OSRR #1150 BOWHEAD Ice Management System Final Abstract

Oil spill response in Arctic conditions is heavily impacted by ice conditions. Ice is an obstacle to cleaning oil spills from the water surface, and it has an irregular surface that collects oil and must itself be cleaned. Serco, Inc. developed and tested an ice management system, called BOWHEAD, to address the problem of recovering oil in an ice-infested environment. Building on previous projects, BSEE contracted Serco Inc. with a $306,361 contract to develop and refine the BOWHEAD for oil recovery in sea ice. The objective of this project was to test the BOWHEAD2, the next and improved iteration of the BOWHEAD device.

BOWHEAD was designed to assist oil cleanup endeavors in Artic conditions with up to 70 percent ice coverage. It is designed to be towed alongside a larger vessel where oil storage and power can be provided onboard the ship. The system is made almost entirely of stainless steel to withstand the harsh marine and weather conditions. The main body is a large conveyer belt and frame, supported by pontoons. At the forward end of the device is a hydraulic motor-powered frontend feeder that pushes ice towards the conveyer mouth. A spray bar washdown system is set atop a frame over the conveyer belt to clean off the ice as it moves up the conveyer. At the aft end, an ice chute drops the clean ice off to the side and out of the way of the skimmer, which follows behind to collect the oil from the water surface.

Serco and BSEE tested the new BOWHEAD2 in February 2024 at Ohmsett after updates were made following the January and February 2021 testing of the BOWHEAD and implementation of recommended improvements. The objective of these tests was to evaluate the performance of the BOWHEAD2 in simulated arctic environmental conditions to include ice and oil and compare the performance to that of standard recovery techniques currently used for ice-infested waters. The test was designed to follow ASTM Standard F3350-18 (*Standard Guide for Collecting Skimmer Performance Data in Ice Conditions*, 2018) as closely as possible.

Even with some continuing issues with oil flow to the skimmer, the BOWHEAD2 ice management system and a standard disk skimmer performed much better than the disk skimmer alone using traditional tactics. The best recover was seen at the higher speed tests where the BOWHEAD2 recovery had rates in the 70% ice coverage ~10 gpm. This is compared to ~1.3 gpm for the skimmer alone in 70% ice coverage. The report concludes with recommendations for an ideal future design.