Ohmsett Newsletter
Fall 2022

The Ohmsett Gazette

The National Oil Spill Response Research & Renewable Energy Test Facility

Ohmsett Tank Refurbishment is Completed

After almost eight months of refurbishment activities, the Ohmsett facility came back online in May. The monumental undertaking involved many moving parts and took a small village to complete all the tasks.

Before the tank could be drained, the basin water quality was tested to ensure it met the New Jersey Department of Environmental Protection discharge standards. Once the discharge permits were issued, the draining began.

Did you ever wonder how long it takes to drain and fill 2.6 million gallons of salt water from the enormous Ohmsett tank? Depending on the pumping rate, it can take between three to six days with draining and filling 24 hours a day!

"While the tank water was draining, a considerable amount of monitoring took place to make sure the in-line filter system could keep up with the high flow rate, all while maintaining the needed water quality," said Tom Coolbaugh, Ohmsett program/facility manager.

The Ohmsett tank was drained in July 2021 for scheduled maintenance. After extensive concrete repair, new seals and viewing windows, and a new epoxy coating, the tank was refilled and ready for customers in May 2022.

With the test tank completely drained the three bridges, rails, wave generator flaps, and wave damping beach were removed by crane to provide full access to all the components of the wave tank, including the concrete tank itself. This access allowed for a range of structural integrity evaluations of the entire tank and all the other components for the first time in nearly 50 years. A baseline was developed to measure any future potential structural issues related to the steel-reinforced concrete.

As part of the maintenance, the bridges were cleaned to bare metal to prepare for structural repairs and improvements, before receiving a new epoxy coating system with a colored top coat. The existing coating of the interior of the test basin was removed by high-pressure water blasting and grinding operations to ensure there was a smooth surface so a new durable epoxy coating could be applied. The coating helps preserve the concrete and allows for easier cleaning. Tick marks and grid patterns were painted on the east wall of the tank to provide visual references during testing. New rubber seals were

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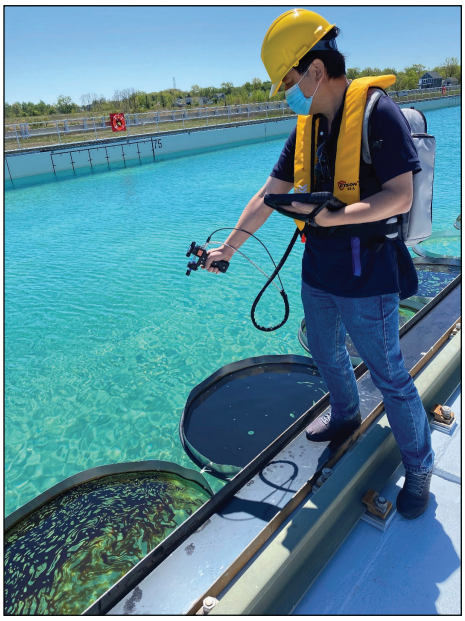
What's Inside

Technology to Detect and Measure Floating Oil

Over the past several years, NOAA's Office of Response and Restoration has led a multi-partner research initiative to test technologies for floating oil detection. In the final phase of testing, a collaborative research team conducted experiments at Ohmsett May 9-13. These were the first experiments conducted at the tank since the completion of the eight-month facility refurbishment. Pre-testing experiments took place at Ohmsett before COVID-19 shut down the facility in October 2020.

The multi-agency research team included the Coastal Response Research Center, students from the University of New Hampshire, the Oil Spill Recovery Institute, scientists from the Bureau of Safety and Environmental Enforcement, the Environmental Protection Agency, and the United States Coast Guard. They designed experiments to evaluate the capabilities of various technologies such as multispectral and thermal sensors, radiometers, light attenuation devices, 'dip plates', tube samplers, and sorbent pads to characterize the oil.

"The oil spill researchers used remote sensing tools and sampling devices to advance the ability to 'see' and measure floating oil, to determine oil slick thickness, and patchiness, and to calculate how much is on the surface of the water," explained Dr. Lisa DiPinto, senior scientist for NOAA's ORR.



Dr. Chuanmin Hu from the University of South Florida collected data to support estimates of surface slick thickness from the test rings using a radiometer.

Prior to testing, students from UNH assembled oil containment test rings constructed with aluminum flashing to prevent splashing over and under the rings. Additionally, Ohmsett staff worked with UNH students to create weathered and emulsified Hoover Offshore Oil Pipeline System oil specifically for the experiments

During testing, an array of the floating rings was arranged on the water surface to contain slicks of oil in known quantities. Individual technologies were then deployed to determine the ability to detect, characterize and measure the floating oil. "Each vendor ring arrangement was different for each experiment on each day. Vendors did not know the type of oil or weathering prior to testing" explained Nancy Mandsager, manager, UNH Coastal Response Research Center.

According to DiPinto, the information gathered during the experiments will help responders understand the particular strengths of different technologies based on the controlled test results. "The findings of these studies will be used to support spill response and assessment activities such as fate and transport modeling, exposure assessments, and oil volume estimates."

Ohmsett Welcomes Junior Electrical Engineer to the Team

We are pleased to announce the addition of Paul Katyal, junior electrical engineer, to the Ohmsett team.

Paul started with us as a summer intern working on upgrading, troubleshooting, and setting up instrumentation, as well as updating the LabVIEW automated test and measurement software.

As the Ohmsett Junior Electrical Engineer, Paul will be responsible for data acquisition and work within LabVIEW to create data captures for measurements.

Paul holds a Bachelor of Science degree in Electrical Engineering from Pennsylvania State University College of Engineering, School of Electrical Engineering.

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Tank Reopened

installed in the expansion joints by the Ohmsett staff, along with six new windows on the west side of the tank.

With everything completed by the middle of April, the Ohmsett staff, with the assistance of the U.S. Coast Guard's Atlantic Strike Team, worked around the clock to refill the basin with water from Sandy Hook Bay. The brackish bay water was shocked with chlorine, salt was added to raise the salinity to open ocean levels, and the water was filtered to make it clear.

"The Ohmsett staff and all the various contractors dealt with the challenges presented by heat, hurricanes, snow, and ice to make sure that BSEE has a wave tank that will be in good shape for the future," Coolbaugh said.

In-line Oil Recovery Efficiency Sensor Could Improve Response Operations

Five years ago, Battelle Memorial Institute of Columbus, Ohio began developing a prototype oil Recovery Efficiency Sensor for use in offshore oil spill response, processing, and transport. The RE Sensor was designed to measure oil content in seawater within the pipe used to mechanically transport recovered fluid during oil spill recovery operations. It could potentially help responders recover oil more efficiently during a response operation by providing valuable, real-time information on the amount of oil actually being recovered; a method that currently is not available in their response tool kit.

In 2018, BSEE funded phase 1 of Battelle's field tests at Ohmsett (Gazette, Fall 2018). Since then the sensor was enhanced with the goal of improved accuracy across the entire range of oil concentrations. "It also includes the ability to account for air in the recovered fluid, the addition of wireless communication, and packaging of the system for easy deployment and use," explained Kristi McKinney, BSEE program manager.

The Battelle team led by Senior Research Scientist Dr. Slawek Winecki, returned to Ohmsett in June 2022 to test how well the enhancements improved the sensor's function by measuring the percentage of oil in an oil/water mixture at multiple flow rates with multiple oil types. "The Battelle team realized the importance of a realistic testing approach that can only be carried out at the Ohmsett facility, specifically, testing at large flows," Winecki commented.

For the project, Ohmsett staff designed and fabricated the test apparatus for the flow sensor to be tested with oil and water. It consisted of a transparent pipe and test stand to accommodate the flow sensor. The test apparatus, configured with equipment, and collection tanks were installed on the main bridge of the test tank.

Ohmsett Engineering Technician, Allen Cannone configures the test stand and collection tanks on main bridge

Ohmsett Test Engineer Alan Guarino and Battelle Senior Research Scientist Dr. Slawek Winecki, discuss the Recovery Efficiency Sensor and data collection.

For each test, the fluid flow rate and oil/water concentration were brought to a steady state. Once a steady state was achieved, the sensor measured the percentage of oil concentration for the specified measurement time which provided an average oil concentration. The fluid was then collected and analyzed in the onsite laboratory for oil concentration and comparative purposes.

"While the tests showed that the sensor's algorithm needs a correction for changing of oil-water flow patterns for different total flows and oil types, the Ohmsett tests were successful and informative," Winecki stated. "Importantly, the raw sensor data collected at Ohmsett, while analyzed at Battelle, indicated that an effective correction is possible and can be implemented into the sensor with a minor software modification. The current RE sensor hardware, the ruggedized tablet PC with its user interface software, wired and wireless communication between both units, and the extremely efficient battery-based operations all work as designed and don't require further development."

MPRI Dispersant Effectiveness Project

A variety of options in a responder's tool kit is vital when combating operational challenges during a spill incident. One such option is dispersants. However, there is an ongoing debate over their effectiveness especially when the oil is weathered and/or photo-oxidized.

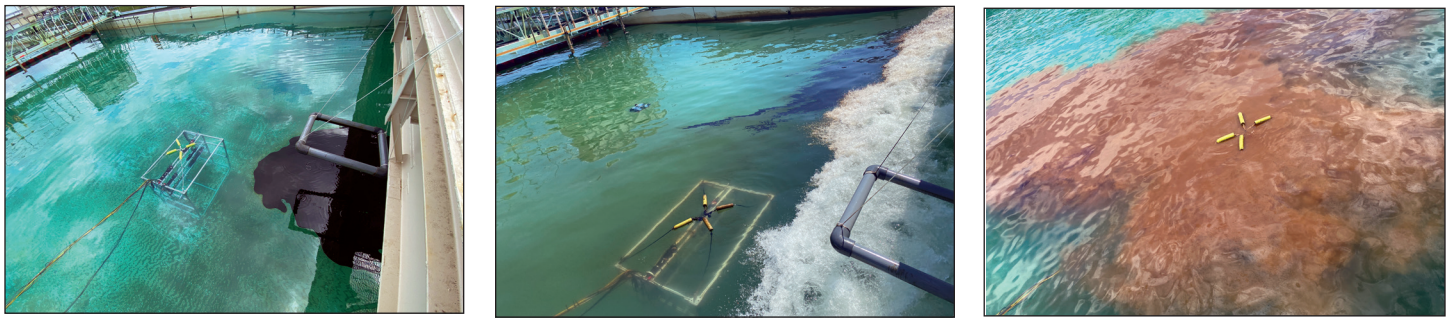
To evaluate dispersant effectiveness in these scenarios, a New Jersey Institute of Technology team led by Professor Boufadel conducted a full-scale chemical treatment analysis of weathered and photo-oxidized Hibernia crude oil at the Ohmsett facility for two weeks in July 2022. Results from this experiment could provide valuable information for responders in implementing contingency plans. The project was funded by the Canada Multi Partner Research Initiative.

The purpose of the project was to capture wave hydrodynamics and crude oil dispersion characteristics using test oil of that were weathered or photo-oxidized to different degrees. The Ohmsett staff assisted with the weathering of the Hibernia oil in advance of the tests. This was accomplished by conducting "in-shade" weathering of 5% and 20% mass loss using heat and air sparging, as well as using outside weathering in natural sunlight and ambient conditions to achieve 20% photo-oxidized weathering.

During the tests, the wave generator was programmed for a plunging breaker at a specified location while the oil slick was contained in a four-foot by four-foot frame. "Dispersant was then applied at a dispersant-to-oil ratio of 1:20. For cases applied to 20 Liters of oil, 1 Liter of dispersant was applied. For cases applied to 5 Liters of oil, 0.4 Liters of dispersant was applied," explained Ruixue Liu, PhD student at NJIT. "The oil was released from the boom when the breaker reached the slick."

A total of 15 test runs were conducted in which the researchers collected oil droplet size, oil concentration, and wave measurements. "The oil droplet sizes were measured by the shadowgraph cameras, and optical laser diffraction instruments. The holographic camera from Johns Hopkins University was also utilized. The oil concentration was measured by fluorometers (Cyclops C7 and SeaOwl) which read the emission from the Hibernia oil. The water velocity was measured by an acoustic doppler velocimeter. The ultrasonic sensor available at the Ohmsett facility was used to measure the water level," Liu said.

Professor Michel Boufadel, Director at Center for Natural Resources NJIT, shared "We built on prior dispersion experiments by us and various groups to closely quantify the dispersion effectiveness in the experiments. The results provide an important link between the lab and the sea results. Close interpretation of the results should help bridge the gap between laboratory and sea experiments."



An oil slick was contained within a boom, dispersant was applied to the slick, then the oil was released from the boom when a breaking wave reached the slick.

U.S. Coast Guard SMART Training

After several years of hiatus due to COVID-19 and attendance at in-person training put on hold, hands-on training sessions resumed this summer at Ohmsett.

The U.S. Coast Guard returned with their Oil Spill Response Technician Training the weeks of July 25 and Aug. 1, 2022, with a new curriculum. Based on the National Strike Force qualification requirements, USCG personnel received training on spill recovery equipment, pumping and transfer operations, Special Monitoring of Applied Response Technologies, and decontamination.

Each five-day training session included classroom instruction, after which, the students were divided into groups rotating through a series of equipment stations. The stations increased their knowledge of setting up oil spill recovery equipment, and dispersant application and monitoring systems in the Ohmsett tank.

NOFI Current Buster Optimized for Speed and Higher Waves

The NOFI Current Buster is a high-speed oil containment systems technology that has been a staple for spill response organizations for many years. Manufactured by NOFI AS, Norway, the Current Buster line of technology has been an important contribution to oil spill contingency systems.

The Current Buster 4, developed for use in coastal areas, particularly in ocean currents, experienced continuous use during the 2010 Deepwater Horizon spill. Observations from this event and minor improvements implemented over the years enabled the NOFI team to garner numerous performance details that led to a total redesign of the system.

"From 2016 to 2019, a total upgrade of the NOFI Current Buster 4 was performed," stated Dag Nilsen, NOFI research & development manager. "While keeping the weight, storage volume, front opening, and operation mode, the upgraded version is optimized in every detail. The results are the ability to operate at a slightly higher speed and in slightly bigger waves. A debris stopper is included to reduce the challenge of debris possibly clogging the pump or skimmer. Problems with snagging the net on the seafloor while deploying the system are almost eliminated. Valves that automatically open and drain the separator reduce intake time, and the oil storage capacity of the separator tank is increased."

The upgraded Current Buster 4 was tested at sea without oil under the observation of DNV, an international accredited registrar and classification society. These tests indicated the system could collect oil at a maximum speed of 4.4 knots. To verify the system is able to collect different types of oil that speed and in waves, NOFI, along with AllMaritim AS and QualiTech Environmental Inc. conducted comprehensive testing on the upgraded Current Buster 4 at Ohmsett in early June this year.

The NOFI Current Buster 4 runs through tests with three types of oil to validate and varify its ability to collect oil at 4.4 knots with and without waves.

During the week-long evaluation, the Current Buster 4 was tested with three types of oil with different viscosities; Hydrocal 300, Calsol 8240, and Diesel. The system, rigged between the main and auxiliary bridges, was towed at speeds from 2 to 4.4 knots in both calm water and with waves to determine the optimal speed for oil recovery.

"This is the fifth time the technology has been tested at Ohmsett, but many of the tests are old. This test will again validate and verify the ability of the technology to efficiently clean up nature after a spill," commented Nilsen.

Oysters Get Their Day in the Bay

For 10 years, the New York/New Jersey Baykeeper raised juvenile oysters in four large aquaculture tanks under one end of the Ohmsett tank in a project to expand the New York/New Jersey living shoreline. Their research provides valuable information on how to best improve coastal resiliency using natural infrastructure while increasing habitat for estuarine species. In August, the oysters reached maturity and were introduced into the local bay. In celebration of the event and the anniversary of the project, the NY/NJ Baykeeper staff, volunteers, and guests christened an oyster castle.

Training Takes the Learning From the Classroom to the Ohmsett Tank

For more than 25 years, Ohmsett has partnered with Texas A&M National Spill Control School to offer hands-on Oil Spill Response Strategies and Tactics training for the response community. This year was no exception with a class being held during the week of Aug. 8, 2022; however, the course was conducted by the new NSCS Director, Dr. Tim Gunter.

"As the number of medium and large oil spills has decreased over the last 10 years due to industry prevention investments, facilities like Ohmsett where students can participate in hands on training is critical to maintaining readiness," commented Gunter. "It's a great honor to represent that National Spill Control School at the BSEE Ohmsett facility. We have one very important thing in common, both are listed in the Oil Pollution Act of 1990."

During the training session, 17 participants gathered to learn decision-making and responder skills essential for efficient oil spill response and recovery operations. It created an opportunity for discussions on spill operations, while the attendees networked to maintain and enhance professional relationships.

Starting with classroom instruction, the focus was on recent developments in the science of oil spills and response operations. These included: current guidance on dispersants and surface cleaning agents; guidance on in-situ burning; special considerations in fast water response; and remote sensing.

The participants then went out to the Ohmsett test basin where they observed oil behavior, containment strategies, and recovery demonstrations using various skimmers. The hands-on tank exercises provided them with the opportunity to take turns operating a skimmer to collect real oil from the test basin. As a bonus, Ohmsett staff conducted a dispersant demonstration where the participants could see first-hand how dispersant, when applied to an oil slick, breaks the oil down into droplets that move into the water column where biodegradation could take place in an open ocean environment.

During the Texas A&M Unviersity National Spill Control School Oil Spill Strategies & Tactics training session, attendees practiced hands-on skimming operations in the Ohmsett tank, as well as SCAT training at a local beach.

Additional hands-on training included a field trip to the New Jersey beaches to conduct Shoreline Cleanup Assessment Technique training. "Students put into action the shoreline assessment theory instruction from the NOAA Shoreline Assessment Manual as part of the course curriculum," Gunter said.

Future Environmental Leaders Visit

We had the pleasure of hosting the Spill Control Association of America's Future Environmental Leaders Committee. The committee is responsible for developing and engaging young response professionals for networking within the industry and for the sustainability of the association.

Sixteen members of the committee, along with SCAA Committee Chair Brian House and Outreach Director, John Allen, toured the facility and the test tank. They were able to view a skimming exercise and saw the wave generator in action while getting a ride down the tank on the main bridge. Facility Manager, Tom Coolbaugh led the tour and gave presentations about Ohmsett and dispersant application and use.

Developing New Test Protocols for Advancing Oil Recovery Systems

Over the years, oil spill recovery organizations have used the Effective Daily Recovery Capacity to evaluate the cleanup capacity of skimming systems. However, as new and upgraded technology is added to the responder toolbox, the EDRC is considered inadequate for calculating oil spill equipment needs. As a result, the Estimated Recovery System Potential was developed to incorporate factors not accounted for in the EDRC.

Test protocols used to evaluate systems for the EDRC do not provide the data needed for the new ESRP. As such, experts in oil spill recovery operations identified a need to develop a defined, repeatable test protocol for advancing skimmer systems with the intent that the protocol results can provide inputs that align with those required by the ERSP. In leading the protocol development, BSEE funded SL Ross Environmental Research, LTD of Ottawa, Canada to investigate and review existing criteria and develop a new test method.

Recently, BSEE hosted a working group at Ohmsett with spill response industry stakeholders to develop an Advancing Containment and Recovery System test method that can be used with the ERSP calculator. "In this initial workgroup meeting, we discussed key aspects of the protocol," said Kristi McKinney, BSEE program manager. "One of the many great outcomes of this meeting was the definition of exactly what types of systems we want this test method to cover."

During the working group, Ohmsett Senior Test Engineer Alan Guarino led a discussion on the Wendy Schmidt X-Prize Challenge and other approved advancing skimmer tests conducted at the facility over the years. Additionally, Facility Manager Tom Coolbaugh guided the participants on a tour of the facility discussing the capabilities for testing skimming systems, as well as other technology for spill response, marine renewable energy conversion, and the Blue Economy.

While the test method is being developed for use at the Ohmsett facility, the development team will consider the capabilities of other large-scale tank facilities to maximize the protocol's applicability for use elsewhere.

According to McKinney, the team anticipates having a protocol ready for testing by November 2023. "This should provide adequate time to socialize it within the ASTM F20 committee, seek comments and input from stakeholders, and iterate the protocol multiple times based on stakeholder inputs."

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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Welcome Back!

Ohmsett is now open with a fully refurbished test tank!

With the focus on concrete and steel repairs, new coatings designed to reduce residual oil on the tank surfaces, and general infrastructure improvements, we're excited to share what you can expect when testing and training at the facility.

- Innovative oil confinement spray system to corral oil or floating test platforms in the center of the tank
- New ports through tank walls at various locations for sensors or other equipment
- Upgraded vacuum system for enhanced water quality management
- New epoxy coasting on tank walls and bridges for ease of cleaning and long-term structural protection

We're open to support your testing and training needs. Call today to schedule your project! 732-866-7183.

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