CRREL Tests Oil Herding Agents

By Marie Darling, ERDC PAO

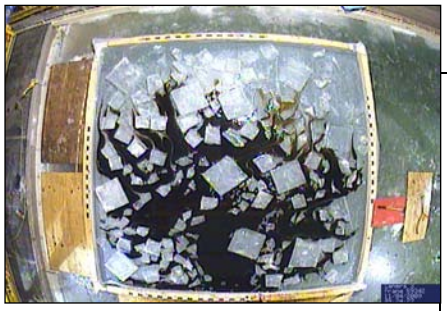
Engineer Research and Development Center's Cold Regions Research and Engineering Laboratory Research Civil Engineer Leonard Zabilansky, in partnership with SL Ross Environmental Research Limited and with support from a major oil company, recently conducted a large-scale oil herder test utilizing CRREL's Environmental Basin.

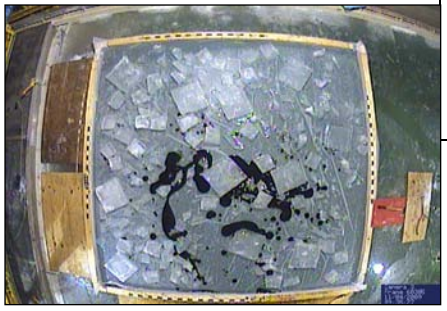
Oil herders are surface-active (surfactant) chemicals dispensed to clear and contain oil slicks on a water surface. Oil will spread on water to 1 mm thickness or less. The objective of a herder is to thicken the oil to 3-5 mm to facilitate ignition and burning in situ in the field. The testing was conducted to determine the efficacy of herding agents to contract oil slicks in specific spill situations where conventional countermeasures have limited effectiveness, i.e., in pack ice; thereby, enhancing marine oil spill response operations. The recent tests experimented with new formulations of herding surfactants at larger scales to find the most effective product.

"What we are trying to do in the basin is to minimize the area and maximize the oil thickness in icy waters once a spill has occurred," said Zabilansky. "Herding agents are another tool in the responder's toolbox that can be used to quickly mitigate an oil spill in ice-infested waters."

The test section was a square shallow pool measuring 17.5 feet on a side constructed on top of the ice sheet with 10 or 30 percent of the water surface covered with 6-inch thick broken ice blocks to simulate a brash ice condition. During testing, the basin's room temperature was maintained just above freezing to avoid formation of ice crystals on the test pool that might interfere with the spread of oil and herding agents.

With the ice in place, Alaskan crude oil was spilled onto the pool and allowed to spread to equilibrium before herding. The herders used in the tests were silicone-based, which had been found in small-scale tests to be more effective than the hydrocarbon-based surfactant used in previous tests at CRREL in 2005.





Images on the left show overhead photos of the pool's Alaskan crude oil contamination before testing (top) and after. Approximately 11 minutes after the herding agent is applied, the oil slick has contracted and thickened. Photos by J. Gagnon.

The test's lead researcher with SL Ross Environmental Research Limited, Ian Buist, begins the oil herding process by placing drops of the silicone-based surfactant with a syringe around the periphery of the pool. Photo by M. Darling

"This is what the facility [Ice Engineering's Environmental Basin] was designed for," said Zabilansky. "We can simulate and conduct a wide range of large-scale environmental tests here to develop confidence in a mitigation technique."

The environmental basin measures 30 feet wide by 8 feet deep and 120 feet long. The room operates at any temperature between 65 and minus 20 degrees Fahrenheit. The basin was designed primarily for large-scale study of the effects of ice forces on such structures as drilling platforms, shore protection systems, bridge piers, and for model studies of icebreaking vessels; however, in recent years there have been an increasing number of non-traditional tests conducted in the facility because of its vast capabilities.

"It's always a pleasure to come to CRREL and work with Zab and his team," said Ian Buist, the test's lead researcher with SL Ross Environmental Research Limited. "They are a very results-oriented group and we always accomplish what we set out to do."