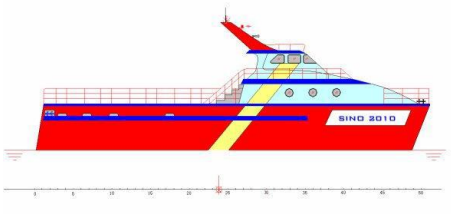
Extreme Spill Technology

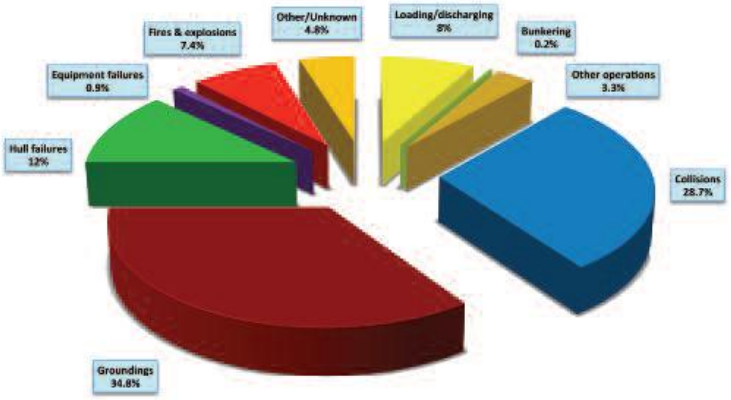


North Slope Borough Oil Spill Mitigation

A: The Historical Record

The historical record of oil spill mitigation on any ocean is a litany of failure. The International Tanker Owner's Pollution Federation (ITOPF), comprising almost 6,200 tanker owners, represents almost all the world's bulk oil, chemical and gas carrier tonnage[1]. Their findings for the causes of large spills from 1970-2010 show that 75% of these spills are caused by groundings, collisions and hull failures.

The accidents shown occurred almost entirely in mild climates, not the Arctic. Here we can expect hull and equipment failures to increase dramatically because the extreme cold weakens the steel and impedes maintenance.



In the Arctic, ships routinely travel through the ice pack in a single-file convoy following an icebreaker. This increases the likelihood of collisions. We will discuss such an event later in this article. Oil drilling and mining means much more ship traffic.

Finally, groundings are a much greater threat in the Arctic. It is mostly uncharted water with large, shallow regions and fast currents and dynamic ice that can take hold of a ship. The highest tides in the world are in the Arctic so huge volumes of Arctic water, and ice, are moving quickly and continuously. In 2010, John Falkingham, a sea ice consultant and member of the International Ice Charting Working Group, had this to say: *Only about 10 per cent of Arctic waters are charted to modern-day standards, and it will take 300 years to complete the job at the current rate*. Falkingham worked with the Canadian Ice Service for nearly 30 years.

ITOPF notes that large oil spill incidents involving ships declined by almost 90% from 1970 to 2010. Unfortunately it only takes a single accident to cause catastrophic damage so incident trends are irrelevant unless you are playing the odds and gambling with the environment.

ITOPF has this to say about the three primary oil spill mitigation methods used worldwide in southern waters and proposed for Arctic waters:

- Booms and skimmers, even in *ideal* conditions, rarely recover more than a relatively small proportion (10-15%) of the spilled oil. Of course, conditions are *rarely* ideal. Ideal means no wind, no waves, no current, no darkness, no fog, no remote locations, etc. In other words, no normal ocean conditions. The average successful oil recovery rate on the ocean over the last 40 years has ranged from 0-5%. BP demonstrated this fact again in 2010. The months-long application of 48,000 workers, thousands of skimmer vessels, 120 aircraft and $8 *billion* resulted in the successful capture of only ***3%*** of the spilled oil.

- Regarding in-situ-burning (ISB), ITOPF says ….*this technique is unlikely to be viable in most ship-source spills, due to the difficulty of collecting and maintaining sufficient thickness of oil to burn. As the most flammable components of the spilled oil evaporate quickly, ignition can also be difficult. Residues from burning may sink, with potential long-term effects on sea bed ecology and fisheries. Close to the shore or the source of the spill, there may be health and safety concerns….or atmospheric fall-out from the smoke plume.*

  The above assessment is for ISB in mild, southern waters. In the Arctic, moving ice, winds greater than 10 kts, darkness, waves, snow and bitter cold make ISB and *all* other mitigation impossible 72% of the time during the short drilling season and impossible the rest of the time according to the WWF.[2] When it can be used the black soot damages Arctic albedo, an essential tool in the fight against global warming.

Saving the environment?

  Just because mitigation *can* be used from time to time doesn't mean it is going to protect the environment. BP had every advantage and perfect weather conditions in the Macondo blowout mitigation effort but ISB only managed to burn ***5%*** of the spilled oil. Like the other two primary oil spill mitigation techniques used today, ISB is pitifully slow (and the ocean is big).

- ITOPF do not believe dispersants are very safe. They say …..*since their use results in the oil being transferred from the sea surface into the water column, there needs to be a careful evaluation of the relative risk to potentially sensitive resources in different parts of the marine environment.*

  The BP Macondo blowout demonstrated the folly of using dispersant. It made the oil "go away" which pleased BP, the government and the tourism industry. However, the oil merely went to the sea bed and into the water column where it destroyed the reputation of the Gulf fishery. There is also strong evidence that the dispersants created a toxic brew that continues to sicken local residents.

In addition to poisoning the Gulf of Mexico in 2010, dispersants were unable to accomplish much. Under perfect conditions they only managed to "treat" ***15%*** of the oil spill. Perhaps that is the good news.

This image is Fourchon Beach, LA in September, *2011*. Vast quantities of BP oil continue to wash ashore one year after BP declared victory and went home. Now BP is back again to restart the cleanup effort.

Dispersants are not an accepted cold-water response option and are not approved for use in Alaska. Robert Bea, a University of California-Berkeley professor who directs the university's Center for Catastrophic Risk Management has described dispersants and in-situ burning as "primitive". He worked for decades as a risk assessor to oil companies, including BP in the 1990s.

"B" Misinformation Stifles Innovation

The oil industry often makes reassuring, but misleading, statements which help undermine support for innovation. Everybody familiar with the Exxon Valdez knows that twenty years later oil from the 1989 spill can still be found on rocks and in small pools on beaches in Prince William Sound. Some of this oil remains toxic and is still polluting.

In the aftermath of the 2010 BP Macondo blowout, the oil industry published the *JOINT INDUSTRY OIL SPILL PREPAREDNESS AND RESPONSE TASK FORCE DRAFT INDUSTRY RECOMMENDATIONS to IMPROVE OIL SPILL PREPAREDNESS and RESPONSE September 3, 2010*.

This was an attempt to whitewash the ongoing fiasco and it is very self-congratulatory….. *Nonetheless, the current surface oil spill response system--as exhibited in the DWH Incident--continues to be effective.*

It was so effective that the Gulf of Mexico and thousands of lives were wrecked, only 3% of the oil was recovered and only 5% was burned. The dispersants caused an environmental nightmare and coated the seafloor with toxic sludge. This is what Shell Oil and the other oil companies propose for North Slope Borough Arctic waters.

"C" Reality

There have been virtually no oil spills coinciding with sea ice. The biggest so far was the sinking of the cargo ship Runner 4 on 5 March 2006 in the Gulf of Finland, following a collision. The Runner 4 was in a convoy travelling through ice in single file and was rammed in the stern

(*in ice pack the cargo ships can't turn away*). The wreck started leaking both light and heavy fuel oil but this was difficult to detect in the first week due to severe ice conditions. http://www.kirj.ee/public/Estonian_Journal_of_Earth_Sciences/2008/issue_3/earth-2008-3-181-191.pdf

The argument has been made that pack ice will contain the oil and prevent it from spreading. However, this very small 300 bbl spill spread to 500 sq km in only 13 days. *Combating operations only started when the wind pushed the ice floes away and the spill was observed in the open sea areas.* The scientists involved did not at the time understand how the oil had spread so far. Of course, knowing does not alter the fact that an oil spill will quickly get away from the best technology currently available. Even developing high-technology tracking systems does not remove the oil from the sea. All modern oil spill mitigation techniques are incredibly slow and ineffective under most normal conditions.

This spill occurred in the Gulf of Finland in March-April with average winds of only 13 kts and maximum winds of only 26 kts. Air temperatures averaged a mild -5C but in the Beaufort Sea the air temperature averages -20C in March-April. The ice pack in the Gulf of Finland when the collision occurred averaged only 45 cm thick. Conditions in the Arctic are far more severe.

Ten days after the *Runner 4* sank, the oil spill mitigation effort began using 3 very large oil spill skimmer ships, including the ultramodern *ORV Halli*. Working continuously for 5 days, these ships were able to gather up a total of only 90 bbl of oil. Industry predictions for the oil recovry performance of the *ORV Halli* at ship speed of one knot is 5,000 bbl/day. The 3 large skimmer ships each recovered an average of ***6*** bbl/day.

The Finnish Environment Institute concluded that it is possible to respond to *small* spills in ice but much work is required to develop effective response methods for *large* spills in ice. The Macondo blowout was 60,000 bbl/day; many people would say that the *Runner 4* spill of only 300 bbl was a *very* small spill. Three modern oil skimmer ships operating close to home and crewed by oil-in-ice mitigation experts were only able to capture 30% of the tiny oil spill.

Statements have been made that the presence of ice makes it easier to clean up an oil spill because the ice acts like a floating boom and also "preserves" the oil for burning. The *Runner 4* experience shows that this "natural boom" *prevents* the mechanical cleanup of the oil. Since ISB is unworkable in winds over 10 kts and dispersants are outlawed by advanced nations, and *everything* is defeated when the ice is moving, it appears that ice cover is of *no* advantage in dealing with the oil. In addition, oil released in broken ice spreads on the surface along the leads

and openings between ice floes and blocks. These areas are essential for air-breathing animals who will be destroyed by ISB and dispersants.

The oil spill mitigation process for the Runner 4 could only begin when *open* water appeared.

A more recent oil spill in ice occurred February 25, 2011 when the containership *Godafoss* ran aground in Norway. On location, WWF-Norway's Frieda Bengtsson said…. *it's shocking how slow the clean up process is. Two days of snowfall has made it impossible to find much of the oil….* and… *the Norwegian Coast Guard says they are learning how to best clean up the oil as they go. This is the first significant oil spill in ice covered waters in Norway.*

Notice the shredded floating boom

WWF-Norway went on to say…. *Norwegian authorities have attempted to contain the spill, but the presence of ice is complicating the efforts, and currents have spread the oil as much as 100 kilometres up the coast.*

The Norwegians are considered the world leaders in oil spill mitigation. This video shows them cleaning up an oil spill in *mid-summer*, 2009. A small, empty cargo ship grounded and contaminated 200 km of coast with bunker C fuel oil. The little skimmer device costs over $1 million and the big ship costs $75 million. This combination can only function in fairly calm water with almost no ice and current http://www.youtube.com/watch?v=FHqjgmUL-Po . This is what Shell Oil and the other oil companies propose for your waters.

"D" Hubris

In 2011 Shell Oil submitted an Arctic drilling plan to BOEMRE. EarthJustice says …….

It assumes that Shell can recover an unprecedented 95 percent of oil spilled in Arctic water using mechanical containment and recovery efforts (like booms and skimmers), despite the fact that such efforts only recovered 8 percent of oil after the Exxon Valdez spill, and only 5 percent of oil after the Deepwater Horizon spill;

Ignores the fact that the most recent oil spill response drill in the Beaufort Sea described mechanical cleanup efforts in icy conditions as a "failure;" and,

Only plans for a "worst case" spill in relatively warm and ice-free August conditions despite the fact that Shell wants to drill through October, when ice, darkness and bad weather prevail.

This video shows the most recent oil spill response exercises in the Arctic performed under near-ideal conditions in 2000: http://na.oceana.org/en/blog/2011/08/what-if-an-oil-spill-happened-in-the-arctic

The 2010 Report to the President observed, *"The Macondo well blowout can be traced to a series of identifiable mistakes made by BP, Halliburton, and Transocean that reveal such systematic failures in risk management that they place in doubt the safety culture of the entire industry."* Industry responded by saying that their mitigation efforts were very effective (3%).

"E" Secret Weapons

Shell Oil has been flogging the same tired oil spill mitigation ideas since 2007 but regularly talks about *recent advances in technology*. Perhaps they are referring to the recent X-Prize that was meant to develop revolutionary new ocean oil spill technology.
http://www.iprizecleanoceans.org/competition-details/competition-results

Peter Velez, Global Emergency Response Manager for Shell International Exploration and Production, was one of the judges. Unfortunately there was nothing revolutionary about the winners. Team Elastec won First Prize with a variation on disc skimmers which have been around for many decades. NOFI won Second Prize using their Ocean Buster technology which is also decades old. Perhaps the fact that the people running the show were mostly entrenched experts had a bearing on the fact that all the technologies accepted for the contest looked strangely familiar. However, there were some surprises:

Surprise #1:

Here is the winner of the X-Prize. http://www.iprizecleanoceans.org/content/team-elastecamerican-marine-wendy-schmidt-oil-cleanup-x-challenge

The Elastec device rafted together a number of their disc skimmers to make a *giant* disc skimmer. This is sensible but hardly a breakthrough. The testing also appeared to be very easy. The oil was pure and low-viscosity. However, the crude oil in the Macondo blowout was always described as thick, gooey "peanut butter". Will real-world crude oil, like sticky peanut butter, plug up the slim grooves which are apparently the technical breakthrough of the Elastek system?

Surprise #2:

The "waves" were gentle 12" ripples spaced well apart to avoid disruptive motions. They even had to speed up the camera to show that there were, indeed, wavelets present. These gentle wavelets had no adverse effect on the Elastec device. However, will real-world waves, often 6-8 feet high and nasty, disrupt the performance of Elastec's winning device? They will bury it.

Here is the Second Prize winner of the X-Prize: http://www.iprizecleanoceans.org/teams/NOFI
The tiny wavelets caused a significant loss of performance in the NOFI ocean oil skimmer; oil recovery efficiency dropped 20% so it appears likely that real ocean waves will limit its ability.

Surprise #3:

Both winners are open-topped devices subject to free-surface effect so will quickly become ineffective in rough seas. As soon as waves strike them the contents will slosh about, emulsify and escape. Both types of devices were utilized in the Macondo blowout to help recover only 3% of the oil and *all* oil skimmer vessels and devices in the Gulf were defeated by 5 foot waves. In addition, even *very* low ice cover will quickly render them helpless.

Surprise #4:

Both these devices were tested at very slow speeds. NOFI talks about operating at 4 kts but it appears that 4 kts is not a winning speed. One of the reasons that all existing technology fails so spectacularly is because it is all so *slow* and *clumsy* and unable to tolerate even small waves.

It's clear that the *recent advances in technology* that Shell Oil talks about are mere fantasies.

"F" Conclusion

The July 12, 2011 SL Ross report for the NEB, *Spill Response Gap Study for the Canadian Beaufort Sea and the Canadian Davis Strait*, states on Page 15 that ISB is *not* possible in winds over 10 kts, and mechanical recovery and dispersants are *not* possible in winds over 15 kts.

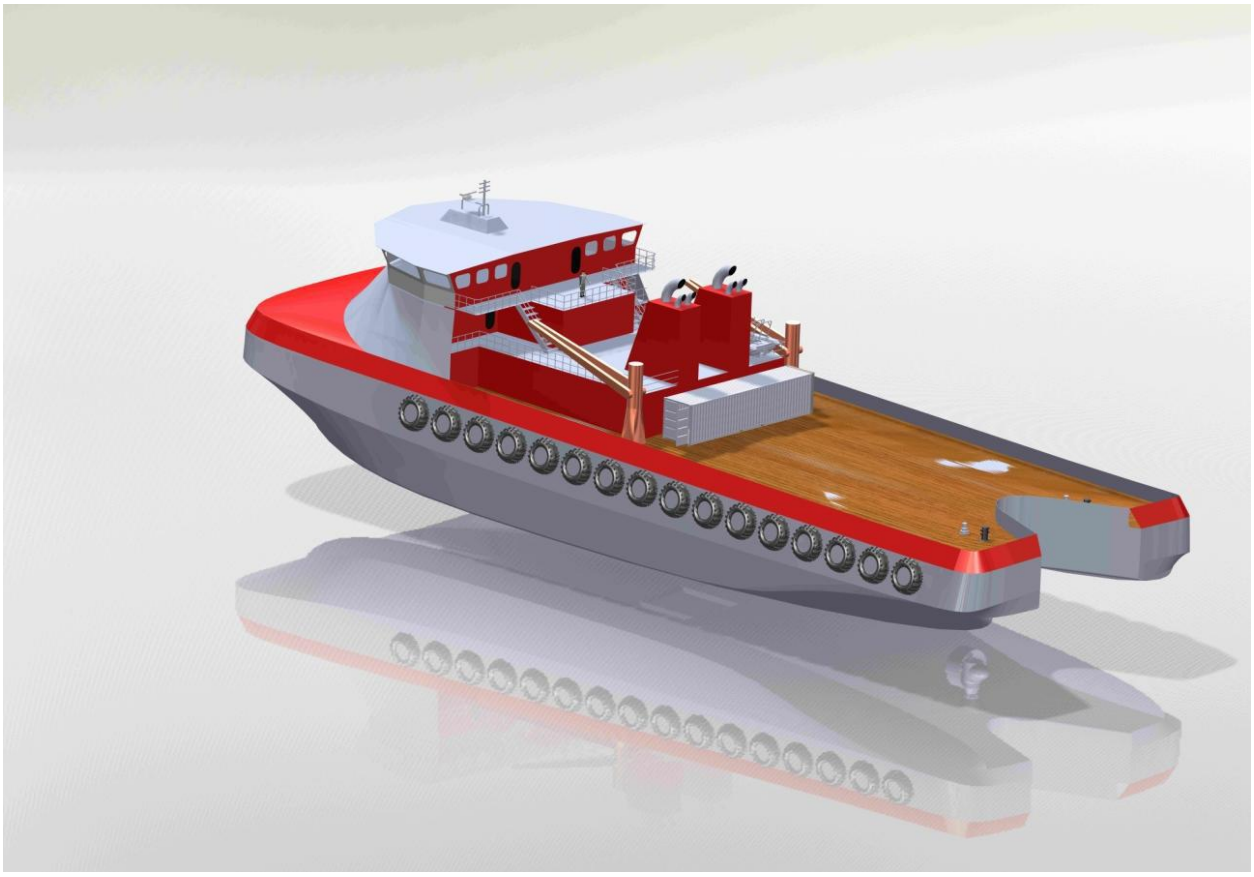
In the Beaufort Sea, from July to September, westerly to northwesterly winds in excess of 20 kts become persistent.[3] This period is when the ice is mobile and most dangerous. The rest of the year the ice is solid and oil spill mitigation is extremely ineffective due to other factors such as cold, darkness and, yes, polar bears. This suggests that the three available mitigation methods (in-situ burning, mechanical recovery and dispersants) are *not* operable most of the year in the Arctic. They accomplished almost nothing in the balmy Gulf of Mexico in the summertime of 2010. The Arctic will be orders of magnitude more difficult.

The key to preventing catastrophic damage and liability in a marine environment is a *very fast* and *effective* cleanup response. This capability does not currently exist.

What is *now* required is the new technology from Extreme Spill Technology (EST). This new oil skimmer technology is getting a great deal of attention in the Newfoundland and Labrador offshore oil industry. The Canadian Coast Guard's oil-in-ice expert, Ron MacKay, calls it the first significant oil spill innovation in 40 years. In 2012 they will be taking delivery of a 40 foot EST skimmer with (limited) ice capability.

In addition EST is working closely with another Canadian company, Spill Green. Their DART spreader system was originally developed by Exxon. The Spill Green product can be deployed with the DART blower mounted on a vessel or vehicle and is perfect for working in ice and saving beaches, marshes and deltas. The non-toxic residue, which floats, can be recovered by a smaller, shallow-draft EST skimmer vessel after the residue has been swept into the water with

water hoses. It can also be left in the environment to turn to dust since it is non-toxic.



Our Polar Ice Class 5 skimmer ships provide effective protection of the land and sea from oil spills. They can be a valuable legacy for the North Slope Borough. Shell Oil can afford them.

Sources:

- RESTCo Inc., Beaufort Sea Project Reprints - http://www.restco.ca/BSP_Reprints.shtml
- SpillGreen Inc
- Shell Oil_Preventing and Responding to Oil Spills in the Alaskan Arctic
- SL Ross_Spill Response Gap Study for the Canadian Beaufort Sea
- Canadian Coast Guard_Ice Navigation_4.2 Ship Handling Techniques in Ice

End notes

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[1] ITOPF Handbook 2011-2012

[2] WWF_NEB_Letter of Comment_Re: SL Ross Report 2011

[3] NRC Canadian Hydraulics Centre_Technical Report CHC-TR-057 - February 2009