To Carry or Not to Carry?

Onboard spill response equipment – is it practicable?

Tim Wadsworth, ITOPF Ltd.

The question as to whether oil tankers should carry oil spill response equipment on board has been the subject of debate for many years. The idea received considerable attention in the early 1990s during the preparation of regulations by the United States Coast Guard as a result of the US Oil Pollution Act of 1990 (OPA'90). In this instance, and after much debate, the resultant US requirement stipulated the carriage of limited equipment for small on-desk spills only and not equipment for a spill of oil into the sea.

The idea was rekindled at the International Maritime Organization in the late 2010s in relation to preparedness for spills of bunker fuel in Arctic waters. After much debate, the idea was dropped in preference for shore-based response operations.

In some circles there is still the perception that the carriage of 'over-the–side' spill response equipment on commercially trading vessels might promote a quicker and easier clean-up of any spilled oil. However, despite the attraction of the immediate availability of resources at the scene of the incident, there are many reasons why the carriage of boom, skimmers and other on water spill response equipment is neither practical nor likely to achieve a better response, and in some instances may be dangerous.

This paper focusses on the carriage and deployment of pollution response equipment from oil tankers. Nonetheless, many of the factors discussed can apply equally to the carriage of such equipment on the myriad other types of vessels trading commercially.

Deployment of onboard equipment

The majority of spills from tankers result from routine operations such as loading, discharging and bunkering which normally occur in ports or at oil terminals. Most of these operational spills are small, with over 90% involving quantities of less than 7 tonnes. It is common for these ports and terminals to have their own, often significant, resources together with trained personnel in readiness to respond to incidents, duplicating and diminishing the role of onboard equipment.

In contrast, larger spills are normally associated with one or a combination of grounding, collision, explosion and hull failure. A significant number have resulted in extensive damage sometimes leading to the total loss of the vessel and loss of life. In many of these catastrophic incidents, including examples such as the AEGEAN SEA, AMOCO CADIZ, BRAER, ERIKA, HAVEN, PRESTIGE, to name a few, no amount of on-board equipment would have prevented shoreline impact. In all likelihood the equipment would have been damaged, destroyed or simply lost.

Not all major incidents result in such disastrous consequences. In these cases, the priorities of a ship's crew are to ensure the safety of life, the stability of the vessel and then to attend to the cargo and any loss of oil. It should be noted that oil tankers are manned with the minimum number of crew required for the safe and efficient operation of the vessel. As more tasks become automated, or achieved remotely, on-board crew levels may reduce. In a casualty the crew should concentrate their efforts on activities such as the internal transfer of cargo from ruptured tanks or the preparation of the vessel for salvage operations rather than the mobilisation of on-water response gear. Vessel crews are not trained spill responders and sending them over the side of a vessel to tend and operate any equipment would be inefficient, detracting their focus from other important tasks. Descending the side of tanker may be potentially highly dangerous, compounded by actions at night, in cold water and high winds, in water covered by oil, or if the casualty is listing or is otherwise unstable, amongst other hazardous scenarios.

Suggestions have been made in some quarters that storing equipment on deck for use by shore-based responders would remove the additional and onerous task of the crew to respond, and allow prompt deployment by shore-based personnel. Where a small vessel is trading on a dedicated, perhaps inter-island, route where it is known that very little resources are available then this may facilitate any response. However, it is preferable for responders to bring their own equipment on which they have been trained. They are able to select this equipment for optimal efficiency given the environmental factors and the type of oil spilled. This equipment will be probably more reliable given the unknown level of maintenance of that on board a vessel. Indeed, the harsher conditions to which the deck of a tanker is exposed will accelerate deterioration of stored equipment in comparison to that stored on land. Crew rosters may limit the time available for maintenance and repair of this equipment, tasks that may require specialist engineering knowledge best undertaken by third parties scheduled to fit in with ships' trading patterns.

In practical terms, pipework and other fitting do not make the deck of a tanker the ideal place to store and launch equipment. Cranes intended for handling manifold hoses or loading stores in the calm conditions of a port cannot be used efficiently and safely in a heavy swell or strong winds. A tanker can have a high freeboard and any descending equipment could be easily damaged or cause further damage to the tanker hull if deployment were not performed carefully.

Thought may also be required on the options for retrieval of deployed equipment after use.

Limitations of an at sea response

The success of any sea response is restricted severely by the inherent shortcomings of containment and recovery techniques, primarily that caused by the rapid spread of oil over the sea surface and the effects of wind, waves and currents on equipment performance. As a result, even highly trained shore-based responders with the latest equipment have difficulty recovering significant amounts of oil floating at sea.

For the operation of equipment to be safe and efficient it would have to be effective in the extremes of weather and locations likely to be encountered, with the variety of oils carried on different voyages and with differing spill rates. It would also have to be reliable and require minimal maintenance. This is a tall order and meeting these requirements, even with shore-based equipment, can be difficult.

While boom placed around the vessel to reduce the rapid spread of oil can facilitate clean-up, safety should be a prime consideration as the confinement of oil and vapours can pose a hazard to crew health and increase the risk of fire and explosion. Furthermore, boom so placed will limit the movement of salvage and other vessels and may become fouled in ships propellers.

Even in calm conditions a boom can become swamped easily by a large instantaneous discharge of oil. As examples, it is likely this would have been the case if boom had been placed around both EXXON VALDEZ and HEBEI SPIRIT in the initial stages of those incidents. Besides, boom is able to contain a limited amount of oil for a finite period only before currents and wind will cause the oil to leak out.

Deployed boom should be held at a proper distance from the vessel, as allowing it to lie against the hull would severely restrict its ability to contain oil. However, anchoring boom in deep water is a difficult, if not impossible, exercise. While the use of sea anchors may allow the boom to maintain its position, these are difficult to manage, being highly susceptible to changes in the current and would provide additional obstacles to rescue and response operations. The use of workboats to hold the boom has been proposed but would require further equipment storage and their deployment and operation is labour intensive and time consuming. Lifeboats should specifically not be used for this or any other purpose for which they were not designed.

To prevent the loss of oil from a boom, the oil must be recovered using skimmers. As with booms, this equipment has severe limitations in an at-sea response and would require additional manpower and vessels to handle not only the skimmers but any attendant power supplies, pumps and hoses. Again, the presence of hoses in the water may impede other operations. Remote operation of skimmers has been proposed. However, effective containment and recovery is likely to be possible only with manual intervention at sea level rather than relying on control of resources solely from the height of the deck of a tanker.

Once any spilled oil has been recovered from the sea surface, it must be pumped to storage. Unless external storage options are available readily, such storage would be either in barges deployed from the deck of the tanker, on the deck of the tanker, or in an empty, sound tank within the tanker. Additional equipment stored on-board, such as oil/water separators, may reduce the amount of liquid requiring storage but, nonetheless, the volume is likely to be significant and their operation require further valuable crew time. While the discharge of the entire cargo into the sea is unlikely, except in catastrophic circumstances, the discharge of even one tank may involve the loss of over 10,000 tonnes of oil. For a successful operation, temporary storage of this or higher capacity might be required. Careful preparations would have to be made to ensure that the onboard storage of any recovered oil does not upset the stability of the vessel which may already be precarious. Furthermore, inflatable barges in particular would require deployment on-board away from deck machinery etc. that may puncture or otherwise damage material integrity.

Dispersant application

On rare occasions it has proved possible to apply dispersant from the deck of a commercial vessel as a way of treating a slow leak of oil. While the use of dispersants may remove oil from the sea surface and reduce the need to send resources over the side, problems such the amenability of the oil to dispersion, contact with the oil and subsequent mixing, and the constraints set by national regulations will all tend to limit its use.

Where dispersant is applied through fixed spray arms the location of these arms relevant to the breach in the hull is crucial to allow effective contact with the oil and subsequent dispersion. The use of portable hoses is limited by the ability to manhandle them around the often very large deck and numerous deck fixtures of the vessel and would again divert the crew from other tasks. Significant quantities of dispersant may be required and the limited shelf life could make storage an uneconomic proposition. Where spraying is an option, the large-scale application by shore-based resources such as aircraft is clearly more effective.

Conclusion

To manage an entire response safely and effectively, sufficient trained response personnel should be on scene, numbers of whom will not be available from the ship's crew in the event of an incident. Vessels simply cannot carry on board sufficient resources to fulfil the requirements of a satisfactory response. The preparation of suitable vessel contingency plans is a much more practicable alternative to achieving a successful response to a spill of oil.

This has been recognised internationally by the International Maritime Organization and reflected in the Convention for the Prevention of Pollution from Ships (MARPOL), which requires tankers to carry a shipboard oil pollution emergency plan. This plan must include emergency activation procedures for the notification of the relevant authorities, the coordination of shipboard action with national and local authorities and the reduction or control of the discharge of oil following the incident. It has been acknowledged that these actions rather than the carriage of equipment onboard will do significantly more to mitigate the effects of an oil spill.

Written originally in October 1998 with several subsequent updates. This version October 2021.