Ohmsett Newsletter
Spring 2025

The Ohmsett Gazette

The National Oil Spill Response Research & Renewable Energy Test Facility

Droplet Size Distribution Testing

Researchers from the Bureau of Safety and Environmental Enforcement (BSEE), Dr. Gina Coelho and Ann Slaughter, recently conducted the Surface Water Droplet Size Distribution (DSD) Instrument Evaluation project. The project aimed to assess the deployment and performance of key oil-spill analysis instruments under towed conditions. With the ability to create various sea-state conditions, the Ohmsett facility was the optimal venue for testing the underwater instrumentation.

The instruments evaluated included a shadowgraph camera, LISST Black instrument system, LISST 200X particle analyzer, DO (dissolved oxygen) probe sensor, and Cyclops 7F-O submersible sensor. This evaluation project allows BSEE to better understand how surface water dispersant monitoring, as specified by the NCP SubPart J Monitoring Rule, can be practically implemented with

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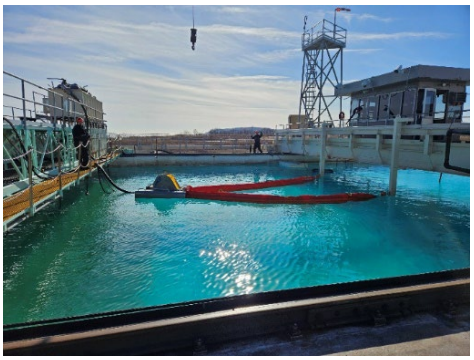
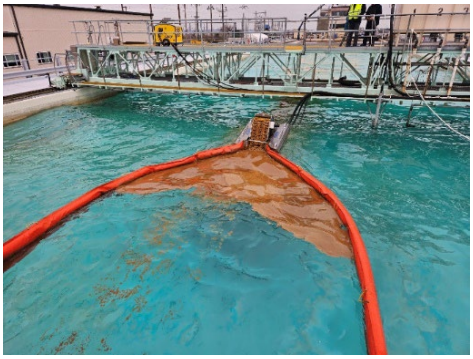
What's Inside

Advancing Skimmer Testing at the Ohmsett Facility: Paving the Way for a New ASTM Standard





Photos of the advancing skimmer test conducted at the Ohmsett facility.

Ohmsett has long been at the forefront of advancing skimmer evaluation, providing a controlled environment that simulates real-world spill conditions. The facility's large-scale wave tank and technical specialty enable testing of skimmers under a variety of conditions, including varying wave heights, sea currents, and diverse types of oils.

As the landscape of oil spill recovery technologies evolves, the need for standardized protocols to evaluate skimmer performance is more critical than ever. The existing ASTM F2709 standard has provided valuable benchmarks for evaluating stationary skimmers, but it falls short in addressing the complexities of real-world spill scenarios, where skimmers must operate under dynamic conditions. To meet this challenge, there is a growing need to develop comprehensive testing methods that assess skimmers not only in calm waters but also under the unpredictable conditions that are typically encountered during oil spill response operations.

BSEE contracted SL Ross (Oil Spill Response Research Project Number 1127) to support the development of a defined, repeatable test protocol for advancing skimmers. A representative skimmer was used for this effort.

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Remote Sensing of Dielectric Fluids

With the proliferation of offshore, electricity-producing wind turbines in recent years, remote sensing capabilities to detect dielectric fluids are being developed.

Dielectric fluids (complex chemical mixtures containing hundreds of primarily semi-volatile, organic compounds) are used as electrical insulators in high-voltage applications such as transformers, capacitors, high-voltage cables, and high-voltage switchgear. These fluids provide electrical insulation, system cooling, and suppression of the corona effect and high-energy arcing. They are primarily organic, hydrophobic, and are often oil based.

To address the concerns surrounding the use of dielectric fluids, BSEE instituted a comprehensive program to define the physical and environmental risks, identify spill potential, evaluate spill mitigation, and develop monitoring technologies associated with the use of these fluids in the marine environment.

In September 2024, a testing program was conducted at Ohmsett that involved evaluating the performance of four commercially available monitoring technologies—visual, thermal, multispectral, and LiDAR (light detecting and ranging).

These monitoring technologies were deployed as an array for remote sensing and mounted on aerial platforms or on a drone. Testing assessed the suitability of each sensor under different conditions and the ability to characterize dielectric fluids floating on saltwater.

Three commercially available dielectric fluids were chosen for testing:

Aerial view of the calibration matrix of known oil thicknesses arrayed on the north deck of the Ohmsett test tank.

Ohmsett staff preparing the calibration matrix.

Envirotemp FR3, Midel 7131, and HyVolt II NG. A crude oil, Hoover Offshore Oil Pipeline System (HOOPS), was included as a candidate test fluid to provide a comparison with a documented petroleum-based oil. The study included variables such as ambient illumination, temperature, and incident angles for imaging of the subject test fluids.

Instrument calibration and initial testing staged on the Ohmsett tank's north deck used a physical matrix of 46 trays with known thicknesses of the candidate oils on saltwater. The instrument package was mounted on the tower building observation deck, adjacent to the calibration matrix, to simulate stable flight (as with a drone) for look-down readings.

The main tests were conducted on the tank where the subject oils were placed in 1-meter-square containment booms. Sensing data was collected from overhead sensors using a mounting jig suspended from a hydraulic deck crane to mimic drone flight.

In addition to aerial detection and characterization of dielectric oils on saltwater surface, discrete scale, subsurface oil plume particle size distribution (PSD) testing was conducted in the Ohmsett high bay work area. An aliquot of subject dielectric oils was mechanically dispersed using syringe injection and mixing into saltwater in approximately 0.6-meter square trays. PSD data was collected using LISST (laser in situ scattering and transmissivity) and fluorometric technologies.

Data from this test program will be used in remote sensing of spilled oil in the marine

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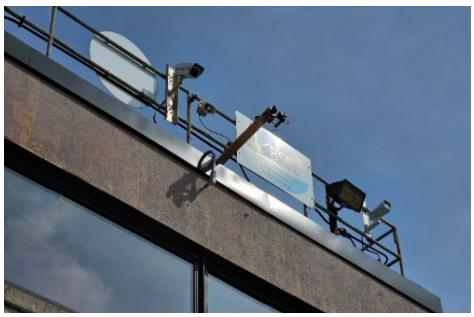

Instrument array mounted on the Ohmsett tower building elevation deck. This arrangement allows for simulated, stable flight look-down readings of the calibration matrix.

Advancing Skimmer Testing

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Testing was conducted in alignment with the ASTM F2709 and F631 guidelines, focusing on how skimmers perform under changing conditions such as fluctuating wave heights and oil types. The results of this test are part of the larger effort to develop ASTM WK90369, a new test method for evaluating advancing skimmers.

Advancing skimming refers to the development of oil recovery systems that move actively toward an oil slick to recover oil from water. Unlike stationary skimmers, which remain fixed in place, advancing skimmers are designed to adjust dynamically to changing spill conditions. These systems—whether skimmers, booms, or related equipment—must be able to adapt to varying environmental factors such as oil viscosity, wave height, and sea currents.

The ability of these systems to perform effectively under unpredictable, dynamic conditions is a key challenge in oil spill response technologies. Whether navigating rough seas, dealing with different oil types, or adjusting to shifting currents, advancing skimming systems must remain efficient in these ever-changing environments.

Data and understanding gained from the 2024 testing contribute significantly to refining existing standards and expanding them to cover both stationary and dynamic skimming systems. By conducting rigorous performance assessments, BSEE and Ohmsett continue to push the boundaries of skimmer testing, ensuring that emerging technologies are evaluated under the challenging conditions they will face in the field. The effort represents a critical step toward advancing the scientific understanding of oil spill response and establishing a standardized protocol that will benefit the entire oil spill response community.

Ohmsett's efforts highlight the critical need for continued collaboration among stakeholders in the oil spill response community. As the field of advancing skimming evolves and new technologies and oil spill response strategies emerge, it is essential that industry leaders, regulatory agencies, and research organizations collaborate continuously to ensure that testing standards keep pace, and skimming systems are ready to respond effectively to future spill events. Through these ongoing efforts, Ohmsett remains committed to advancing oil spill response technologies, developing reliable standards, and supporting the scientific community in its efforts to protect our oceans and waterways.

Droplet Size Distribution Testing

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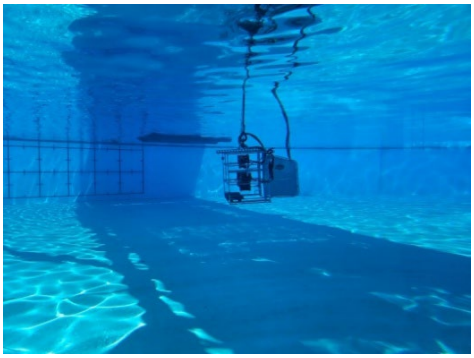
existing technology, with specific emphasis on detection of oil and dispersed oil droplets in depths of 1 to 5 meters. In turn, this provided BSEE Oil Spill Preparedness Verification inspectors with valuable insights into the effectiveness and reliability of oil spill response technologies.

External researchers and Ohmsett staff prepare the instrument rack for deployment in the Ohmsett test tank.

Following this test, BSEE conducted a sea trial to evaluate the performance of their newly designed instrument rack under dynamic towing conditions. Ohmsett Electrical Engineer Paul Katyal provided technical support to the test team helping advance the knowledge gained from Ohmsett mesocosm tests to open ocean testing and instrumentation deployment (with no oil).

The trial assessed the rack's stability and functionality at varying speeds and gathered data on oil spill response instrumentation for greater field efficiency and efficacy. The Towed SilCam from SINTEF and LISST Black from Sequoia Scientific, along with the instrumentation rack, are available for use for enhanced testing including simultaneous detection of droplets and fluorescence. Both instruments measure DSD, fluorescence, depth, and temperature, and can be positioned stationary or towed.



The instrumentation rack is towed through the Ohmsett tank to determine optimal low speeds.

Tower Building Upgraded for Enhanced Client Experience

Soaring over the Ohmsett test tank stands a three-story structure known as "The Tower," which contains an electrical room and a restroom on the first floor and open, flexible use spaces on the second and third floors. Originally constructed over 50 years ago, the facility was recently refurbished to modernize the space and enhance customer experience.

Numerous changes were made to the building during the renovation project. The second and third floors now feature updated finishes, including freshly painted walls and new energy-efficient LED lighting fixtures. The addition of new desks and chairs to the space completes the second floor as a dedicated test observation and office space that enables clients and staff to view testing taking place in the tank. Similar updates were made to the third floor, which now serves as a permanent office space for BSEE staff.

The changes to the tower also reflect Ohmsett's storied history. The second-floor entrance now features a mural depicting the facility's opening day ceremony. As you walk into the room you are greeted by this nostalgic wall mural; by taking a few steps further panoramic views of the tank abound.

The new space for customers in the tower building provides a view of testing in the tank during all seasons and weather conditions.

The conference table on the second floor was constructed using repurposed tank windows removed during the previous refurbishment.

The upgrades will not only lead to more productivity and enhanced usability, but a better overall experience for clients and staff alike. This effort is just one of Ohmsett's projects that have been planned to reaffirm our commitment to providing our customers and the public with modern facilities and state-of-the-art capabilities.

With our conference room and available client spaces, the Ohmsett facility is also an ideal facility to host meetings. Since reopening the tower, Ohmsett hosted a local Federal Lab Consortium (FLC) meeting that allowed valuable sharing of information between local, federal laboratories and test facilities.

Remote Sensing of Dielectric Fluids

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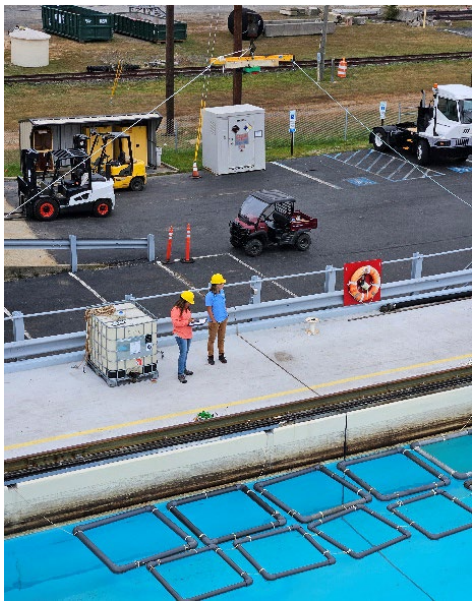
environment to aid in early warning and monitoring, spill trajectory and tracking, fate and transport, and spill response and mitigation.

This key research will help BSEE gain valuable insights into the potential environmental impact of dielectric fluids and address the need for monitoring and spill mitigation techniques. Of note, BSEE and ARA personnel collaborated with naval personnel at Naval Weapons Station Earle, and flights of approved drones are now able to be conducted during testing and evaluation events at Ohmsett.



On the left, overhead flight was simulated using a mounting jig suspended from a hydraulic deck crane for remote sensing.

Enhancing Capabilities for the Future: Preparing for a Major Tank Refurbishment

Ohmsett is embarking on an ambitious tank refurbishment project that promises to enhance its operational capabilities and solidify its role as a world-class testing facility.

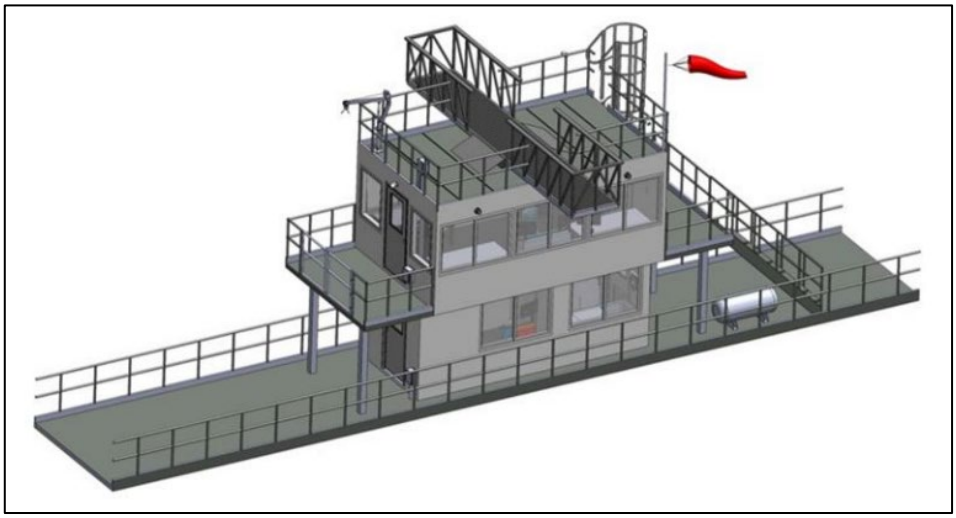
Ohmsett has been a cornerstone of oil spill response research and renewable energy testing since 1974. This refurbishment marks a crucial step forward in maintaining the facility's cutting-edge status while preparing it for future advancements in technology and environmental solutions.

The refurbishment project includes a series of upgrades that will significantly improve the functionality and efficiency of the facility's iconic saltwater test tank—the largest of its kind in North America. The refurbishment project will involve the following enhancements.

Draining the Tank: The tank, which holds approximately 2.5 million gallons of saltwater, will be drained to facilitate the upgrade and repair work. Given the nature of the planned upgrades and repairs, draining the tank is necessary.

Installing New Construction Joints: To maintain the structural integrity of the tank, advanced construction joints will be installed utilizing proven sealant materials. These upgrades are designed to extend the tank's longevity and support rigorous testing conditions while minimizing environmental risk for the facility.

Adding a Main Bridge Control Room: A state-of-the-art, two-story control room will be added to the main bridge. This upgrade will streamline operational workflows, allowing for more efficient management of testing protocols and equipment calibration. Dedicated customer space on the second-floor features fold-down workspaces with abundant electrical outlets to power electronics. The rooftop features a central pulpit that cantilevers over the structure from which sensors can be mounted. The first floor holds mechanical equipment and space for sampling and basic analysis.



A conceptual drawing of the new Ohmsett main bridge control structure.

Upgrading the Bridge Drive System Controls: The bridge travels the length of the tank towing customer equipment and sensors. Modernizing the bridge drive system controls will bring greater precision and reliability to the tank's operations, ensuring consistent performance during testing.

Enhancing the Wave Dampening Beach: The beach, critical for replicating real-world oceanic conditions, will undergo improvements to optimize its functionality. These improvements are expected to provide more accurate wave simulations, further enhancing Ohmsett's research quality. This upgrade aims to achieve faster wave attenuation and quiescence in the test basin, which will allow for quicker testing reset times. This will ultimately allow our customers to complete more test runs, resulting in additional data collection.

Upgrading the Filter System: The tank's filter system, vital for maintaining water quality, will be improved to enhance efficiency and sustainability. This step aligns with Ohmsett's commitment to environmental stewardship and operational excellence.

Refilling the Tank: The final step will be filling the tank basin with seawater from Sandy Hook Bay. With help from the U.S. Coast Guard (USCG), the tank will be filled over the course of a week. Using our upgraded filter system, we will treat and bring the water quality up to the required levels to prepare for upcoming testing and training customers.

The Ohmsett tank reopens in August with a full schedule of testing and training events. This renovation is more than just a maintenance project—it is an investment in the future of oil spill response and renewable energy innovation. By upgrading its infrastructure and systems, Ohmsett will enhance its ability to support cutting-edge research, foster technological advancements, and address global environmental challenges.

As Ohmsett prepares for this exciting new chapter, the facility continues to demonstrate its commitment to excellence, innovation, and sustainability. With these upgrades, Ohmsett is poised to better serve the research community and contribute to the development of solutions that protect our oceans and environment.

Ohmsett Beach Redesign and Retrofit

Since its original design and installation in the early 1970s, the Ohmsett wave damping beach system has served the facility and the oil spill research community well.

Although various materials have been replaced during periodic tank refurbishments, the basic design had not changed until the 2020–21 full tank refurbishment project. During that refurbishment, some changes in geometry and a new lifting system were installed, but no update in quantitative evaluation of beach performance had been performed since that recommissioning.

As required by present-day oil spill response studies, BSEE is funding a redesign and retrofit of the original (or legacy) beach system to improve the scope and repeatability of wave generation.

The overall design goal is to reduce reflectance, the ratio of reflected wave energy to incoming wave energy, under a wider range of usable wavelengths. Specialized steel plates will be installed on the lower panels to augment the wooden stats on the upper panel to dissipate the wave energy so as not to be reflected back into the tank.

The image below shows three of the six beach sections presently in place at Ohmsett. The discontinuous slope due to the concave fold where the upper and lower panels join is currently a major source of reflection. Also note the horizontal wooden slats that function as the surface of the upper beach panels.

The legacy beach was evaluated for energy-absorbing performance by first measuring incoming wave characteristics, then measuring the characteristics of the reflected energy. In addition to evaluating the legacy beach, proposed metal sections with various surface features were evaluated separately with a prototype beach panel to be used on the upper section of a new beach system.

The prototype beach panel was evaluated approximately mid-tank with visual and instrumental monitoring of different surface configurations.

Armed with information gained through literature searches and visits to other wave-producing test tanks, as well as the test data obtained in the legacy beach and prototype beach panel tests, the team proposed an initial design for the new beach system.

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A profile view of the existing beach configuration.

Beach Redesign and Retrofit

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Construction of the new beach system is scheduled to be completed during the tank refurbishment period.

The planned beach retrofit and improvements will greatly enhance the Ohmsett facility's ability to provide reproducible waves of greater bandwidth and improved fidelity of waveform. The upgraded beach design will now allow for comprehensive hydrodynamic data for analysis, design, and production.

These improvements reflect Ohmsett's commitment to serving as the premier oil spill test facility for many years to come.

Left: Monitored test wave breaking on the legacy beach in the Ohmsett wave tank.

Right: Test wave breaking on the prototype beach panel with serrated surface features.

Ohmsett

Oil Spill Response Research & Renewable Energy Facility

The *Ohmsett Gazette* is published biannually to update our readers on testing, training, and research activities at the facility.

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Prototype Testing Solutions

Think Tank. Think Answers. Think Ohmsett!

Prototyping is an important step in new product development for oil spill technology, marine energy systems, and blue technology. Whether it is to explore new designs or refine existing technologies, Ohmsett can assist in testing for maximum results in performance, survivability, autonomous operation, maneuverability, and sensor integration.

In the relatively controlled and repeatable test environment of the outdoor wave tank, developers have access to expertise and tools for scaling new technology and validating engineering expectations under varying flow, position, and load conditions.

- Full-scale testing with oil
- Skimming systems
- Containment boom & barriers
- Sensors
- Wave energy converters
- Protocol development
- Controlled marine environment
- Accurate and reliable results

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