

Zainab Incident and Developments in Oil Spill Response Programs after the Incident

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Abstract

Oil spills present a significant risk to the United Arab Emirates (UAE). Its extensive coastline has a variety of sensitive ecosystems, and increasingly is becoming a popular tourist destination. Additionally, the coastal environment is the primary source of water within the UAE for both industrial applications as well as drinking water. Sources of potential spills include third parties such as the Zaynab tanker that sunk off the UAE coast last year as well as ADNOC's extensive oil and gas operations.

ADNOC has had an active and successful spill response strategy in place since 1986. However in recent years, rapid economic development, fuelled by oil and gas expansion, has outpaced oil spill response capability. The sinking of the Zaynab off the coast of Dubai in April of 2001 provided several valuable lessons on how spill response could be improved. To address the identified gaps, ADNOC is in the process of revising and strengthening its spill response strategy. The strategy is based on a four-pronged approach that includes ensuring that the right equipment, trained manpower, organizational structure, and plans are in place to ensure a timely and effective response. The proposed strategy covers all sizes of spills and follows the generally accepted oil industry practice of categorizing oil spills into three tiers, depending upon their severity. Tier I spills are small operational type spills that can be handled using on site resources. Tier II is a medium sized spill that exceeds the capability of on-site resources and requires additional resources from within the region to complete the clean up. Tier III spills require national or international resources.

Through additional commitment and focused effort, the spill response capability in Abu Dhabi can be raised to a level that is commensurate with today's risk.

Environmental Setting

The UAE has a relatively small but very important coastline, both from an environmental and socio-economic perspective. Including the large number of islands immediately offshore, the UAE has about a 675 km coastline. Approximately 90% (610 km's) borders the Arabian Gulf, with the remainder found on the east coast, bordering the Gulf of Oman.

In the sub-tidal areas of the UAE coast, coral reefs support a diverse array of fish, benthic invertebrates, sponges and algae. Mangroves, usually found on sheltered shores and in estuaries, are highly productive areas and provide habitats for a large variety of organisms as well as serving as a nursery ground for many fish and species of crustacean (many of which have commercial value). Sea grasses are also important nursery grounds for fish and a food source for dugong and green sea turtles. The waters southeast of Butini Island are home to a large population of dugong and are protected under the UN World Heritage Site program¹.

Concentrations of shore, wading and diving birds can also be found in the coastal waters of the UAE. There are a number of priority species (rare, endangered or threatened) that nest or breed in the region. This includes species of cormorant, heron, plovers, terns and flamingo.

From a socio-economic perspective, the UAE has a population of about 3.1 million, 75 % of which resides along the coast. Desalinated seawater provides the majority of the freshwater needs of the country. Large quantities of seawater are also required to provide cooling water for power generation as well as chemical and industrial processing.

Oil contamination of seawater used for fresh water production can have several adverse affects. Light fractions of oil will distill over with the water giving it an unpleasant odor. If the seawater is subjected to pre-chlorination (to discourage marine life and fouling inside the distillers), the chlorine interaction with the oil produces a variety of halogenated hydrocarbons, some of which are carcinogens and mutagens².

For both cooling purposes and freshwater production, contamination by heavy oil fractions bring about operational difficulties for the impacted facility, in the form of tube blockage, flow-restriction and/or equipment malfunction.

In recent years the region has become a popular tourist destination, with the development of the associated infrastructure to support the tourist industry. This includes large hotels, amenity beaches and associated water sport activities.

Subsistence fishing, while still of some local importance, has declined in significance in recent years.

Oil Pollution Sources

There are a variety of potential sources of oil pollution in the Gulf region. Locally, ADNOC and its Group Companies produce about 2.2 million barrels of oil per day (bopd). Well over half of this oil is produced offshore. The majority of the oil produced in Abu Dhabi is exported via ship. Approximately 15% (300,000 barrels) of the oil is piped to either Ruwais or Umm Al Nar for refining and then marine export.

On a regional basis, 65% of the world's proven reserves are located in the Gulf of Arabia area. In 1999, the daily average production of oil out of the region was 21 million bopd.³ The majority of the oil is exported via ship, with 30% of the world's oil tankers operating in the Gulf region. Fujarah on the east coast of the UAE has become one of the world's largest bunkering facilities, servicing tankers moving in and out of the Gulf.

In 1996 it was estimated that 1.2 million barrels of oil are spilled annually in the Arabian Gulf Region⁴. Surface currents in the eastern Arabian Gulf move in a counterclockwise gyre, bringing oil that has been spilled in the lower Gulf waters to the UAE Coast.

Over the last several years there have been a number of spills in UAE waters that have involved the illegal movement of Iraqi oil in sub-standard vessels. In February of 2000, the Al Jazya 1 sank off the coast of Abu Dhabi releasing 400 tonnes of heavy fuel oil. In April of 2001, the Zaynab sunk off of Jebel Ali spilling 600 tonnes of heavy fuel oil. Both of these spills shut down or threatened desalination plants and impacted the tourist trade. The ADNOC response to the Zaynab spill is discussed in greater detail below.

Zaynab Spill

On April 13, 2001, the vessel Zaynab, carrying 1300 tonnes. of Iraqi fuel oil sunk approximately 26 miles west of Dubai. On the morning of April 15th ADNOC was contacted by the Federal Environment Agency (FEA) and requested to provide assistance in responding to the spill.

ADNOC's initial spill response to the incident was limited as their oil spill warehouse had burned to the ground on March 29, 2001, destroying the majority of ADNOC's spill response capability. Provisions to temporarily replace the lost equipment were immediately made. This comprised positioning an offshore containment and recovery system from the Petroleum Association of Japan (PAJ) stockpile in Abu Dhabi to the Ruwais industrial area. Additionally, arrangements were made to lease equipment from OSRL on an interim basis until the destroyed equipment could be replaced. This equipment was enroute via aircraft from OSRL when ADNOC received the request to respond to the Zaynab spill.

ADNOC immediately mobilized two supply vessels with dispersant spraying capability to Port Rashid in Dubai. A B-412 helicopter was also mobilized out of Abu Dhabi and proceeded to Port Rashid with ADNOC's only remaining helicopter spray bucket. Four staff were mobilized from Abu Dhabi and Ruwais to assist in the response.

Recognizing there was a shortage of trained spill response personnel, ADNOC requested 4 staff from Oil Spill Response Limited (OSRL) in Southampton. This team was on site in Dubai on the morning of April 16th.

ADNOC responsibilities were initially identified as on water response operations. Early on in the response ADNOC also assumed responsibility for providing technical advise to the municipalities as well as aerial observation and tracking. The ADNOC helicopter was used to conduct early morning surveillance of the spill area. Information from this aerial over flight was then used to deploy dispersant operations and mechanical containment and recovery systems. Information on those areas of the beach that had been most heavily oiled was also passed onto the municipalities for them to deploy their beach cleaning teams. The lack of air to ground communications hindered the ability of the aerial over flights to provide real time information to the operational teams on the water.

Initially dispersants were the primary response technique. Both aerial and vessel spraying operations were conducted. As the oil emulsified the effectiveness of the dispersants decreased and it was agreed to stop using dispersant on the 3rd day of the response. The spill highlighted the need to improve the training for ADNOC vessel crews operating dispersant systems and to maintain a better inventory of dispersant stocks in both the UAE and the Gulf generally.

An offshore skimming system hired by the Dubai Ports Authority was used to provide the initial mechanical containment and recovery response. Upon arrival in Dubai, ADNOC built a second system using PAJ equipment. OSRL equipment that had been ordered from the UK was held up in customs and did not arrive until the afternoon of April 17th. By April 18th there were 4 offshore containment and recovery systems operating immediately offshore of Dubai. Fortunately the Dubai Dry-dock was immediately adjacent to Port Rashid and had the facilities to handle recovered oil. Offloading of recovered oil was completed in the evenings after the skimming systems had returned to port. By April 21st most of the oil was either stranded ashore or corralled in Port Rashid. Offshore systems were demobilized and cleanup in the harbor commenced.

The municipalities handled shoreline cleanup operations. This was undoubtedly the best-organized and most effective element of the response. In particular the Dubai municipality was very well organized. Upon receiving notification of oil on the beach, a crew would be dispatched to recover floating oil and oiled sand. The sand was immediately packaged in bags and hauled to landfills for disposal. If excessive quantities of sand had to be removed, clean sand was hauled in to replace it.

The salvage of the remaining cargo on board the Zaynab was delayed over the issue of who would pay for the operation. Eventually this was successfully negotiated and oil removal commenced on April 28th. The oil removal operation was completed by May 5th. Approximately 750 tonnes of oil was removed from the wreck.

There were a number of lessons learned from this spill. In particular it was recognized that there is a need for additional equipment and trained manpower to respond to significant spill incidents. Refinements are required to the methodology of managing a spill or any type of emergency. The establishment of a pollution fund, which can be accessed immediately in the event of a spill, would expedite response operations.

Following the Zaynab spill ADNOC developed a proposed strategy to address many of the problems that were encountered. The remainder of this paper discusses the proposed ADNOC strategy.

Tiered Response System

ADNOC and the Group Companies operate on a tiered system for oil spill response. This is a generally accepted practice in the oil industry internationally. Typically, each facility is expected to maintain sufficient resources to handle small operational type spills. As the size of a spill increases beyond the capability of the affected facility, other resources can be mobilized from within, or outside the region. The tiered response capability is categorized as follows:

- ?? Tier I – Small operational type spills that can be handled using on site resources.
- ?? Tier II – A medium sized spill that exceeds the capability of on-site resources. Additional resources from within the region are required to complete the clean up.
- ?? Tier III – A large spill that requires national or international resources.

ADNOC Strategy

In order to successfully respond to any type of emergency there are four essential requirements:

- ?? Equipment
- ?? Trained manpower
- ?? Organizational structure
- ?? Defined plans

ADNOC is proposing a strategy that builds on the tiered concept and covers all four elements of a response. This strategy is summarized in Table 1 below, showing the requirements for tier I, II & III responses.

For ADNOC Group Companies, tier I requirements for all elements of a response will be the responsibility of the individual Operating Company. Tier II requirements will be the responsibility of ADNOC, working in close liaison with the Operating Companies. ADNOC will also assume responsibility for ensuring all tier III requirements are in place (see Table 1).

**Table 1
Proposed Spill Response Strategy**

Responsibility	Tier	Equipment	Manpower	Management	Plans
Operating Company	I	On-site Equipment ?? Mechanical ?? Dispersant	Minimum of 4 people per facility	On-site Team	Facility Specific Plan
ADNOC & Operating Companies	II	ADNOC Spill Response Center ?? Mechanical ?? Dispersant	?? 6 man ADNOC Team ?? Mutual Aid from facilities	Combined Team from the Group Companies	Area Contingency Plan
ADNOC	III	?? PAJ ?? OSRL ?? GAOCAMO	3 rd party contract	3 rd party contract	National Contingency Plan

Equipment

For tier I, each facility that has the potential to spill oil would be expected to have on site equipment to facilitate an immediate response. This will comprise mechanical containment and recovery equipment and/or dispersants, depending upon the circumstances at the facility.

The ADNOC Pollution Officer will be available to provide expert advice on recommended equipment purchases for individual facilities. This will ensure that the best equipment selection is made, based on the unique operating environment of each operation and to ensure equipment compatibility across the Group Companies and the ADNOC tier II equipment.

ADNOC will maintain a tier II response capability to handle up to a 2000 tonne spill utilizing mechanical containment and recovery techniques. This will be backed up with a dispersant capability. This equipment will be strategically located within the Emirate of Abu Dhabi. The exact positioning of the equipment will be determined based on a number of factors including, but not limited to; risk, access to adequate storage facilities and logistics (vessels).

This increase in spill response capability will meet ADNOC's commitments to the Federal Environment Agency (FEA) to stock and man two spill response bases in the Emirate of Abu Dhabi, per the FEA National Contingency Plan.

Under UAE Federal Law number 24, Act 1999, Article 2 of the National Contingency Plan for the Control of Marine Environment Pollution, six operational oil spill centers are to be established around the country as follows:

- ?? Western Area – Ruwais Center
- ?? Western Area and Abu Dhabi – Abu Dhabi Center
- ?? Abu Dhabi and Dubai – Jebel Ali Center
- ?? Dubai, Sharjah and Ajman – Sharjah Center
- ?? Umm Al Quwain & Ras Al Khaimah – Ras Al Khaimah Center
- ?? Eastern Coast – Fujarah Center

ADNOC will be responsible for stocking and maintaining the Western Area centers in Ruwais and Abu Dhabi. The equipment for these two centers is in the process of being purchased and delivered. Once the Federal Environment Agency (FEA) completes stocking of the remaining four oil spill equipment bases in the UAE, this equipment will also be available for tier II response.

For tier III response, ADNOC maintains membership in the oil spill response organization, Oil Spill Response Limited (OSRL) based out of Southampton, UK. ADNOC membership covers all of the ADNOC Group Companies. OSRL has the ability to provide trained manpower and spill response equipment anywhere in the world within 24 hours of notification. OSRL were activated by ADNOC for both the Al Jazya 1 and Zaynab pollution incidents. ADNOC membership in OSRL will continue.

There is also a stockpile of equipment in Abu Dhabi, maintained by the Petroleum Association of Japan (PAJ). This equipment can be made available on an as needed basis. This equipment was utilized by ADNOC during the Al Jazya 1 and Zaynab pollution incidents. It should be noted that PAJ is under no obligation to maintain this equipment in Abu Dhabi or release it for a spill.

ADNOC is a member of the Gulf Area Oil Companies Mutual Aid Organization (GAOCMAO). This is a mutual aid organization comprising oil companies operating in the Arabian Gulf. GAOCMAO maintains a listing of oil spill equipment owned by each member. There are no obligations under this agreement for members to provide equipment in the event of a significant incident. Longer term, ADNOC views GAOCMAO as a potential building block for developing a stronger tier III spill response capability within the Gulf region.

Manpower

To provide immediate tier I response capability, voluntary spill response teams will be established at each facility that has the potential to spill oil. A minimum of four trained positions will be available at each facility. These personnel will hold positions within the facility that allow them to be released for response in the event of an oil spill. Individual facilities may choose at their discretion to increase the size of the team beyond four. The ADNOC Oil Spill Center will provide the training necessary to ensure the competency of the voluntary response teams. This will include initial training and an ongoing program to maintain competency.

For tier II, the manpower at the ADNOC spill response center will be increased from the present level of two positions (Pollution Officer and Technician) to six; Pollution Officer, Lead Technician/Trainer and four Technicians. The six positions will be fully staffed on a 365 day per year basis. This team will be responsible for the maintenance and readiness of the tier I equipment of the Operating Companies as well as the tier II spill response equipment. They will provide training to the voluntary spill response teams at each facility. In addition to the

six-man team from the ADNOC spill response center, the voluntary manpower trained at each facility will be available for response to a tier II incident. An operating company requiring additional trained manpower will be able to access personnel from other facilities.

A labor contract will be established with a company or group of companies to provide the manpower that would be required to address a large tier III response. Previous experience with large marine oil spills has shown that manpower requirements typically peak several weeks into a spill. Depending upon the size of the spill and its location, manpower requirements can easily exceed several thousand workers.

The contingency contracts to be put in place will articulate the commercial aspects associated with the provision of the manpower, but will have no costs associated with them unless they are initiated by ADNOC.

Management

On-site management will handle a tier I oil spill, utilizing in-house resources. All Operating Companies will adopt a single management structure for dealing with an emergency (oil spill or otherwise). The generally recognized system that is presently in use in much of the world is the Incident Command System (ICS). ADNOC will commence training on ICS in 2002 for ADNOC and the Group Companies. After the initial exposure to ICS, each Operating Company will assume responsibility for ensuring their emergency response personnel are properly trained in ICS. ADNOC will work with key government agencies to ensure they are knowledgeable regarding ICS.

Once ICS training has been provided, a list of qualified personnel within the Group Companies will be developed and maintained. In a tier II event, Group Companies will have the ability to access qualified personnel from other companies to assist in an emergency.

For a tier III event, a contingency contract will be established with a company or group of companies to provide the trained management required to address a large response. There are several organizations throughout the world that provide this type of service. The contingency contracts will articulate the commercial aspects and will have no costs associated with them unless they are actually initiated by ADNOC.

Plans

Each facility that has the potential to spill oil will develop and maintain a facility oil spill plan. The Plan will include a risk assessment, identification of the local resources at risk, the strategy (equipment, manpower, and management structure) to be used in responding to an oil spill and an operational plan for implementing the identified strategy.

A draft Area Contingency Plan for the Abu Dhabi offshore area (tier II) has been developed for the FEA by the mutual aid organization, Abu Dhabi Emergency Support Committee of Offshore Operators (ADESCO). This plan identifies the general strategy for responding to a spill, the resources available in Abu Dhabi for response, and general sensitivities. It also includes details on accessing tier II and tier III resources.

The FEA has developed a National Contingency Plan (tier III). The plan identifies the UAE government's general policy on responding to oil spills, establishment of six operational response bases, the establishment of emergency committees to manage a spill response and the establishment of area contingency plans.

Challenges of Implementation

There are some significant challenges that will need to be overcome to fully implement the strategy. The first challenge will be to obtain consensus amongst the various interested parties. The stakeholders are many and varied. They include ADNOC, a number of the group companies, ADNOC industrial shareholders, UAE Coast Guard, Federal Environment Agency (FEA), Environmental Research and Wildlife Development Agency (ERWDA), Civil Defense, Municipality of Abu Dhabi, and others. Recent spill events have been a catalyst for a number of stakeholders to start addressing spill preparedness and response issues. Coordination and consensus amongst all the stakeholders will be critical.

There will also be a significant commitment of resources required both from a financial and manpower perspective. Cost sharing principles will need to be defined and implemented to ensure that an equitable means of funding the strategy is in place as well as a cost recovery mechanism.

This is a multi-year strategy that will require time to fully implement. Stakeholders will need to be patient with the rate of implementation yet also ensure that regular progress is made. A significant advantage in the ADNOC Group is the low rate of turnover in personnel. This makes the training requirements much more manageable.

The strategy needs to be realistic and also sustainable vis-à-vis the spill risk and the cost of implementation. Experience has shown that grand plans and commitments usually don't survive the scrutiny of time and economic justification. A compelling example of this occurred in the United States after the Exxon Valdez spill. The major oil shippers in the U.S. committed 6 billion dollars to fund the Marine Spill Response Corporation (MSRC) for a period of 5 years. At the completion of the 5 years the MSRC organization was dramatically downsized and came under tight fiscal control from its owners.

The strategy also needs to be adaptable to change. As the risk profile and the ADNOC business model changes over time, or the strategy is tested in a real event, it will need to be constantly scrutinized to ensure it is keeping pace with the changing business environment. This will keep the strategy from becoming outdated, particularly in today's fast paced environment. This need to identify, evaluate, manage and review risk is identified and articulated in both the ADNOC HSE Risk Management Guideline and the HSEMS Management System Guidelines.

The prize that awaits us for successful implementation of this strategy is an order of magnitude improvement in response capability. ADNOC believes that this response strategy is measured, timely, coordinated and cost effective. It will focus all the stakeholders on the common goals of protecting the delicate biological environment of the region and the socio-economic structure on which we rely, while being fiscally responsible. Successful implementation of this response strategy will have positive impacts for ADNOC, Abu Dhabi, the UAE and the Gulf region generally.

References

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