OIL SPILL RISKS – OLD CHALLENGES AND NEW TECHNOLOGIES

The author, Capt. D. C. Sekhar is the India representative on the council of ISCO. He was a captain of oil tankers and a marine risk management professional at a Singapore oil tanker company.

His Bengaluru, India based company, AlphaMERS Pvt. Ltd. provides resources and services in setting up spill response capability, besides developing new technology. sekhar@alphamers.com

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Oil spills like most emergencies, come unannounced. Scenarios that are safely tucked away in contingency plans, suddenly stare at us from television screens. It puts to test the investment of time, effort and funds, preparing exactly for such a day. When the incident happens, the preparedness or the lack of it manifests itself under full public glare.

This risk, like any other risk, is not sought to be completely eliminated, that being a utopian wish list. Rather the risk is sought to be methodically assessed, mitigating capability set up and the residual risk minimized to acceptable levels. That is putting a very complex subject in a few simple words.

Since many of these incidents may have trans-national implications, the OPRC and OPRC HNS conventions (OPRC - Oil Pollution Preparedness Response and Co-operation Convention, HNS Hazardous and Noxious Substances) seek to bring a certain worldwide standardization of approach to the preparedness. The national NOSDCP (National Oil Spill Disaster Contingency Plan) provides the national review and perspective for this preparedness in India. The scale of such incidents varies hugely. The Gulf of Mexico event surprised even the usually well prepared United States of America. Here, it will be worth pointing out, that some fundamental differences exist between an oilfield spill and a ship accident.

The offshore oilfield operates within the jurisdiction of the coastal government, with consequent accountability and periodic inspections built into the system. The pour points, viscosity and toxicity of the oil being produced are known. The spill trajectory models have been fed with sea currents and vulnerability index of the particular geography. A runaway oilfield, though overwhelming, leaks over a period of time. The response actions are initiated after the initial shock has been weathered and response strategy is sometimes developed and put into place even during the leak. Shipping traffic on the coast is however a different ballgame. The vessels Prestige, Erika, Braer and Natuna Sea brought untold catastrophes to various coastlines one fine morning to an unsuspecting coastal population. Thousands of tons of crude oil landed on the coast, all of a sudden, as the vessels' grounded or broke up and capsized. Hundreds of vessels of these sizes pass our coast every day.

The regime to test the maintenance standards of a vessel flying the flag of another country, is not absolute. There is a port state convention that gives a limited leverage to a port state over vessels visiting her ports. This does not extend to stopping and inspecting vessels passing few miles off the country's coastline, which may have questionable standards of upkeep depending on her owners, flag and classification societies.

Incidents involving such vessels incidents on the coast are a mess to start with and often end up like that. Ownership of such vessels may be located anywhere in the world, behind a maze of holding companies and the vessel registration may be in flags of convenience. The oil quantity and characteristics are not known immediately unless the vessel is arriving or has departed from a port in the country. Coastal states have sometimes precipitated such incidents due to reluctance to provide refuge to a disabled tanker. To be fair the decision maker has a difficult job on hand. He will be judged, depending on the outcome - if the sheltered water actually saves the vessel or the vessel sinks after entering the port. Dedicated technology modernization has been slow to come by in oil spill response sector. We are not talking of automated machines here, but enhanced functional deliverables. Containment of spills in strong currents was always a challenge, be it in rivers or in waters of Gulfs of Kutch or Khambatt, where tidal streams are of the orders of 4 knots. Laying a boom with a skirt hanging 1 meter vertically into the waters and expecting it to stay near vertical is an unrealistic dream. Concrete dams may perhaps hold the flow, but not hanging fabric weighed down by a chain. (The author's firm has designed and patent applied for a boom design without a skirt for high current and river applications. This design is in the testing stage.)

The storm water drains of coastal refineries are an unwitting source to carry a leak within the refinery to the sea. The risk is compounded when a spill reaches the drain during night or during rains. There is need for reduced dependence on human factors in spill surveillance and a design that will raise an alarm and auto start the skimming system is in the testing stage.

Disaster management is all about what you have in order to deal with the situation on hand. Many spill responses in remote parts of the world have seen a lot of home made quick fix equipment solutions to contain the spread of oil. Many if not most, have worked. The booms used in Macando spill in Gulf of Mexico were of various types and sizes. Something on hand was clearly preferable to having nothing.

The technology for spill detection has however moved much ahead with development of remote sensing for various applications. Now you can detect the spill over a large area by satellite, or a smaller area by aerial surveillance, or pick up oil spill by a specialized radar, carry out surveillance from a drone or a Helium filled balloon mounted camera, or by a buoy mounted HC detector or a 360 degree floating camera that picks up floating oil and security threats. The options to configure the platform, the sensors, the telemetry systems and power management systems are many. The capex, opex and cost benefit varies with each configuration.

The oil spill trajectory modeling over land has developed faster and the visualization of such incidents is excellent in multiple colors, viewing the oil flow through the terrain features and with provision for inputting changes of viscosity of the spilt oil. The various cross country oil pipelines, existing or upcoming, will have spill contingency plans where incidents, impact and response can be intuitively visualized. A decision support system is under development for use by offshore spill incident commander, wherein he can visualize

the trajectory of the spill, the timelines for the spill to reach sensitive areas and the connectivity time to equipment stockpile, all on a single screen.

One promising development is the wing in ground effect crafts that make use of ground lift. These crafts are now designed for passenger movement and the take-off and landing is on water. They are characterized by 'flying' at 100 knots speed, few meters above ground and making use of ‘airlift’ from the water surface. These crafts will come in handy for coastal surveillance besides spraying Oil Spill Dispersant (OSD) over the spill. The small height over the water will facilitate optimum use of the OSD without wastage.

When the spill happens in coastal waters, the extreme time sensitivity is in the initial few hours of the leak. Few tons of furnace oil leaking from a six inch air pipe of a foundered vessel can coat a coastline of 25 kms with oil. An ability for source control or an ability for containment can minimize a lot of damage. This requires an ability to connect resources to the incident site quickly. Read that to mean an excellent capability for mobility of resources or a large well distributed inventory of equipment.

Photo: A new boom reel being transported on a trailer

The spill response equipment does not lend itself for quick mobility. A typical boom reel with just 300 meters of boom will weigh in the region of 2.5 Tons and occupy about 5 cbm of space. Not the kind of parcels that can be moved around by aircrafts. To put in perspective the Macando Gulf of Mexico incident used thousands of kms of boom. The truck is usually the only option from the warehouse to the landing jetty. Once the oil has hit the coastline, the time sensitivity is not in hours anymore, but in days, accompanied by socio economic issues and a high dependence on manual cleanup.

Oil spill dispersant is not the preferred method for dealing with spills, but often ends up being the only practical and available method, wherever allowed by the authorities for reasons of spill proximity to vulnerable locations or extreme weather conditions. Bioremediation has caught on in many sectors. The treatment usually takes weeks, and containing the contaminated waters for long periods is a challenge. However bio remediation products have come up where the remediation agent quickly adheres to the oil and then need not be contained. Bio remediation however comes in handy for proper shoreline cleanup disposal. That is, if the remediation agent can break down long carbon chain hydrocarbons in time and efficiently.

Risk management is always a difficult argument. I pay for life insurance every year for decades, but I die only once! Risk perception being a product of probability and consequence, while the consequence is easier to estimate, the probability is usually seen in the historical perspective. This explains why major regulatory changes in the industry have happened soon after major incidents. The country has a lot of oil industry activity and can support a sizable spill response capability and equipment stockpile kept within the country, typically a large Tier II or a small Tier III stockpile. Understandably as shared resource stockpile, the inventory carrying costs per facility is reduced drastically, while yet having a realistic access to a large equipment inventory stored within the country and within trucking distances. Once the economy of scale kicks in, enhanced technology for various applications will develop locally, including subsea interventions.

The International Spill Control Organization (www.spillcontrol.org) is a not for profit organization with members in 45 countries. ISCO is a consultant to International Maritime Organization (IMO). This is a great organization to mobilize knowledge, expertise and resources from its worldwide members during an emergency or otherwise. ISCO has recently conducted a very pioneering seminar on Group V oils (non-buoyant oils), which highlights the issues with pollutants that sink and are not visible on the surface. It is very important to realize that spill response is a specialized role and cannot be efficiently executed in an emergency by facility staff practicing mock drill once in six months. There are undeniably few exceptions to this statement, where facilities have actually invested good time and effort to get their hands wet on this job. But the time has come for specialist service providers (called OSRO-Oil Spill Response Organization), who possess relevant domain knowledge, have trained manpower and equipment stockpile within the country. It is also imperative for such agencies to have international arrangements to mobilize additional resources in a major emergency. Such OSROs can proverbially hit the ground running, when the emergency strikes.

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