

PREVENTION AND ABATEMENT OF MARINE POLLUTION IN TUNISIAN COMMERCIAL PORTS

*Robert H. Hazelton, Robert M. Sargent, and Erich R. Gundlach
Massachusetts Maritime Academy (CMEPS)
101 Academy Drive
Buzzards Bay, Massachusetts 02532*

*Mohamed Anis Boussetta
Office de la Marine Marchande et des Ports
Batiment Administratif
2060 la Goulette, Tunisia*

*Ahmed Ben Djebara
Tunisie Assistance
3, rue Jebel El Feth
1001 Tunis, Tunisia*

*Sahbene Ben Fadhel
Office de la Marine Marchande et des Ports
Director of the Port of Bizerte
Bizerte, Tunisia*

ABSTRACT: *In addition to having ports that ship and receive oil and other commercial products by sea, the Republic of Tunisia is exposed to potential spills from vessels that are routed close to shore as they transit the Mediterranean. This paper summarizes a study that was conducted to evaluate Tunisia's commercial ports' oil spill contingency plans, response equipment, and response management systems, for the purposes of increasing the spill response capability of the Tunisian Office of the Merchant Marine and Ports (OMMP) and bringing each plan up to criteria established by Tunisia's 1996 oil spill legislation and international standards. The four ports evaluated were Bizerte, Tunis-Goulette-Radès (TGR), Sfax, and Zarzis.*

Interviews and discussions were conducted with representatives of the OMMP, the Agency for Environmental Protection (ANPE), the Tunisian Petroleum Activities Enterprise (ETAP), the Tunisian Navy and Merchant Marine, the Directorate General of Energy, the state-owned oil transportation company (TRAPSA), and selected private sector oil companies. The equipment review entailed analysis of existing equipment in each port, potential spill size and location, time to respond, and environmentally sensitive areas needing protection.

Specific recommendations were made for improving the readiness posture of Tunisia's commercial ports and for the purchase of additional spill-response equipment and services. Implementation of these recommendations will result in a significantly improved capability on the part of the private and public sector users of Tunisia's commercial ports to respond effectively to marine oil spills, should one occur.

This paper highlights the readiness capability of each port and the extent of oil transportation activities, and provides recommendations to improve response via equipment purchases, improvement of the existing response management system, implementation of a training and exercise program, and changes to the port contingency plans.

Discussion

In December 1998, the Office of the Merchant Marine and Ports (OMMP) engaged the Massachusetts Maritime Academy (MMA) to review existing oil spill contingency plans for four of Tunisia's commercial ports, and to make recommendations to help the OMMP bring these plans up to the standards established by Tunisia's 1996 oil spill legislation. The ports that were the subject of this study are Bizerte, Tunis-Goulette-Rades (TGR), Sfax, and Zarzis, all of which are operated by the OMMP.

Following a review of existing contingency plans, a team from the MMA's Center for Marine Environmental Protection and Safety (CMEPS) traveled to Tunisia for 2 weeks of interviews and site visits. Working with a local partner, the team met with representatives of the OMMP and other Tunisian government agencies concerned with marine oil spills, and with private sector organizations engaged in the production, refining, storage, and transportation of petroleum products. Site visits provided opportunities for discussions with the people responsible for response planning, as well as for surveys of response equipment and local operational climates.

The OMMP's greatest strength is a small group of managers who understand the concepts of effective marine oil spill response. If allowed the requisite resources for staffing, equipment, and training, this management cadre is capable of creating and operating oil spill response programs in these four ports that meet domestic and international standards.

The OMMP already possesses much of the equipment necessary to contain and clean up spills of moderate size within the confines of the four ports concerned, and it is maintained in good condition. Shortages exist in floating temporary storage, appropriate workboats, and tactical communications. For the OMMP, the greatest challenge to effective oil spill response is the lack of facilities for medium-term storage and permanent disposal of recovered wastes.

In the short term, the OMMP's greatest needs are in the areas of training and systems development. The MMA report (*Prevention and Abatement of Marine Pollution in Tunisian Commercial*

Ports, 1999) recommended application of the Incident Command System to OMMP marine oil spill response management, as well as training programs and an increased tempo of response exercises, including some to be enriched by the participation of international expert observers and the use of computer simulation tools.

The level of the oil companies' coordination with the OMMP in response planning in the four ports is uneven. In one port, oil companies provide a level of leadership which is admirable, but which has inadvertently enabled the OMMP's *de facto* abdication of its management role. Elsewhere, equipment inventories maintained by the oil companies are questionable to inadequate, and the level of communication between the oil companies and the OMMP on response planning seems limited, to the detriment of readiness in the ports.

The apparently low level of readiness and compliance on the part of most of the oil companies that operate marine terminals in Tunisia was astonishing. With the notable exception of Zarzis, it appeared that response equipment at terminals was not present in sufficient quantities, and that the equipment that was present was not maintained in an operable condition. Most of these companies are subsidiaries of large international oil companies, some of which are leaders in environmental response planning in other areas of the world and could bring resources to bear in Tunisia to improve the preparedness of their Tunisian affiliates.

None of the four ports possesses equipment sufficient to clean up a large spill. While OMMP policy projects interport mutual assistance in such situations, adequate planning for the rapid transportation of equipment from one port to another does not appear to be in place. The apparent inaccessibility of information on spill response equipment maintained in and near the ports by the Tunisian Navy and the Ministry of Interior complicates planning for optimal use of these resources. The ports would benefit from closer coordination on the use of resources among and between the respective public and private sector organizations, and the execution of formal mutual assistance agreements where appropriate.

The existing port contingency plans contain useful information. However, all the plans should be revised, expanded and, above all, standardized with respect to both format and content in order to decrease the work effort required to provide information that common to all ports (i.e., cleanup techniques). The maintenance, update and implementation of the plans, including required training and exercises, will require the continuing technical support of the OMMP.

The OMMP as an organization, and the responsible OMMP port officials, are committed to the greatest extent of preparedness possible, and there is a great deal of dedication in working toward achieving this goal. Officials are fully aware that such readiness involves thorough operational and environmental planning, substantial investments in equipment, an integrated training and exercise program, and an effective emergency management system, and that if any of these components is missing the effectiveness of the whole system is significantly reduced.

Considering that nearly 5 years have passed since enactment of the enabling Tunisian legislation, it is unfortunate that implementation of many of the provisions of this law have yet to be accomplished. From the perspective of the OMMP's efforts to improve port readiness for oil spills, it is particularly notable that neither the National Contingency Plan nor its prescribed 27 Annexes has yet been published. As the law requires port contingency plans to comply with the National Contingency Plan and its Annexes, the OMMP's job is made all the more challenging in their absence.

Communication on planning issues between OMMP port officials and their private sector counterparts can be significantly

improved, with again one notable exception in Bizerte with the collaboration of the local refinery (Société Tunisienne d'Industries du Raffinage [STIR]) and the OMMP in developing a joint contingency plan. OMMP and oil company planners in all ports would benefit from working to develop one coordinated plan in each port similar to the Bizerte model or, failing that, to develop and exercise their respective plans to ensure they are compatible, to build on each other's strengths, and to avoid counterproductive duplications of effort.

The OMMP has taken major strides toward being able to respond effectively to oil spills in Tunisia's commercial ports. Future efforts will include working internally and with domestic and international consulting partners to promulgate contingency plans that meet international standards and Tunisian law, and then to ensure the long-term success of these plans by instituting effective and continuing training and exercise programs.

Background

In November 1996, a group of Tunisian officials concerned with marine oil-spill response issues visited the United States to become better acquainted with U.S. capabilities and experience in the field. This orientation visit was funded by the U.S. Trade and Development Agency (USTDA), and coincided roughly with Tunisia's promulgation of Law No. 96-29 relating to national contingency planning for response to marine oil-spills.

At the conclusion of the 1996 Orientation Visit, the delegates and a USTDA contractor prepared a list of recommended follow-up actions, including one that the government of Tunisia (GOT) request consulting support for a comprehensive review of Tunisia's marine oil-spill contingency planning.

In due course, GOT submitted to the USTDA a request for support of an assessment of the GOT's readiness to respond to marine oil-spills. The request was reviewed for USTDA by a U.S. consultant, whose findings were published as a USTDA Desk Study (*Desk Study on Maritime Projects in Tunisia*, 1997).

The terms of reference for the study focused on a review of contingency planning in Tunisia's commercial ports. Excluded, for the time being, were Tunisia's numerous fishing ports, pleasure boat marinas, the petroleum terminal at La Skhira operated by the state-owned company TRAPSA, the ports of Gabes and Sousse, and offshore exploration and production operations. In December 1998, the OMMP engaged the MMA to conduct this review as a Feasibility Study under a USTDA grant.

The MMA first team reviewed the 1996 law, then studied existing contingency plans for the ports of Tunis-Goulette-Radès (TGR), Bizerte, Zarzis, and Sfax. It also reviewed extracts of a 1993 study by the French consulting group Centre de Documentation, de Recherche et d'Expérimentations (CEDRE, *Projet pour un Système de Gestion de la Pollution Pétrolière pour l'Algérie, le Maroc et la Tunisie, Comité Régional de Coordination*), and a 1998 study by Det Norske Veritas (*Oil Pollution Management Project for the South Mediterranean Sea*).

The MMA team then visited Tunisia for consultations with OMMP officials and site visits to each of the ports in question. Interviews were conducted with OMMP officials and representatives of the other Tunisian government agencies and oil companies as described earlier in this paper. All of the team's interviews and site visits were characterized by total frankness on the part of its Tunisian counterparts, all of whom seemed dedicated to establishing world class programs in marine oil-spill response in their respective areas of jurisdiction.

The team also visited the Tunisian Lubricating Oils Company (SOTULUB), which reprocesses some 14,000 m³ of lubricating oils annually. SOTULUB has developed and patented innovative

and cost-efficient methods for recycling industrial waste oils. Its capabilities in analysis and reprocessing have some relevance to Tunisia's readiness to respond to marine oil spills, and potentially to dispose of petroleum products recovered during such events.

Port descriptions

The Port of Bizerte is located near the northernmost tip of Tunisia (Figure 1). There are substantial oil-related and other commercial activities in the port. The entrance to the port also serves the Port of Menzel Bourguiba, located further to the interior. Two OMMP tugs, two OMMP pilot boats, and two OMMP mooring boats serve the port and can serve as spill response platforms as required.

Petroleum related imports and exports comprise over 70% of the total traffic in the port. A total of 264 petroleum-related vessels called at the port in 1997 (Table 1). There are no bunkering vessels, and all bunkering is provided from tank trucks.

Two significant spills have been reported in Bizerte in recent years: 36 m³ of heavy fuel oil in 1995 from a tanker, and 10 m³ of oily ballast water in 1996 from a pipeline. The anchorage is located outside the port, and strong winds have forced vessels ashore in the past.



Figure 1. Map of Tunisia.

Table 1. Petroleum-related traffic in the Port of Bizerte in 1997.

Type of ship	Tonnage handled
Crude oil	1,805,169
Refined product + LPG	2,465,623
Total Petroleum	4,270,792
Total for the port	5,970,824

The Port of Tunis-Goulette-Radès (TGR) is located in the southwestern corner of the Gulf of Tunis. The port complex is comprised of facilities in the three named cities, which are managed by the OMMP as one commercial port. The facilities in Radès and La Goulette are near the entrance to the port and are connected to Tunis by the 9.7 kilometer-long Tunis-La Goulette Canal. The Port of TGR handles a wide variety of products from Ro-Ro and container ships, car ferries and cruise ships, and include general cargo, vegetable oils, olive oil, grains, petroleum products, bulk solids, asphalt, alcohol, and liquid chemicals. Two tugboats and two pilot boats owned and operated by OMMP serve the port.

All oil handled in the port is in the form of imported refined products. All petroleum transfers are handled at a one-berth facility in La Goulette that is operated jointly by five oil companies. Management of the facility rotates among these companies, with one managing all operations at the terminal for terms of 3 years. In 1997, approximately 700,000 m³ of refined petroleum products were discharged from 160 ships, of which 449,000 m³ were heavy fuel oil. Tankers do not load in the port of TGR, and there are no bunkering vessels.

A reported 2,765 vessels called at the Port of TGR in 1997 (Table 2). The anchorage is located outside the port, and vessels anchor in the Gulf of Tunis, several miles from the entrance.

Forty spills are reported to have occurred in the port since 1992, the most significant of which were 100 m³ of heavy fuel oil from a ship in 1994, 60 m³ of fuel oil from a ship in 1992, and 10 m³ of fuel oil from a ship in 1995. Most of the other spills were 500 liters or less.

Table 2. Vessel traffic in the Port of TGR in 1997.

Type of ship	Number of ships
Petroleum tankers	159
Asphalt tankers	23
Vegetable oil tankers	36
Alcohol tankers	05
Liquid chemical tankers	12
Ro-Ro's	994
Container ships	307
Bulk Solids carriers	66
Car ferries	338
Cruise ships	175
Grain ships	64
Naval vessels	82
General cargo	504
Total for the port	2,765

The Port of Sfax is located on the east coast of Tunisia on the northern shore of the Gulf of Gabes. It is a major commercial port for the region, and contains facilities for Ro-Ro ships, container and cruise ships, general cargo, bulk carriers, petroleum tankers, olive oil tankers, gas ships, military ships, and others. Two tugboats and two pilot boats owned and operated by the OMMP serve the port.

All petroleum handled in the port is in the form of refined products. In 1997, approximately 1,027,926 m³ of petroleum products were discharged from 165 ships, including gasoline, heavy fuel oil, asphalt and diesel oil. All petroleum products are handled at a one-berth facility in the eastern corner of the port that is operated jointly by the oil companies with operations in the port, and each company handles its own transfers. Planning is underway for all these oil companies to move to the Port of La Skhira sometime in the near future.

A reported 1,487 vessels handled cargo in the Port of Sfax in 1997 (Table 3), an average of slightly more than eight arrivals and departures per day. Bunkering is available from a small tank barge. Only three oil spills are reported to have occurred in the Port of Sfax in recent years, with no information available regarding the type or quantity of pollutants.

The Port of Zarzis is located in the southeast of the country, approximately 50 km from the Libyan border. The primary purpose of this port is to serve the onshore and offshore oil exploration and production in the area. An 18 km pipeline brings crude oil in from offshore fields, where it is stored in a 44,000 m³ tank for transport.

Approximately 90% of vessel traffic in the port is related to crude oil export. The number of ships entering the port has varied from a maximum of 20 in 1993 to only 9 in 1997 (Table 4). Traffic is expected to increase by approximately 25 vessels per year in the future because of the projected import of approximately 150,000 m³/year of refined petroleum products and one ship/year with used automobile imports. There are no bunkering vessels in the port. The only reported spill at the terminal was 1.4 m³ from a ruptured hose in 1991.

Good cooperation between the oil companies, the OMMP and other government agencies is indicated by their integrated response to an offshore spill in 1996. One company, having more equipment than the others, responded as Incident Commander to support the spiller. Fishing boats and equipment from other companies and government agencies supported the response.

Existing response equipment

The OMMP maintains standard equipment inventories in each port that are uniform with respect to manufacturers, while capacities of equipment vary according to local needs. This standardization benefits the OMMP by facilitating maintenance and training. There is less equipment stockpiled in Zarzis than in the other ports; however, plans call for Zarzis to be augmented with equipment from Sfax in the event of a large spill.

The OMMP operates tugboats and pilot boats in each port. Although not their primary duty, these vessels are generally available for spill response operations in roles that might include transportation and deployment of resources, or vessel traffic control. As they are under the direction of the OMMP Port Directors, whose duties include primary responsibility for spill response, availability of these vessels will not be a problem in most cases. However, they could be called on at a time when they are already assisting a ship, perhaps outside the immediate port, and so might not be available to assist in the response for some period of time.

Table 3. Vessel traffic in the Port of Sfax in 1997.

Type of ship	Number of ships
Petroleum tankers	165
Liquid chemical tankers	131
Ro-Ro's	2
Bulk Solids carriers	347
Gas ships	33
Cruise ships	2
General cargo	307
Special ships	500
Total for the port	1,487

Table 4. Estimated vessel traffic in the Port of Zarzis in 1999.

Type of ship	DWT	Number of ships
Oil tankers (crude)	>30,000	12
Oil tankers (refined)	<15,000	25
Olive oil tankers	<5,000	10
Salt carriers		15
General cargo ships	<5,000	10
Others*	<2,000	300
Total for the port		372

* In transit, supply boats, etc.

The OMMP recently engaged in a tugboat construction program in a European shipyard, the goals of which are to replace existing tugboats in some ports with newer and/or more powerful vessels, and to expand the number of tugboats in other ports. There appears to be an overreliance in the OMMP's port plans on tugboats, pilot boats and patrol boats for deploying response resources. Although important for transportation, traffic control and other roles, these vessels are too large in terms of horsepower, freeboard and draft for many important spill response functions. More appropriate for this type of work are small, outboard-powered boats, and the plans are silent with respect to availability of such boats.

Accurate evaluations of the adequacy of existing equipment inventories to achieve the concurrent goals of protection of sensitive areas, containment of spilled oil at or near its source, and containment and recovery of free-floating oil will not be possible until detailed risk assessments have been performed. Existing equipment inventories reflect an improving response capability in Tunisia, which continues with the recent acquisition by the OMMP of a 12-m self-propelled skimming vessel, three 7-m self-propelled skimmers, and significant purchases of containment boom.

The MMA study included calculations which demonstrated that existing equipment would not suffice to contain a spill in most cases as planned, because during the time required to receive the notification, assemble personnel, and stage, transport and deploy resources to the scene, much of the oil would no longer be at the ship or alongside the pier because of the effects of wind and currents. Sufficient resources must be available to deploy in least two different sites concurrently.

The study concluded that there is adequate containment boom, skimming, and temporary storage capacity available in each port for a 10-m³ spill. There is probably adequate containment boom in each port for a 100-m³ spill, but there is a need for

considerably more temporary storage capacity. There are not adequate resources in any of the ports to respond effectively to a 1,000-m³ spill. The OMMP stores boom and skimmers in La Goulette and Sfax that might be adequate to respond to a 1,000-m³ spill, and temporary storage that would help. However, requisite support systems including transportation (i.e., highway flatbed trucks), vacuum trucks, temporary storage and boom-handling boats are not identified in the existing port plans. With the information not available with regard to how long it would take for these additional resources to arrive in the port, it is not possible to evaluate the extent to which they would support an effective response.

The study also evaluated port readiness for larger spills using arbitrary but realistic planning volumes. It was determined that marine oil spills of 10,000 m³ or more would overwhelm the Tunisian response infrastructure. Effective response to a spill of this magnitude would require significant technical, equipment and personnel support from outside the country.

Contingency planning concepts

This section of the study emphasized that successful planning is a continuum of plan writing, training, and exercises. It stressed the complexity of sometimes competing interests that confront response managers, including search and rescue, cargo lightering, firefighting and/or salvage operations, fisheries, recreation, public health and safety, and environmental protection.

Contingency planning should follow a tiered approach, with the foundation level being the local port-specific emergency plan. Most oil spills are small and can be dealt with locally (Tier 1). If the size and/or impact of the incident are beyond local capabilities or affect a larger area, an enhanced, regional response (Tier 2), or a national plan response (Tier 3), may be required. National plans in turn may be integrated into international response arrangements.

Format. The study also stressed the importance of a standard format for all Tunisian port contingency plans, including Tier 1, Tier 2, and Tier 3. Figure 2 offers a recommended format developed using the Tunisian national contingency plan requirements for guidance.

Training programs should be developed for response personnel, both management and field operators. Exercises should be held regularly to ensure the plans function correctly and to familiarize participants with its contents and their prescribed roles, and the training and exercise schedules should be included in each plan. Equipment should be deployed periodically to test availability and performance, and to document operator readiness. An oil spill provides the best opportunity for improving a plan. Actual spills should be objectively reviewed soon after cleanup has been completed, and plans revised on the basis of lessons learned. Procedures for capturing this information from exercises and actual spills and feeding it back into the planning process should be described in the plan.

Conclusions

The OMMP takes very seriously its responsibility to ensure readiness to respond to marine oil spills in Tunisia's commercial ports. The Agency's greatest strength is a small group of managers who understand the concepts of effective oil spill response, and are capable of implementing programs that correspond to domestic and international standards. These officers recognize existing gaps in the OMMP's equipment

1.0	Strategic Plan
1.1	Introduction
1.2	Risk Assessment
1.2.1	Discharge History
1.2.2	Response Scenarios
1.3	Resources at Risk and Priorities for Protection
1.4	Organization and Management
1.5	Response Resources
1.6	Training, Exercises and Update Procedures
2.0	Response Action Plan
2.1	Reporting and Notification
2.2	Emergency Action Checklist
2.3	Communications
2.4	Mobilization and Deployment Strategies
2.5	Implementation of Response Strategies
2.5.1	Fire Prevention and Control
2.5.2	Discharge Tracking
2.5.3	Containment and Control Strategies
2.5.4	Recovery Strategies
2.5.5	Temporary Waste Storage and Disposal
2.5.6	Wildlife Protection
2.5.7	Shoreline Cleanup
2.6	Response Termination Procedures
3.0	Supplemental Information
3.1	Logistical Support
3.2	Incident Command System Training
3.3	Health and Safety Plan
3.4	Use of dispersants

Figure 2. Recommended Tunisian Port contingency plan format.

inventories, training, and support systems, and are confident of the availability of financial resources to address those needs.

OMMP officials understand that, by default, the agency also must serve as a model, and a catalyst, for the development of readiness programs throughout the country, as required by Tunisia's well conceived 1996 oil spill legislation. The level of oil company coordination with the OMMP is uneven, and equipment inventories maintained by the oil companies are, for the most part, inadequate, and poorly maintained. The apparent inaccessibility of information on spill response equipment maintained by the Tunisian Navy and the Ministry of Interior further complicates planning for optimal use of these resources.

Tunisia has not been immune to marine oil spills. While reporting has been uneven at best, the record shows a half-dozen significant spills in the past ten years in the four commercial ports within the purview of this report. A broader national picture probably would include a larger number of significant incidents.

The OMMP's spill response equipment has shortages in floating temporary storage capacity, appropriate workboats, and tactical communications. The greatest single challenge is the lack of facilities for medium-term storage and permanent disposal of recovered wastes.

In the short term, the OMMP's greatest needs are in the areas of training and support systems development. With consulting support, the agency should recast existing port contingency plans

in a prescribed common format, with only port-specific details varying from port to port. This process should drive the adoption of a standard incident management system, preferably one based on the National Interagency Incident Management System (NIIMS) Incident Command System.

The OMMP should institute a rigorous response management training and exercise program designed, executed and evaluated by experienced international consultants, and enhanced through the use of computer simulation tools. The OMMP should assume leadership of a government-wide search for a viable solution for the storage and disposal of oily wastes, and urge the GOT's adoption of regulations requiring such a facility's use by both private and public sector spillers.

To remain up to date on current best practices and equipment, OMMP oil spill response officials should regularly attend the International Oil Spill Conference. With counsel and support from the U. S. Coast Guard's National Strike Force Coordination Center in Elizabeth City, North Carolina, OMMP officials also should periodically attend and observe major training/exercises in the United States.

Biography

Mr. Robert H. Hazelton was Coordinator of Corporate Training Programs at the Center for Marine Environmental Protection & Safety at the Massachusetts Maritime Academy from 1996–1998. Prior to that he served in the U.S. Coast Guard for 22 years, specializing in marine safety and oil spill response management. His experience with significant spills began in 1979 and continues to the present. With the passage of OPA 90, Mr. Hazelton led a team of specialists advising Federal On-Scene Coordinators on the implementation of OPA 90 response management, exercise and training requirements. He was integrally involved in the development of five U.S. Area Contingency Plans and the design, execution and evaluation of several major domestic and international response oil spill response exercises. He is now an independent consultant.