complete on the safety of the operation, acting in the ship-terminal interface. A document that complements the ISGOTT, providing uniformity in safety assessments and environmental protection in terminals of oil and derivatives. For many years, *Baseline* was the standard document for the evaluation of terminals management, with a focus on the ship-terminal interface, and was used both in self-assessments and in assessments between companies.

Other forums and bodies launched other publications intended to be guides, for example, for the construction of equipment, for the exchange of information and for compatibility between practices and equipment, among others.

The trend to standardization of equipment and management aimed to improve safety and operational efficiency has been spreading over the years in the most diverse areas. Notably, in the case of the oil industry, ships and now terminals have standardized various items (equipment and publications), such as:

12.1. AIS - *Automatic Identification System*

It is equipment that allows identification of the vessel and sending information on the course, documentations and inspections to other ships and ports. Its code is used globally and its installation became mandatory for large vessels, gradually extending to smaller vessels.

12.2. ISGOTT - *International Safety Guide for Oil Tankers and Terminals*

International safety guide for ships and terminals, which deals with the safety of the ship operations in terminals. Among its most important subjects is a standardized Operational Safety Checklist, globally used to verify the problems that prevent loading and unloading operations in terminals.

12.3. ISGINTT - *International Safety Guide for Sea and Inland Navigation Tank-Barges and Terminals*

It deals with the safety of operations of barges in terminals, and includes a Safety Checklist as the ISGOTT.

12.4. TMSA - *Tanker Management and Self Assessment*

This program began in 2004 as a tool to aid in the diagnosis of vessels. It is complementary to the quality codes of the industry, with a view to encourage self-regulation of companies and promote continuous improvement among tanker operators.

12.5. SOLAS - *Safety Of Life At Sea*

It is an international convention for the safeguard of life at sea, with a view to improving the safety in merchant ships with the purpose of reaching a zero accident rate.

12.6. ARPEL - *Reference Manual for Terminals Operation Management*

Guidelines on terminals management for signatory companies. It is a work reference to study the basic elements recommended to be included in an integrity plan, without limiting the degree of deepness and development required in each particular case. It has Checklists to evaluate adherence of terminals to the world's best practices.

12.7. MTIS– *Marine Terminal Information System*

With the proposal to standardize the management of terminals around the world, OCIMF created the MTIS. It is a global program to ensure that terminals reach a high standard of safety and environmental protection. In its development, this work seeks to fill the existing gaps in current international standards and complement other OCIMF publications and papers. The MTIS aims to be a global system which contains tools that have been created to guide the actions of control of safety conditions in operations involving the ship-terminal interface.

12.8. MTPQ - *Marine Terminal Particulars Questionnaire*

It is intended to be a data bank to store relevant information of the more than ten thousand terminals existing on the planet. This information may range from the size of the berth to the flows of transfer, including the equipment installed. The MTPQ was developed to collect this information in a standardized manner. One of its innumerable possibilities is to compare the information generated by MTPQ and SIRE, and thus make a better determination of the compatibility of vessels and terminals, increasing safety, operational efficiency and environmental protection. The system was developed between 2009 and 2011, and officially launched in October 2011. It may be accessed through the website of OCIMF. On this site, we will find forms with an easy system to enter data and a modern system of privacy policy and hierarchy of data that ensures the confidentiality and the organization of information. It is expected that data on more than ten thousand marine terminals operating in the world be entered. In the case of MTPQ, the information is public.

12.9. MTMSA - *Marine Terminal Management and Self Assessment*

This is the evolution of the *Baseline Criteria*. Again, with the *feedback* of the industries, the Ports and Terminal Committee (PTC) of OCIMF met to develop a new publication to update the *Baseline Criteria*. For this purpose, it relied on the experience gained in the TMSA, an extremely practical guide and a very popular tool used by operators of vessels, including all tankers. Improvements in the *Baseline Criteria* resulted in the same format as the TMSA, and consequently, it was necessary to name this new publication as *Marine Terminal Management and Self Assessment* - MTMSA. The MTMSA is a guide containing the best practices and performance expected for each terminal to achieve excellence in its operations, its origin and in the ship-terminal interface. This document will raise the questions of safety and efficiency in operations between terminals and vessels to a new level.

A specific group created the system for this purpose. A checklist was developed to be used in the diagnosis of conditions of operational safety of marine terminals. The results of the MTMSA diagnostics in terminals can be entered in the same database of the MTPQ; however, they are not public. They may be restricted to the company that enters the data or they may be made available to those firms that the company wishes.

It is a standard tool for global application with a view to help terminals measure the efficiency of its management system with regard to the operations with ships and the ship-terminal interface. As it may act in conjunction with the MTPQ, terminals are encouraged to submit the results of their self-assessments to OCIMF. Potential or existing users can make the analysis of these data.

Today the MTMSA is the main tool of standardization of evaluation criteria for marine terminals in the world. Occupying the same place as formerly occupied by *Baseline Criteria*, it is an evolution of these, changing in form and contents, and being more focused on management.

Having models for the evaluation of terminal management is today an already consolidated path in the oil industry. Some companies are already going along this path; others are still beginning, but for the sustainability of the industry, this path must be walked constantly. Various equipments are already standardized, even if they are built in accordance with the needs of the client. Various safety systems are already mandatory and standardized in the world. Management and evaluation of terminals is a step forward on this path. In addition, at this point, the MTIS has proved to be an indispensable tool for us to have a database that will allow us to continue to increase safety and operational efficiency of terminals throughout the world.

Regional Association of Oil, Gas and Biofuels Sector Companies in Latin America and the Caribbean

ARPEL is a non-profit association gathering oil, gas and biofuels sector companies and institutions in Latin America and the Caribbean. It was founded in 1965 as a vehicle of cooperation and mutual assistance between companies in the sector, with the primary purpose of actively promoting industry integration and competitive growth and the sustainable energy development in the region. Its membership represent over 90% of upstream and downstream activities in the region and includes national, international and independent operating companies, providers of technology, goods and services to the value chain, and national and international sector institutions.

Mission

To promote the integration, growth, operational excellence and effective socio-environmental performance of the industry in the region, facilitating the dialogue, cooperation, development of synergies among players as well as the shared creation of value among members through the exchange and expansion of collective knowledge.

Vision

To be an institution of reference in the consolidation of the oil and gas industry, furthering the provision of reliable and safe energy that meets the growing regional energy demand in a sustainable manner.

MEMBER COMPANIES

MEMBER INSTITUTIONS

ALLIANCES

REGIONAL ASSOCIATION OF
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