Industry & Government: Co-operation to manage oil spill risks

Mr Archie Smith, CEO Oil Spill Response Limited

Abstract

There is a definitive increase in risk arising from the rise in Oil export traffic from Northern Russia, particularly Sakhalin, the Barents Sea and the Baltic ports. The oil industry takes these risks very seriously and is committed to doing whatever it can to mitigate them. This will include preventative actions, improving preparedness and maximising the response capability. Industry cannot do this effectively in isolation and must therefore engage the relevant governments in ensuring that any action is co-ordinated and that interested parties co-operate wherever possible. This keynote paper sets out some of the issues arising, identifies areas of conflict and highlights some of the realities of government/industry co-operation.

Overview

As the World moves into 21st Century the dependence upon hydrocarbons as the main source of energy remains high. As production from older sources begins to diminish, oil companies are carrying out new exploration into more remote and less accessible areas to meet the World's needs.

One of the most major new areas of exploration, and now production, is Russia. Estimates of Russia's oil reserves vary from around 50 billion to 150 billion barrels but are generally accepted to be circa 60 billion barrels. The peak daily output for 2004 was approaching 9.3 million barrels. It is now the second largest oil-producing country after Saudi Arabia (http://www.eia.doe.gov/emeu/cabs/russia.html). The majority of Russia's reserves are located between the Ural Mountains and the Central Siberian Plateau. Almost a quarter of the reserves (14 billion barrels) is located on Sakhalin Island on the East Coast of Russia.

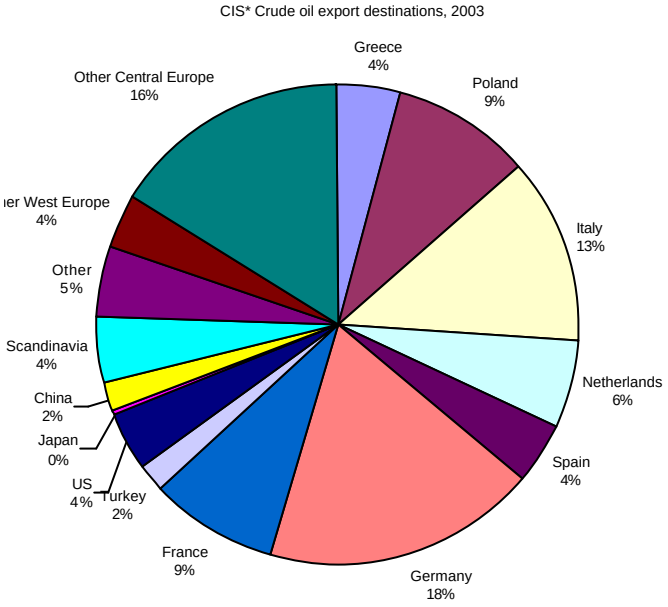
Moving into more remote regions can have many difficulties and associated risks. There may be very limited infrastructures either due to challenging topography or a lack of investment. The availability of a skilled local labour force may be limited due to the remoteness and inhospitable aspects of the region. The terrain and/or climates may be strenuous to operate within, for example, extreme heat or cold, mountainous or marshy terrain. Such regions are often so remote that the distance to transport to export markets can be almost prohibitive. Each of these factors increases the difficulty for an oil company to operate in such a region. This in turn increases the risk of accidents and spills and can hinder the effective recovery/response to such an event.

Russia suffers many of these difficult circumstances. There is snow cover for up to six months of the year across many regions with temperatures dropping as low as –45ºC. Much of the ground is frozen solid for a large proportion of the year. The vast scale of the region mean that there are large, uninhabited areas through which oil exports pass.

Risk

Transportation

Oil exported from Russian fields is distributed globally (see figure 1).



*CIS refers to all the countries of the former Soviet Union excluding Estonia, Latvia and Lithuania

Figure 1 – Crude oil exports destinations, 2003 (adapted from http://www.eia.doe.gov/emeu/cabs/russia.html)

There are three main methods of transportation – pipeline, river barge and railway (see figure 2).

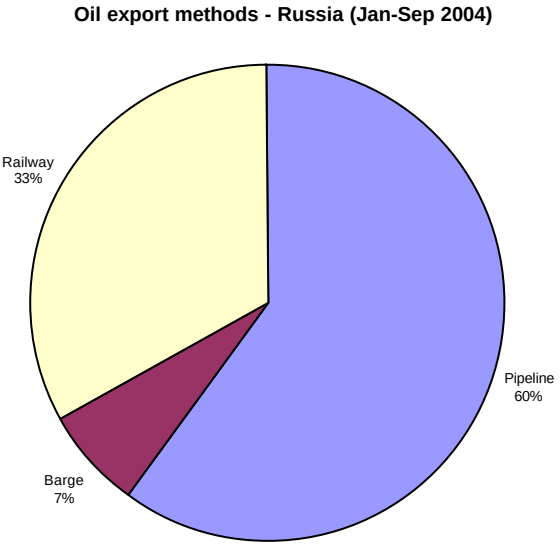


Figure 2 – Oil export methods – Russia, Jan-Sep 2004 (adapted from http://www.eia.doe.gov/emeu/cabs/russia.html)

Most of these methods also involve the use of for final trans-shipment. The methods used to export oil from Russia depend upon the means available, geographical location of the field and the final destination of the oil.

i) Pipelines

Approximately 60% of oil produced in Russia is exported by pipeline. This figure is only restricted by the capacity of the pipeline. Pipelines pass through very remote and often uninhabited areas of Russia. Russian pipeline terminals are located on the Baltic Sea at Primorsk (Russia) Ventspils and Butinge(Lithuania), where it is transferred to tankers for the journey to its destination. This route takes the tankers through the Baltic Sea, North Sea and English Channel, a very constricted and busy shipping lane increasing the collision risk. South East Russian terminals are located at Supsa in Georgia, Yuzhnaya Ozereika and Novorossiisk in Russia and and Ceyhan in Turkey. Vessels loading at Supsa,Yuzhnaya Ozereika and Novorossiisk pass through the Black Sea and then into the Mediterranean and vessels from Ceyhan pass only through the Mediterranean. The Supsa/Yuzhnaya Ozereika/Novorossiisk route takes vessels through the very of the narrow shipping channels of the Bosphorus and Dardanelles increasing the risk of collisions or groundings (see figure 3).

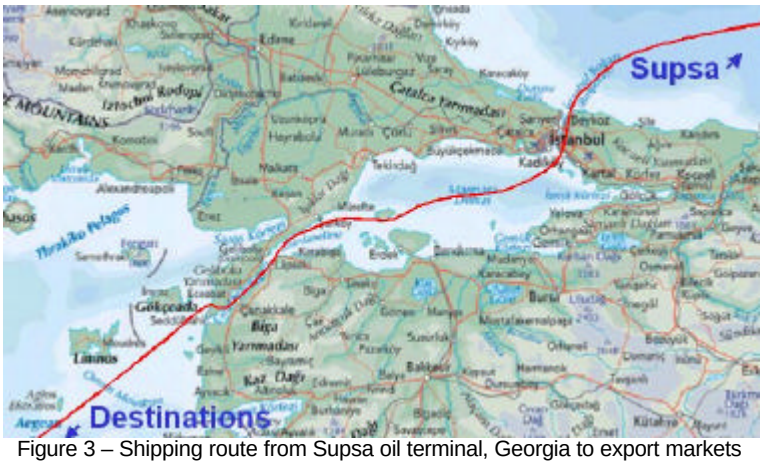


Figure 3 – Shipping route from Supsa oil terminal, Georgia to export markets

Each of these routes pass through the Mediterranean, which is a very busy shipping route increasing the risk of a collision. The Mediterranean is an enclosed Sea with a high dependance upon its beaches to attract tourism thus any pollution incident in this area would have major impacts.

There is currently work being carried out to develop oil terminals at Arkhangelsk and Murmansk to provide ice-free routes through which to export from the North West of Russia. This would reduce the risk of ice-damage to vessel hulls but there is some perception that the shipping route would put Norwegian coastlines at risk. This route, however, has very little shipping traffic so the risk of a collision is very low.

The main oil fields in the East of Russia are found on Sakhalin Island. The pipeline routes on the Island run from Northern fields to the terminals in the South (see figure 4).

Figure 4 – map showing location of pipelines on Sakhalin Island
(http://www.hydrocarbons-technology.com/projects/sakhalin2/sakhalin26.html)

From the southern terminals oil is shipped to East Asian destinations via the Sea of Japan and East China Sea which is one of the most heavily congested shipping routes anywhere in the World. Oil is also exported from Sakhalin to the US. Any tankers on this route would cross the Sea of Okhotsk and pass between the Kuril Islands. The Kuril Islands are a chain of volcanic islands along the edge of the Pacific rim (see figure 5).

Figure 5 – map of the Kuril Islands, Sea of Okhotsk (http://www.askasia.org/image/maps/kuril1.htm)

The passages are narrow and treacherous for large vessels, greatly increasing the risk of a grounding. These islands are currently under consideration for World Heritage status so an oil spill in this region would have a major impact upon the wildlife and habitats surrounding the islands (http://www.greenpeace.org/russia_en/campaigns/intro?campaign_id=154523).

ii) River transportation

Oil that is produced from central Russian fields is transported to the coast by river tankers or barges during summer months but only if there is no pipeline nearby and access to a river is practical. The Volga is heavily used to move around half of all river freight within Russia (http://www.volgawriter.com/VW%20Volga%20River.htm) and is being used more frequently to move oil cargoes. The Volga empties into the Caspian Sea but there are canal links to the Baltic Sea to permit shipping traffic to gain access to the Mediterranean to reach the export markets. Tankers and barges using these routes are, again, at higher risk of collision due to the busy and narrow shipping channels.

iii) Railway

Carriage of oil by rail tankers from production sites to loading terminals has increased greatly in recent years. This has been necessary to overcome the limited capacity of the pipeline network. From 1st January 2005 7 million tonnes of Lukoil's oil will be transported by rail to Vysotsk terminal per annum (http://www.eatu.org/eng/newsweek.php#doc7407). Ilinka terminal in Astrakhan receives up to one million tonnes of oil per annum from rail tankers. Each train is made of up to 50 tankers. Once at the terminal the oil is loaded onto marine vessels for trans-shipment (http://www.lukoil.com/static_6_5id_256_.html). Rail transportation is also used to export oil directly to international destinations. Lukoil will use rail links to export 3 million tonnes of oil to China in 2005 (http://www.eatu.org/eng/newsweek.php#doc7407). Rail routes take oil through some of the remotest areas of Russia thus if there was a train incident it may take a substantial amount of time to get response equipment and personnel to site.

Oil Industry response to risks

The Oil Industry takes these risks very seriously and is committed to doing whatever it can to mitigate them. This will include preventative actions, improving preparedness and maximising the response capability. The risks and problems associated with oil spills, however, cannot be diminished solely through government legislation either. Neither party can work effectively in isolation and must therefore engage one another to ensure that any action is co-ordinated and that interested parties co-operate wherever possible. There are many methods through which Industry and Government can co-operate to mitigate the impact of a spill (see figure 6).

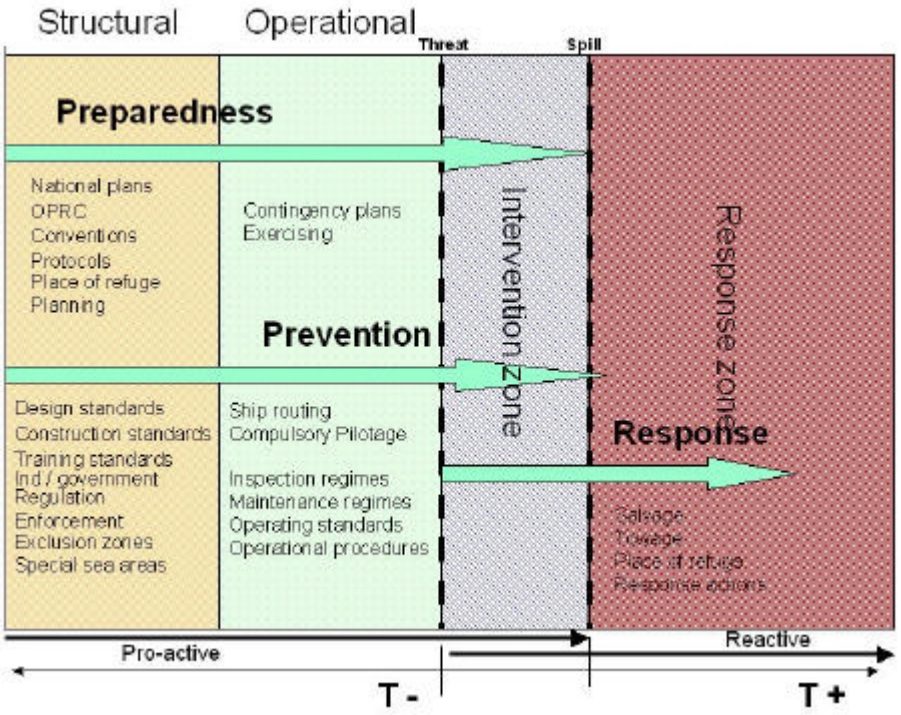


Figure 6 – Methods of preparedness, prevention and response

The Oil Industry has worked hard in the region to overcome risks of spills from operational processes at all stages of the oil chain i.e. from sources to destination. As mentioned above, these measures take three forms; prevention, preparedness and response but none of these can work in isolation – they must all be applied together at all stages.

i) Prevention

The best method through which to mitigate risk is to prevent it wherever practically possible. Major oil companies pride themselves on the quality of their engineering and continually fine-tuning and improving their designs to help achieve this. Prevention methods involve modifications to structures ('hard' methods) or processes ('soft' methods) to reduce the chance of spills.

Engineering - An example of an engineering modification is the use of specialist ice-class vessels that break through ice, stern-ahead thus minimising the risk of damage to their cargo tanks. Such vessels are used on routes that become ice-bound for long periods of the year for example, routes from the Baltic and North Seas to Finland (http://www.fortum.com/news_section_item.asp?path=14022;25730;551;14466). Another example to overcome ice issues is to use subsea pipelines that run from the source to a floating storage and offloading unit (FSO) in an area that does not become ice-bound. This prevents the need for tankers to enter hazardous water, avoiding damage and thus accidental spillage (http://www.sakhalinenergy.com/common/cmn_sakhalin.asp). The Oil Industry also uses very sensitive leak detection systems in the pipelines so that even the smallest change in pressure is seen as well as the location of the pressure drop. This allows operators to

pinpoint the leak and therefore react more quickly and efficiently on a pipeline that may be hundreds to thousands of kilometres long.

Processes – An example of process modification to minimise spill risk is to ensure that standardised systems are utilised and enforced in all operational activities, for example, the use of risk assessment forms before any new activity can take place. This method helps to identify and deal with risks before they occur. Process engineering, weather mapping, route planning are also good examples of preventative processes and show that the quality of a project shows from its conception through the design phase and into operation. Government and Industry must work together to continue to improve all these aspects.

ii) Preparedness

The requirement for 'preparedness' was first formally laid out in the International Convention on Oil Pollution Preparedness, Response and Co-operation, 1990 (OPRC). Any parties signing up to this agreement must adhere to the following (table 1):

Table 1 - International Convention on Oil Pollution Preparedness, Response and Co-operation, 1990 (OPRC)

Parties to the OPRC convention are required to establish measures for dealing with pollution incidents, either nationally or in co-operation with other countries.

Ships are required to carry a shipboard oil pollution emergency plan, the to be developed by IMO. Operators of offshore units under the jurisdiction of Parties are also required to have oil pollution emergency plans or similar arrangements which must be co-ordinated with national systems for responding promptly and effectively to oil pollution incidents.

Ships are required to report incidents of pollution to coastal authorities and the convention details the actions that are then to be taken. The convention calls for the establishment of stockpiles of oil spill combating equipment, the holding of oil spill combating exercises and the development of detailed plans for dealing with pollution incidents.

Parties to the convention are required to provide assistance to others in the event of a pollution emergency and provision is made for the reimbursement of any assistance provided.

The Convention provides for IMO to play an important co-ordinating role.

(http://www.imo.org/Conventions/mainframe.asp?topic_id=258&doc_id=682)

Industry spends a lot of time on preparedness issues including environmental risk assessments, contingency planning, training and exercising. There is a common misconception that exercises must be very large and costly, however, even a table-top exercise can create many lessons-learned for the participants. Governments should work with Industry on these issues as they are already well established and have been proven to work again and again. Trying to compete only causes more problems. There should be a good understanding of issues from both parties.

iii) Response

Industry has used an effective response structure for many years to maximum effectiveness (see figure 7). This method is efficient and effective so should continue to be used but always taking into account and adapting it to local levels of risk.

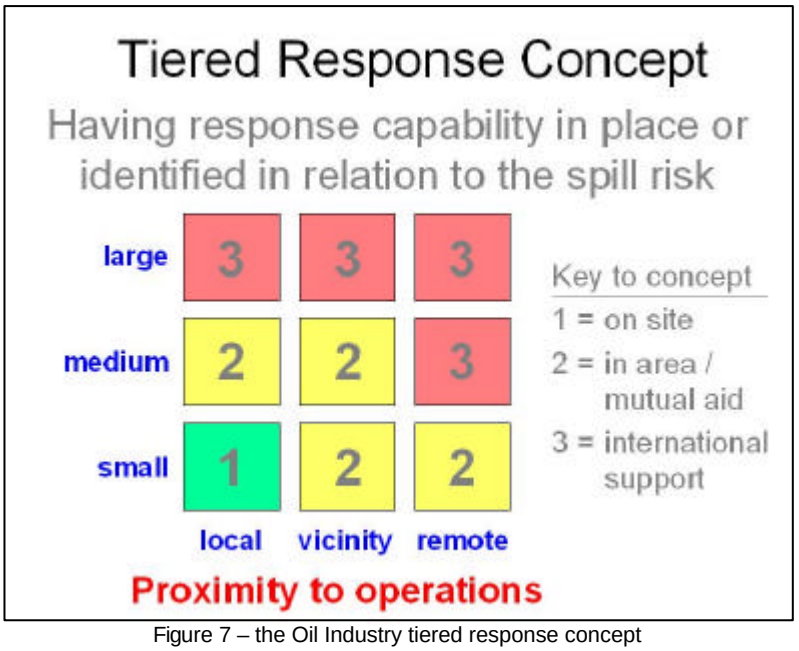


Figure 7 – the Oil Industry tiered response concept

Tiers 1 and 2 should be adjusted to meet the requirements of the region. Tier 3 response organisations are used when the regional capability has been exceeded.

Spill response methods must be relevant to the region and practical, for example, governments cannot legislate for spilled oil to be completely recovered within 24-hours as this is not only impractical but impossible. Much of Russia's coastline is ice-bound for long periods of the year making conventional response methods ineffective. Many systems for recovering oil from under ice have been proposed but as yet nothing has been confirmed successful. It must be accepted that offshore recovery of oil is generally only 10% effective and that the equipment necessary for that type of operation is hugely expensive for example response vessels, large skimmers and ocean booms. An alternative method is to use dispersants. These are, however, only effective on medium to light oils but the cold waters to the north and east of Russia could cause spilled oil viscosity to increase too high for dispersants to be a practicable option. In most situations the oil will end up impacting the shoreline. Equipment for local stockpiles should, therefore, comprise a greater proportion of more cost-effective shoreline equipment that can be rapidly deployed in the event of a spill. The majority of the environment at risk from spills in Russia is inland. These areas also suffer being frozen for long periods of time so if a spill occurs in some cases it can only be recovered during the summer months. Local response personnel must be trained in techniques specific to inland response.

Co-operation

As it has already been mentioned above, any effort to reduce the risk of spills through prevention, preparedness and response techniques are only fully effective if all stakeholders are working in co-operation with one another. This is essential between the oil industry and governments. If parties work in isolation there is no synergy in the event of a spill, exacerbating the problems and issues. Regional working groups must be formed comprising oil industry and local/national governments from each neighbouring country to work together and draw on each other's knowledge and expertise. The International Petroleum Industry Conservation Association (IPIECA) and the International Maritime Organisation (IMO) jointly run the Global Initiative programme to help industry and governments to set such groups up. This is currently being carried out successfully in many regions, for example WACAF (West and Central Africa), NOWPAP (North West Pacific Action Plan) and OSPRI (Oil Spill Preparedness Regional Initiative - covering the Black and Caspian Seas and Central Eurasia). Groups like these make joint decisions on best practices relevant to the region through writing National Plans, exercising and training together and deciding upon the level of response capability required. Joint incident command structures are formed, defining each party's role

during a spill. This prevents conflict in spill situations. Working in this way also prevents unnecessary expenditure on expensive response equipment. Regional or 'Tier 2' stockpiles are formed and funded by both parties. Alternatively, mutual aid relationships can be formed whereby each member of the group can call upon the resources of other members.

Summary

The development of newer, more remote oil fields to maintain the current level of hydrocarbon consumption poses a high level of environmental risk. Risks arise at each stage of the oil chain from production through transportation to refining and the end user. The oil industry aims to mitigate these risks through adapting engineering and systems to the physical and political idiosyncrasies of each region. Success in minimising the risks can only be achieved if a co-operative approach is taken using the opinions of all stakeholders at each stage of the decision making. This is best achieved through the formation of regional forums and working groups. Spill risks cannot be prevented through legislation – plans must be practical and realistic. The Oil Industry has spent many years investing and researching all areas to mitigate risk – Governments can gain maximum benefit from this experience and should work with the Industry and not against it.

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