Oil Spill Response Research & Renewable Energy Test Facility

The Ohmsett Gazette

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Creating Waves in the Test Basin

What is a perfect wave? For the Ohmsett engineering staff, it is one that is verifiable and repeatable for a consistent baseline of testing. In order to ensure the quality standards of wave making capabilities are comparable with each and every test scenario, the staff conducted an analysis of the waves created in the Ohmsett test tank. The primary objective of the study was to create a table which correlates wave height and wavelength with user input settings.

How do we make a perfect wave? Over the years, significant changes and upgrades have been made to the wave making system. It was converted from a flywheel system to a computer-controlled hydraulic cylinder system that uses a touchscreen Human Machine Interface (HMI). The touchscreen is a more efficient way to program custom wave settings and to control the wave system from both the main bridge and the control tower. Additional changes in the system capabilities include a higher working range of the wave flaps, increased horsepower, and the ability to make setting

Continued on page 2

What's Inside

Large-scale Warm Water Dispersant Comparison

During oil spill response operations, there are many technologies that can be used to mitigate the spill. One of the technologies is dispersants, which is used to break down the oil into smaller droplets that readily mixes with the water where it is broken down by natural processes. As new dispersants enter the market, their performance has yet to be studied at a large scale.

During two weeks in October 2015, the Bureau of Safety and Environmental Enforcement (BSEE) conducted a comparative study on the performance of five commercially available dispersants at Ohmsett. These dispersants were: Corexit 9500, Finasol OSR 52, Accell Clean DWD, Marine-D Blue Clean, and ZI 400.

"The goal was to conduct repeatable, large scale tests to obtain performance data about each product," said Tim Steffek, Petroleum Engineer for BSEE. "The study compared the performance as measured by Dispersant Efficiency (DE) and the size distribution of dispersed oil droplets in the water column."

Testing consisted of conducting three tests per dispersant on HOOPS Blend, a Gulf of Mexico oil from ExxonMobil, in the Ohmsett test tank. Conducting three tests per dispersant minimized the random effects of changes in weather, human error, and property changes of the tank water and the oil from varying external conditions.

For each test run, an oil slick was created on the water's surface in the test tank. The dispersants were then applied to the slick

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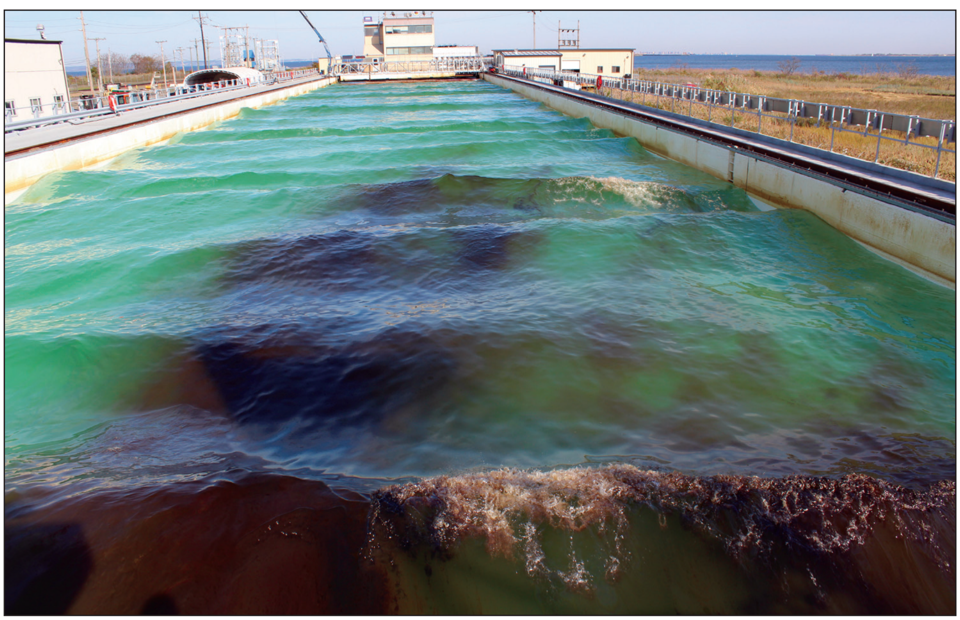


The Bureau of Safety and Environmental Enforcement conducted a large-scale comparative study on the performance of five commercially available dispersants at Ohmsett.

Dispersants

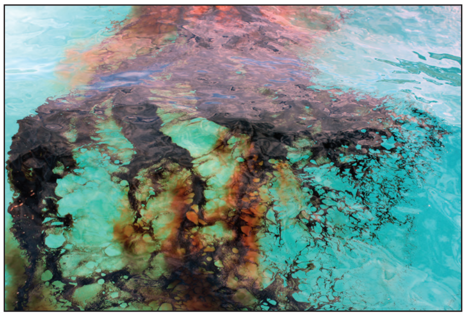
Continued from page 1

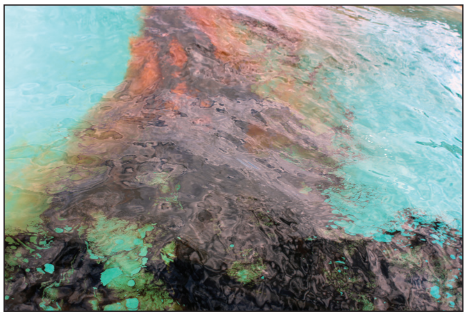
using Ohmsett's spray bar, which simulates a boat spraying system. The data collected included dispersant effectiveness which is based on the volume of the surface slick that remained at the end of the test run, as compared to the volume dispersed into the water column. In addition, droplet size distribution was measured using a LISST particle size analyzer mounted to the main bridge.

"These tests were not meant to fully replicate any specific environmental or operational conditions or determine dispersibility of the specific oil. They were meant to provide up-to-date performance data of the products in pseudo-field conditions," Steffek explained. "Operational performance was also captured as a general discussion in relation to the ease of use, limitations, and concerns during operations."

The results from the study will aid BSEE and other federal agencies in their decision making regarding dispersant use on the U.S. Outer Continental Shelf. "If it is shown that a specific oil and dispersant combination is most effective, the oil spill response plan could incorporate those findings," commented Steffek.

"As oil spill response organizations look to replenish stockpiles with alternative dispersant products, they could be tested in a similar fashion. Also, select dispersants could be tested on a large scale at Ohmsett on oils from new fields."





An oil slick was created on the water's surface in the test tank. The dispersants were then applied to the slick. Performance was measured by Dispersant Efficiency and the size distribution of dispersed oil droplets in the water column.

Waves

Continued from page 1

changes more quickly.

With these enhanced capabilities, a thorough analysis of wave characteristics versus computer input settings was conducted. For three weeks in February 2016, the engineers took on the task to correlate the wave generator settings for sine and harbor chop waves to the actual wave conditions in the test tank.

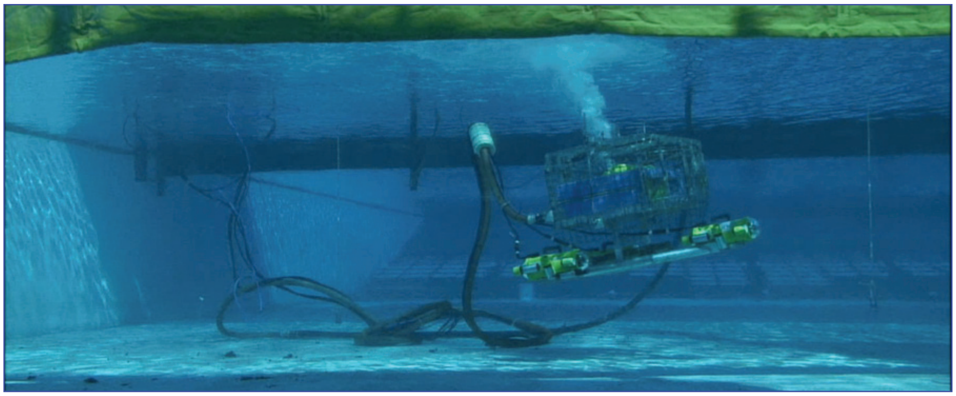
After establishing a data acquisition protocol, testing involved the full operating range of the wave generator system, such as the available flap stoke range and the cycle per minute operating speed. To capture wave data, the staff used ultrasonic distance sensors, a data acquisition panel, and wave analysis software. With this data, the engineers were able to compute significant wave height, average wave height, wave period, and wavelength of each wave setting performed.

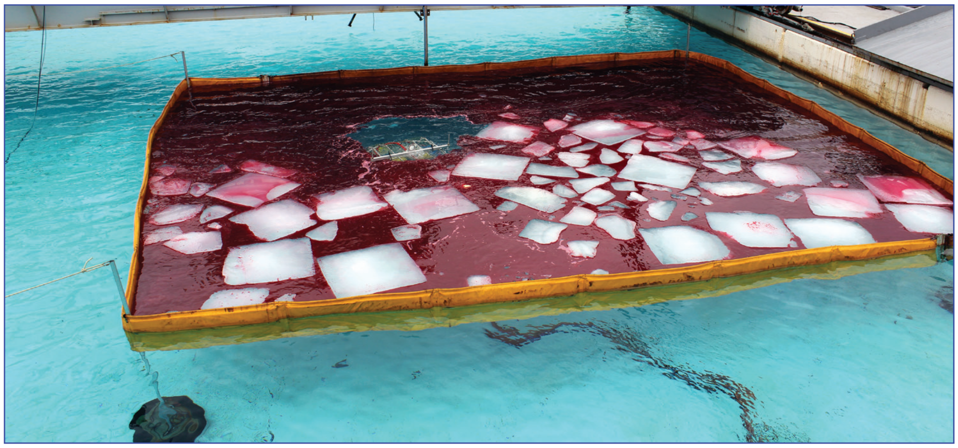
Once the data from the study is analyzed, the staff will develop a table that correlates the wave characteristics with the user input settings. The table will be used as a reference when programming wave generator settings to provide waves best suited for customer's needs.

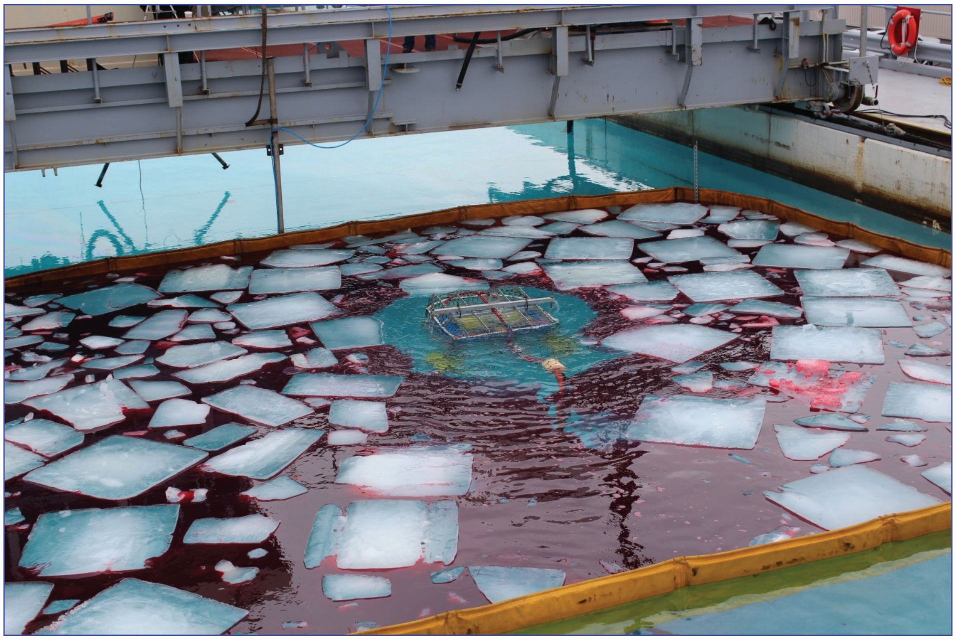
A study of the waves created in the Ohmsett test tank will enable the engineers to create a table which correlates wave height and wavelength with user input settings.

ICEHORSE: A Submersible Skimmer

Picture this: a skimmer is deployed under the water and it surfaces among oil and ice to recover the oil. It's hard to imagine, isn't it? However, for the Bureau of Safety and Environmental Enforcement (BSEE), this vision is on the road to becoming reality. As part of a project to develop a new approach to how oil skimmer technologies are deployed in ice-infested waters, this technology could potentially improve the response industry's ability to remove oil from otherwise inaccessible locations.







In 2014, BSEE funded Alion Science and Technologies of New London, Connecticut to develop a submersible skimming system that can be deployed from a vessel and maneuvered underwater to the location of the oil. Alion developed a prototype system based upon their concept, using off-the-shelf components.

During the first week in February 2016, Alion came to Ohmsett to test this prototype system in an oil and ice field. The prototype, called the ICEHORSE, consists of a small smoothed drum skimmer and three ROVs mounted to an aluminum frame, with an ice cage to prevent ice from interfering with the oil recovery process.

To simulate the broken ice field the system needed for testing, Ohmsett needed ice. Staff engineers designed and developed a system for producing the ice blocks. Frames were constructed at the facility, and chiller boxes maintained at 0º F were used for freezing and storage. This was a first for Ohmsett, and added to its capabilities for testing in a simulated Arctic environment.

The ICEHORSE was initially assessed on its ability to maneuver, travel speed, thrust, turning radius, and submerging and surfacing characteristics. After those initial tests, ice and diesel fuel oil (dyed red for visibility) were placed in a boomed test area to create a spill within the broken ice. The ICEHORSE, initially located outside the test area, submerged, traveled underwater, and surfaced among the oil and ice to recover the oil. Tests were conducted in 30% and 70% ice coverage.

"The submersible skimmer test successfully demonstrated the concept of operation. The prototype was able to successfully submerge, maneuver under the ice, surface within the field and recover diesel oil," commented Kristi McKinney, BSEE's project manager. "Next steps will be to review test results with an eye towards future development of this concept."

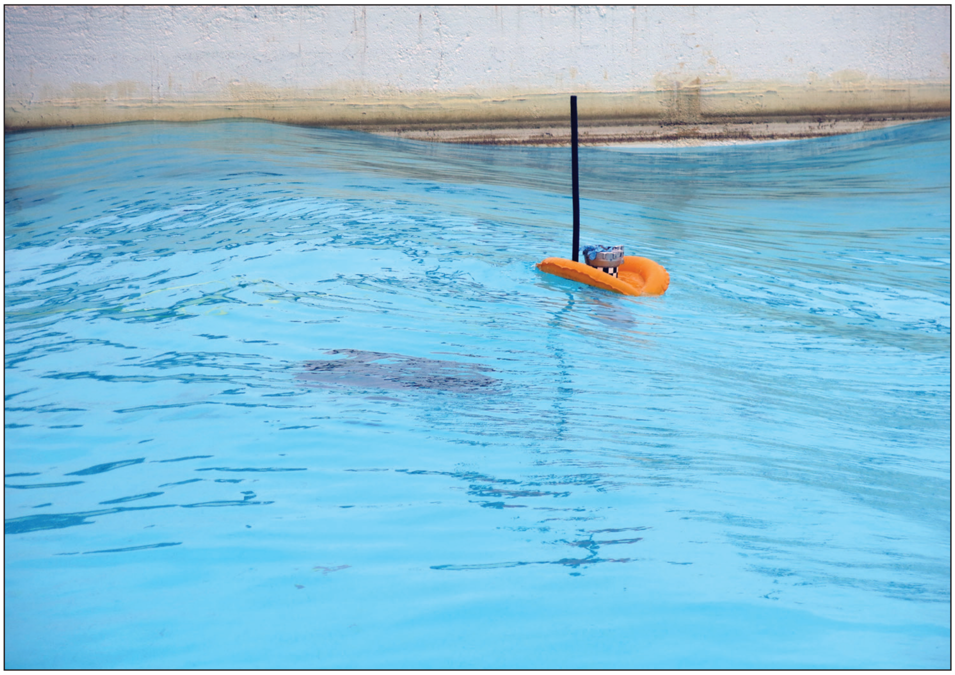
The ICEHORSE skimmer was initially located outside the test area, it then submerged, traveled underwater, and surfaced among the oil and ice to recover the oil.

The Roll, Pitch, and Heave of a Buoy Launch System

Lockheed Martin of Owego, New York is working on a Rapid Acquisition Project to develop a maritime canister-launched Small Unmanned Aircraft System. As part of the development process, several engineers came to Ohmsett the week of November 3, 2015 to evaluate a prototype canister buoy in a marine environment.

The canister buoy is a launch system that includes a floatable radio system and underwater platform that is intended to withstand wave conditions of 1 foot-8 inches to 4 feet-1 inch (Sea State 3). When its mission is completed, it is able to be recovered.

During the week at Ohmsett, several test scenarios were used to gain a better understanding of the roll, pitch, and heave behavior of the system in various sea states, which will help determine the optimal timing for launch. The tests were performed with the canister free floating, moored, and towed in the tank to simulate a current.



A prototype canister buoy for launching a Small Unmanned Aircraft System was tested in the Ohmsett tank to gain a better understanding of the roll, pitch, and heave behavior of the system in harbor chop and sinusoidal wave conditions.

Ohmsett engineers collected weather and wave data for each scenario, while the Lockheed Martin staff collected navigation and accelerometer data for analysis. In addition, a wave analysis was performed to quantify key wave characteristics, which included significant wave height, mean wave height, period, and wavelength for the wave conditions produced.

With the first set of tests, the canister free-floated in the test basin as the wave generator created several sets of sinusoidal waves that varied in wavelength and amplitude. The system was also tested in this configuration while encountering a confused harbor chop wave condition.

During the next set of tests, similar wave and sea state conditions were repeated; however this time a scaled mooring system was used to tether the canister in place at the bottom of the test basin.

The final set of tests involved tethering the canister to an extension off of the main bridge below the surface of the water. The canister was towed at various speeds to simulate natural ocean currents in calm, sinusoidal, and harbor chop conditions.

Chevron's Comprehensive Spill Response Training

The Ohmsett classroom and test basin were bustling the week of April 18, 2016 as employees from Chevron met for a comprehensive spill response training program. The employees had traveled from Chevron operating companies located in Australia, Scotland, Angola, Nigeria, Canada, and around the United States.

The students were divided into four teams as they rotated through classroom instruction and tank exercises.

Classroom instruction, led by trainers from ConocoPhillips, Oil Spill Response Limited (OSRL), ExxonMobil, Bureau Veritas, and Marine Spill Response Corporation (MSRC), covered multiple topics such as: booming configurations, dispersant use, applications of Shoreline Clean Up and Assessment Teams in tactical decision making, HAZWOPER, air monitoring, equipment selection, and aerial application of dispersant.

"The curriculum in the classroom focused on developing field assignments (ICS 204's) for the different types of response strategies and decontamination procedures that they had experienced over the course of the week," said Holly Osen, Chevron's Emergency Management Senior Advisor.

During tank-side training the students observed an equipment demonstration by MSRC and received hands-on skimming exercises in the tank. "The course focused on exposing Chevron's Corporate Emergency Response Team members to oil spill equipment and gave them hands-on practical experience," Osen explained.

"The Ohmsett staff was able to reference previous industry training packages to find a schedule of training activities to make our week successful. Our group had a fantastic time working with the staff at Ohmsett and using the facility," Osen commented.

Research of Oil and Dispersants on Whale Feeding Filter

Sometimes a research project comes to Ohmsett that isn't typical to the oil spill industry. That was the case when a National Oceanic and Atmospheric Administration (NOAA) led team of researchers came to Ohmsett with three specimens of Mysticete whale baleen to study the possible effects of crude oil, dispersant, and dispersed oil on the baleen.

"Baleen provides the means by which a number of whale species feed. These plates, made of keratin like fingernails, are fixed in the mouth of whales and filter out food items like plankton or small fish, depending on species," explained Gary Shigenaka, a Marine Biologist for NOAA.

Since whales frequently feed near the surface of the water, they can fall victim to the effects of floating oil which can coat the baleen or be ingested during feeding. With very little research to draw upon, NOAA came to Ohmsett in September and October 2015, and January 2016 to conduct an in depth study of the effects of oil on the baleen and its filtering ability.

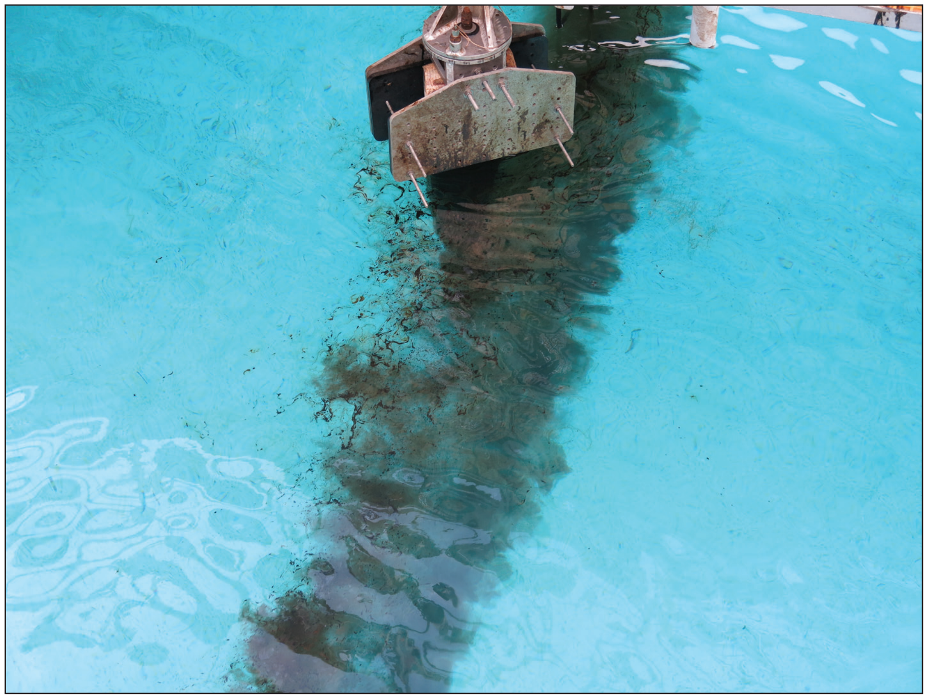
According to Shigenaka, the question has not been investigated since the 1980s when researchers found little effect of oil on baleen. "The objective of the study was to revisit the question of whether and how oil/dispersed oil/dispersant affect the physical performance metrics of whale baleen and to compare differences among species. Because the size and structure varies from species to species, we tested baleen from three different species: Bowhead, Humpback, and Right. The Bowhead baleen was contributed by the Alaskan Arctic community of Barrow from its seasonal harvests, and the other species were stranded on the east coast."

"The study presented a number of challenges, not the least of which was: how do you connect a piece of an animal to the physical structure of the Ohmsett tank?" commented Shigenaka. Engineers from the Woods Hole Oceanographic Institute worked closely with the engineering staff at Ohmsett to design a pivoting mount to hold the baleen and that could be installed on one of the tank's movable bridges.

During the study, the mounted baleen was installed on the auxiliary bridge, while load cells were attached to the baleen to measure the changes in force exerted by the water at different speeds with different treatments on the baleen. When dispersant was used in testing, a LISST collected particle size data to confirm actual dispersion into the water column.

As the bridge moved, a video camera array recorded the movement of baleen plates and fringes, while underwater cameras documented oil, dispersant, and dispersed oil behavior.

"With 127 runs in total, we have a tremendous amount of data to review and then statistically interpret, and this process is underway now," Shigenaka commented. "While the recent spill in the Gulf has shown us that effects of oil on marine mammals can be complex and debilitating, we are hoping that this experiment will indicate whether whale exposure to oil and dispersants while they are feeding should be added to our list of concerns."



NOAA researchers came to Ohmsett with three specimens of Mysticete whale baleen to study the possible effects of crude oil, dispersant, and dispersed oil on the baleen. The specimens were attached to a pivoting mount installed on the auxiliary bridge and exposed to oil, dispersant and dispersed oil.

360º Surveillance for Oil Spill Detection

Working with oil companies to improve technologies for the detection of oil spills, ISPAS of Norway developed an Oil Spill Detection (OSD) radar with enhanced capabilities. Due to its high range resolution, electronic steerable antenna, and 360º surveillance, the ISPAS OSD radar can detect an oil spill in calm water and waves.

In 2009 ISPAS entered a competition for new technology and was awarded a proposal to develop the OSD radar that has the ability to identify an oil spill on calm sea surface. "This is generally a problem with the technology today, that you need waves in order to detect oil spills on the sea," said Richard Norland of ISPAS. "We conducted some initial tests in 2010 and the Norwegian oil company Statoil supported some of the development work until 2014. In 2014 the oil company Lundin Norway also supported the development."

To evaluate the OSD in simulated marine environment using oil, ISPAS came to Ohmsett in November 2015 with the goal of determining the radar's ability to distinguish between oil types and to measure the oil's thickness in various sea states.

With the radar mounted to the main bridge and the antenna secured to the handrails above the surface of the tank, the ISPAS team calibrated the antenna by measuring sinusoidal waves created by the Ohmsett wave generator.

Once the antenna was calibrated, an oil slick was created on the water's surface to start a series of tests. Over 50 tests were conducted where the system was evaluated while varying the test parameters such as oil viscosity, wave spectrum, sensor distance from the oil slick, and antenna location.

"We were able to obtain good measurements. We are very happy with both the results and the staff at the Ohmsett facility that helped us in every way possible during the tests," Norland commented.

The ISPAS Oil Spill Detection (OSD) radar was evaluated at Ohmsett. Mounted to the main bridge, the radar was tested for its ability to detect an oil spill in calm water and waves.

To schedule a testing or training event call 732-866-7183

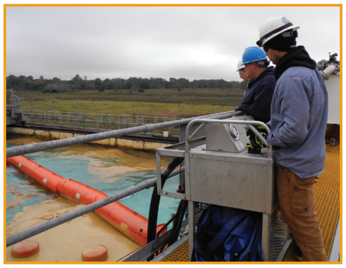
Oil Spill Response Strategies & Tactics Training

August 29-31, 2016

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)
- National Incident Management System (NIMS)
- Current guidance on in situ burning
- Responder Safety
- Hands-on skimmer operations
- And More!



When:
August 29-31, 2016
8:00 a.m. - 5:00 p.m.

Where:
Ohmsett
Leonardo, NJ USA

Register Today!
www.ohmsett.com

Phone: 732-866-7286

Ohmsett

News Briefs

Delia Appointed Program Manager for Ohmsett

MAR (MD) LLC has named John Delia the Program manager for Ohmsett, succeeding Bill Schmidt who retired in December 2015. Delia was most recently with BAE Systems where he served as a Program Manager responsible for the production and development of systems as well as the logistics for the Low Probability of Altimeter (LPIA), Common Data Link (CDL) and F-22 product lines within the Electronic Systems group.

Prior to working at BAE systems he served as a Senior Engineer with Northrop Grumman supporting the Defense Metrological Satellite Program (DMSP) where he performed extensive data analysis and operations of sensors on satellites. He developed specifications and programs for testing all operating modes of the sensors and collaborated with on-site customers to provide technical support for pre- launch and launch support of four satellite launches at Vandenberg AFB, California followed by early orbit support at Offutt AFB, Nebraska.

Delia has a Master's degree in Management from the Polytechnic University in Brooklyn, New York and a Bachelor's degree in Electrical Engineering with a minor in Mathematics from the City College of New York.

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3D at Depth R&D

3D at Depth LLC of Boulder, Colorado is dedicated to underwater imaging solutions using a patented technology. During the week of April 4, researchers from 3D at Depth came to Ohmsett to conduct a characterization study of their laser sensor, combined with a subsurface navigation unit, while in motion. A previous study at Ohmsett in 2013 focused on the static characterization of the sensor. "The Ohmsett facility and staff provided an excellent resource for our laser R & D efforts," said Brett Nickerson, Co-Founder and Director of 3D at Depth, LLC.

Opening of the New Ohmsett Warehouse

On May 12, 2016 the Bureau of Safety and Environmental Enforcement (BSEE) and the Ohmsett staff held a ribbon cutting ceremony for the opening of the new warehouse at Ohmsett. Building R-41 replaced the warehouse that was destroyed during Hurricane Sandy in October 2012. Pictured from left to right: Keith Van Dyke, Susan Cunneff, Caroline Laikin-Credno, Dave DeVitis, John Delia, Pete Reno, Paul Meyer, Dave Knapp, Lori Medley, and Mike Brennan.

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Ohmsett is managed by the Bureau of Safety and Environmental Enforcement (BSEE) through a contract with MAR (MD) LLC.

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