



## Mid-scale test tank research on using oil herding surfactants to thicken oil slicks in broken ice



Field deployment tests of skimmers in broken ice conditions, a few years ago, in the Alaskan Beaufort Sea highlighted the severe limitations of conventional oil spill containment and recovery equipment in even trace concentrations of broken ice. In situ burning may be one of the few viable options to quickly remove oil spilled in such conditions. One fundamental problem for the application of in situ burning to oil slicks in moving loose broken ice (less than 6 to 7 tenths) is that the slicks can either be too thin initially, or they can thin quickly preventing effective ignition and burning. If these slicks could be thickened to the 2- to 5-mm range, effective burns could be carried out.

A conventional fire boom will not work in these ice conditions; however, the use of specific surface-active chemical agents, sometimes called oil herders or oil collecting agents, to clear and contain oil slicks on open water surfaces is well known. These agents have the ability to spread rapidly over a water surface into a monomolecular layer, as a result of their high spreading coefficients, or spreading pressures. Small quantities of these surfactants (about 5 litres per lineal kilometre or 2 gallons/mile) will quickly clear thin films of oil from large areas of water surface contracting the oil into thicker slicks.

Preliminary, small-scale testing of herding agents on cold water and among ice pieces has shown promise. In light of the paucity of other viable, high encounter rate oil spill cleanup techniques for broken ice, further testing on the use of herders to enhance the potential for in situ burning is warranted. A recent workshop on Advancing Oil Spill Research in Ice-covered Waters sponsored by the U. S. Arctic Research Commission and the Prince William Sound Oil Spill Recovery Institute included this idea as one of their recommended program areas.

The objective of the present research is to continue studying the use of chemical herding agents to thicken oil spills in broken ice to allow spills to be effectively ignited and burned in situ. The research at the U.S. Army Engineer Research and Development Center's Cold Regions Research and Engineering Laboratory (CRREL) is the first in a series of three tests at different facilities: the other two tests are to be carried out next year at Ohmsett, in Leonardo, N.J., and in Prudhoe Bay, Alaska.

The test program at CRREL involves measuring the effect of the herding agent on oil slicks in various concentrations of broken ice at a scale of approximately 100 m<sup>2</sup>. Test variables include:

- ice cover (10, 30, 50, and 70 percent);
- waves; and
- air temperature.

The research is being funded by Department of the Interior's Minerals Management Service, ExxonMobil, Statoil, AGIP and Shell. The testing is being carried out by an international team of experts to include SL Ross Environmental Research, MAR Inc., CRREL, and Alaska Clean Seas.