SPILL RESPONSE PLANNING IN THE REPUBLIC OF KAZAKHSTAN[1]

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ABSTRACT: In recent years the international oil industry has been increasingly active in the former Soviet Union region. The Caspian Sea area alone has estimated reserves of 70 billion barrels of oil. The northeast Caspian region, the focus of major exploration campaigns in the last two years, is a unique environment where the sea level can vary between zero and 10 metres purely as a consequence of the wind direction. Temperatures range between +40 degrees Celsius in the summer to –40 degrees in winter, with the north east Caspian sea being frozen for some four to five months of the year. These factors not only make the region very challenging from an operational point of view, but present a whole new set of challenges for the oil spill response planners. The Republic of Kazakhstan (RoK) is a very large country and industry is widely distributed with operational oil spill risks arising from pipeline operations, exploration, production and distribution of refined product. The goal was set by the oil industry to assess the spill risks in the region and firstly to identify individual Tier 1 requirements. Having established the Tier 1 needs, the study progressed to a review of the logistics and of the available infrastructure. Using a combination of these resources, one could determine whether a credible Tier 2 capability could be developed or whether additional stockpiles and trained personnel would be required.

Introduction

Kazakhstan is one of the largest members of the Commonwealth of Independent States (CIS) and covers an area of approximately 2.7 million Km″ or roughly five times the size of France. It has been a member of the CIS since 1991 when the Soviet Union broke up.

Kazakhstan has been producing hydrocarbons since before its independence. At present all of the hydrocarbons produced in the RoK come from land operations.

In 1994/95, a consortium of oil companies including Agip, Exxon, Shell, Phillips, BP, Statoil, TotalFinaElf, BG and Impex formed OKIOC (Offshore Kazakhstan International Operating Company N.V.) to commence seismic operations in the north east sector of the Caspian Sea. In 2000, appraisal drilling was started on the Kashigan field which is estimated to be one of the largest reservoirs found in the last three decades (Figure 1 shows a map of the operating area). OKIOC is now known as Agip Kazakhstan North Caspian Operating Company NV (Agip KCO) and in sturgeon travel up the Ural River to spawn from March until June. In addition there are the reed communities (Phragmites August of 2001 under the Partners Share Agreement (PSA) Agip was granted the operator's licence for the OKIOC consortium .

Oil Spill Response Limited (OSRL) first started working with OKIOC in November 2000 when it was engaged to carry out a capability review. This led to a request for assistance with a third party spill in February 2001. During this time OSRL found that the area presented oil spill clean-up teams with a new set of challenges.

At the time of the oil spill, which had come from an old abandoned well head, the North East Caspian Sea was frozen. The Republic of Kazakhstan Government (RoK), along with the national oil company, visited the site of the reported spill. It was found that the well head was covered by ice rubble which had to be removed before any operations could be carried out. At this time OKIOC decided to call on the assistance of OSRL to help advise on the best course of action. Following discussions with OSRL, OKIOC and TengizChevroil (TCO) offered assistance to the RoK in minimising the environmental impact of the oil spill and it was during this period that many lessons were learnt.

Characteristics of the area

Two particular difficulties associated with operating in the Caspian are the sea level and the climate.

The sea level has fluctuated considerably over the centuries, and such sea level dynamics have considerable environmental consequences. Approximately 85% of the total water discharged into the Caspian passes through the North Caspian via the Volga and Ural outflows. The North Caspian represents about 24% (91,942km″) of the area of the whole Caspian Sea, but it is by far the shallowest sector of the sea, its water volume being around 0.5% of the total volume of the Caspian.

The north east region of the Caspian is a unique environment where the water levels can also vary by up to 10 metres depending on the wind direction. The temperatures range from +40 degrees Celsius in the summer months to -40 degrees Celsius in the winter. The north east sector of the Caspian Sea can be frozen for up to five months of the year, but generally for three months. These factors alone require special consideration when considering oil spill preparedness.

The Caspian Sea is an environmentally sensitive area. The north east Caspian is home to a variety of fish, the major including the commercially important sturgeon. The female australis) around the Ural delta and the north east coast, which are home to a variety of wildlife as well as the Caspian Seals and a

staging area for migrating birds such as the flamingos, other waterfowl and white-tailed sea eagles. All of these are in the operating area of Agip KCO.

Oil spill response planning

During the summer of 2001, consultants from OSRL travelled to Western Kazakhstan to meet with oil industry representatives and discuss issues and concerns regarding oil spill response in Kazakhstan. Most of these operators have land-based operations, although some have interests in pipelines and tanker operations out of the marine terminal in Aktau. During the site visits the consultants had the chance to see at first hand the operating areas as well as some of the various shoreline types. It was established that each operation has its own Tier 1 equipment stockpile as well as associations with a Tier 2 contractor located outside Kazakhstan.

The response planning issues addressed, including the optimum location for stockpiling equipment, balancing the need for a quick and effective response not only to land and marine-based spills, but also to incidents involving river crossings and pipelines. The operations within Western Kazakhstan are spread out over a wide area and the roads linking the operations are either in poor state of repair or non-existent. For example, during the site visits a 500 kilometre road journey from one operation to another took over 11 hours.

The marine base for Agip KCO's offshore operations is located in Bautino, the northern most ice-free port in the Caspian and some 18 hours steaming from the Klamkas operating field, in summer conditions. During the winter, transportation within the country can be severely hampered due to the extreme cold temperature. Another factor that can affect a response in the North East Caspian is the rapid fluctuations in water levels. Over on the eastern coast of Western Kazakhstan the water depth can change overnight depending on the wind direction. This has made an area which has become known as a "transition zone" of over 20kms. The area was once dry land and can now be completely covered in water. It is believed that around this section of the Caspian there are in excess of 200 abandoned land wells that are now subject to frequent submergence.

Planning a response operation of any description must take into account not only any sensitivities in the area but also the time of year and the exact location of the operation. The equipment that would be required to carry out a spill response in any location and at any given time of year will need to be reviewed as this may vary with the season.

OSRL looked at specialised equipment and the strategies that would be required to operate in these conditions. Operations can be broken down into three areas: (a) offshore/transition zone, (b) shoreline and (c) river crossings.

(a) Offshore/Transition Zone

The water depths for the north Caspian vary from 10 metres to an operating depth of less than 1 metre towards the north east coast of the Caspian. The shallow gradient of much of the offshore and onshore areas of the North Caspian means that small increases in sea level can have a wide-ranging effect. Short-term increases/decreases may result from changes in meteorological conditions such as wind direction, storms or pressure systems. These may result in non-periodic surges (increases) or retreats (decreases) in sea level and the flood of coastlines or the exposure of the seabed. Variations in depths of up to 3 metres have been known, although 1-2 metre changes are more common. There is also a seasonal effect , as there is more water in the springtime due to the thaw. The Ural River and the Volga River have an average annual flow of 242km^3 and 9km^3 respectively, an estimated 80% of the water intake intro the Caspian Sea.

Coupled with the restrictions from operating in shallow waters there is also the fact that the North Caspian Sea can be frozen for anything up to 3 months of the year. The ice in the Caspian is very dynamic which can cause huge ice shifts. The ice does not remain land-locked through the thaw.

The following questions must be considered when planning an offshore response. Are there enough vessels with shallow draft to operate in the area? Will vessel operations need to be done in stages? Due to the density of the reed beds, some of the locations can only be reached from the sea, so do deeper-drafted vessels need to be replaced to some sort of shallow water platform/inflatable craft?

Other issues arise from safety considerations. What happens if the wind changes direction and the vessels are stranded without water? Perhaps worse, what happens if personnel are suddenly isolated from the shore or a vessel because the water has returned? This is a major problem in the area as the winds are so unpredictable, therefore specialised vehicles have to be considered. Seismic companies sometimes have a good deal of experience in these areas, as do the military who are used to operating in extreme conditions with purpose-built equipment of the specification that is suitable to the environment. In particular, the Russian military have considerable expertise and equipment capable of operating in shallow waters. However, a drawback of some amphibious vehicle designs for this kind of work is that tracked vehicles tend to damage the environment. A different approach is to use operating platforms that can be floated or towed out to the transition zone but which need to be located near to the shoreline for rapid deployment. They can be used as working platforms when there is water in the area or as a refuge if the water should return rapidly. These response operations, like all others, must be conducted in a safe manner given the environmental hazards of water level fluctuations and ice.

During the winter months a different set of strategies may be required: monitoring and evaluating the situation is one option, as is in-situ burning. Ice core samples should be taken at regular intervals and ice strengths worked out before any personnel or equipment are committed. For burning, the safety of the surrounding area must be considered, permits issued and the prevailing conditions evaluated. A good strategy for oil spills on ice is to monitor the spill and mark its location using GPS, dye, tracker buoy or some other means. As the ice starts to thaw and the oil enters open water its direction of travel can then be followed with greater accuracy.

(b) Shoreline

The main issue associated with planning for a shoreline response is the basic internal infrastructure. The roads in the outer reaches of the larger cities within Kazakhstan are in a poor condition and in some places non-existent. Transporting personnel and or equipment can take longer than might normally be expected.

These constraints often need to be considered when stockpiling equipment. Issues to be addressed include where best to store equipment should a response be required taking into account the local infrastructure and how long it will take to mobilise people and equipment. Another key consideration is whether this is the best location for protecting the sensitivities or should the equipment be located elsewhere. Also, will it be safe from the elements given the varied climate in the region.

The remoteness of the North East coast also creates particular problems of logistics and personnel safety as well as how long it could take to get skilled personnel to the area, where they would stay and what protection from the elements would be required. One issue that is currently being addressed in Kazakhstan is the development of a good working relationship with the regulators so that issues such as international assistance, if and when required, is not hampered by delays with customs and immigration authorities. This is being done by running training courses at Tier 3 centres as well as exercises involving the government agencies.

Another pre-response consideration is shoreline clean-up strategies, as the very flat shoreline can stretch for kilometres without a change in characteristic. The shoreline types that can be encountered in the area include gravel beaches, exposed salt flats or sors, sheltered mud flats, marshes and reed communities. The equipment that would be required for operating in these areas is not significantly different to that used in conventional operations coupled with using the shallow water equipment.

(c) River Crossings

Some consideration has to be given to the potential for spills from pipelines and especially river crossings. The two main issues with river crossing are the local infrastructure and the river condition. Access to a river crossings can be difficult and it could take a number of hours to get equipment and personnel from the response base to the incident. Some of the locations considered for equipment stockpiles are the pipeline pump stations along the pipeline route. These offer not only a secure location but also manpower and are often located near the river crossings.

If the river is in flood, then there can be a substantial water movement along the river as has been found in other areas where the pipeline crosses the river sub surface or surface crossings. This amount of water can cause problems to the supporting stations or it can uncover the pipeline making it more susceptible to damage from debris being carried down the river.

General

A good deal of specialised equipment is required to carry out any kind of operation in the North East Caspian, ranging from the use of shallow craft and amphibious vehicles through to potentially having an in-situ burning capability.

There is also the need to consider accommodation for response personnel since in many of the remote locations there are no hotels. For example, is the location suitable for either offshore accommodation barges or mobile onshore camps? These matters need to be considered and addressed prior to any incident so if a response is required the plan could be put into place without any delay in identifying facilities. It may be that this sort of equipment needs to be bought and maintained in case of an incident.

Conclusion

As discussed, the environment in the Caspian attracts new challenges for operators and oil spill responders. In addition, logistics may be difficult and pre-planning is critical to the success of any operation. Agip KCO has recognised these issues and is working to identify the best options available to them and hence the resources that will be required whilst maintaining dialogue with the regulatory authorities to ensure the best interests of the region are considered.

Biography

Mark Shepherd, a consultant with Oil Spill Response Ltd, has worked in the Kazakhstan region since the end of 2000 on a range of issues including advising during an oil spill, participating in exercises and writing contingency plans. In May 2002, Mark was seconded to Agip KCO to assist in developing their oil spill preparedness.

Information sources

1. *The Northeast Caspian Environment*: Brochure written for OKIOC with contributions from:
2. Emil Nurmambetov (institute of Geography), Alexander Bolshov, Valery Melnikov and Lyudmila Sharapova (KazNIIRKh); Natalia Ogar and Larissa Stogova (ENVIRC); Anatoly Gistsov (Institute of Zoology): Gulsim Mutysheva (Agip KCO ecologist): Annette Woodman, Paul Mowatt and Gordon Beattie (ERT)
3. *Oil Spill Sensitivity Study for the Northeast Caspian Coast (Agip KCO)* February 1999. Internal report
4. *Transboundary Diagnostic Analysis for the Caspian Sea.*
5. Caspian Environmental Programme. 2002
6. *The Caspian Sea (1996).* The Seas Project. The Sea. Hydrometeorology and Hydrochemistry. Volume VI. The Caspian Sea issue 2. Hydrochemical Conditions and Oceanography basis for Biological productivity formation. St. Petersburg.

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