Oil in Ice – a challenge in oil spill response?

Within the last few years, SSPA has seen an increase in activities in the Arctic areas, and, along with this, come new risks and new challenges. Much focus is put on the risk of oil spills and the potential problems these may cause in cold climates, especially since the environment in the Arctic is highly vulnerable and, to a great extent, unexploited. Even though the risk of oil spills is minimised, we still have to deal with the consequences if it happens.

The oil blowout accident from the Deepwater Horizon rig in the Mexican Gulf has put considerably more focus on safety and the environmental risks associated with all offshore activities. This accident further emphasises the importance of minimising risks and showing that there are effective response organisations and plans for all planned and forthcoming exploration operations.

Ice Management

Oil spills in ice and cold climates are completely different from spill situations in thermal waters. The presence of often drifting pack ice in high concentrations and low temperatures rule out ordinary spill response strategies and techniques. Oil booms are hindered by pack ice; the oil may be frozen and captured in growing ice or spread below a solid ice sheet. The ice conditions more or less fully dominate the situation. Still, all parts of the well-established operational and logistical strategies for handling oil spills in water must be fulfilled including detection, control, recovery, storage and destruction of recovered oil.

The key factor in all winter spill operations in the Arctic, and also in the Baltic Sea, is the requisite access to capable transport and operational resources. Oil spill recovery operations in ice require effective ice management resources and you must be able to reach the spill site! It is, therefore, strongly recommended that a well-prepared spill contingency plan is fully integrated in the ice management plan set up for a drill site operation or in other remote arctic operations. Powerful, modern ice breakers also operate as supply vessels, providing storage capacity for equipment and recovered oil. Emergency plans are implemented by professional and trained crew onboard. As described in previous SSPA Highlights, SSPA is very active in this area, providing decision support tools for the offshore and oil industries.

The ice – exercises, experiences and the need for know how

SSPA has been active since the 1980s in the field of oil in ice. SSPA’s experts actively participated in the European Union funded SPREEX, Spill Response Experience, with a special focus on the need for developing of winter spill response methods and techniques. This Concerted Action finalised its work during 2009. Today, SSPA can provide a wide range of expertise in marine pollution and can offer risk analyses, training courses and operational advice.

In April this year SSPA took part in a workshop and exercise on oil in ice arranged by the Swedish Civil Contingencies Agency (MSB) in cooperation with the Swedish Coast Guard. The focus was on near-shore oil contamination and SSPA provided lectures on available techniques and presented a new updated manual on shoreline clean-up, including recommendations and methods applicable in winter conditions. About 40 officials and employee from various organisations attended the workshop and took part in the field demonstrations and exercises in the 60 cm thick ice outside Umeå on the Baltic coast of northern Sweden.

The ice demands advanced strategies and methods

The total number of oil spills per year has declined drastically over the last thirty years, but nonetheless serious accidents are still a common reality that which can happen at any time. In fact, most large oil spills have not occurred in icy conditions, as yet. This makes the actual experience of responding to oil in ice rather limited, and only relatively small spills can be referred to as good

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Photo: Van Hooker V. and G Photogalleries
examples of how to handle oil in ice. However, known winter spills clearly emphasise the need for winterised response strategies and methodologies to be developed.

The oil recovery equipment available in almost every modern spill response organisation is basically designed for open water use and only a few pieces of equipment are considered to be effective in ice conditions. Thus, more designated winter equipment and training are needed in order to be able to handle spills with the presence of ice.

Oil in Ice Code

In order to design an effective spill response organisation, the main design criteria must be defined and operational conditions identified. SSPA has set up an Oil in Ice Code. This code is a decision backing support system that systematically structures expected ice conditions, concentrations, thermal regimes, spill types, the logistical resources available, expected weather conditions and the expected oil types to be handled. In accordance with regional conditions, statistics and other input, the response team will be prepared with efficient tools and strategies. It is recommended that the code approach becomes an integral part of operational planning, also based on ICE MASTER support, see Highlights 47/2009.

The icy water and dispersants

The latest developments regarding oil spill responses in ice conditions have mainly been related to the use of dispersants in cold climates. While dispersants were previously seen as inefficient and hence not to be recom-

One spectacular field experiment was conducted in sea ice outside Göteborg, where blasting techniques were used to create a hole in ice to facilitate the recovery of oil trapped under ice. Blasting is a quick method but conventional hole cutting using a chain saw creates smoother edges and an ice free surface with more favourable conditions for mechanical recovery.

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Oil in Ice Code

F/C/T/D

Iceform / concentration / temperature / dynamics

<table>
<thead>
<tr>
<th>Iceform - Type</th>
<th>Concentration</th>
<th>Temperature</th>
<th>Dynamics</th>
</tr>
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<tbody>
<tr>
<td>0</td>
<td>ice free water</td>
<td>0 = close to 0°C</td>
<td>0 = calm</td>
</tr>
<tr>
<td>1</td>
<td>slush</td>
<td>1 ≤ 1/10 concentration</td>
<td>1 = oil and ice drift</td>
</tr>
<tr>
<td>2</td>
<td>small brash</td>
<td>2 ≤ 2/10</td>
<td>2 = severe movement, ridging, waves</td>
</tr>
<tr>
<td>3</td>
<td>brash</td>
<td>3 ≤ 3/10</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>floes</td>
<td>4 ≤ 4/10</td>
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<tr>
<td>5</td>
<td>floes</td>
<td>5 ≤ 5/10</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>large floes</td>
<td>6 ≤ 6/10</td>
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<td>7 ≤ 7/10</td>
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</tr>
<tr>
<td>10</td>
<td></td>
<td>10 &gt; 9/10, incl. ridges</td>
<td></td>
</tr>
</tbody>
</table>

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