SELECTING SPILL RESPONSE OPTIONS FOR EXPLORATION OPERATIONS IN DEVELOPING REGIONS

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ABSTRACT: *The oil industry is continually seeking to identify new areas for exploration to increase its reserves. The major international oil companies are investing millions of dollars in ever more technologically advanced drilling programmes which will ensure future levels of production. In doing so the industry is increasingly moving into frontier regions to explore new development areas. The governments in these areas require the industry to plan and prepare for potential oil spill incidents. Issues for industry to consider include what level of response should be available to support exploration activities and what options are available to deliver this response. The aim of this paper is to review the potential risks associated with drilling operations during the exploration phase, set against a backdrop of legislation requirements and increasing environmental awareness. The paper will investigate the options for spill response during exploration operations and their respective benefits and limitations. The paper will also discuss the drivers in the decision making process for selecting which strategy is the most appropriate for each potential scenario*

Introduction

The contents of this paper are based on exploration operations being conducted offshore or near shore. References to environmental protection procedures are derived from various pieces of legislation already in force within Europe.

To date, in the region of seventy thousand oil and gas fields have been discovered, accommodating in excess of nine hundred thousand producing wells. Since the early boom years the international oil industry has experienced many changes, none greater than its own perception in the eyes of the general public at large. Today the major oil companies wish to be seen as environmentally conscious and responsible, whilst in reality the search for new discoveries is moving them into frontier areas.

By using state of the art technology when conducting geological and seismic surveys to detect oil trap conditions, geologists are reducing the number of dry wells being sunk and in turn reducing the risk of potential spills. However, drilling is still the only undoubted method of proving that reserves exist.

Drilling operations during the exploration phase involve a small diameter hole, typically twenty to fifty centimetres, being drilled for up to several thousand metres. The introduction of the associated services required to accomplish this task, for example mobile rigs and supply vessels, represents the most likely cause of uncontrolled releases of utility products such as oil based drilling muds, diesel, hydraulic and lubricating oils. Adoption of best management practices which promote sound operating procedures and good housekeeping habits to prevent pollution have been developed in an attempt to limit the number of small operational spills. Although generally small in size, requiring only Tier 1 response, a response strategy is still necessary.

Table 1. Examples of oil volumes spilled during well blowouts.

Incident	Location	Date	Quantity (tonnes)
Ixtoc 1	Gulf of Mexico	June 1979	507,000
Nowruz field	Persian Gulf	Feb 1983	600,000
Ekofisk field	North Sea	Apr 1977	28,000
Agip landwell	Milan, Italy	1994	15,000

In the absence of international legislation setting the preventative measures required during exploration drilling, national Governments have each developed their own guidelines. Whilst it is highly likely that applications to drill in areas with well-publicized sensitivities will already have license obligations set by government there may be regions where these do not exist and it falls to the operator to ensure suitable measures are in place.

Under certain circumstances an environmental statement may also be required for wells which are deemed to be likely to have a significant effect on the environment by virtue of their nature, size or location. In this case it is most probable that independent specialist contractors will be employed to collate environmental information and prepare the statement. This process will require consideration to be given to possible sources of pollution and potential spill sizes.

Decision-makers must consider a range of parameters for a particular operation before choosing which response strategy best suits their needs. Of primary importance is the likelihood and timing of any shoreline impact. One option is the use of

dispersant which, if permitted, can offer many benefits providing it is available in sufficient quantities and in good enough time. A rapid response technique, this option has the advantages that dispersant is relatively easy to store and it does not produce any waste requiring disposal. There is also generally no shortage of supply boats or helicopters in the field, from which to mount spraying operations. The possibility may even exist for aerial response service to be contracted to a specialist operator who could have aircraft and dispersant delivery systems on stand-by remote from the operation. Pre-determined response times will indicate the viability of such a strategy. However, the relatively small window of opportunity and potentially limited stocks available locally will require effective targeting by staff, who will require some basic training and forward planning to ensure prolonged spraying activities can be maintained if required.

An alternative strategy is containment and recovery at the source of the spill. Containerized tailored packages, capable of being utilized in at sea operations, are available for use during the drilling phase. These generally comprise offshore containment booms, recovery skimmers, diesel hydraulic power packs and all ancillaries. This strategy offers the benefit of access to specialized equipment without the initial capital investment or associated on-going maintenance and storage costs.

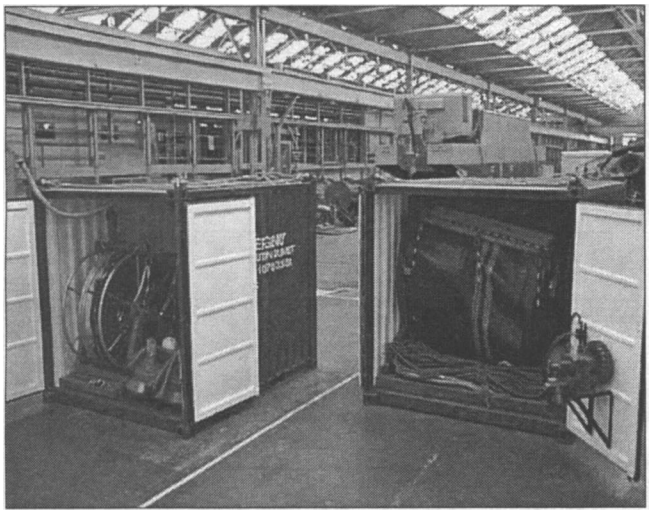

Figure 1. Compact containerized offshore containment and recovery package.

Training of crew and essential staff in the operation of the equipment is necessary if any deployment is to be successful. Before deciding upon a containment and recovery strategy however, special consideration must also be given to the prevailing weather conditions. Experience has shown that in sea states in excess of Force 5, attempts at recovery at sea are fairly ineffective and may be stopped on grounds of safety. There is also extra demand placed upon the logistics network in terms of equipment storage, transportation and the requirement for deployment and boom towing vessels to be made permanently available. Lastly although recovery rates rarely exceed 20 (twenty) percent plans must be made as to where to store recovered product and where it can later be re-processed/disposed of.

Depending upon where the operation is to be carried out the option of in-situ burning may be viable, although it should be noted that this is only accepted as a strategy in certain parts of the world. However, for in-situ burning the prevailing weather trends must allow at sea containment operations which, as already pointed out, have historically proved only minimally successful in the wrong conditions. Encounter rates can however be enhanced with the use of aerial surveillance facilities to guide vessels to the spilled oil. Sufficient quantities of 'fire-boom', capable of being stored in containers, will be required as will an adequate method of ignition. Whilst the principles of in-situ burning are relatively straightforward and low tech, expertise will be necessary when assessing whether the conditions to achieve combustion are met. Further consideration must be given to the residual by-product of combustion which will require recovery and disposal as will the scorched lengths of boom. Unpopular amongst environmental lobbyists due to the excessive atmospheric pollution generated, there are several benefits offered to operators. As the equipment is relatively compact the storage requirements are minimal and, coupled with the potential of mounting a rapid, effective response with little waste to dispose of, this strategy can be appealing.

The harsh reality is that unless situated a considerable distance offshore, a moderately sized spill will ultimately impact land. Good use can be made of computerized trajectory models to indicate the areas likely to be affected for a range of tidal, weather and oil states. This allows the identification and prioritizing of different shoreline types and response strategies while conducting shoreline surveys can highlight any access limitations for a given area. A single or series of shoreline protection packages strategically located from where equipment could be dispatched could be capable of guarding a considerable stretch of coastline. Constrained by available space the items included in any package are a balance between protection, containment, recovery and storage devices. Unlike any of the other response strategies, once oil has beached, the co-ordination of any clean-up operation will require close liaison with various government agencies. Greater logistical back-up in the form of labor, some of which will need to be skilled, transportation and vessels will also be required.

Conclusion

By its very definition, exploration activities have any number of unknown variables. This is why the identification process of potential risks and moreover consequences of spill incidents is of paramount importance. To a great extent modern technology and the implementation of best management practices have played their part in reducing risks to a minimum. However, when called to decide upon a response strategy to what in essence is a hypothetical spill scenario, decision makers are faced with a challenging task. In order to be objective the limitations of any support package first have to be recognized and disseminated amongst concerned parties. Tools such as Net Environmental Benefit Analysis (NEBA) may be called upon during this process not only to assist with decision making but also to justify any decisions made.

The likelihood of any single response strategy being completely effective is remote. Ideally as a spill develops so to the response effort adapts to best suit the situation. Realistically no support package is capable of providing a complete response product. Instead the chosen strategy will be a compromise between financial, operational and logistical restraints, whilst offering the optimum response in the initial stages of a spill. Actions taken during the initial stages of a spill are critical if ultimately the response is to be effective. By having the procedures and the equipment in place to enable those initial

actions to be taken can buy precious time whilst back-up resources are mobilizing to any major incident.

Biography

During his time since joining OSRL as a Technician in April 1999, Marcus Russell has gained valuable experience in responding to several major international incidents. In particular, he assisted with shoreline clean-up operations following the sinking of the Erika and helped in recovery operations after an earthquake damaged a refinery near Izmit, Turkey.