Equipment Testing in Ice-Infested Waters:
Recent Experience and Lessons Learned from the Ohmsett Test Facility

Grant Coolbaugh, Senior Mechanical Engineer
Applied Research Associates, Inc. | Ohmsett
gcoolbaugh@ohmsett.com
732-866-7287

Kristi McKinney, U.S. Department of the Interior
Bureau of Safety and Environmental Enforcement (BSEE)
Sterling, VA USA
kristi.mckinney@bsee.gov

Abstract

The Ohmsett wave/tow test tank is one of the largest of its kind, measuring 203 meters long, 20 meters wide, 2.4 meters deep, and containing 10 million liters of saltwater. During its extensive history supporting oil spill response research, Ohmsett has been used to simulate a variety of harsh environments, including those found during winter months, with and without waves measuring up to 1 meter in amplitude. Since 2013, six ice tests were conducted at the facility that led to the development of ASTM 3350-18 “Standard Guide for Collecting Skimmer Performance Data in Ice Conditions.”

This paper serves to highlight the extensive amount of work performed at the Ohmsett facility over the years with respect to testing in ice-infested waters. Primary emphasis is on lessons learned, the challenges involved with performing work in an open-air environment in potentially harsh winter conditions, practical limitations of manufacturing large ice blocks (e.g., in excess of 200 kg in weight), and several potential future enhancements, including those related to personnel safety. For example, during early Ohmsett-based tests, large quantities of ice blocks were procured from an external source hundreds of miles away presenting significant logistical challenges. Those challenges have been obviated during recent test programs by devising a system to manufacture ice on-site in Leonardo, New Jersey through the use of several onsite refrigerated chillers.

Most recently, during the winter of 2021, a test was performed that required approximately 60,000 kg of large ice blocks deployed into the tank over several days to meet a relatively dynamic test schedule. The use of specific equipment that had not been used previously (i.e., a telehandler), made for quick and more effective delivery of the ice from the ground level outside of the wave tank by reaching up directly into the tank where the ice was transferred smoothly to the water’s surface. This new approach resulted in less ice block breakage than experienced during prior tests when a fork truck transfer from the upper deck of the tank was employed.

While ice manufacture is a critical component of testing equipment in the presence of ice, the weather can be an additional concern due to the varying nature of the external environment off the Atlantic coast of New Jersey. For instance, during a test performed in the late winter of 2020, unseasonably warm weather caused ice blocks to melt in the tank faster than anticipated. For the 2021 test, a large-scale industrial chiller was employed to mitigate the potential for warm tank water and to minimize any ensuing ice melt. This large chiller was used to demonstrate that the temperature of the 10 million liters of saltwater could be maintained at -1^{o}C. During the actual test, cold temperatures and a significant

snowstorm provided additional chilling, although the natural slush ice that formed in the tank did significantly delay some of the testing. Additional details associated with lessons learned will be provided.

Finally, a discussion of safety considerations while working in an icy on-water environment where freezing water temperatures exist is imperative. It is important that future researchers are aware of the realities of managing large ice blocks in an oily environment around very cold water. Appropriate planning is essential to conduct work safely. The paper will cover key safety protocols associated with ensuring that no one gets hurt.