ARCTIC RESPONSE TECHNOLOGY
OIL SPILL PREPAREDNESS

IN-SITU BURNING OF OIL IN ICE-AFFECTED WATERS: STATE OF KNOWLEDGE

PROJECT 7

The controlled in-situ burning (ISB) of an oil slick as a response technology is well established, having been researched and employed in one form or another at a variety of oil spills since the late 1950s, including limited use during the Exxon Valdez accident and extensively during the Deepwater Horizon incident. Many researchers and first responders believe that in-situ burning is especially suited for use in ice conditions. Much of the research and development on in-situ burning in sea ice conditions over the past four decades focused on its use for spills on and under solid sea ice, as well as for oil encapsulated in pack ice offshore. The effectiveness of ISB in removing spilled oil from a sea surface in a variety of ice environments was demonstrated in large-scale experimental spills in the Beaufort Sea in 1975, 1980, 1982, as well as off the Canadian East Coast in 1986, and in Norway in 2006, 2008 and 2009.

More recently, research addressed the burning of spilled oils of various concentrations in pack ice, slush ice, and brash ice. In general, the ISB technique has proven to be very effective for thick oil slicks in high ice concentrations and has been used successfully to remove oil resulting from pipeline, storage tank and ship accidents in ice-covered waters in Alaska, Canada and Scandinavia. Project 7, "In Situ Burning in Ice-Affected Waters: State of Knowledge" began in winter 2012 and will be completed in spring 2013.

KEY GOALS

Project 7's overall objective is to understand the degree to which ISB can currently be used effectively as a response technique in arctic conditions and to raise awareness of the benefits and drawbacks of ISB as a response technique.

As interest in arctic oil exploration and production continues to increase, the industry wishes to ensure that in-situ burning is available when needed.

This requires that ISB becomes incorporated into contingency planning and that response organisations have the necessary resources and training.

The JIP believes that in order to raise awareness of the potential benefits and trade-offs associated with ISB, there is an urgent need to better communicate the state of knowledge surrounding this response option to external stakeholders.

KEY COMPONENTS

- In-situ burn: state of knowledge review.
- Summary report and research needs analysis.
- Summary report of existing regulatory requirements and options for regulatory consideration.
- Preparation of educational and outreach materials.

SCOPE OF WORK

Phase 1 - State of knowledge on ISB in ice affected environments

In phase 1 of the research project the JIP will prepare a detailed state of knowledge report which summarises the role, function, benefits and limitations of ISB as a response option in arctic offshore environments. The deliverables from this phase are intended for specialists and informed stakeholders interested in the details of the ISB process and/or planners and responders who seek the necessary information for contingency planning.

IN-SITU BURNING (ISB) AT A GLANCE

ISB is a proven response technique that in certain scenarios can rapidly eliminate more than 90 per cent of encountered oil.

The presence of colder temperatures and calmer sea conditions in ice-covered arctic areas may actually increase the window of opportunity for the effective use of ISB compared to southern locations.

Different oil-in-ice concentrations and, principally, the film thickness will influence the efficiency of ISB and these must be robustly tested.

ISB emissions are short lived and extensive test data show that they are not likely to cause significant environmental effects or human health issues. Safety regulations and air quality monitoring requirements are in place for ISB to ensure the on-going safety of its use.

Compared to other response methods requiring extensive offshore storage and marine support, the relatively minimal equipment and personnel demands of ISB can make it a more practical response method in remote arctic environments.

KEY PERSONNEL

Chair: Nere' Mabile, BP
Co-Chair: Alexis Steen, ExxonMobil
Joint Industry Programme (JIP) Manager: Joseph Mullin
JIP Head of Communications: Phil Dyer
Contractor: SL Ross Environmental Research Ltd.

The JIP's state of knowledge report will cover all planning and operational aspects of burning, including the potential impacts on human health and the environment.

Several recently released reports provide a starting point for assessing the state of knowledge in this area: The SINTEF Oil-in-Ice joint industry project reports, as well as the Beaufort Sea Oil Spills State of Knowledge Review are two examples. In addition, the In-Situ Burning Guidelines for Alaska and the Alaska Clean Seas Tactics Manual contain valuable background information on all operational aspects of ISB in an arctic environment.

In addition, the JIP will prepare a summary of key scientific studies and experiments, case studies and previous research efforts on the use of ISB in arctic environments, both offshore and onshore. This summary report will highlight findings and conclusions, and important references. It will also help the JIP compile a research needs analysis that will identify the current limitations to the use of ISB as well as opportunities to improve efficiency and extend the window of opportunity for its use.

The JIP hopes the outputs from this phase will serve to inform the industry of the state-of-knowledge on ISB and avoid the unnecessary duplication of research.

Phase 2 - Preparation of educational and outreach materials

Phase 2 of this project will build upon the results of phase 1 yet with a focus on a much wider audience with the aim of updating and informing key stakeholders on the significant body of knowledge on ISB.

The first component of the second phase will involve preparing a report that identifies and summarises the regulatory requirements for obtaining approvals to use ISB in nations with arctic conditions (Canada, Finland, Greenland and Denmark, Iceland, Norway, Kazakhstan, Russia, Sweden, and the United States).

As part of that effort, materials will be prepared which could become a template for the development of ISB approvals. The JIP will also identify what near-term opportunities exist to effectively communicate the merits of ISB as a response countermeasure, identify key technical and regulatory obstacles and the target audiences and nations for receipt of ISB outreach.

In the second component of the second phase, the JIP will develop an ISB education and outreach strategy that will include various materials including an interactive and fully populated series of web pages dealing with ISB, including the environmental aspects of ISB that would be required to conduct a robust *Net Environmental Benefit Analysis* (NEBA).

These pages will summarise in detail the role, function, benefits and limitations of ISB as a response option in arctic offshore environments and will be available for wider public consumption.

Two further research projects

Project 8 - Aerial Ignition Systems for In-Situ Burning: The objective of this project is to develop improved ignition systems to facilitate the use of ISB in offshore arctic environments, including ice-infested waters, when the presence of sea ice restricts the use of vessels as a platform for this response option. This project will commence in 2013.

Project 9 - Chemical Herders and In-Situ Burning: The objectives of this research project are to evaluate the use of herders to enable ISB in open water and among broken ice, to demonstrate that herders remain effective during an in situ burn, and to develop an application system to allow herders to be sprayed from either boats or aircraft in very cold environmental conditions.

These goals will be accomplished through a program of large-scale basin testing and field verification. Initial planning of this project will commence in winter 2012.

ABOUT THE JOINT INDUSTRY PROGRAMME

In January 2012, members of the international oil and gas industry launched a collaborative effort to enhance arctic oil spill capabilities under the auspices of the International Association of Oil and Gas Producers (IOGP). This collaboration, called the Arctic Oil Spill Response Technology Joint Industry Programme (JIP), will expand industry knowledge of, and proficiencies in arctic oil spill response.

The JIP is supported by nine international oil and gas companies: BP, Chevron, ConocoPhillips, Eni, ExxonMobil, North Caspian Operating Company (NCOC), Shell, Statoil, and Total, making it the largest industry programme dedicated to arctic oil spill response research.

The JIP's primary aim as a four year research programme is to build on the decades of R&D into arctic technology but with a specific focus on oil spill response technology. The full research programme comprises of 10 individual projects each led by an expert scientist in the field and comprising of other members from each of the JIP's member companies. A truly ground-breaking venture in "best in class" information sharing.

The ten research projects are:

1. Fate of dispersed oil under ice.
2. Dispersant testing under realistic conditions.
3. Environmental impacts from arctic oil spills and spill response technologies.
4. Oil spill trajectory modelling in ice.
5. Oil spill detection and mapping in low visibility and ice.
6. Mechanical recovery of oil in ice.
7. In-situ burning of oil in ice-affected waters: state of knowledge.
8. Aerial ignition systems for in-situ burning.
9. Chemical herders and in-situ burning.
10. Field research.

The JIP is aiming to make its research project findings available either in peer reviewed journals or within its website and general materials.

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