

The Ohmsett Gazette

The National Oil Spill Response Research & Renewable Energy Test Facility

ARA Awarded Ohmsett Contract

Ohmsett is a national research asset within the Department of Interior's Bureau of Safety and Environmental Enforcement (BSEE). The test facility provides a unique environment for the development and testing of new oil spill response technologies, assessing spill prevention, response methods, and providing oil spill response training and for ongoing developments in marine renewable energy.

In August, Applied Research Associates, Inc. (ARA) was selected by the BSEE to operate and maintain the Ohmsett facility with an effective date

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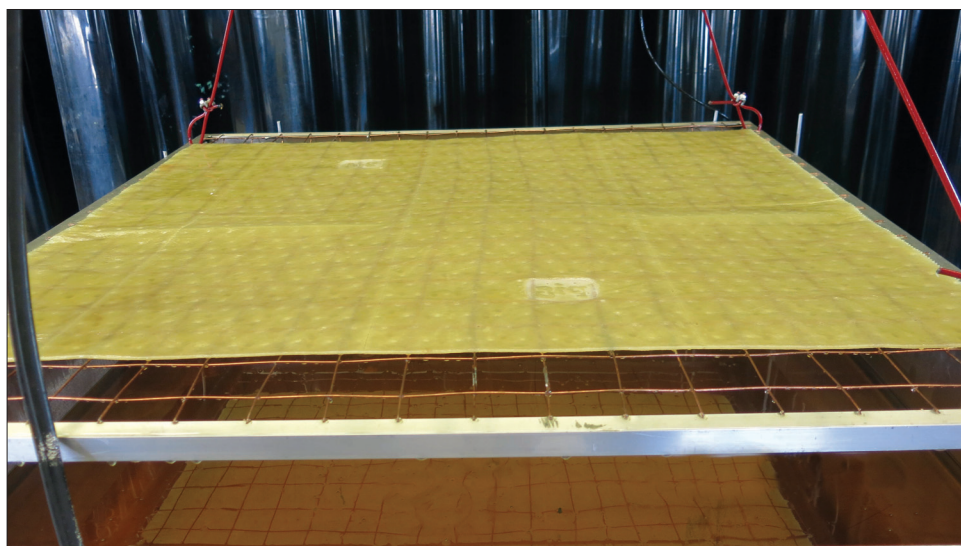
Testing the Methods of a Full Scale Sorbent Protocol

When it comes to sorbent products, it has been reported that the industry lacks a recognized test protocol for the performance evaluation of full or meso-scale sample sizes. There is the ASTM F726 Standard Test Method for Sorbent Performance of Adsorbents for use on Crude Oil; however it is a laboratory scale standard used to evaluate 6 cm x 6 cm samples and is not scalable to full scale testing.

To address the lack of testing

standards, the Bureau of Safety and Environmental Enforcement (BSEE) and the Ohmsett staff conducted an evaluation of a preliminary adsorbent test procedure the week of June 30, 2018. During the evaluation, the staff experimented with various test methods and sorbent materials to assess their performance which will aid in developing a standard test protocol that is repeatable and is proven to be

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A support rack was designed to provide consistent handling of the sorbents where there would be minimal contact with the sample, it has the ability to support the sample horizontally, and includes a weight measurement device.

Sorbent Test Protocol

accurate.

“This project is a prerequisite to create a formal full-scale adsorbent test protocol being developed at Ohmsett. We are exploring various testing methods to quantify performance characteristics of sorbent pads, mats, sheets and roll style sorbents,” said Dave DeVitis, Ohmsett test director. “The primary objective was to identify physical characteristics of sorbents for evaluation that correlate to successful performance when in field use.”

“The protocol will help manufacturers and users quantify performance and possibly classify sorbent products in the future – from this effort and other experiences it’s safe to say all sorbents are not created equal.”

The first step was to design a support rack that provides consistent handling of the sorbents where personnel would have minimal contact with the sample, has the ability to support the sample horizontal, and includes a weight measurement device. Designed and fabricated on-site by Ohmsett personnel, the result was a lightweight aluminum angle frame with wire mesh within the open frame where the sorbent sample would be placed. To obtain tare and test weight measurements, a high accuracy load cell and data logger was used. A second tray and support rack was fabricated with the addition of a controllable motion table to explore sorbent performance and acceleration of tests with the presence of surface energy.

Three different test methods were conducted with the sample sorbents; Support Rack Weight Study, Sorbent Maximum Oil Capacity, and Sorbent Water Uptake. The three oils used during the series of testing were diesel, Hydrocal 300, and a commercially available hydraulic fluid.

During the support rack weight study, seven tests were performed to determine if the oil adhering to the

support rack after being submerged in the oil bath affects weight. Each test was performed twice where the support rack was submerged in an oil bath and then pulled from the test oil after two minutes. Once the initial dripping stopped, the rack weight was stable and measured. In between tests the support rack was washed and dried. “The repeat values were found to be consistently within 0.01 pounds for the respective oil types,” explains DeVitis. “The net value of oil adhering to the support rack was found to be incrementally higher with increasing viscosities but insignificant to the gross weight measurements.”

The protocol development will include input from industry experts with the end goal of it becoming an ASTM F20 recognized test method.

“When conducting the sorbent maximum oil capacity study, 12 tests were performed using the three oils and two different sorbent products to evaluate the validity, repeatability, and characteristic of the proposed maximum oil capacity test method,” said DeVitis. “We also explored the concept of ‘Point of No Dripping’ and corresponding hang times.”

Oil baths two inches thick were created which provided an inch of oil above the support rack. In each test a 36-inch square sorbent sample was placed on the support rack and a

combined weight was recorded. The support rack was then lowered to the bottom of the temporary tank and the sample was allowed to float freely on the oil surface. After a defined contact time the sample was lifted out of the bath at which point the staff recorded the hang-time changes in the gross weight and observed for point of no dripping.

Sorbent water uptake tests with oil were performed to determine if the sorbent sample will recover water with oil when the volume of oil available is less than the capacity of the sorbent sample. After being in the oil bath for one hour, the sample was raised and the weight of the oil adsorbed was recorded at one minute intervals and continued until the point of no dripping.

Further development of the test methods and subsequent test standards will continue. “This effort focused on a few of the higher priority quantifiable performance attributes namely maximum oil capacity, water uptake and oil retention. There are various other important characteristics worthy of quantifying such as tear strength, puncture strength and buoyancy,” commented DeVitis. The protocol development will include input from industry experts and become another testing capability for the Ohmsett Facility with the end goal of becoming an ASTM F20 recognized test method.

Why test to the ASTM Standards?

End users need a methodology to provide standardized test parameters when collecting performance data. Standardized test methods and results assist manufacturers and other stakeholders to verify and accurately report performance for the selection of equipment. Ohmsett uses ASTM standards for all oil spill equipment evaluations.

Organic Oleophilic Spill Mats

For 15 years Adsorb-oil Technology, based in Argentina, has produced products used for the prevention of oil spills for the upstream oil industry. The products have protected the soil and underground water during the perforation process of oil wells and other operations such as workover, pulling and fracking. Due to the oil sorbent capacity of the products and its ability to float, Adsorb-oil recently developed sorbent mats designed for use on land as well as on water for cleaning up spills.

The light weight mats can be deployed effortlessly and pre-staged under equipment work areas and oil platforms. The large mats can be easily joined at the perimeter hem to create a continuous barrier rugged enough to work on.

Imported by Ambere of Dubai, UAE, the organic oleophilic spill mats are primarily manufactured from processed and sterilized bird feathers that have the inherent ability to effectively adsorb hydrocarbons and petroleum products. “This characteristic makes our sorbent retain the contaminant, allowing our product to be manipulated and transported without the risk of oil being released, and thus spreading contamination to other places,” said Jose Piccinini, Ambere’s Chief Executive Officer.

With its limited use on water, the Ambere team wanted to test, analyze and further develop Adsorb-oil spill mats for spill remediation. Performance testing of the sorbent mats

was conducted at Ohmsett May 29 – June 1, 2018. The study was designed to evaluate the quantitative attributes of the product while adsorbing two different types of test oils; diesel and HOOPS weathered crude oil.

“We wanted to confirm what we know about the product’s properties at a well-known and globally accepted institution so we can present the results to international clients,” said Piccinini. “Secondly, we wanted to look for any weaknesses of the product in all conditions we tested it, and work to improve them.”

Using the preliminary adsorbent test protocol being developed at Ohmsett, full scale tests were performed in a boomed area in the basin to demonstrate the deployment of large scale mats onto a controlled spill scenario; followed by demonstrating the retrieval process, and finally by quantifying recovery effectiveness.

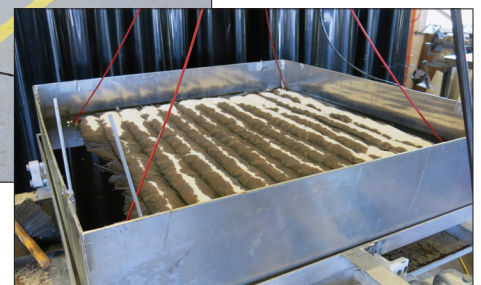
Additionally, small scale sorbent tests were performed within 1 meter²

trays under various test parameters such as test duration, exposure to oil and water, and oil only.

“We are very happy with the professionalism and the intensity of the tests. We agreed to perform some other tests along the way as we discovered they were needed to get a deeper understanding of other aspects of the product,” commented Piccinini. “Testing was a very objective and powerful tool to refocus our attention to some critical aspects of the manufacturing process of the product. Some results were as expected; others were very revealing in exposing some weaknesses of the product that we need to tackle. Overall the testing at Ohmsett was a fantastic and very useful experience for us. We will come back when we rethink and modify the sorbent for retesting.”



Full scale tests were performed in a boomed area in the basin to demonstrate the deployment of large scale organic oleophilic spill mats onto a controlled spill scenario.



Small scale tests were performed with the support rack where the organic oleophilic sorbent was exposed to oil and oil/water.

Sensors and Algorithms to Estimate Oil Slick Thickness

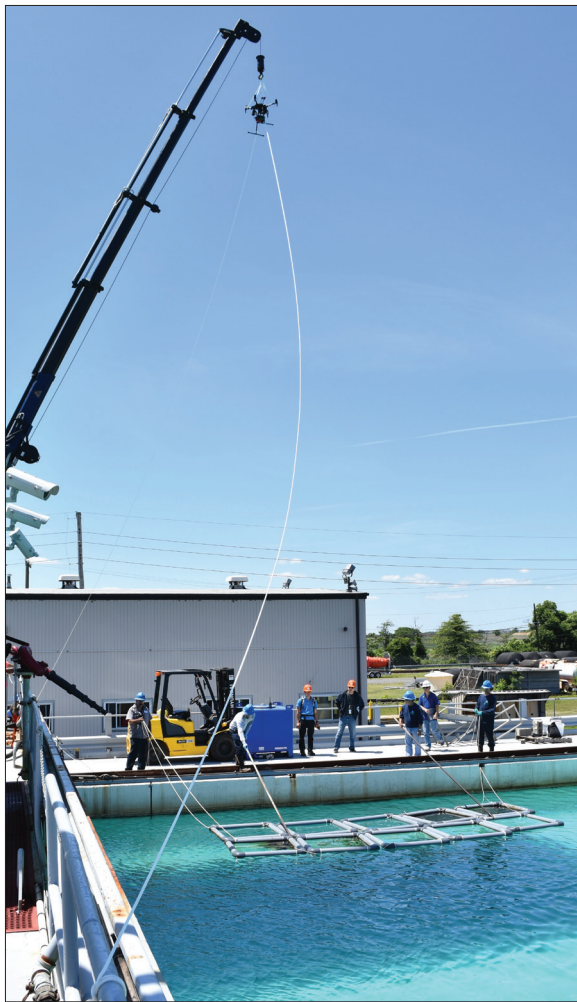
In 2016, Water Mapping, LLC developed and tested a unmanned aerial system (UAS) rigged with thermal and high resolution cameras at Ohmsett during a National Oceanic and Atmospheric Administration (NOAA) and Bureau of Safety and Environmental Enforcement (BSEE) project to evaluate remote sensing platforms to characterize oil thicknesses. Since then, they have added multiple channels to be able to see different oil signatures resulting from different oil characteristics.

“During the 2016 evaluation, we had a thermal and R-G-B channels. Our current configuration now uses an array of sensors covering from UV to Long Infrared. There are no commercial multispectral sensors suitable for an UAS [Drone] platform that covers all the wavelengths that we were looking for,” said Dr. Oscar Garcia-Pineda, director at Water Mapping. “We had to complement our multi-array of sensors with four different cameras that had, in total, 10 independent channels set with different radiometric resolutions to retrieve from UV reflectances to near infrared, as well as thermal emissivity and calibrated temperature.”

During testing that took place the week of June 13, 2018, Water Mapping brought the new multispectral array system to evaluate its near real time classification algorithm to produce quantitative thickness classifications of the oil on salt water. Simultaneous direct physical measurements were used for proofing,

including oil to water ratio and oil thickness using the Water Mapping Oil Sampler (WM-OS), underwater video, and a hand-held field radiometric spectrometer.

Prior to testing, Ohmsett’s certified divers placed a black tarp on the bottom of the tank to replicate the dark background of the ocean. Suspended from the crane located at the side of the main bridge, the drone was positioned at a suitable altitude to capture a grid of



The multi spectral array system was mounted on a drone. Suspended from a crane, the drone was positioned to capture a grid of square targets containing various oils and oil emulsion thicknesses.

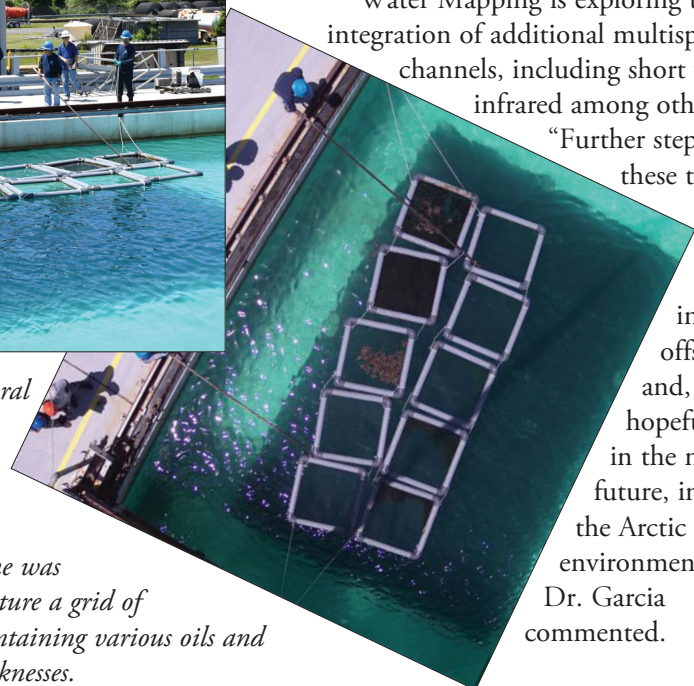
square targets containing various oils and oil emulsion thicknesses. “We created grids of 1x1 meter squares where we mixed oil, emulsions, and sargassum to mimic what we observe in the field, and imaged the oil as it was progressively emulsified,” said Dr. Garcia.

Additionally, the team tested a Remotely Operated Vehicle (ROV) which collects water samples of the underwater oil plume. “The ROV has the ability to broadcast real-time fluorometry levels that are related to oil dissolved on the water,” explained Dr. Garcia. “We also validated our measurements using our Water Mapping sampler for physical thickness measurements. This sampler was tested for thicknesses from thin sheens to thick oil emulsions.

According to Dr. Garcia, with the analysis of this data, they will test their near real time oil thickness classification algorithm in the field soon. “We look forward to advance the TRL of this system that will offer rapid classifications of oil thickness levels that could be delivered on near real time to oil responders.”

Water Mapping is exploring the integration of additional multispectral channels, including short wave infrared among others.

“Further steps of these tests



include offshore and, hopefully in the near future, in the Arctic environment,” Dr. Garcia commented.

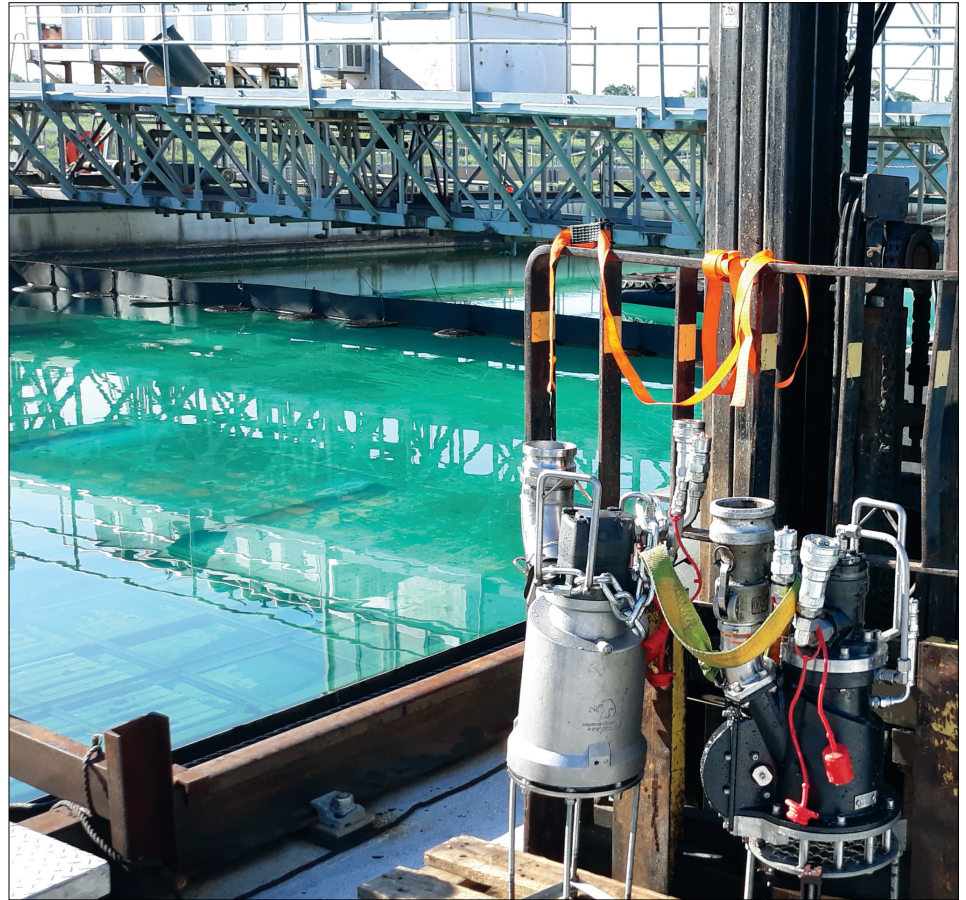
Pumping More Fluid With Less Energy

While working on a skimmer that is able to separate water from oil as well as recover micro plastics from the sea, the engineers at SEDOSR Engineering S.L. decided to design an Archimedes' Screw pump that could pump more fluid with less energy, and not only work with their skimmer and its particular requirements but also with other skimmers. The result after three years of research and development was the SEDOSR Pump One 300 and the SEDOSR Pump One 750. Both feature a one-piece modular sealing disc that connects to the Archimedes' screw; a new concept that has reduced the number of pump cavity internal moving components to only two.

"The sealing disc is made of VITON rubber coated stainless steel. Thus maintenance and cleaning is easier," said Juan Altarriba, CEO and technical manager for Sedosr. "High quality materials have been used in manufacturing the SEDOSR PUMP ONE; stainless steel AISI316, PTFE (teflon family), and bronze. We have also used the latest coating technologies to reduce friction on moving parts, reducing energy consumption, and to enhance cleaning."

To test their pumps performance, the SEDOSR team came to Ohmsett the week of July 16, 2018. "Our main objective at Ohmsett was to test our pumps in a world-wide known institute, with different fluids in order to better understand our pumps behavior, its functioning parameters, and its improvement points," said Altarriba.

Testing took place in the Ohmsett oil storage tank farm. The test set up allowed for multiple applications; an inline transfer pump, a skimmer pump, or for this test series, a submersible pump. The pump was placed into a dedicated source tank attached to an instrumented discharge manifold to record pressure and fluid temperature data in addition to providing flow



The SEDOSR Pump One 300 and the SEDOSR Pump One 750 feature a one-piece modular sealing disc that connects to the Archimedes screw for pumping more fluid with less energy.

restriction control. Three stock refined oils varying in viscosities were used during testing; Hydrocal 300, Calsol 8240, and Sundex 790. Hydraulic power was supplied by a 100 hp prime mover able to provide 2500 psi maximum pressure and a maximum flow rate of 53 gpm. A control stand was used to regulate hydraulic flow to the drive motor using an adjustable stop allowing for fine adjustment to maintain a constant flow during tests.

Pump performance was quantified while transferring each of the test oils through a range of discharge pressures, from an open discharge to a severely restricted flow condition. LabView data collection included pump flow rate, discharge pressure, hydraulic pressure, hydraulic flow and fluid temperature throughout the testing. "With all this

data we got our pumps performance curves and obtained confirmation of something that we already sensed; we have great pumping capacity and low energy consumption," said Altarriba.

The next steps for the SEDOSR team will be to develop a bigger pump, greater than 60 m³/h, and start mass production. They plan to proceed with several product certifications. According to Altarriba, the first pumps will be supplied to clients in early 2019.

"Spending a week working hand in hand with the staff of Ohmsett has enriched us technically and has allowed us to better understand the operation of our pumps. Undoubtedly, an experience that we will repeat in the future," commented Altarriba.

In-line Recovery Efficiency Sensors to Enhance Response Operations

The primary goal in spill response operations at sea is to recover as much floating oil as possible. When using a skimmer to remove oil from the water surface, if not operating in ideal conditions, it could recover large amounts of water along with the oil. This often results in the temporary storage tank for recovered fluids filling quickly, consequently halting response efforts.

Imagine how the response operations could improve if the responder knew how much oil was actually being recovered. That was the focus of the Bureau of Safety and Environmental Enforcement (BSEE) and Battelle Memorial Institute research project to develop a recovery efficiency sensor that could be installed in-line between the skimmer and the storage tank. “Utilizing a Recovery Efficiency Sensor during response operations can give a responder valuable, real time information on the amount of oil that

is actually being recovered,” said Kristi McKinney an engineer for the Oil Spill Preparedness Division of BSEE. “If the responder is recovering mostly water, he/she can make a decision to stop the skimmer and collect a thicker layer of oil prior to continuing recovery, thus minimizing water collection and maximizing the available temporary storage.”

According to McKinney, this project was identified as a result of testing a commercially available sensor for a separate BSEE project. “In testing the commercial sensor it was clear that oil/water measurements were not accurate once the oil percentage dropped below 70%. BSEE wanted to support the development of a low cost sensor that would maintain accuracy across the entire oil/water range, operate well in various salinities, and not require calibration for oil type.”

During the week of June 4, 2018, a prototype Recovery Efficiency Sensor

was evaluated at Ohmsett to determine how accurately it was able to measure the oil/water ratios when tested with multiple oils, multiple water salinities, multiple flow rates, and across multiple oil

concentrations. For this particular test, the prototype was fabricated to be installed in-line with a 4-inch diameter recovery hose. However, the technology is adaptable to other hose diameters.

Sixty tests were performed using a recirculation loop filled with known quantities of oil and water. Two different refined oils were used during these tests; Diesel, a low viscosity oil and Hydrocal, a medium viscosity oil. Throughout the tests, the sensor measured and recorded the oil fraction as a function of time. For each test performed, the recorded data was plotted as a function of time and the average oil fraction was calculated. Fluid samples were collected and analyzed in the Ohmsett oil/water laboratory to provide comparison data.

“The test results were very promising with this Phase I prototype. The sensor was able to conduct relatively accurate measurements across the entire oil/water spectrum and in both salinities tested,” commented McKinney. “Testing identified areas where improvements could be made to the sensor.”

“This was a very technically stimulating project, particularly enhanced by Ohmsett staff leadership in designing the testing setup, its construction, and seamlessly carrying out the tests. Battelle would also like to thank BSEE for sponsoring the project, its programmatic oversight, and technical expertise. We look forward to the next phase of this fruitful collaboration,” said Slawek Winecki, Battelle’s scientist and principal investigator for this project.

After all results are analyzed, BSEE will work with Battelle to determine how the sensor could be enhanced to further improve accuracy of measurement.



Battelle Memorial Institute developed a recovery efficiency sensor that could be installed in-line between the skimmer and the storage tank that measures, in real time, the amount of oil that is being recovered.

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ARA Awarded Contract

of September 1, 2018. Under the new contract, ARA will support BSEE in creating an environment to advance oil spill response science and technology innovations, as well as other applications for the unique test facility.

“As a focal point for the oil spill response community, the research conducted at Ohmsett influences the many important aspects of spill response technology development,” said Len Zabilansky, ARA program manager for Ohmsett.

ARA is an international research and engineering company with a broad range of technical expertise in defense technologies, civil engineering, computer software and simulation, systems analysis, environmental technologies, and blast testing and measurement.

“With a quick transition from the incumbent to ARA, the facility has maintained uninterrupted operations while the staff continues to work with customers to develop test plans and schedule their time in the tank,” said Zabilansky. “Customers will be pleased to see the familiar faces of our knowledgeable and skilled technical staff.”

During this contract period of one base year and four option years, ARA will be instrumental in managing the five year refurbishment project scheduled for the summer of 2020. During this time, the tank will be drained, seals replaced, surfaces pressure washed and painted, as well as other maintenance tasks. For more information about the facility, and to discuss potential projects or schedule tank time, please contact Len Zabilansky at 732-866-7183 or email lzabilansky@ohmsettnj.com.



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

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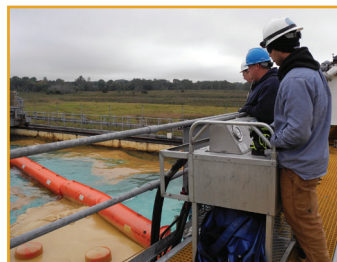
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Oil Spill Response Strategies & Tactics Training

May 14-17, 2019
August 6-9, 2019



Ohmsett, in partnership with Texas A&M National Spill Control School, offers the hands-on training course you can't afford to miss! You will learn the strategies and tactics for successful spill response operations.

Course Topics:

- Fates & effects of spilled oil
- Oil skimmer & containment boom selection, use & recovery strategies
- Factors affecting oil spill movement
- Incident Command System (ICS)
- Shoreline Characterization (Introduction to SCAT)
- River & tidal inlet strategies
- Hands-on skimmer operations
- Responder safety
- And More!

When:
May 14-17, 2019
August 6-9, 2019
8:00 a.m. - 4:00 p.m.

Where:
Ohmsett
Leonardo, NJ USA

Phone: 732-866-7286

www.ohmsett.com



Test with oil. Train with oil.

Book your Test Today!

Now is the perfect time to evaluate new designs, prototypes, or to test the efficiency of your oil spill equipment against a wide range of controlled conditions in a marine environment.

ARA will be preparing Ohmsett for the five year refurbishment project scheduled for the summer of 2020 when the tank will be drained for maintenance tasks.

Schedule your testing projects now before the tank goes offline for refurbishment in the Summer of 2020!

Facility Capabilities:

- Independent and objective testing
- Measurable & repeatable test parameters
- Full-scale testing and research with real oil
- ASTM Standards testing
- Chemical treating agents and dispersant effectiveness
- Emulsion formation
- Oil recovery in broken ice
- Evaluation of remote sensing systems
- Hands-on oil spill response training

**Don't miss your tank time!
Contact us now to schedule your test.**

Interested in testing before the scheduled refurbishment in 2020? Contact
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